

# Twelfth Five Year Plan (2012–2017)

Faster, More Inclusive and  
Sustainable Growth

Volume I

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Volume I



सत्यमेव जयते

Planning Commission  
Government of India

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## Foreword



## Preface





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## Acronyms

|            |   |          |  |
|------------|---|----------|--|
| AAGR       | Average Annual Growth Rate  | BARC     | Bhabha Atomic Research Centre                          |
| AAI        | Airport Authority of India  | BC Ratio | Benefit-Cost Ratio                                     |
| AAS        | Agromet Advisory Services   | BCM      | Billion Cubic Metre                                    |
| ACA        | Additional Central Assistance   | BCR      | Balance from Current Revenues                          |
| AcSIR      | Academy of Scientific and Innovative Research   | BE       | Budget Estimates                                       |
| ACTREC-TMC | Advanced Centre for Treatment, Research and Education in Cancer at Tata Memorial Centre         | BEL      | Bharat Electronics Limited                             |
| ACWADAM    | Advanced Centre for Water Resources Development and Management                                  | BIMARU   | Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh     |
| ADB        | Asian Development Bank  | BIPP     | Biotechnology Industry Partnership Programme           |
| AHWR       | Advanced Heavy Water Reactor  | BIRAC    | Biotechnology Industry Research Assistance Council     |
| AIBP       | Accelerated Irrigation Benefit Programme  | BIRD     | Building Industrial R&D and Common Research Facilities |
| AIIMS      | All India Institute for Medical Sciences  | BOD      | Biological Oxygen Demand                               |
| ALICE      | A Large Ion Collider Experiment   | BRAI     | Biotechnology Regulatory Authority of India            |
| ALTM       | Airborne Laser Terrain Mapper   | BRGF     | Backward Regions Grant Fund                            |
| AMA        | Aquifer Management Association  | BRNS     | Board of Research in Nuclear Sciences                  |
| AMIs       | Airport Meteorological Instruments  | CA       | Cascade Associations/Central Assistance                |
| ANUSAT     | Anna University Satellite   | CAT      | Centre for Atmospheric Technology                      |
| APFAMGS    | Andhra Pradesh Farmers Managed Groundwater System   | CBS      | Core Banking Solutions                                 |
| APPRC      | Action Plan for Preparation of Regulations, CBRs (Conduct of Business Regulations) and Criteria | CCCR     | Centre for Climate Change Research                     |
| ARGs       | Automatic Rain Gauges   | CCI      | Cabinet Committee on Infrastructure                    |
| ATTF       | AHWR Thermal Hydraulics Test Facility   | CDMA     | Code Division Multiple Access                          |
| AWSs       | Automatic Weather Stations  | CEL      | Central Electronics Ltd                                |
| AYUSH      | Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy                                     | CERN     | European Organization for Nuclear Research             |
| BADP       | Border Area Development Programme   | CHTR     | Compact High Temperature Reactor                       |
|            |   | CICC     | Cable-In-Conduit-Conductor                             |
|            |   | CICs     | Cluster Innovation Centres                             |

|             |  |       |   |
|-------------|--|-------|---|
| CKMNT       | Centre for Knowledge Management of Nano Science and Technology         | ESSO  | Earth System Science Organisation               |
| CMIE        | Centre for Monitoring of Indian Economy                                | EWS   | Economically Weaker Section                     |
| CMS         | Compact Muon Solenoid  | FAIR  | Facility for Anti-proton and Ion Research       |
| CPSE        | Central Public Sector Enterprises                                      | FBR   | Fast Breeder Reactor                            |
| CPSMS       | Central Plan Schemes Monitoring System                                 | FC    | Finance Commission                              |
| CSIR        | Council of Scientific and Industrial Research                          | FIST  | Fund for Improvement of S&T Infrastructure      |
| CSIR-CSMCRI | Central Salt and Marine Chemicals Research Institute                   | FMTF  | Fuelling Machine Test Facility                  |
| CSR         | Corporate Social Responsibility  | FRBMA | Fiscal Responsibility and Budget Management Act |
| CSS         | Centrally Sponsored Scheme   | FTE   | Full-Time Equivalent                            |
| CSTRI       | Council for Science and Technology for Rural India                     | GBS   | Gross Budgetary Support                         |
| CURIE       | Consolidation of University Research, Innovation and Excellence        | GCNEP | Global Centre for Nuclear Energy Partnership    |
| CVD         | Chemical Vapour Deposition   | GDDP  | Gross District Domestic Product                 |
| CWG         | Common Wealth Games  | GDP   | Gross Domestic Product                          |
| DAE         | Department of Atomic Energy  | GISAT | Geo Imaging Satellite                           |
| DAE-SRC     | Department of Atomic Energy–Science Research Council                   | GLP   | Good Laboratory Practice                        |
| DBT         | Department of Biotechnology  | GM    | Genetic Modification/Genetically Modified       |
| DFCCIL      | Dedicated Freight Corridor Corporation of India Limited                | GMP   | Genetically Modified Products                   |
| DMS         | Disaster Management Support  | GNSS  | Global Navigation Satellite System              |
| DOCS        | Distributed Organic Chemical Synthesis                                 | GOI   | Government of India                             |
| DOS         | Department of Space  | GPS   | Global Positioning System                       |
| DRDO        | Defence Research and Development Organisation                          | GSDP  | Gross State Domestic Product                    |
| DSSCs       | Dye Sensitised Solar Cells   | GSI.V | Geosynchronous Satellite Launch Vehicle         |
| DST         | Department of Science & Technology                                     | GSO   | Geostationary Earth Orbit                       |
| DWRs        | Doppler Weather Radars   | GST   | Goods and Services Tax                          |
| EAPs        | External Aided Projects  | HADP  | Hill Areas Development Programme                |
| ECB         | External Commercial Borrowings   | HAGAR | High Altitude Gamma Ray                         |
| ECVs        | Essential Climate Variables  | HBNI  | Homi Bhabha National Institute                  |
| EEZ         | Exclusive Economic Zone  | HCR   | Head Count Ratio                                |
| EMPOWER     | Encouraging and Motivating Pursuit of World Class Exploratory Research | HDI   | Human Development Index                         |
| Eos         | Earth Observations   | HDN   | Hemolytic Disease of the New born               |
| EPO         | European Patent Office   | HDRs  | Human Development Reports                       |
|             |  | HFRR  | High Flux Research Reactor                      |
|             |  | HLEC  | High Level Expert Committee                     |
|             |  | HLNRA | High-Level Natural Background Radiation Areas   |
|             |  | HRD   | Human Resource Development                      |
|             |  | HUD   | Head Up Display                                 |



|            |  |         |  |
|------------|--|---------|--|
| IAP        | Integrated Action Plan   | JNCASR  | Jawaharlal Nehru Centre for Advanced Scientific Research |
| IARCI      | International Advanced Research Centre for Powder Metallurgy and New Materials | JNNURM  | Jawaharlal Nehru National Urban Renewal Mission          |
| ICAR       | Indian Council of Agricultural Research  | JNPT    | Jawaharlal Nehru Port Trust                              |
| ICMR       | Indian Council of Medical Research   | LCA     | Light Combat Aircraft                                    |
| ICTS       | International Centre for Theoretical Sciences                                  | LEHIPA  | Linear Proton Accelerator                                |
| IDFs       | Infrastructure Development Funds   | LHC     | Large Hadron Collider                                    |
| IEBR       | Internal & Extra Budgetary Resources   | LIGO    | Laser Interferometer Gravitational Wave Observatory      |
| IERMON     | Indian Environmental Radiation Monitoring Network                              | LTTD    | Low Temperature Thermal Desalination                     |
| IGCAR      | Indira Gandhi Centre for Atomic Research                                       | LWE     | Left Wing Extremism                                      |
| IGVdb      | Indian Genome Variation database   | LWR     | Light Water Reactor                                      |
| IICs       | Inter-Institutional Centres  | MCAs    | Model Concession Agreements                              |
| IIFCL      | India Infrastructure Finance Company Limited                                   | MCR     | Miscellaneous Capital Receipts                           |
| IIPDF      | India Infrastructure Project Development Fund                                  | MGNREGA | Mahatma Gandhi National Rural Employment Guarantee Act   |
| IIST       | Indian Institute of Space Science and Technology                               | MIS     | Micro Irrigation Systems                                 |
| IIT        | Indian Institute of Technology   | MMR     | Maternal Mortality Rate                                  |
| IMD        | India Meteorological Department  | MNCs    | Multinational Companies                                  |
| IMR        | Infant Mortality Rate  | MoES    | Ministry of Earth Sciences                               |
| India-WRIS | India-Water Resource Information System  | MoU     | Memorandum of Understanding                              |
| INGO       | Indian Geographical Organisation   | MOX     | Mixed oxide  |
| INO        | India-based Neutrino Observatory   | MPLADs  | Member of Parliament's Local Area Development Programme  |
| INSAT      | Indian National Satellite System   | NABL    | National Accreditation Board for Testing Laboratories    |
| IP         | Intellectual property  | NATMO   | National Atlas and Thematic Organisation                 |
| IRNSS      | Indian Regional Navigational Satellite System                                  | NCA     | Normal Central Assistance                                |
| IRS        | Indian Remote Sensing  | NCAD    | National Civil Aircraft Development                      |
| ISRO       | Indian Space Research Organisation   | NCS     | National Centre for Seismology                           |
| IT         | Income Tax   | NDEM    | National Database for Emergency Management               |
| ITER       | International Thermonuclear Experimental Reactor                               | NE      | North East   |
| ITIs       | Industrial Training Institutes   | NEC     | North Eastern Council                                    |
| IUCs       | Inter-University Centres   | NeGAP   | National e-Governance Assistance Programme               |
|            |  | NGIS    | National Geographic Information Systems                  |
|            |  | NGOs    | Non-Governmental Organisations                           |
|            |  | NHDP    | National Highway Development Projects                    |
|            |  | NIF     | National Innovation Foundation                           |

|        |  |        |  |
|--------|--|--------|--|
| NISER  | National Institute of Science Education Research                         | PMN    | Polymetallic Manganese Nodule                              |
| NLSRC  | National Life Sciences Resource Centre                                   | PPP    | Public–Private Partnership                                 |
| NMITLI | New Millennium Indian Technology Leadership Initiative                   | PPPAC  | Public–Private Partnership Appraisal Committee             |
| NNRMS  | National Natural Resources Management System                             | PRIs   | Panchayati Raj Institutions                                |
| NPRE   | Non Plan Revenue Expenditure   | PRISM  | Promoting Innovations in Individuals, Start-ups and MSMEs  |
| NRDMS  | Natural Resources Data Management System                                 | PSEs   | Public Sector Enterprises                                  |
| NSAP   | National Social Assistance Programme                                     | PSLV   | Polar Satellite Launch Vehicle                             |
| NSDI   | National Spatial Data Infrastructure                                     | PSUs   | Public Sector Undertakings                                 |
| NSDP   | Net State Domestic Product   | PURSE  | Promotion of University Research and Scientific Excellence |
| NSERB  | National Science and Engineering Research Board                          | R&D    | Research and Development                                   |
| NSS    | National Service Scheme  | R&R    | Resettlement & Rehabilitation                              |
| NUIS   | National Urban Information System  | RE     | Revised Estimates  |
| NWC    | National Water Commission  | RF     | Radio Frequency  |
| NWFL   | National Water Framework Law   | RISK   | Research Initiative to Scale New Knowledgebase             |
| NWM    | National Water Mission   | RKVVY  | Rashtriya Krishi Vikas Yojana                              |
| NWP    | National Water Policy/Numerical Weather Prediction                       | RLV    | Reusable launch vehicle                                    |
| NWR-IC | National Water Resources – Information Centre                            | RO     | Reverse Osmosis  |
| O&M    | Operation & Maintenance  | ROV    | Remotely Operated Vehicle                                  |
| OCM    | Ocean Colour Monitor   | RRCAT  | Raja Ramanna Centre for Advanced Technology                |
| ODS    | Oxide Dispersion Strengthened  | RRI    | Raman Research Institute                                   |
| OfWat  | Office of Water, Regulator   | RRR    | Repair, Renovation and Restoration                         |
| OOS    | Ocean Observation System   | RS     | Restricted Service   |
| OSDD   | Open Source Drug Discovery   | RSBY   | Rashtriya Swasthya Bima Yojana                             |
| PACE   | Patent Acquisition and Collaborative Research and Technology Development | RSDP   | Remote Sensing Data Policy                                 |
| PCI    | Per Capita Income  | RSVY   | Rashtriya Sam Vikas Yojana                                 |
| PCTs   | Patent Cooperation Treaties  | RTE    | Right to Education   |
| PET    | Potential Evapo-Transpiration  | S&T    | Science and Technology                                     |
| PFBR   | Prototype Fast Breeder Reactor   | SBIRI  | Small Business Innovative Research Initiative              |
| PFZs   | Potential Fishing Zones  | SC     | State Water Regulatory and Development Council             |
| PHWR   | Pressurised Heavy Water Reactor  | SCA    | Special Central Assistance                                 |
| PIM    | Participatory Irrigation Management                                      | SCI    | Science Citation Index                                     |
| PMGSY  | Pradhan Mantri Grameen Sadak Yojana                                      | SDP    | State Domestic Product                                     |
|        |  | SEZs   | Special economic zones                                     |
|        |  | SHGs   | Self Help Groups   |
|        |  | SIROs  | Scientific & Industrial Research Organisations             |
|        |  | SIS-DP | Space-based Information Support for Decentralised Planning |

|          |  |         |  |
|----------|--|---------|--|
| SIWEA    | State Independent Water Expert Authority                   | TRGs    | Tele-metred Automatic Rain Gauges                        |
| SKA      | Square Kilometre Array                                     | TTC     | Telemetry, Tracking and Command                          |
| SNP      | Satellite Navigation Programme                             | U-Excel | Unit for Excellence                                      |
| Sol      | Survey of India  | UGC-DAE | University Grants Commission-Department of Atomic Energy |
| SOTEF    | Solar Test Facility  | UK      | United Kingdom   |
| SPA      | Special Plan Assistance                                    | ULBs    | Urban Local Bodies                                       |
| SPS      | Standard Positioning Service                               | UMPPs   | Ultra Mega Power Projects                                |
| SPV      | Solar Photovoltaic   | UNDP    | United Nations Development Programme                     |
| SSA      | Sarva Shiksha Abhiyan                                      | USPTO   | United States Patent and Trademark Office                |
| ST       | Solar Thermal  | UTs     | Union Territories  |
| STI      | Technology and Innovation                                  | UVIT    | Ultraviolet Imaging Telescope                            |
| TBM      | Test blanket module  | VAT     | Value Added Tax  |
| TCC      | Trichy City Corporation                                    | VGF     | Viability Gap Funding                                    |
| TCIS     | TIFR Centre for Interdisciplinary Sciences                 | VOL     | Vinati Organics Limited                                  |
| TDB      | Technology Development Board                               | VP      | Vigyan Prasar  |
| TDDP     | Technology Development and Demonstration Programme         | VSAT    | Very Small Aperture Terminal                             |
| TDEM     | Time Domain Electromagnetic                                | WALMIs  | Water and Land Management Institutes                     |
| TECHVILS | Technology Enabled Villages                                | WASSAN  | Watershed Support Services and Activities Network        |
| TEM      | Transmission Electron Microscope                           | WAVE    | Women's Action for Village Empowerment                   |
| TePP     | Technopreneur Promotion Programme                          | WGDP    | Western Ghat Development Programme                       |
| THSTI    | Translational Health Science and Technology Institute      | WRIS    | Water Resources Information System                       |
| TIFAC    | Technology Information, Forecasting and Assessment Council | WUAs    | Water Users Associations                                 |
| TIFR     | Tata Institute of Fundamental Research                     | WUGs    | Water Users Groups                                       |
| TKDL     | Traditional Knowledge Digital Library                      | ZBB     | Zero based budgeting                                     |
| TMT      | Thirty Metre Telescope                                     |         |  |

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## Twelfth Plan: An Overview

### INTRODUCTION

1.1. India's 1.25 billion citizens have higher expectations about their future today, than they have ever had before. They have seen the economy grow much faster in the past 10 years than it did earlier, and deliver visible benefits to a large number of people. This has understandably raised the expectations of all sections, especially those who have benefited less. Our people are now much more aware of what is possible, and they will settle for no less. The Twelfth Five Year Plan must rise to the challenge of meeting these high expectations.

### The Initial Conditions

1.2. Though expectations have mounted, the circumstances in which the Twelfth Plan has commenced are less favourable than at the start of the Eleventh Plan in 2007–08. At that time, the economy was growing robustly, the macroeconomic balance was improving and global economic developments were supportive. The situation today is much more difficult. The global economy is going through what looks like a prolonged slowdown. The domestic economy has also run up against several internal constraints. Macro-economic imbalances have surfaced following the fiscal expansion undertaken after 2008 to give a fiscal stimulus to the economy. Inflationary pressures have built up. Major investment projects in energy and transport have slowed down because of a variety of implementation problems. Some changes in tax treatment in the 2012–13 have caused uncertainty among investors.

1.3. These developments have produced a reduction in the rate of investment, and a slowing down of economic growth to 6.2 per cent in 2011–12, which was the last year of the Eleventh Plan. The growth rate in the first half of 2012–13, which is the first year of the Twelfth Plan, is even lower. The downturn clearly requires urgent corrective action but it should not lead to unwarranted pessimism about the medium term. India's economic fundamentals have been improving in many dimensions, and this is reflected in the fact that despite the slowdown in 2011–12, the growth rate of the economy averaged 8 per cent in the Eleventh Plan period. This was lower than the Plan target of 9 per cent, but it was better than the achievement of 7.8 per cent in the Tenth Plan. The fact that this growth occurred in a period which saw two global crises, one in 2008 and another in 2011, is indicative of the resilience which the economy has developed.

### The Policy Challenge

1.4. The policy challenge in the Twelfth Plan is, therefore, two-fold. The immediate challenge is to reverse the observed deceleration in growth by reviving investment as quickly as possible. This calls for urgent action to tackle implementation constraints in infrastructure which are holding up large projects, combined with action to deal with tax related issues which have created uncertainty in the investment climate. From a longer term perspective, the Plan must put in place policies that can leverage the many strengths of the economy to bring it back to its

## 2 Twelfth Five Year Plan

real growth potential. This will take time but the aim should be to get back to 9 per cent growth by the end of the Twelfth Plan period.

1.5. The preparation of a Five Year Plan for the country is an opportunity to step back, take stock of the ‘big picture’, identify the strengths that can be leveraged to enable the country to move forward, and the constraints that could hold it back, and on this basis develop a strategic agenda. In developing such an agenda, the Planning Commission has relied on four key elements.

- First, the strategy must be firmly grounded in an understanding of the complexities of the development challenges that India faces, recognising the transformation that is taking place in the economy and in the world. This understanding of the ground reality must be used to identify the critical leverage points where government action could have the maximum impact. The focus must be on identifying the strategic leverage points where successful action could trigger many supportive reactions rather than fixing everything everywhere.
- Second, progress will be achieved through a combination of government action in both policies and public programmes, and the efforts of many private actors that are important in the economy. Much of the inclusive growth we hope to achieve depends on investment in the private sector which accounts for over 70 per cent of total investment. This includes not only the organised corporate sector, but also Micro, Small and Medium Enterprises (MSMEs), individual farmers and myriads of small businessmen who add to Gross Domestic Product (GDP) and create jobs. The dynamism of this segment, and its ability to seize economic opportunities, is critical for inclusive growth and the Plan must address the constraints faced by all these private actors in achieving better results.
- Third, the outlay on government programmes has to increase in many areas but this must be accompanied by improved implementation. For this, it is necessary to focus on capacity building and governance reforms, including system change that will increase accountability in the public sector. The Twelfth Plan must back this focus by

making specific allocations to improve the ability of government to work better.

- Finally, the planning process must serve as a way of getting different stakeholders to work together to achieve broad consensus on key issues. These stakeholders include (i) different levels of the government sector: Centre, States and Panchayati Raj Institutions (PRIs)/Urban Local Bodies (ULBs); (ii) the private sector, both big companies and small businesses, whose investments will drive our growth and (iii) citizens’ groups and the voluntary sector, who bring the key element of people’s participation and can greatly help improve the quality of government action.

1.6. The Planning Commission has consulted widely over the past two years with other Ministries, with State Governments, with experts and also with Civil Society Organisations (CSOs). As many as 900 CSOs have been consulted through workshops and other fora. Several expert groups were set up to advice on various aspects of the economy and their reports are important inputs. These include the High Level Expert Group (HLEG) on Health, the HLEG on Transport, the Expert Group on Infrastructure Financing, the Expert Group on the Low Carbon Economy, the Expert Group on Venture Capital and Angel Investors, and the Expert Group on Management of Public Enterprises.

1.7. This Chapter is not an executive summary. Rather it provides an overview of the basic rationale of the Plan and the key areas of intervention. The Chapter is organised as follows:

- Section 1.2 presents the basic vision and aspirations which drive the Plan and which are captured in the sub-title ‘Faster, sustainable and More Inclusive Growth’.
- Section 1.3 focuses on the development of capabilities—both human and institutional—to achieve the vision.
- Section 1.4 focuses on the challenge of managing our national resources rationally; a critical area for planning if we want growth to be sustainable.
- Section 1.5 deals with India’s engagement with the world in the Twelfth Plan and beyond.

- Section 1.6 presents a summary of some of the major policy initiatives that taken together would contribute a strategy for achieving faster, more inclusive and sustainable growth.

## VISION AND ASPIRATIONS

1.8. The broad vision and aspirations which the Twelfth Plan seeks to fulfil are reflected in the subtitle: 'Faster, Sustainable, and More Inclusive Growth'. The simultaneous achievement of each of these elements is critical for the success of the Plan.

### The Need for Faster Growth

1.9. Planners are sometimes criticised for focusing too much on GDP growth, when the real objective should be to achieve an improved quality of life of the people across both economic and non-economic dimensions. The Twelfth Plan fully recognises that the objective of development is broad-based improvement in the economic and social conditions of our people. However, rapid growth of GDP is an essential requirement for achieving this objective.

1.10. There are two reasons why GDP growth is important for the inclusiveness objective. First, rapid growth of GDP produces a larger expansion in total income and production which, if the growth process is sufficiently inclusive, will directly raise living standards of a large section of our people by providing them with employment and other income enhancing activities. Our focus should not be just on GDP growth itself, but on achieving a growth process that is as inclusive as possible. For example, rapid growth which involves faster growth in agriculture, and especially in rain-fed areas where most of the poor live, will be much more inclusive than a GDP growth that is driven entirely by mining or extraction of minerals for exports. Similarly, rapid growth which is based on faster growth for the manufacturing sector as a whole, including MSME, will generate a much broader spread of employment and income earning opportunities and is therefore more inclusive than a growth which is largely driven by extractive industries.

1.11. The second reason why rapid growth is important for inclusiveness is that it generates higher revenues, which help to finance critical programmes

of inclusiveness. There are many such programmes which either deliver benefits directly to the poor and the excluded groups, or increase their ability to access employment and income opportunities generated by the growth process. Examples of such programmes are the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), Sarva Siksha Abhiyan (SSA), Mid Day Meals (MDMs), Pradhan Mantri Gram Sadak Yojana (PMGSY), Integrated Child Development Services (ICDS), National Rural Health Mission (NRHM), and so on. This is also relevant for the sustainability objective since programmes aimed at making development more sustainable also involve additional costs.

### Growth Prospects

1.12. The Approach Paper to the Twelfth Plan, approved by the National Development Council (NDC) in 2011, had set a target of 9 per cent average growth of GDP over the Plan period. That was before the Eurozone crisis in that year triggered a sharp downturn in global economic prospects, and also before the extent of the slowdown in the domestic economy was known. A realistic assessment of the growth prospects of the economy in the Twelfth Plan period is given in Chapter 2. It concludes that the current slowdown in GDP growth can be reversed through strong corrective action, including especially an expansion in investment with a corresponding increase in savings to keep inflationary pressures under control. However, while our full growth potential remains around 9 per cent, acceleration to this level can only occur in a phased manner, especially since the global economy is expected to remain weak for the first half of the Plan period. Taking account of all these factors, the Twelfth Plan should work towards bringing GDP growth back to an inclusive 9 per cent in the last two years of the Plan, which will yield an average growth rate of about 8 per cent over the entire Plan period. The outcome is conditional on many policy actions as is described in scenario one.

1.13. Within the aggregate GDP growth target, two sub-targets are especially important for inclusiveness. These are a growth rate of 4 per cent for the agricultural sector over the Twelfth Plan period and around 10 per cent in the last two years of the Plan

## 4 Twelfth Five Year Plan

for the manufacturing sector. The policies needed to achieve these sectoral targets are summarised in Section 1.6.

1.14. The Twelfth Plan's strategy for growth depends crucially on productivity gains as one of the key drivers of growth. Productivity is the additional contribution to growth after taking account of the effect of capital accumulation and growth in labour. These traditional sources of growth are not likely to be enough for India in the coming years and we must therefore focus much more on productivity improvements among all constituents: big businesses, MSMEs, farmers and even government. This can be done by improving the business regulatory environment, strengthening the governance capacity of States, investing more in infrastructure rather than subsidies, and by using Science and Technology (S&T) to drive innovation.

### Alternative Scenarios

1.15. The projection of 8 per cent growth in the Twelfth Plan period should not be viewed as a 'business as usual' outcome that can be realised with relatively little effort. It is in fact a projection of what is possible if we take early steps to reverse the current slowdown and also take other policy actions needed to address other key constraints that will otherwise prevent the economy from returning to a higher growth path. Failure to act firmly on these policies will lead to lower growth and also poorer outcomes on inclusiveness.

1.16. To illustrate the consequences of inaction on key growth promoting policies, the Planning Commission has undertaken a systematic process of 'scenario planning' based on diverse views and disciplines to understand the interplay of the principal forces, internal and external, shaping India's progress. This analysis suggests three alternative scenarios of how India's economy might develop titled, 'Strong Inclusive Growth', 'Insufficient Action' and 'Policy Logjam'.

1.17. The first scenario 'Strong Inclusive Growth', describes the conditions that will emerge if a

well-designed strategy is implemented, intervening at the key leverage points in the system. This in effect is the scenario underpinning the Twelfth Plan growth projections of 8 per cent, starting from below 6 per cent in the first year to reach 9 per cent in the last two years. The second scenario 'Insufficient Action' describes the consequences of half hearted action in which the direction of policy is endorsed, but sufficient action is not taken. The growth in this scenario declines to around 6 per cent to 6.5 per cent. The third scenario 'Policy Logjam', projects the consequences of Policy Inaction persisting too long. The growth rate in this scenario can drift down to 5 per cent to 5.5 per cent.

1.18. The scenarios are discussed in greater detail in Chapter 2 and presented in another document complementing the Plan. Public discussion of these scenarios could help to generate a discourse going beyond the parameters of the Twelfth Five Year Plan and assist in building a national consensus about the policies that are necessary if India's future is to unfold as we want. It is important to emphasise that the scenarios are not presented an alternative option form which we can choose. In fact, the only scenario that will meet the aspiration of the people is scenario one. The other scenarios are only presented to illustrate the consequences of inaction.

1.19. Ours is a diverse society and also an argumentative one. We are suspicious when decisions that affect us are not taken transparently and we resent too much centralisation of decision-making. But we all believe in democracy, we respect the views of others and, although we may disagree, we admire and learn from those who work together to offer any vision of a better India. We need to do more to build a greater consensus around a common national goal.

1.20. The Twelfth Plan should aim at a growth process that preserves emphasis on inclusion and sustainability while minimising downside effects on growth. Plans are traditionally viewed as being about what governments should do, but that is a narrow view since most investment today is private, and much of that is corporate. The Twelfth Plan must provide a competitive environment in which the private sector, including the corporate sector but also



all Indians, both as individuals and in the collective, are able to reach their full potential. The objective must be to stimulate new entrepreneurship while enabling existing MSMEs, including in agriculture, to invest more and grow faster. For this, we need to meet their needs for infrastructure and for easier, cheaper and faster access to capital.

1.21. India is fortunate that it is richly endowed in entrepreneurial talent. At a rough estimate, the number of non-agricultural establishments in the country increases by about 8 million every 10 years. While many of these enterprises are very small, and reflect basic survival strategies, many are not. The past decade has shown the dynamism that is possible in this sector under the right circumstances. Many of the leading corporates today belonged to the MSME category at the turn of the century. In this context, the Twelfth Plan's overarching priority on developing human capital can, with the proper prioritisation of infrastructure and with innovative use of technology and finance, unleash a truly inclusive growth story.

1.22. This inclusive strategy involves a much greater role of the States, and closer coordination between the Centre and the States, than would be needed for a purely corporate-led growth strategy. This is because most of the policy measures and institutional support required for small and medium entrepreneur-led growth lie in the domain of State Governments and local bodies. The Centre's contributions would lie mainly in creating the appropriate macroeconomic framework, financial sector policies and national level infrastructure.

### The Meaning of Inclusiveness

1.23. Inclusiveness means many different things and each aspect of inclusiveness poses its own challenges for policy.

#### *Inclusiveness as Poverty Reduction*

1.24. Distributional concerns have traditionally been viewed as ensuring an adequate flow of benefits to the poor and the most marginalised. This must remain an important policy focus in the Twelfth Plan. It is

worth noting that the record in this dimension of inclusiveness is encouraging. The percentage of the population below the official poverty line has been falling but even as that happens, the numbers below the poverty line remain large. According to the latest official estimates of poverty based on the Tendulkar Committee poverty line, as many as 29.8 per cent of the population, that is, 350 million people were below the poverty line in 2009–10. Questions have been raised about the appropriateness of the Tendulkar poverty line which corresponds to a family consumption level of ₹3,900 per month in rural areas and ₹4,800 per month in urban areas (in both cases for a family of five). There is no doubt that the Tendulkar Committee poverty line represents a very low level of consumption and the scale of poverty even on this basis is substantial. An Expert committee under Dr. C. Rangarajan has been set up to review all issues related to the poverty line keeping in view international practices.

1.25. Chapter 2 reports on the progress made in reducing poverty over time. It is well established that the percentage of the population in poverty has been falling consistently but the rate of decline was too slow. The rate of decline in poverty in the period 2004–05 to 2009–10 was 1.5 percentage points per year, which is twice the rate of decline of 0.74 percentage points per year observed between 1993–94 and 2004–05. Normally, large sample surveys used for official estimates of poverty are conducted every five years, but because 2009–10 was a drought year, the National Sample Survey Office (NSSO) felt that it would tend to overstate poverty and it was therefore decided to advance the next large sample survey to 2011–12. The results of this survey will yield an official estimate of the extent of poverty in 2011–12, that is, the position at the end of the Eleventh Plan period, but this will be available only in mid-2013. However, preliminary results from the survey have been published and they suggest that the percentage of the population in poverty will decline significantly compared to 2009–10. According to some non-official estimates, the rate of decline in poverty between 2004–05 and 2011–12 will be close to 2 per cent per year, which was the Eleventh Plan target. If this turns

out to be the case, it can be claimed that the Eleventh Plan has indeed delivered on inclusiveness.

#### *Inclusiveness as Group Equality*

1.26. Inclusiveness is not just about bringing those below an official fixed poverty line to a level above it. It is also about a growth process which is seen to be 'fair' by different socio-economic groups that constitute our society. The poor are certainly one target group, but inclusiveness must also embrace the concern of other groups such as the Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Classes (OBCs), Minorities, the differently abled and other marginalised groups. Women can also be viewed as a disadvantaged group for this purpose. These distinct 'identity groups' are sometimes correlated with income slabs—the SCs and STs, for example, are in the lower income category—and all poverty alleviation strategies help them directly. Women on the other hand span the entire income spectrum, but there are gender-based issues of inclusiveness that are relevant all along the spectrum.

1.27. Inclusiveness from a group perspective obviously goes beyond a poverty reduction perspective and includes consideration of the status of the group as a whole relative to the general population. For example, narrowing the gap between the SCs or STs and the general population must be part of any reasonable definition of inclusiveness, and this is quite distinct from the concern with poverty, or inequality. For example, it is perfectly possible for anti-poverty strategies to be reducing income poverty among SCs and STs without reducing the income gap between these groups and the general population.

#### *Inclusiveness as Regional Balance*

1.28. Another aspect of inclusiveness relates to whether all States, and indeed all regions, are seen to benefit from the growth process. The regional dimension has grown in importance in recent years. On the positive side, as documented in Chapter 11, many of the erstwhile backward States have begun to show significant improvement in growth performance and the variation in growth rates across States

has narrowed. However, both the better performing and other States are increasingly concerned about their backward regions, or districts, which may not share the general improvement in living standards experienced elsewhere. Many of these districts have unique characteristics including high concentration of tribal population in forested areas, or Minorities in urban areas. Some districts are also affected by left wing extremism, making the task of development much more difficult.

1.29. In the Twelfth Plan, we must pay special attention to the scope for accelerating growth in the States that are lagging behind. This will require strengthening of States' own capacities to plan, to implement and to bring greater synergies within their own administration and with the Central Government. As a first step, the Planning Commission is working with its counterpart Planning Boards and Planning Departments in all State Governments to improve their capabilities. An important constraint on the growth of backward regions in the country is the poor state of infrastructure, especially road connectivity, schools and health facilities and the availability of electricity, all of which combine to hold back development. Improvement in infrastructure must therefore be an important component of any regionally inclusive development strategy.

#### *Inclusiveness and Inequality*

1.30. Inclusiveness also means greater attention to income inequality. The extent of inequality is measured by indices such as the Gini coefficient, which provide a measure of the inequality in the distribution on a whole, or by measures that focus on particular segments such as the ratio of consumption of the top 10 per cent or 20 per cent of the population to that of the bottom 10 per cent or 20 per cent of the population, or in terms of rural-urban, such as the ratio of mean consumption in urban *versus* rural areas. An aspect of inequality that has come sharply into focus in industrialised countries, in the wake of the financial crisis, is the problem of extreme concentration of income at the very top, that is, the top 1 per cent and this concern is also reflected in the public debate in India.

1.31. Perfect equality is not found anywhere and there are many reasons why it may not even be a feasible objective. However, there can be no two opinions on the fact that inequality must be kept within tolerable limits. Some increase in inequality in a developing country during a period of rapid growth and transformation may be unavoidable and it may even be tolerated if it is accompanied by sufficiently rapid improvement in the living standards of the poor. However, an increase in inequality with little or no improvement in the living standards of the poor is a recipe for social tensions. Static measures of inequality do not capture the phenomenon of equality of opportunity which needs special attention. Any given level of inequality of outcomes is much more socially acceptable if it results from a system which provides greater equality of opportunity. As a society, we therefore need to move as rapidly as possible to the ideal of giving every child in India a fair opportunity in life, which means assuring every child access to good health and quality education. While this may not be possible to achieve in one Plan period, the Twelfth Plan should aim at making substantial progress in this dimension.

#### *Inclusiveness as Empowerment*

1.32. Finally, inclusiveness is not just about ensuring a broad-based flow of benefits or economic opportunities, it is also about empowerment and participation. It is a measure of the success we have achieved in building a participatory democracy that people are no longer prepared to be passive recipients of benefits doled out by the Government. They are slowly beginning to demand these benefits and opportunities as rights and they also want a say in how they are administered. This brings to the fore issues of governance, accountability and peoples participation to much greater extent than before. This also covers areas like access to information about government schemes, knowledge of the relevant laws and how to access justice. The growing concern with governance has also focused attention on corruption. How to tackle corruption is now at the centre stage of policy debates.

#### *Inclusiveness through Employment Programmes*

1.33. One of the most important interventions for fostering inclusion during Eleventh Plan was the

MGNREGA. While its achievements in ameliorating poverty and preventing acute distress during times of drought have been recorded and appreciated, there are also some complaints against MGNREGA, primarily on the grounds that it is a dole, involving huge expenditures that could have been spent more productively. There are also complaints that it is leading to increase in wages of agricultural labour and construction workers.

1.34. The view that rising wages by themselves represent a problem is not credible since this is the only mechanism through which landless agricultural labour can benefit from economic growth. If rising wages squeeze farm profitability, the solution lies in raising farm productivity to accommodate higher wages. Several initiatives in this regard are discussed in Chapter 8. In any case, rural labour relations in large parts of the country continue to be feudal, and use of migrant labour for both agriculture and construction continues to be exploitative. These inequities would not get corrected by themselves. We should not be looking to perpetuate a situation where low-cost labour provides the necessary profit margins for farmers, removing incentives to invest in efficiency improvement.

1.35. The main point to note is that employment schemes are not new in India, and they have a well-established poverty reducing impact. With National Sample Survey showing an eightfold increase in employment in public works after MGNREGA, there is no doubt that its impact on rural wage earnings and poverty has been much larger than all previous rural employment schemes. What is less appreciated is that this has been achieved with a rather modest increase in the share spent on rural employment schemes out of total Central Plan expenditures. It has increased from an average of 11.8 per cent in the three years before MGNREGA (2002–03 to 2004–05) to 13.3 per cent in the last three (2009–10 to 2011–12). This means that although MGNREGA is not free of leakages, these have declined considerably. Thus, far from opening a bottomless pit as some critics still claim, the provision of employment as a legal right, has greatly improved the share of intended beneficiaries in what government spends for development of rural areas.

1.36. There is also evidence that wherever land productivity has improved and greater water security been delivered, small and marginal farmers working in MGNREGA sites have reverted back to farming and allied livelihoods. There is also evidence that MGNREGA is enabling crop diversification, particularly into horticulture, wherever it has adequately converged with schemes of Agricultural Departments. An important lesson from this experience is that it is the quality of assets created, which will determine whether MGNREGA can go beyond the safety net to become a springboard for entrepreneurship, even at the lowest income levels.

1.37. Each of the dimensions of inclusiveness discussed above is relevant, and public attention often focuses on one or the other at different times. We should aim at achieving steady progress in each of these dimensions. Accelerated growth in recent years has yielded distinct benefits to many and the prosperity which this has generated is visible to all, raising the expectations of all sections of the population, and creating a demand for a fair share of the benefits of growth. Policymaking has to be watchful of developments in each dimension of fairness and be quick to take corrective steps as soon as the need arises. Box 1.1 provides an assessment of trends in some key

### Box 1.1 Eleventh Plan Achievements on Inclusive Growth

The following are some important indicators showing the extent to which the Eleventh Plan succeeded in fulfilling the objective of inclusive growth. (In some cases, where the data relate to the NSSO surveys, the time period for comparison is before and after 2004–05.)

- GDP growth in the Eleventh Plan 2007–08 to 2011–12 was 8 per cent compared with 7.6 per cent in the Tenth Plan (2002–03 to 2006–07) and only 5.7 per cent in the Ninth Plan (1997–98 to 2001–02). The growth rate of 7.9 per cent in the Eleventh Plan period is one of the highest of any country in that period which saw two global crises.
- Agricultural GDP growth accelerated in the Eleventh Plan, to an average rate of 3.7 per cent, compared with 2.4 per cent in the Tenth Plan, and 2.5 per cent in the Ninth Plan.
- The percentage of the population below the poverty line declined at the rate of 1.5 percentage points (ppt) per year in the period 2004–05 to 2009–10, twice the rate at which it declined in the previous period 1993–94 to 2004–05. (When the data for the latest NSSO survey for 2011–12 become available, it is likely that the rate of decline may be close to 2 ppt per year.)
- The rate of growth of real consumption per capita in rural areas in the period 2004–05 to 2011–12 was 3.4 per cent per year which was four times the rate in the previous period 1993–94 to 2004–05.
- The rate of unemployment declined from 8.2 per cent in 2004–05 to 6.6 per cent in 2009–10 reversing the trend observed in the earlier period when it had actually increased from 6.1 per cent in 1993–94 to 8.2 per cent in 2004–05.
- Rural real wages increased 6.8 per cent per year in the Eleventh Plan (2007–08 to 2011–12) compared to an average 1.1 per cent per year in the previous decade, led largely by the government's rural policies and initiatives.
- Complete immunization rate increased by 2.1 ppt per year between 2002–04 and 2007–08, compared to a 1.7 ppt fall per year between 1998–99 and 2002–04. Similarly, institutional deliveries increased by 1.6 ppt per year between 2002–04 and 2007–08 higher than the 1.3 ppt increase per year between 1998–99 and 2002–04.
- Net enrolment rate at the primary level rose to a near universal 98.3 per cent in 2009–10. Dropout rate (classes I–VIII) also showed improvements, falling 1.7 ppt per year between 2003–04 and 2009–10, which was twice the 0.8 ppt fall between 1998–99 and 2003–04.

### Box 1.2 Prime Minister Dr Manmohan Singh at the 57th NDC

“Gender inequality is an aspect which deserves special attention. Women and girls represent half the population and our society has not been fair to this half. Their socio-economic status is improving, but gaps persist. The emergence of women in public spaces, which is an absolutely essential part of social emancipation, is accompanied by growing threats to their security.”

Prime Minister Dr Manmohan Singh in his opening remarks at the 57th National Development Council (NDC) meeting on 27th December 2012.

variables which point to the greater inclusiveness of growth in recent years.

1.38. Ending of gender based inequities, discrimination and all forms of violence against girls and women is being accorded overriding priority in the Twelfth Plan. This is fundamental to enabling women to participate fully in development processes and in fulfilling their social, economic, civil and political rights, for more inclusive growth.

### Environmental Sustainability

1.39. While striving for faster and more inclusive growth, the Twelfth Plan must also pay attention to the problem of sustainability. No development process can afford to neglect the environmental consequences of economic activity, or allow unsustainable depletion and deterioration of natural resources. Unfortunately, the experience of development in many countries, and our own past experience in some respects, suggests that this can easily happen unless appropriate corrective steps are taken at early stages. The Twelfth Plan must devise a strategy of development which effectively reconciles the objective of development with the objective of protecting the environment.

1.40. Development cannot take place without additional energy and the energy requirement of development will have to be reconciled with the objective of protection of environment. The economy depends heavily on coal and hydro power to meet its energy needs and the development of each of these energy sources involves potential trade-offs with conservation of forests and the objective of avoiding displacement of people. We need to manage these conflicting objectives more efficiently, with adequate compensation for those dispossessed and appropriate remedial steps to correct for loss of forest cover where this is unavoidable. Nuclear energy is another important energy source for the country, and has the greatest potential over the next 20 years, of providing a substitute for coal-based electricity. However, here too environmental and safety issues have arisen, especially after the Fukushima accident. These concerns are being addressed.

1.41. The achievement of environmental sustainability will impact the life of communities in several

dimensions. It will require the need development of new energy efficient practices in urban housing and transport to contain the growth in the demand for energy. It would mean use of far more energy efficient technologies in coal-based electricity generation such as the introduction of super critical and ultra super critical boilers. It would require active promotion of energy efficiency in industries, farms and offices, and the promotion of more energy efficient appliances through policies of branding and mandatory standards. Transport policies and related technologies for more energy efficient vehicles will need to be developed and adopted.

1.42. The issue of sustainability also has a global dimension because of the threat of climate change caused by the accumulation of carbon dioxide and other Greenhouse Gases (GHG) in the atmosphere due to human activity. Since GHG emission in any country accelerates the process of global warming, this is obviously an area where a global cooperative solution is needed. No country will have sufficient incentive to contain its own emissions unless it is part of a global compact. Such a compact in turn is possible only if there is a fair distribution of the burden. Developing countries have consistently argued that since it is the industrialised countries that have historically contributed the bulk of the accumulated stock of GHG, and are also the most able to pay, they must bear burden of global mitigation and adjustment. India is participating in the ongoing international negotiations under the UN Framework Convention on Climate Change, but progress thus far has been minimal.

1.43. We cannot, however, abstain from taking action to deal with climate change until an international solution is found. It is known that India will be one of the countries most severely affected if global warming proceeds unchecked and as such appropriate domestic action is necessary. A National Action Plan for climate change has been evolved with eight component Missions. Implementation of these missions must be an integral part of the Twelfth Plan. Policies should be closely monitored to ensure that we achieve the stated objective of reducing the emissions intensity of our GDP by 20 per cent to 25 per cent between 2005 and 2020.

1.44. Resolving the conflict between energy and the environment is not without cost. It involves additional upfront costs both of mitigating the adverse impact on the environment and of switching to more expensive renewable energy sources. These costs must be built into the cost and the pricing of the energy produced. The reluctance to bear these costs arises largely because the cost of environmental damage is not properly measured. It is only when this is done that the cost of avoiding such damage can be compared with the environmental benefits to reach a rational decision on whether the costs are worth it. Part of the problem is that the conventional ways of measuring GDP in terms of production do not take account of environmental damage caused by production of certain goods which should properly be reflected as a subtraction from GDP. Only if GDP is adjusted in this way for environmental costs that growth of adjusted GDP can be called a measure of the increase in total production in the economy. Recognising this problem, the Planning Commission has commissioned an Expert Group under Professor Partha Dasgupta to prepare a template for estimating green national accounts which would measure national production while allowing for negative effects on national resources.

1.45. To summarise, the Twelfth Plan must be guided by a vision of India moving forward in a way that would ensure a broad-based improvement in living standards of all sections of the people through a growth process which is faster than in the past, more inclusive and also more environmentally sustainable. What is needed to achieve this objective is outlined in subsequent sections of this chapter.

### DEVELOPING CAPABILITIES

1.46. In this section, we focus on the capabilities we need to develop to achieve the objective of faster, more inclusive and sustainable growth. We first consider the development of human capabilities, which are in many ways the most important. Then we focus on institutional capabilities and the development of infrastructure which is a general capability enhancer for all agents. Both the Central and State Governments have a large role to play in developing these capabilities and the Twelfth Plan at the Central

and State level should accord high importance to this effort.

### Development of Human Capabilities

1.47. The development of human capabilities must be the first priority, for three reasons. First, these capabilities are actually ends in themselves. Second, they are also important instrumentalities which interact positively with others to raise the productive capacity of our economy and therefore its ability to satisfy the material needs of our population. Third, proper development of human capabilities will also ensure that our growth is more inclusive in the sense that the marginalised and disadvantaged sections of our society will be more able to access the opportunities thrown up by the growth process.

### Life and Longevity

1.48. The most fundamental of all human capabilities is life itself and the steady rise in life expectation in the country suggests that significant progress has been made in this dimension. Life expectancy which was only 32 years at the time of Independence is now 67 years. In other words, every Indian can expect to live twice as long as was the case at Independence! Nevertheless, the level of life expectancy in India remains lower than in many emerging market economies and it is appropriate to plan for significant further improvements in this important dimension.

1.49. The infant mortality rate (IMR) is another dimension of human capability where we are making progress. IMR fell from 80 in 1991 to 66 in 2001 and at a faster rate thereafter to 47 in 2010. The rate of decline was 14 in the first period and 19 in the second period. Nevertheless, the level of IMR remains high and we need to do much better for our children. We must strive to bring the IMR down to 28 by the end of the Twelfth Plan. Maternal mortality rates (MMRs) are another indication of weakness in our performance. MMR has been falling over time, thanks to the initiatives for promoting institutional deliveries under the NRHM. The percentage of women giving birth in institutions with the benefit of skilled birth attendants has increased from 53 per cent in 2005 to 73 per cent in 2009. We need to do even better, and the Twelfth Plan must bring MMR down to 1 per 1,000 by the end of the Plan period.

1.50. While there has been progress in the dimensions discussed above, the decline in the child sex ratio rings an urgent alarm. This is an area of grave concern since it implies that society is denying life to female children, and increasingly resorting to female foeticide. The spread of diagnostic and medical facilities has paradoxically actually worsened the situation, as the falling child sex rate is being seen in the more developed areas and cities.

### *Education*

1.51. India has a young population, and consequently, the labour force, which is expected to decline in most developed countries and even in China, is expected to increase over the next 20 years. This 'demographic dividend' can add to our growth potential through its impact on the supply of labour and also, via the falling dependency ratio, on the rate of domestic savings. Besides, a young population brings with it the aspirations and the impatience of youth, which in turn can become strong drivers for bringing about change and innovation. To reap this demographic dividend we must ensure that our younger citizens come into the labour force with higher levels of education and the skills needed to support rapid growth. The SSA has brought us close to the target of universalisation of primary education and the Right to Education Act (RTE) 2009 makes eight years of elementary education a fundamental right for all the children. The MDM Scheme has ensured that retention in schools has improved greatly. However, the learning outcomes for a majority of children continue to be disappointing. Addressing the quality issue in our schools is critical for the effective development of human capabilities and for achieving the objective of equality of opportunities. The quality of teachers and, even more important, their motivation and accountability will need to be improved. Many of the children who are presently in school are first-generation learners, and these children need supplementary instruction. This is not easy due to shortage of qualified teachers in many schools across the country. New and innovative approaches such as multigrade learning, which has been successfully tried in Tamil Nadu, could be adopted in such cases.

1.52. The success of the SSA has put pressure on expanding the capacity of secondary schools and

the Rashtriya Madhyamik Shiksha Abhiyan (RMSA) addresses this issue. Although there is considerable focus on providing secondary school access, the dropout rates between elementary and secondary schools continue to be high, and between the secondary and post-secondary stage they are even higher. This is a particularly serious problem for girls, who have to travel longer distances to attend secondary schools. Curricular and examination reforms in secondary schooling would receive special attention aimed at fostering critical thinking and analytical skills, and preparing students for further education. All this requires innovative approaches, some of which are already in evidence in certain States.

1.53. The last decade has also seen a huge increase in the demand for higher education and this is expected to increase further as more children complete school and more and more jobs are seen to require higher-level qualifications. However, our higher education institutions also suffer from problems of quality. Too many of our universities are producing graduates in subjects that are not required by the changing job market, and the quality is also not what it should be. Higher education policy has to be driven by three 'E's: expansion, equity and excellence. Of these, the third E, 'excellence', is the most difficult to achieve. India cannot hope to be competitive in an increasingly knowledge driven world if our higher education institutions do not come up to the high standards of excellence needed to be able to be globally competitive. Not even one Indian university figures in the latest list of the top 200 universities in the world. We should work towards ensuring that there are at least five by the end of the Twelfth Plan. For this, universities at the top of the quality hierarchy should be identified and generously supported so that they can reach the top league. Centres of excellence within existing universities should be created. A special initiative should be launched to attract high calibre faculty from around the world on non-permanent teaching assignments. All these initiatives should be pooled into an India Excellence Initiative in the Twelfth Plan.

### *Skill Development*

1.54. The Skill Development Mission has been launched to skill at least 50 million individuals by the end of the Twelfth Plan. Skill development

programmes in the past have been run mainly by the government, with insufficient connection with market demand. To ensure that skills match demand, special efforts are needed to ensure that employers and enterprises play an integral role in the conception and implementation of vocational training programmes, including managing Industrial Training Institutes (ITIs) and in the development of faculty. An enabling framework is needed that would attract private investment in Vocational Training through Public–Private Partnership (PPP). We should try to optimise on the respective strengths of the public and private sector entities engaged in skill development. Mobilising the required investments, setting up first rate ITIs, ensuring efficiency in operations and management and enabling post-training employment will be the primary responsibilities of private sector entities while the government will provide the enabling framework and the requisite financial support especially in respect of SC, ST, Minorities and differently abled persons and other deprived sections of society.

#### *Nutrition*

1.55. Poor learning outcomes in our schools are partly because of poor quality of teaching but they are also partly due to high incidence of child malnutrition, which reduces learning ability. India has had the largest and the longest running child development programme in the world in the form of ICDS, but the problem of malnutrition remains large. Unfortunately, the latest data on child malnutrition are from the National Family Health Survey (NFHS-3) conducted in the period 2005–07 which pre-dates the Eleventh Plan. The full impact of the Eleventh Plan programmes on this aspect of human capability is therefore not yet known. Surveys undertaken by the State Governments seem to suggest that malnutrition has fallen in many States. The next Annual Health Survey for 2012–13 will include data on malnutrition and these data will provide a reliable basis for assessing what has happened since NFHS-3. Meanwhile, the ICDS programme will be expanded and comprehensively restructured in the Twelfth Plan to make it more effective.

1.56. Malnutrition is also a problem among adults, especially women. The incidence of anaemia and low

body mass among women is very high in the country. The causes of this persistent malnutrition are not well understood. The availability of food, especially better quality food products such as fruits, vegetables and dairy products, is significantly better today than it was in the past. Nevertheless, the incidence of malnutrition remains high. There is a need to bring this dimension of human capability to the fore front of policy attention. The Food Security Bill under consideration will address some of these issues, but the problem of nutrition is actually much more complex and a multidimensional approach is necessary.

#### *Health*

1.57. Health is another critical dimension of human capability, which needs much greater attention in the Twelfth Plan. At present, less than 30 per cent of outpatient and less than half of inpatient health care capacity of the country is in the public sector, and the majority of the population relies on private health care provision which often imposes a heavy financial burden. It is, therefore, essential to expand public sector capacity in health care especially in the rural areas. The NRHM, launched during the Tenth Plan, made an important start in expanding health care facilities in rural areas. While additional infrastructure has been created, there are large shortages of personnel, especially specialists in rural health facilities, reflecting the fact that trained human resources in health are in short supply and it takes many years to set up new medical colleges to train the required number of doctors.

1.58. Ideally, the public health care system must be expanded to address the health needs of the vast majority of citizens, recognising that upper-income groups may opt for private health care. The Twelfth Plan will therefore see the transformation of the NRHM into a National Health Mission, covering both rural and urban areas. Unlike rural residents, those in urban areas have access to private health care providers, but private health care is costly and large numbers of urban residents especially slum dwellers cannot afford it. An important component of the National Health Mission will be the Urban Health Initiative for the Poor, providing public sector primary care facilities in selected low-income



urban areas. This will require additional resources in the public sector from the budgets of both the Centre and the States, and cities.

1.59. There is a massive shortage of healthcare professionals in the country and their supply must therefore be expanded rapidly if we want to fulfil our commitments in this sector. We must therefore plan for an expansion of teaching and training programmes for healthcare professionals, particularly in the public sector institutions.

1.60. Finally, attainment of good health outcomes is not just a matter of providing curative care. We need to give much greater attention to public health which has traditionally suffered from neglect. We also need to focus much more on a provision of clean drinking water and sanitation, which can make a major contribution to improved health. This was the experience in industrialised countries over a hundred years ago, and this is also true for us today.

1.61. The longer-term objective of Health Policy must be the provision of Universal Health Care (UHC), whereby any one who wants it is assured of access to a well defined set of health care entitlements. Putting a UHC system in place will take time, but we need to start building an appropriate architecture.

#### *Drinking Water and Sanitation*

1.62. The problem of providing safe drinking water is particularly acute in the rural areas. Successive plans have emphasised programmes for expanding the coverage of rural drinking water but they have not had as much success, as desired. The incidence of 'slipped back' habitations appears to be accelerating and serious problems of water quality have emerged in many areas. Part of the problem is that rural drinking water schemes are not fully integrated with national system of aquifer management. Excessive drawal of groundwater for irrigation is leading to lowering of water tables causing drinking water hand pumps to run dry and lowering of the water table is also causing salinity and chemical pollution, making the water non-potable. A sustainable solution to the

rural drinking water problem has to be found as part of a holistic approach for aquifer management.

1.63. Sanitation and clean drinking water are critical determinants of health and are complementary to each other. Without proper sanitation, the incidence of diarrhoeal diseases due to contaminated drinking water will not come down, and without adequate water supply, improved sanitation is generally not possible. It is, therefore, necessary to adopt a habitation approach to sanitation and to institutionalise the integration of water supply with sanitation in each habitation. The problem of sanitation in urban areas is also very serious since almost all our cities, including even the State capitals and major metros, have a large percentage of the population (45 per cent in Delhi) not connected to the sewer system. Urban development must give top priority to planning for water, toilets and sewerage as an integrated whole taking into account the likely expansion of the urban population.

#### *Enhancing Human Capabilities through Information Technology*

1.64. The ability to access information is an important institutional capability we need to develop. Lack of ready access information is often a major impediment in efforts to improve the well-being of the people. With improvement in literacy and education, and developments in information technology, we are in a position to provide our people with access to information, including obtaining birth records, land records, payment records for utilities and so on.

1.65. The rapid spread of mobile telephony, including in rural areas has facilitated innumerable innovations which directly benefit the ordinary citizen. Farmers in some parts of the country are able to subscribe to commercial services which deliver relevant information for a particular crop to the farmer through Short Message Service (SMS). The parents of babies born in municipal hospitals in Bengaluru get an SMS alert, when the next vaccination is due. Such innovations need to be encouraged. Yet another human capability that is important is the ease and effectiveness of establishing identity. The

Aadhar project, which provides a unique identification (UID) number, backed by biometric data capture, to establish identity unambiguously, is a major step forward. Identity can be difficult to establish, especially for the poor, when they move from their place of origin, whether by choice or by compulsion. The UID project has already enrolled 200 million persons. Experiments with using Aadhar to make payments under MGNREGS electronically into no frill bank accounts which can be accessed through mobile phones have begun in 51 districts. It will soon be possible for large-scale use of the Aadhar platform to make various types of government payments due to individuals in a seamless manner electronically, avoiding problems of misuse and leakage.

1.66. The Aadhar platform will also facilitate a shift from the physical delivery of subsidised commodities through the Public Distribution System (PDS) to a system of cash payment, if desired. Some States have indicated that they would be interested in such a shift. Adoption of a target to move the major subsidies and beneficiary payments to a cash basis linked to Aadhar by the end of the Twelfth Plan period would be a major step towards improving efficiency.

#### Development of Institutional Capabilities

1.67. The Twelfth Plan also needs to focus on developing the capabilities of our institutions to perform the increasingly complex and demanding tasks expected of them. We have three pillars of governance (Legislature, Executive and Judiciary) and three tiers of government (Centre, State and Panchayats/ULBs). The capabilities of these institutions to deliver on their mandate need to be greatly improved. The gaps are most evident at the lowest level of PRIs and ULBs, where trained personnel are lacking and the training systems are also inadequate. It is also true at higher levels, where trained personnel may be available, but the capability of the systems is poor because they are not performance oriented and motivation is low.

#### Implementation Capability

1.68. The consultations undertaken by the Planning Commission in the course of preparing the

Twelfth Plan have revealed a near universal perception that the capacity to implement is low at all levels of government. The government simply does not function with the efficiency that is required in the twenty-first century. This is partly because of the lack of motivation at various levels, but it is primarily because governmental systems and procedures are largely process-driven. They are not outcome-oriented. Accountability is often viewed as adhering to procedures with no incentive to depart from procedures to secure better results. Unless this weakness is overcome, mere provision of more funds for programmes implemented in the same old way will not help.

1.69. Where implementation rests within one Ministry, there are problems of (i) insufficient attention to evidence-based analysis in the design of policies and programmes, (ii) insufficient concurrent evaluation that would give feedback on outcomes achieved and (iii) lack of willingness or ability to bring about systemic changes needed to improve outcomes. Even when it is known that a change in procedures will help, it takes very long to bring about that change. The problem is greatly multiplied when the effectiveness of a programme depends, as it often does, on actions that have to be taken by several different Ministries. Inter-ministerial consultations take far too long, and more importantly, are typically not oriented to resolving problems. This is because each Ministry works in a silo, applying its own rules and procedures. The effort is to seek a consensus if possible, with little ability to over rule positions taken by individual Ministries in the interest of a holistic problem solving approach. Resolving conflicting stands by consensus is of course desirable if possible, but beyond a point, it may not be possible, and some systems for conflict resolution are needed.

1.70. To deal effectively with these problems it may be necessary to redesign governmental decision-making systems. There has been a great deal of system redesign in the private sector in response to the new environment created by economic reforms. A similar redesign of government is needed. For example, one way of accelerating the processing of

large infrastructure projects is to set up a National Investment Approval Board chaired by the Prime Minister and including all key Ministers and to amend the Transaction of Business Rules so that statutory clearances under various Acts for all infrastructure projects above a given size are given by the Board, taking into account the views of all Ministries. The allocation of business rules could provide that such clearances would be issued by the Cabinet Secretariat based on the decision of the Board. This would be a systemic change which would ensure a holistic consideration of complex issues and greatly accelerate decision-making. Several other changes are discussed in Chapter 6 including in particular the need for greater reliance on industry specialists with domain knowledge.

#### *Delivery of Public Services*

1.71. Delivery of public services in many States is hampered by weak institutional capacity. Thus, although public hospitals may have trained doctors and nurses, and public schools may have trained teachers, neither of these institutions will have administrators who are trained in the operation of health care or educational institutions. Too much of the knowledge needed to manage public service delivery is learnt on the job, which detracts from the institution's effective functioning.

1.72. The first step in reforming public service delivery is to devise mechanisms for measuring the extent of public satisfaction with public services and publicising the results. The Public Affairs Centre at Bengaluru has done excellent work in conducting systematic surveys of public perception or satisfaction with various types of public services ranging from water and sanitation, health and education, public transport, police and so on. Such surveys periodically conducted produce valuable information for the political leadership on where performance is felt to be poor and where it is improving.

1.73. Greater involvement of citizens' organisations can help focus government attention on these problem areas. The Delhi Government's experiment with Bhagidhari is example of citizen involvement and

consultation operating through Resident Welfare Associations.

#### *Regulatory Institutions*

1.74. An area where the lack of institutional capability is beginning to manifest itself is in our expanding system of regulatory bodies. As areas that were earlier dominated by the public sector have been opened up for private operators, often competing among themselves or with existing public sector operators, independent regulatory institutions have been established to oversee the functioning of the players in the system. The effectiveness of regulatory organisations depends critically upon the quality of the personnel running the institutions and the degree of independence established. Too many of the regulatory agencies are staffed by former bureaucrats and there is not enough induction of specialists with domain knowledge. A thorough review of the regulatory system established in different sectors is needed to determine the weaknesses of the system currently in place and recommend ways of correcting them. This is especially true as the next two five year Plans are likely to see faster change in the global economy and in the structure of the Indian economy too.

#### *Development of Infrastructure*

1.75. Infrastructure provides the basic support system for other sectors of the economy expanding capabilities everywhere. A distinguishing characteristic of infrastructure is that where imports can meet the gap between demand and supply, deficiencies in infrastructure cannot be made good through imports. Infrastructure requirements can only be met through development of the relevant infrastructure capacity in the domestic economy. Furthermore, Good quality infrastructure is important not only for faster growth but also to ensure that growth is inclusive. Small businesses spread throughout the country need access to good quality and reliable infrastructure services to compete effectively. Large enterprises can often develop their own infrastructure as they often do with captive power, and being large can even locate themselves *ab initio* where other infrastructure is better, that is, nearer ports and near transport hubs. Small enterprises on the other hand

are dispersed across the country, and have to rely on the general infrastructure available. Their ability to compete successfully, which is critical for growth to be employment generating and inclusive, depends upon the quality of this infrastructure.

#### Power

1.76. Electric power is a critical input into all economic activity and rapid and inclusive growth is only possible if reliable electricity is made available everywhere. It is essential not only for agriculture, industry and commercial business but also for basic household lighting. The percentage of households with electricity has increased from 56 in 2001 to 67 in 2011, but even so almost 45 per cent of rural households have no electricity connection. Furthermore, those that do typically do not have assured power, even in urban areas.

1.77. The Eleventh Plan added 55,000 MW of generation capacity which, though short of the target, was more than twice the capacity added in the Tenth Plan. The Twelfth Plan aims to add another 88,000 MW. This level of additional capacity is not infeasible but delivery of power depends critically on solving serious fuel availability problems that have arisen relating to coal and natural gas. Uncertainties about fuel availability would seriously dampen investment activity, especially since about half the generation capacity is expected to come from the private sector, and they will not be able to achieve financing if fuel supply issues are not resolved. The problem is not that fuel cannot be made available since domestic shortfalls can be met by imports but since imports are at much higher prices, power producers are reluctant to accept. The problem can be resolved by resorting to some form of price pooling and this must be explored. Equally important is the need to address the financial weakness of the distribution segment of the power sector. Almost all the distribution companies (discoms) are running large financial losses, reflecting high transmission and distribution losses and also an unwillingness to raise tariffs in line with rising cost. Some discoms have recently raised tariffs after many years, which is a welcome development but most have yet to do so. Some of the critical

policy correctives to deal with these problems are outlined in Section 1.6.

1.78. Renewable energy, especially wind energy and solar energy are potentially promising alternatives to conventional fossil fuel-based electric power. They are more expensive at present, but given likely trends in fossil fuel prices globally, and technological developments in these sectors there is a need to expand the contribution from these sectors. The scope for doing so is discussed in detail in Chapter 10.

#### Telecommunications

1.79. Telecommunications has seen impressive expansion and large investments in the past several years with a tele-density increasing from 26.2 per cent in 2008 to 78.7 per cent in 2012. The expansion has been led by private sector service providers whose market share (in terms of number of connections) increased in this period from 73.5 per cent to 86.3 per cent. Unfortunately, issues related to alleged improprieties in the allocation of spectrum in 2008 have dominated public discussions. Several 2G licenses and associated spectrum allotted in 2008 were cancelled by the Supreme Court in 2011 and the court ordered the government to auction the spectrum. This process of auctioning is currently underway and is expected to be completed by January 2013.

1.80. There is tremendous scope for further expansion in telecommunications, especially with the introduction of 3G services. Telecommunications, and the associated increase in Internet connectivity is clearly a productivity enhancing development, and India is well placed to benefit from this. Already, a large number of services benefiting ordinary people have come into being. For a small fee, farmers can sign up for a service which provides customer specific information through SMS on market prices in nearby markets, conditions and possible disease outbreaks in specific crops in which the farmer is currently interested. Mobile banking, through business correspondents acting as agents, is giving ordinary people in villages,

far from a brick and mortar bank branch, virtually direct access to simple banking service.

1.81. There is scope for using the Universal Services Obligation Fund (USOF) creatively to enhance access to mobile telephone including especially as a platform for delivery of a range of services to the underserved in rural areas.

### *Road Transport*

1.82. In the area of transport, there has been some progress in the roads sector, both in the development of national highways and in rural roads, but much more needs to be done. The National Highway Development Programme needs to be stepped up with an aggressive pursuit of PPP to construct toll roads on a Build-Operate-Transfer (BOT) basis. The States too need to expand their road programmes to provide good quality connectivity in all areas. Many States have resorted successfully to PPP as a mode of road development.

1.83. A special effort is needed to speed up road connectivity in Jammu & Kashmir, the North East and other Special Category States. A good start has been made in the SARDP-NE in the Eleventh Plan and this needs to be pursued with greater vigour in the Twelfth Plan. Enhanced connectivity of the North East should be a high priority. This is also true for districts affected by Left-Wing Extremism.

### *Railways*

1.84. Development of capability in the Railways is another urgent priority for the Twelfth Plan. Capacity in the Railways has lagged far behind what is needed and feasible, especially given the need to shift from road transport to rail in the interest of improving energy efficiency, and reducing the carbon footprint of our development. Expansion of the system must be accompanied by technological modernisation, greater attention to safety and steps to ensure financial viability. Several important new initiatives are underway which will materialise in the course of the Twelfth Plan. These include flagship projects such as the Western and Eastern Freight

Corridor, the Mumbai Elevated Rail Corridor and the High Speed Corridor. Given the scarcity of resources, there is need and also considerable scope, for pursuing PPP initiatives in this sector along the lines outlined in Chapter 9.

### *Airports*

1.85. Airport development is a basic infrastructure requirement for connectivity, especially since the demand for air travel is projected to grow rapidly. This area has seen a sea change in the Eleventh Plan with the development of four new airports through private participation in the PPP mode (Bengaluru, Hyderabad, Delhi and Mumbai), the upgradation of two metro airports by Airport Authority of India (AAI) (Chennai and Kolkata) and the development of 35 non-metro airports by AAI. There is need for further expansion in the Twelfth Plan with the creative use of PPP wherever possible. Several projects are likely to be taken up in the Twelfth Plan. These include the Navi Mumbai Airport, the Goa Airport and the Kannur Airport. A policy to make some of our airports into international hubs is also being considered.

### *Ports*

1.86. Ports are another critical capability for international trade connectivity. Progress in this area in the Eleventh Plan was disappointing as for as major ports were concerned because several institutional issues had to be resolved for the proposed PPP expansion plans to materialise. These have now been resolved and it is expected that the Twelfth Plan will see a much greater expansion. In contrast minor ports (which come under State Governments) have done very well in the Eleventh Plan. An aggressive expansion of port capacity in the major ports based on PPP is essential in the Twelfth Plan. In addition, two entirely new PPP ports are proposed by the Central Government; one in West Bengal and the other in Andhra Pradesh.

### *Financing Infrastructure*

1.87. Traditionally, infrastructure development used to occur through the public sector. However,

given the scarcity of public resources, and the need to shift scarce public resources into health and education, efforts have been made to induct private participation in the development of infrastructure. These efforts have met with a fair degree of success. As of 31 March 2012, 390 PPP projects have been approved involving an investment of ₹3,05010 crore. According to a report published by the World Bank, India has been the top recipient of PPP investment since 2006 and has accounted for almost half of the investment in new PPP projects implemented in the first half of 2011 in developing countries. An Asian Development Bank report states that India stands in the same league as developed economies like South Korea and Japan on implementation of PPP projects and the Model Concession Agreements prepared in India and used in our PPP projects have also been commended.

1.88. The total investment in infrastructure sectors in the Twelfth Plan is estimated to be ₹55.7 lakh crore, which is roughly one trillion dollars at prevailing exchange rates. The share of private investment in the total investment in infrastructure rose from 22 per cent in the Tenth Plan to 36.61 per cent in the Eleventh Plan. It will have to increase to about 48 per cent during the Twelfth Plan if the infrastructure investment target is to be met. These projections have also been validated by the high level committee on infrastructure set up under the chairmanship of Shri Deepak Parekh. The committee has however qualified its projections as dependent on several policy initiatives that the government would need to take for ensuring this level of investment.

1.89. The Twelfth Plan lays special emphasis on the development of social sectors in view of their impact on human development and quality of life. Unlike the case with other infrastructure, experiments with PPP in the social sector have been more limited. Many States have experimented with PPPs in health and education. The Central Government has approved setting up of 2,500 Model Schools in PPP mode and a proposal for setting up 3,000 ITIs through PPP is under consideration. These initiatives will be strengthened during the Twelfth Plan.

1.90. Resort to PPPs in the social sector often raises concerns about the commercialisation of services that are normally expected to be provided free or highly subsidised. These are important concerns but they can be addressed by well-drafted concession agreements and strict monitoring to ensure that PPP concessionaires abide by their commitments. This must be reinforced with penalties for non compliance. While extending the concept of PPP to social and urban sector projects, the need for 'people's' participation in the design and monitoring of PPP schemes becomes crucial. Local citizens are direct stakeholders in such projects and therefore their support becomes crucial. Therefore, some cities and States have begun to shape PPPs in the social and urban sectors as People–Public–Private Partnerships (PPPPs). This is a valuable innovation which should be applauded.

### The Reach of Banking and Insurance

1.91. Like infrastructure, development of an efficient financial services system is a key enabler of capabilities which affects how well individuals can manage life cycle needs and also affect the functioning of enterprises and their prospects of growth. More broadly, it affects the extent of entrepreneurship and of competition. India is underserved by financial services on every parameter. More than 40 per cent of households avail no banking service at all. The ratio of total bank credit outstanding to GDP is only about 57 per cent as against over 140 per cent in East Asia and Pacific. Insurance premia account for less than 1 per cent of GDP, which is only about a third of the international average. The organised financial sector does not reach out to large segments of the population which are serviced if at all by all manner of informal financial entities at terms and costs that retard their growth prospects.

1.92. Lack of insurance products is an example of under-supply of financial services. It can be nobody's case that the Indian economy has lower inherent risks than others, or that life cover is any less important. It is rather that costs of providing cover and assessing claims are currently so high relative to the cover itself that either premium-to-cover ratios

become exorbitant or appropriate insurance products are simply not created. High transactions costs relative to size of accounts are also the main reason for low banking coverage and this is compounded by high risk perception of banks, in part because of lack of insurance. Agriculture and other forms of MSMEs are particularly ill-served and the situation has in fact deteriorated in some ways over the last two decades because of problems afflicting the cooperative banking sector.

1.93. In recent years, financial inclusion has come back into focus, partly because technology (such as the IT-infrastructure, set-up of a core banking network, mobile phones, satellite imagery and automatic weather stations) now permits solutions such as banking correspondents and weather insurance which cut down on overhead costs; and partly because the power of cooperation, whether through SHG-bank linkage, Joint Liability Groups or simply the old fashioned Primary Agricultural Co-operative Society is again being revitalised. Cooperatives still have the widest credit reach and their local knowledge and risk sharing potential is an asset for the financial sector as a whole which has not been fully exploited. They should be given increased prominence during Twelfth Plan because potential benefits and cost of inaction are both very high. An area that government should take a lead in creation of suitable databases of registry information both for easier collateral and finer actuarial calculations. The UID project can help with this, but there are also more basic requirements such as proper land records and property titling which should not meet the same fate as the so far disappointing record on registering births and deaths.

1.94. In the industrial sector smaller firms are credit constrained. The size distribution of firms in India shows that there are a number of large firms, as in other countries, but there are not enough firms in the middle range with employees ranging from 100 to 500. Instead an overwhelming number of firms are concentrated at the small end with less than 50 employees. This suggests that our small firms do not

operate in an environment in which they can graduate to the middle category. One of the constraints is finance. Banks and other financial institutions have to be more creative to respond to the needs of potentially dynamic entrepreneurs capable of rapid growth. Indian banks typically do not exercise judgement in expanding credit limits in a manner which favours companies that are more likely to grow.

1.95. The capital market has been an important source of funding for larger companies and the opening of the economy to portfolio flows from Foreign Institutional Investors (FIIs) in recent years has produced a buoyant capital market where companies have raised significant funds through new issues. However, this mechanism has been used mainly by the larger companies to raise funds. We do not have effective institutions that can channel equity funding to smaller companies and start-ups. In a knowledge economy, we need to do much more to encourage the growth of venture capital funds and angel investors. The Planning Commission had appointed a Committee on Angel Investment and Early Stage Venture Capital which has since submitted its report. The Committee has made a number of recommendations which are discussed in Chapter 2 and which need to be given serious consideration.

### Science and Technology

1.96. S&T is a vital aspect of national capability. Science Departments/Agencies have played a significant role in solving the socio-economic issues. The Department of Space through satellite-based system has provided nationwide land use/land cover mapping for natural resources management, thematic mapping for national urban information system, the process of measuring forest and wasteland, locating potential drinking water zones and potential fishing zone and crop production forecasting. The Twelfth Five Year Plan must build on the scientific base created by earlier Plans and give a renewed thrust to emphasise creative and relevant research and innovation. The central focus must be to ensure that S&T becomes a major driver in the process of the national development.

1.97. The Twelfth Plan programmes of the Indian Science should aim at three outcomes:

1. Realisation of the Indian vision to emerge as global leader in advanced science;
2. Encourage and facilitate Indian Science to address the major developmental needs of the country like food security, energy and environmental needs, addressing the water challenges and providing technological solutions to affordable health care requirements and
3. Gain global competitiveness through a well-designed innovation ecosystem, encouraging global research centres of multinational corporations (MNCs) to be set up in India.

1.98. To realise these objectives, it will be necessary to build technology partnerships with States and socio-economic ministries through new models of technological solutions, design, development and delivery. India's aspiration to emerge as a stronger scientific power at the end of the Twelfth Plan period will require additional funding and also an effort to interconnect available resources and competitiveness. Indian researchers must also be able to gain access to the large global Research and Development (R&D) infrastructure and work in collaboration with others to develop necessary indigenous capabilities. There is need for much greater flexibility in the way scientific establishments work. We need to encourage collaboration with universities, with private and public sector corporations and also with global research centres. The Twelfth Plan must also experiment with new models of funding scientific research. Instead of all government research funds being allocated to the budget of different scientific departments, there is a case for creating a new National Research Fund which can receive competing research proposals from different research institutions, or combinations of institutions, and select from these proposals to fund the most promising on a project basis. Research funding for particular projects should be continued only on the basis of periodic peer reviews which indicate whether progress is satisfactory and also point to corrective steps which might help.

1.99. S&T endeavours over the last decade have placed increasing emphasis on contributing to the societal development and improving the quality of life of citizens. Such new initiatives in turn have also created in some cases societal reactions stemming from issues like health and environmental safety. In the recent past, introduction of genetically modified (GM) foods and Nuclear Energy are two such examples. The Twelfth Plan envisages a more effective institutional framework in linking S&T with society through a variety of outreach strategies. This is proposed to be carried out both through the scientific establishments as well as through educational programmes including initiatives from non-governmental organisations (NGOs).

## MANAGING NATURAL RESOURCES AND THE ENVIRONMENT

1.100. Achievement of rapid and sustainable growth is critically dependent on our ability to manage our natural resources effectively. India is not liberally endowed with natural resources. In fact, we are among the lowest in the world on almost all measures of resource availability on a per capita basis. In recent years, the deficiencies in the way in which we manage natural resources have come under increasingly critical scrutiny. Agitations around land acquisition, deforestation, water use, air and water pollution, and also our response to natural disasters, have become more common. These are no longer peripheral issues: They are issues which demand mainstream attention and pose challenges which this Plan must address squarely.

### Soil Health and Productivity

1.101. Soil is one of the basic natural resources that support life on earth and this resource is under threat in India from soil erosion due to natural factors compounded by deforestation which increases run off and also from excessive use of chemical fertilisers. The soil ecosystem is a living self-balancing system and excessive use of synthetic chemical fertilisers disturbs this balance often causing long-term damage to the soil.



1.102. Chemical fertilisers, especially urea, are highly subsidised and the fertiliser subsidy has grown exponentially during the last three decades. These heavy subsidies on some fertilisers prompt overuse of the subsidised chemical fertilisers which has resulted in severe depletion of micronutrients and degradation of soil in many parts of the country. Chemical fertilisers should be used with great care and in conjunction with other means of using organic sources to replenish the soil. The way forward is to rejuvenate the soil and restore soil health through addition of organic matter in large quantities. Use of organic manures will gradually bring down the dependence on chemical fertilisers. However, the use of organic manures is discouraged because they receive no subsidy while urea is heavily subsidised. This price distortion is an important factor discouraging the shift.

1.103. More generally, support for ecological/organic fertilisation is scattered under various schemes and hence it is not getting its due. The best practices of soil fertility management need to be adopted, which include generation of biomass for bulk addition of organic matter in the soil to maintain proper soil health, *in situ* degeneration of biomass through sole cropping/inter-cropping/bund cropping of green manure crops, recycling of farm and household waste through use of intensive nutrient recycling methods such as composting, production of bio-fertilisers at regional and local levels, adoption of bio-dynamic farming methods and crop rotations to enrich the soil.

### Rational Use of Land

1.104. Land is a fixed resource and its availability in India on a per capita basis is relatively low compared with most countries. Furthermore, the country's population is likely to continue to grow till at least 2040 whereas the land mass may actually shrink with increased coastal erosion and flooding due to climate change. In these circumstances, the rational and planned use of land must be an issue that needs the highest priority, and should be made a central focus of our resource planning. Land is a state subject, but the issues are so critical that there is need for better coordination at the national level.

1.105. There are three main areas of conflict that need to be addressed. The first relates to the allocation of available land between agriculture, industry and urban use. The second potential conflict arises from the fact that allocation across different uses cannot occur simply through market processes and some land acquisition is therefore necessary, but the terms on which this had been done in the past are no longer acceptable. The third potential conflict arises because most of our mineral resources are in areas, which are forested and the effective exploitation of these resources calls for acquisition, which may disrupt some tribal communities.

1.106. As far as the allocation to alternative sectors is concerned, it is important to recognise that diversion of land from agricultural to non-agricultural uses is inevitable in any development process since industry must expand and cities must also expand and in both cases land needed for this expansion can only come from agriculture. Concern is often raised in this context about the impact on food security. This problem is greatly exaggerated because the productivity of land in agriculture at present is very low and the shift of some land from agriculture to non-agricultural use can easily be offset by productivity increases, which are feasible and have been seen in many other developing countries. We need a clearer articulation of a strategy for dealing with such shifts while ensuring the continuing increase in the supply of agricultural products of the appropriate mix of grains, horticulture products and cash crops. The scope for achieving productivity increases in agriculture is discussed in detail in Chapter 12.

1.107. If the shift of land from agriculture to non-agricultural use could take place without any compulsory acquisition it would not pose a major problem since all such shifts would be voluntary. Unfortunately, this is not always possible. Land required for constructing a road or a railway line or even a dam has to be location specific and this effectively gives the landowner a veto right over the project. Given the large number of landowners involved, problems can arise even if the vast majority of the landowners are adequately compensated which is

why compulsory acquisition provisions are unavoidable and exist in every country. Compulsory acquisition is unavoidable where there is a genuine public purpose such as acquiring land for infrastructure development. There may be a case for using acquisition for certain lands of privately owned facilities which serve a public purpose but this needs to be carefully defined. To remedy the deficiencies in the existing legislation for land acquisition which dates back to colonial times, the government has introduced the Land Acquisition Relief and Rehabilitation Bill in Parliament which is expected to create a much more balanced framework protecting the rights of those whose land is being acquired, as well as those whose livelihood will be disrupted.

1.108. The third potential conflict between accessing our mineral resources and minimising disturbance to forests also poses difficult problems. The services that are rendered by forests are unique and cannot be easily replaced. They include sustaining the life styles of the adivasis, but go well beyond that to include critical ecological services such as acting as a carbon sink and as a natural harvester of water through enhanced groundwater recharging. Mining encroaches on forest land and involves displacement of tribals, but the conflict can be reconciled if mining is combined with scientific replanting or regeneration, plus compensatory forestation on a larger scale, which may enable effective exploitation of our mineral resources with an actual increase in total forest cover. There may be some areas of forests that we view as sacrosanct, such as special reserves and biodiversity hotspots, where no intrusion is allowed, but other than these it should be possible to reconcile the two conflicting objectives, extracting valuable minerals and protecting the forests, through scientific methods of exploitation combined with steps which can protect and even enhance forest cover.

1.109. Resolution of this conflict is particularly necessary in view of the energy challenge facing the country. Most of our coal resources and hydro potential are in ecologically sensitive areas and a successful resolution of these problems is critical if we are to be able to exploit our potential energy resources.

The alternative is to either accept a much lower rate of growth, or rely even more than we already do on imported energy, which has implications for both the balance of payments and energy security.

1.110. Alternative energy sources, including a variety of renewable energy sources, provide another route for energy security especially in the longer run. However, its quantitative potential over the next 10 years is small at present though it is expected to expand to 50,000 MW by the end of the Twelfth Plan. The costs of these sources are also much higher though they are falling. This is a potentially profitable area for further research, which is of special interest for us.

1.111. Expansion of nuclear energy as an important potential alternative to coal-based electricity poses a new set of concerns following the Fukushima accident in Japan which has heightened fears of possible accidents with leakages in radiation. This has promoted agitations against nuclear power in some parts of the country but it is an option that cannot be closed if we are to meet the essential energy needs of the country. However, much greater attention will have to be paid towards improving the confidence of the people and especially in providing world-class systems to counter the risks associated with this form of energy.

### Water as a Scarce Natural Resource

1.112. Water is another key natural resource in fixed supply and its availability is now at a level which is just about equal to demand on average. Availability in some areas is greater than demand but there are other areas which are seriously water-stressed. While intensive use of groundwater made a great contribution to the Green Revolution, today in large parts of west, central and south India there is a man-made crisis of falling water tables. Economic growth at between 8 per cent and 9 per cent a year will only be possible if the water requirements of the expanding population, with a growing degree of urbanisation and the water requirement of expanding GDP can be met. Detailed studies suggest that on a business as usual basis, the total demand for water by 2031 is likely to be 50 per cent higher than today. This gap

has to be bridged if the projected GDP growth is not to be choked. It is estimated that about 20 per cent of the gap at most can be bridged by taking steps to augment available supply through additional storage and groundwater retention. The rest of the deficit has to be bridged through greater water use efficiency.

1.113. Fortunately, there is large scope for improving water use efficiency in our economy. Agriculture consumes around 80 per cent of our available water resources at present and its water use efficiency is among the lowest in the world. Absence of rational pricing for canal water, combined with free or very cheap power for agriculture, has encouraged agricultural practices which are extremely wasteful. Cheap power has encouraged excess drawal of groundwater leading to falling water tables in large parts of the country. However, the man-made crisis of falling water tables is forcing some change as farmers are beginning to recognise the need to adopt technologies that economise on water.

1.114. The Twelfth Plan must break new ground in bringing sustainable management of our aquifers to the forefront of policymaking. Although efforts are being made for recharging of groundwater sources, these are yet to show sustained results across most parts of the country. An aquifer mapping programme that would enable more informed participatory management and better alignment of cropping patterns to water availability across the country will need to be the starting point of our efforts. This must be combined with a massive groundwater recharge programme based on integrating a reformulated MGNREGS with programmes on watershed development and restoration of water bodies.

1.115. It is also necessary to consider whether a new legislative framework is necessary to help manage our water resources better. Water, except for interstate rivers, is a state subject and as such, it is largely up to the States to consider what initiatives are feasible to avoid a steady intensification of the problem. A framework law, that is, an umbrella statement of general principles governing the exercise of legislative and/or executive (or devolved) powers by the

Centre, the States and the local governance institutions needs to be developed. Such a framework law is not intended to either centralise water management or change Centre–State relations or alter the Constitutional position on water in any way. It is intended to be justiciable, in the sense that the laws are passed, and the executive actions are taken by the Central and State Governments, and the devolved functions exercised by PRIs conform to the general principles and priorities laid down in the framework law, and that deviations can be challenged in a court of law. These are, indeed, sensitive issues, and action on them must be preceded by the largest possible consensus across States. However, the urgency of moving forward on these critical matters can no longer be disputed.

1.116. New model legislation is needed for protection, conservation, management and regulation of groundwater. The present model bill amounts to little more than grandfathering existing uses. What is remarkable is that some of the most important legal principles governing groundwater even today were laid down in British common law as early as the middle of the nineteenth century and have not been updated since then. The new model bill would need to recognise that over the last two decades, not only has the groundwater situation in India acquired crisis proportions, new developments in jurisprudence have created the basis as well as the necessity to redefine the legal framework for use of groundwater. These include the Public Trust Doctrine enunciated by the Supreme Court, principles of environmental law and the 73rd and 74th amendments to the Constitution. These issues are discussed in detail in Chapter 4.

1.117. Parallel efforts are needed to contain pollution of surface water and contamination of groundwater, which is reaching serious proportions. Industry must be pushed to adopt the best international practices to improve water use efficiency. Consumption of fresh water can be substantively reduced through use of water-efficient technologies or changed processes in various manufacturing activities and also by reusing and recycling the waste water from water using

industrial processes and making the reclaimed water available for use in the secondary activities within or outside the industry. Enforcing pollution control measures in a context where the vast majority of producers are small and widely dispersed is not easy. However, this is a challenge in policy design, which cannot be ignored. States have to ensure that it is fully integrated into local planning.

1.118. Increased urbanisation will also pose additional problems for water management since urban populations need to be serviced with piped water systems available on a 24 × 7 basis and these systems should be accompanied by sewerage systems, which ensure that only cleaned water is returned to rivers or other disposal sites. At present, no Indian city is in a position to boast of a complete sewerage system. We have installed capacity to treat only about 30 per cent of the human waste we generate. Just two cities, Delhi and Mumbai, which generate around 17 per cent of the country's urban sewage, have nearly 40 per cent of the country's installed capacity. The Twelfth Plan must ensure that no water scheme in urban India will be sanctioned without an integrated sewage treatment component, which ensures that city waste does not pollute our fresh water sources.

### ENGAGEMENT WITH THE WORLD

1.119. Economic reforms over the past two decades have made India a much more open economy. The share of exports of goods and services in total GDP has increased from 6.9 per cent in 1991 to 24.6 per cent in 2012. Imports of goods and services as a percentage of GDP have also increased from 8.3 per cent to 29.8 per cent in the same period. These changes are the result of conscious efforts to open up the economy. Import duties have been reduced over time and a number of preferential trading arrangements have been introduced as part of Comprehensive Economic Partnership Arrangements with individual countries and groups of countries, especially Association of Southeast Asian Nations (ASEAN), Japan, Korea, Singapore and Sri Lanka. More such agreements are being negotiated with the European Union and with Australia. Investment into India, and also from India to other countries has increased.

For all these reasons, India's growth prospects in the years ahead cannot be viewed in isolation from what is happening in the world economy.

### Global Economic Prospects

1.120. The global economy is currently going through a very difficult phase. The financial crisis of 2008–09 interrupted what had been a long period of global growth. Initially, the global economy appeared to respond well to the stimulus policies introduced by many countries in 2009, but the horizon was again clouded by the Eurozone crisis which is currently seen as a major fault line in the world economy. Many European countries are facing severe social and economic pain in their effort to introduce fiscal discipline aimed at regaining market confidence. The International Monetary Fund (IMF) projects zero growth in the Eurozone in 2012 with only a gradual improvement thereafter, on the assumption that a disruptive outcome is avoided.

1.121. The major industrialised and developing countries, meeting at Summit level in the G20, have repeatedly emphasised the importance of avoiding disruptive outcomes and the need for all countries to act in concert and cooperation to bring the global economy back on a path of sustainable growth. It is to be hoped that global economic cooperation will prove strong enough to avoid a hard landing. Although uncertainty remains high, and downside risks are significant, the most reasonable assumption on which to plan is that the global economy will recover gradually. However, the structural change that has been underway for some time, with industrialised countries growing more slowly while the emerging market countries, especially in Asia, grow more rapidly, will continue in the foreseeable future. We must, therefore, plan for a world in which the share of global GDP will therefore shift steadily away from the current industrialised countries and towards the faster growing emerging economies, especially in Asia.

### Implications for the Balance on Current Account

1.122. Slower growth in industrialised countries will mean that our exports to these countries may be

adversely affected. Our exports to Europe fell 9 per cent in April–December 2012, undoubtedly affected by economic conditions there. Fortunately, India's export basket is relatively diversified and since emerging market countries are expected to grow more rapidly in the years ahead, we may be able to benefit from this. There is also scope for increasing our share in industrialised country markets by competing more aggressively with countries like China, which will experience loss of competitiveness because of rising labour costs at home. This is especially true of services, where India's increasing sophistication will allow it to win more business from cost-conscious developed countries. However, there is no room for complacency, because other developing countries, such as the Philippines, are improving their capabilities and there are moves within developed countries to 'on shore' services hitherto outsourced. It is difficult to quantify the net effect of all these factors, but it is reasonable to plan for merchandise exports growing at an average annual rate of about 15 per cent in the Twelfth Plan than compared with 20.7 per cent in the Eleventh Plan. Growth of earnings from tourism and also remittances are likely to be subdued.

1.123. On the import side, the targeted GDP growth of average 8 per cent per annum will require a rapid growth of imports, particularly because of our incremental energy needs. The impact on the balance of payments will of course depend on what happens to oil and gas prices, but these are not expected to moderate significantly in the short to medium term, and indeed may even go up as the world economy recovers gradually from the global crisis, or due to any sudden shocks in the Middle East. High import payments combined with modest export growth means that the current account deficit will be an important source of stress in the coming years.

1.124. Another contingency that we have to keep in mind is the likely trend in global food prices. For a variety of reasons, most notably rising demand from emerging markets as their incomes expand, combined with lagging agricultural productivity in many emerging market countries and possible diversion of land to production of renewable energy

in industrialised countries, global food prices are likely to be high in the years ahead. Fortunately, our domestic food grain production has been expanding but food security considerations may require import in certain conditions. Domestic import and export policies and our buffer stock policy have to be calibrated to meet domestic demand while responding to developments in global markets.

1.125. India's current account deficit was a surplus 2.3 per cent of GDP in 2003–04. Since then it has gone into deficit, reaching 2.7 per cent of GDP in 2010–11 and 4.2 per cent in 2011–12. As pointed out in Chapter 2, a large part of the increase in 2011–12 was due to imports of gold, which are not expected to be repeated. Even so, the current account deficit in the first year of the Twelfth Plan will be around 5 per cent, which exceeds what has traditionally been regarded as a sustainable level. The macroeconomic analysis in Chapter 2 prescribes that policies must be calibrated to ensure that the current account deficit in the Twelfth Plan period averages around 2.9 per cent. On current prospects, it is likely to be somewhat higher. The ability to finance this deficit through stable capital flows is therefore critical.

### Capital Flows

1.126. India has followed a calibrated policy of opening up the capital account, differentiating according to the nature of capital flows. Foreign Direct Investment (FDI) is regarded as the most stable capital flow which also provides technology and marketing links, and has therefore been most freely allowed. Portfolio flows are not as stable as FDI, but they are also not as volatile as short-term debt and have been allowed freely from qualified FIIs. Short-term debt from abroad is the least stable form of capital flow and is, therefore, highly controlled except for trade credit. Longer-term external borrowing is allowed more liberally, but subject to caps. This policy produced good results in the Eleventh Plan, yielding an annual average net capital inflow of 4.1 per cent of GDP during the Eleventh Plan. Since the average current account deficit was 2.7 per cent of GDP, the net capital inflows exceeded what was required to finance the current account deficit and contributed to a build up of forex reserves.

1.127. Looking ahead, if we assume that worst case outcomes will be avoided, then even though Europe may grow very slowly in the coming years, world financial markets can be expected to stabilise. On this assumption, it is reasonable to assume that India can finance a current account deficit of around 2.5 per cent of GDP relying mainly on FDI and FII flows, with some recourse to long-term borrowing. Since the projected current account deficit for 8 per cent growth is somewhat higher, financing the deficit will be a stress point in the years ahead. Capital flows from Europe may well be subdued, but there is scope for diversifying to tap other markets, notably Japan and also the sovereign wealth funds in the Middle East. The key element that will make this possible is that India must be seen to be set on a high growth path, with macroeconomic balances coming under control over the medium term, and policies towards foreign investment being viewed as supportive. The specific policy requirements for achieving this outcome are discussed in Section 1.6.

#### Other Aspects of External Engagement

1.128. There are several other aspects of engagement with the world economy, which are relevant for achieving our overall growth objectives. First and the most important relates to energy supply and energy security. India's dependence on imported energy is high and is generally expected to increase. Apart from our traditional dependence upon oil imports, the import of natural gas and coal will also need to increase significantly. The price of imported energy will obviously have an impact on our growth capacity in the sense that high energy prices impose a cost on the economy and make it more difficult to generate domestic surpluses for investment. Dependence on energy imports also raises concern about energy security. We need to have sufficient flexibility to be able to alter our fuel composition to respond to movements in energy prices. We also need to develop stable long-term steady sources of supply for different fuels relying on long-term supply agreements with countries in different geographies, and through asset acquisition abroad.

1.129. Second, non-financial aspects of India's engagement with the world need to be strengthened. S&T is an important area to project India's engagement with the world. India has the potential to emerge as a major scientific power, provided the right policies and frameworks are implemented. The need for more global collaboration and partnerships in research on the part of our universities, research institutes and the corporate sector has been mentioned earlier. Such activity needs to be strongly encouraged.

1.130. Finally, India needs to engage more proactively with the global community at bilateral, regional and multilateral levels. In the last 10 years India has worked on several bilateral agreements—these take time to show impact, and positive effects of these will start showing up soon. Special attention needs to be paid to our immediate neighbours. The South Asian Association for Regional Cooperation (SAARC) mechanism is yet to achieve the necessary degree of salience. The bilateral efforts have certainly been more fruitful but much greater emphasis needs to be placed on the regional cooperation agenda as the benefits can go well beyond what is possible through the bilateral route. While this is largely a political issue, it may be desirable to begin the process of instituting dialogue between the apex planning agencies of neighbouring countries.

1.131. Looking beyond our immediate neighbourhood, India needs to be proactive in traditional multilateral forums such as the United Nations (UN), and also participate proactively in new emerging forums of importance such as the G20, IBSA, BASIC and so on. This will sometimes require us to go beyond our comfort zone and be prepared for out-of-the-box modes of engagement. India will also need to play an active role in breaking deadlocks and ensuring progress on two economically important multilateral forums, the World Trade Organization (WTO) and United Nations Framework Convention on Climate Change (UNFCCC).

## KEY POLICY INITIATIVES NEEDED

1.132. In this section, we discuss some of the major policy initiatives needed to achieve rapid, more inclusive and sustainable growth. Policies and programmes to improve human capabilities, institutional capabilities and to develop infrastructure, have been discussed in Section 1.3. They are all necessary for achieving the Twelfth Plan objectives and should have high priority.

### Immediate Priorities: Reviving Investor Sentiments

1.133. An immediate policy objective in the very first year of the Plan must be to revive animal spirits, which have suffered for a variety of reasons. Some of the reasons for a downturn in investor sentiment can be easily corrected. For example, the perception among investors, that some of the tax changes introduced in the Budget are anti-investor need to be allayed as quickly as possible. The Finance Ministry has appointed two expert committees to look into these issues and it is hoped that the recommendations of these committees will provide a reasonable basis for reviving investor confidence on these issues. A firm decision on the recommendations of the Committee should be announced as early as possible.

1.134. The next important short-term action must be to remove the impediments to implementation of projects in infrastructure, especially in the area of energy. The following steps are especially urgent.

#### *Fuel Supply to Power Stations*

1.135. The fuel supply problem affecting electric power generation stations that have been commissioned but do not have adequate assurance of supply of coal or gas, and the problems of power stations currently under implementation which have yet to tie up fuel supply agreements, need to be addressed urgently. Coal India is the dominant domestic producer of coal because of nationalisation. It must take on the responsibility of making coal available to all power plants which are governed by regulated tariffs or have entered into PPAs based on competitive bidding for tariffs. Coal India must take steps to enhance its domestic production capability

as much as possible, including by exploring possible PPP arrangements with mine development operators working on a contract basis. In the short run, however, the shortage can only be made up by imports. Additional imports are possible but the fact that imported coal is available only at much higher prices discourages potential consumers. One way of resolving this problem is through a system of pricing pooling. This should be explored and it should be implemented urgently.

#### *Financial Problems of Discoms*

1.136. Many discoms have accumulated high volumes of debt to finance their large current losses. Commercial banks are increasingly unwilling to finance the losses any further. This in turn has created unwillingness on the part of banks to finance power generation projects that are being set up because of doubts that they will be paid by the discoms. A debt restructuring plan, in which State Governments take over a large part of the burden of paying back the debt has been approved by the Cabinet and must be implemented by all the affected States. The commercial banks will have to bear part of the burden by restructuring the loans, and the Reserve Bank of India (RBI) may have to allow some regulatory forbearance relieving the banks of treating the restructured loans as non-performing assets (NPA) and making suitable provisions for them. As envisaged in the package, these steps must be combined with credible steps on the part of the State Governments and the discoms to ensure restoration of the operational viability of the discoms in future. An early implementation of open access would help create an environment that would promote efficiency and competitiveness.

#### *Clarity in Terms of NELP Contracts*

1.137. Several problems have arisen in interpreting existing New Exploration Licensing Policy (NELP) contracts especially related to the process for approving expenditure on the development plan and the approval for gas prices. This uncertainty is not conducive to attracting private investment in this very important part of the energy sector. A committee under Dr. C. Rangarajan has been set up to make

recommendations on future NELP contracts, which would avoid uncertainty and establish clear rules regarding the pricing of oil and gas from future NELP fields. An early decision on this issue should be taken within calendar year 2012.

### The Size of the Public Sector Plan

1.138. Although planning should cover both the activities of the government and those of the private sector, a great deal of the public debate on planning in India takes place around the size of the public sector plan. The Twelfth Plan lays out an ambitious set of government programmes, which will help to achieve the objective of rapid and inclusive growth. These programmes add up to a total plan size for the Centre of ₹43,33,739 crores including both budget resources and the resources of the public sector enterprises which comes to about 6.35 per cent of GDP. This compares with ₹20,25,130 crores in the Eleventh Plan, which was 5.96 per cent of GDP. The total plan size of the States is ₹37,16,385 crore or 5.45 per cent of GDP, as compared to ₹17,25,848 crore in the Eleventh Plan, which was 5 per cent of GDP.

1.139. Although the proposed Plan size is large, the demand from various sectors is also very high. However, resource constraints are a reality and even the plan size projected is conditional on high growth rate of revenue and a significant degree of control over subsidies. If for any reason these assumptions prove too optimistic, the size of the Plan may have to be trimmed at the time of the Mid Term Review.

1.140. In view of the scarcity of resources, it is essential to take bold steps to improve the efficiency of public expenditure through plan programmes. To this end the Planning Commission had established a Committee under Member, B. K. Chaturvedi to make recommendations for rationalisation and to increase efficiency of Centrally Sponsored Schemes (CSSs) and for improving their efficiency. There has been a proliferation of CSS over the years, many of which are quite small. The Chaturvedi Committee had recommended that the number of CSSs should be drastically reduced and the guidelines under which the schemes are implemented should be made

much more flexible. The recommendations have been discussed with the Ministries and the States and have generally been welcomed. It is proposed to implement these recommendations with effect from 2013–14.

### Longer-Term Increase in Investment and Saving Rates

1.141. Bringing the economy back to 9 per cent growth by the end of the Twelfth Plan requires fixed investment rate to rise to 35 per cent of GDP by the end of the Plan period. This will require action to revive private investment, including private corporate investment, and also action to stimulate public investment, especially in key areas of infrastructure especially, energy, transport, water supply and water resource management.

1.142. The strategy of expanding investment will help to counter the weakening of external demand on account of the global downturn. It is important that the expansion in domestic demand should not be in the form of consumption, but in the form of higher levels of investment. This not only provides demand in the short run to support higher levels production but also strengthens the longer-term growth potential of the economy. We should also ensure that a large part of the increase in investment goes into infrastructure as this would have a positive effect on reviving private investment in other sectors and would ease supply constraints, which limit future growth. The Eleventh Plan succeeded in raising investment in infrastructure from 5.04 per cent of GDP in the Tenth Plan to 7.2 per cent of GDP in the Eleventh Plan. The Twelfth Plan aims to raise it further to 9 per cent of GDP by 2016–17.

1.143. Higher levels of investment have to be supported by a sufficient expansion in domestic savings to keep the investment savings gap, which is also the current account deficit, at a level which can be financed through external capital. India's domestic savings capacity has been an important strength of the economy, although recent years saw a distinct weakening in this area because of deterioration in both government and corporate savings. Household



savings, however, have remained strong and are likely to increase in the future, both because of our age composition and as result of increased financial inclusion. Nonetheless, reversal of the combined deterioration in government and corporate savings has to be a key element in our strategy.

### The Need for Fiscal Correction

1.144. The decline in public savings in the past few years is largely a reflection of the stimulus policies that were followed, which are reflected in the expansion in the fiscal deficit. The Central Government fiscal deficit was 5.9 per cent of GDP in 2011–12. Allowing for a fiscal deficit of just under 3 per cent for the States, the combined deficit of the Centre and the State Governments, which had fallen to 4.7 per cent in 2007–08, expanded to just under 9 per cent in 2011–12. This has to be reversed through a credible correction over the medium term. The Finance Ministry has set up an Independent Expert Committee to advise on a credible medium-term road map for fiscal correction. The Committee has recommended a new road map for fiscal deficit reduction to bring the Central government deficit down to 3 per cent by the end of the Twelfth Plan. It will be necessary to take action on two fronts:

1. The Centre must persevere with reforms of the tax structure, notably the introduction of Good and Services Tax (GST), which will represent a major modernisation of the indirect tax system. GST will greatly simplify the system and improve revenue mobilisation, primarily by plugging loopholes. Since introduction of GST requires a Constitutional amendment, it needs a broad political support which has taken time to build. However, if it can be introduced soon, it will give a boost to efficiency and to revenue mobilisation without raising rates.
2. It will require a reversal of the trend witnessed in recent years for Central Government subsidies to grow as a percentage of GDP. It must be emphasised that the objective is not to eliminate subsidies. Subsidies can even increase in absolute terms as the GDP grows, but they must be reduced as a percentage of the GDP. There is a

role for targeted subsidies that advance the cause of inclusiveness, but such subsidies can be contained within a predetermined level of affordability. It should be possible to do this without hurting the poor. Some subsidies such as under the proposed Food Security Act will be predetermined. Others such as on fertiliser can be redesigned to serve their purpose at less cost. Subsidies, on petroleum products are untargeted and do not benefit the poor and the most needy. They will have to be reduced.

1.145. The State Governments also need to take steps to reduce the growing burden of subsidies, most especially the large and growing losses in the power sector.

### Managing the Current Account Deficit

1.146. The initiatives described above to increase government savings and corporate savings will create conditions conducive to keeping the current account deficit at 2.5 per cent of GDP. This level of deficit can be financed through long-term capital flows as long as India's macroeconomic parameters are seen to be improving and GDP growth recovers above 7 per cent. India is still under weight in most global portfolios given its economic size and growth potential and positive signals about the revival of growth, combined with a credible commitment to improve macroeconomic balances and a welcoming stance towards foreign investment will ensure the financing needed to maintain a current account deficit of 2.5 per cent.

1.147. The steps taken to liberalise FDI, especially in areas where there is evident investor interest such as for example, FDI in retail, would help by sending the right signals. We must build on the success of previous liberalisation in FDI in other sectors, such as insurance, and before that telecom.

### Economic Reforms and Efficiency of Resource Use

1.148. While higher investment is necessary for faster growth, it is equally important to ensure efficiency in resource use, both in the public and private

sectors. The implementation of the reform relating to CSSs mentioned above will help achieve greater efficiency to implement in the public sector.

1.149. In the private sector—which accounts for over 70 per cent of total investment—the main instrument available for improved efficiency of resource use is to continue economic reforms, which increase competitive pressure in the system and give producers the flexibility and freedom they need to upgrade technology and expand capacity. In this context, it is worth noting that the global experience with the financial crisis, and the policy rethinking it has triggered, a backlash against market based reform in the financial sector. We need to consider what implications this has for our own policies of economic reforms.

1.150. There is no doubt that the financial excesses in the United States, the United Kingdom and Europe have revealed deep institutional weaknesses in the financial system in these countries and this has produced a backlash against ‘Wall Street’, ‘greedy capitalism’ and also against ‘markets’ generally. What this implies for the pursuit of efficiency promoting economic reforms in emerging market countries needs careful consideration. The principal lesson from the global financial crisis is that financial systems are prone to vulnerability if internal controls are weak; the structure of incentives does not incentivise risk-averse behaviour and if the structure of regulation and the quality of supervision is poor. Since financial integration has made financial systems highly interconnected, vulnerability in one part of the system can extend rapidly to others. These weaknesses explain the severity of the crisis in the industrialised countries. However, our financial system was not exposed to these problems, partly because the degree of integration with global financial markets was low (that is, capital controls were in place which limited cross border banking activity) and partly also because the banking system was much more tightly regulated. On both issues, the cautious approach of the Government of India (GOI) and the RBI towards capital account liberalisation and the maintenance of fairly tight regulatory control on the banks stand vindicated.

1.151. The principal lesson we should learn is that we should continue with our strategy of gradual liberalisation in the financial sector. There is no case for reversing this process of gradual liberalisation, or even stopping it. Countries that had gone too far towards adopting ‘light touch regulation’ are quite correctly tightening their regulatory standards though it should be noted that concern is beginning to be expressed in these countries that this process may be going too far. India was never at that end of the spectrum. In fact, we were if anything at the other end where control over banks and financial institutions is much stronger than in most other jurisdictions and is sometimes excessive.

1.152. However, there is one aspect that does require attention. The global financial crisis highlights the moral hazard problems of following universal banking principles and has brought back into prominence the issue of segregating the commercial and investment banking functions. Our efforts to liberalise the financial sector in the past have meant that Indian banks are today required to undertake investments lending less by design than by default. With the demise of development finance institutions (DFIs), the function of term lending has devolved on the commercial banking sector, which may not be entirely prepared to carry out this function. First, it is not clear whether the Indian banking sector has acquired the requisite risk assessment and project appraisal skills for term loans, without which financing long-duration projects can be hazardous. Second, the entire sector is now more vulnerable to asset-liability imbalance, requiring more frequent recapitalisation particularly as global regulatory norms tighten following the crisis. Third, since there has been no change in the sources from which banks can raise their resources, all increases in term lending are at the cost of funds available for working capital purposes. This leads to smaller and weaker clients being crowded out from the credit space whenever norms stiffen or investment increases. This makes our banking system less inclusive than it would otherwise have been. It is an opportune time, therefore, to blend further gradual liberalisation with a broader consideration of the design of our banking

sector and ensure that the laws are consistent with the intentions.

1.153. Looking beyond the financial sector, to the real sector, there is no reason to backtrack on the use of market mechanisms to achieve efficiency or from an open economy, including a freer flow of foreign direct investment. No such reversal is taking place anywhere in the world and we should act no differently. Protectionist noises have certainly increased in industrialised countries, which is disturbing, but actions have been relatively contained thus far. The G20, of which India is a part, have regularly called in their summits for an avoidance of new protectionist measures. It is to be hoped that this high level consensus will be translated into action. None of this justifies a retreat from international openness on our part. Those arguing for protectionism in industrialised countries are fighting to protect their economies from the loss of competitiveness vis-à-vis emerging markets. It is not in India's interest to support such voices by willingly redirecting our own policies in that direction. On the contrary, it is in our interest, as we gain in competitiveness, to ensure that global markets remain open.

### Transparency in Allocating Scarce Natural Resources

1.154. The economic reforms successfully eliminated discretionary decision-making in areas such as industrial licenses and import licenses. The process of extending transparent policies and mechanisms to allocation of scarce natural resources to private companies for commercial purposes has also been initiated. This is an extremely important gain. It will be further carried forward during the Twelfth Plan.

### Agricultural Growth

1.155. It is well recognised that faster growth of agriculture makes the overall growth process more inclusive. A positive feature of the experience is that agricultural growth increased from 2.4 per cent in the Tenth Plan to 3.7 per cent in the Eleventh Plan. Further acceleration to 4 per cent is essential to ensure inclusiveness.

1.156. Action is needed on several fronts including provision of basic support services such as technology and irrigation infrastructure, access to credit, good and reliable seeds and improved post-harvest technology. The latter is particularly important since the bulk of the acceleration in growth will come from diversification towards horticulture, animal husbandry and fisheries. The greatest potential for improving productivity is in the rain-fed areas, which account for 55 per cent of net sown area and where most of the poor live. Land productivity is low in these areas, but a combination of effective water management combined with better seeds, promotion of soil health and critical on farm investments combined with public sector efforts to improve infrastructure can make a big difference. Rain-fed farming requires a natural resource management perspective with a farming systems approach focusing on producing diverse products that mutually reinforce each other and stabilise the system. These areas are ecologically fragile and highly vulnerable to the vagaries of climate, so the resilience of the system has to be increased. They require knowledge and institutional investments to improve soil moisture management, enhance soil productivity, revitalise common pool resources, provide appropriate seed and low external input systems as also farm mechanisation, along with diverse livelihood options such as livestock and fisheries. Some of the government's key inclusiveness promoting programmes, such as MGNREGA, can make a major contribution to improving land productivity, if the projects under it are structured to increase on farm productivity. Properly designed and converged, MGNREGA can contribute to creating positive synergy with agricultural growth.

1.157. In addition, the Twelfth Plan must address some basic imbalances. First, to increase rice productivity in Eastern India and at same time relieve North-West India from the stress on groundwater caused by this water-intensive crop. Second, to focus on growing imbalances in nutrient use that can affect productivity seriously. Third, to ensure that there is enough parity between procurement operations for crops such as oilseeds and pulses as for rice and wheat, so that we can avoid situations like at present

when huge stocks of the latter coexist with huge imports of the former. Fourth, to put at the centre of our agricultural policies. These matters are discussed in Chapter 12.

### Manufacturing

1.158. The manufacturing sector provides the best opportunity for creating quality jobs, which require skills which are relatively easily imparted to someone who has finished secondary school. However, this is also an area where business as usual will not produce rapid growth and a paradigm shift is needed. The reasons why manufacturing in India has not grown sufficiently rapidly and also not created as much employment in the formal sector as might have been expected, have been analysed in Chapter 9. The following are some of the initiatives needed to correct this performance:

- First, India ranks towards the bottom of international comparisons of ease of doing business. The business regulatory environment in the country is intimidating for manufacturers, especially small-scale enterprises. It saps their productivity and deters further investments. The Plan proposes some initiatives to tune up India's business regulatory environment. Much of the action needed lies with State Governments.
- Second is the state of the physical infrastructure—power and transport, in particular—on which manufacturing enterprises depend much more than IT-based service enterprises, strategies for improving infrastructure are a core of the Plan and they will make a difference to performance of manufacturing as a whole.
- Third, India needs to increase the technological depth of its manufacturing sector to improve its competitiveness and also the country's trade balance. India is increasingly importing high-tech and capital goods and exporting raw materials in return. Strategies are required to induce more depth and value-addition in India's manufacturing sector that are not 'protectionist' and that leverage FDI and are compatible with an open global trade regime.
- Fourth is a rethinking of the role of human resources in manufacturing. Successful manufacturing requires learning and absorption of technologies and the ability to improve them and this takes place principally through the human side of the enterprise. Sustainable competitiveness will also require a new way of dealing with labour. Refurbishing of India's outdated labour laws is necessary, but improvement of industrial relations and the collaboration that is necessary between employees and management will not be obtained merely by changing the laws. It will require a new social contract founded on a developmental orientation and on partnerships in India's Manufacturing and Industrial sectors and in the enterprises within them.
- Fifth, the growth of the MSME sector must be a central focus of India's manufacturing strategy. This sector is the foundation for a strong manufacturing sector providing more employment with less capital. It has a complementary relationship with large industries because it supplies components and inputs to them. It is the entry point for workers and entrepreneurs who move through it to larger-scale enterprises. Whereas much government attention is given to consult with and address the issues of larger enterprises, the development of the MSME sector must become more central to the deliberations about the challenges of Indian industry and the Indian economy. The sector must be viewed not as a static and weak sector, requiring constant support and protection, but as an integral part of the industrial system with upward mobility for individual units within it.
- Lastly, many of the changes in policy and implementation that are required to improve the environment for manufacturing—in the business regulatory environment, in implementing infrastructure projects, in industrial relations, and the requirements of SMEs—are within the domains of the States. This includes the quality of power supply, much of road connectivity, implementation of sales tax administration, implementation of laws relating to safety, pollution control and labour, industrial parks and so on. The Centre also has a critical role to play in areas such as rail

transportation, income tax, Cenvat, export regulation and the functioning of the financial system.

1.159. These issues are also relevant for India's entire business sector, which apart from manufacturing, covers services and off-farm rural enterprises. All of them will benefit from better business regulation and better infrastructure.

### Energy Policies for Long-Term Growth

1.160. A growth rate of 8 per cent in GDP requires a growth rate of about 6 per cent in total energy use from all sources. Unfortunately, our capacity to expand domestic energy supplies to meet this demand is severely limited. We are not well-endowed with energy resources except for coal and the existence of policy distortions make management of demand and supply more difficult. Some of these problems have already been discussed earlier in this Chapter in connection with the immediate need to revive investor sentiment. There are also longer-term constraints that need to be addressed.

#### Coal Production

1.161. Coal is the most abundant primary energy source available in the country, but most of the country's coal resources are in forest areas, traditionally inhabited by our tribal population. Coal production for supply to third parties is nationalised but projects in some sectors are allowed to have captive coal mines. Coal India was not able to meet its coal production targets in the Eleventh Plan and, as pointed out earlier, domestic coal supplies are not assured for coal-based power projects coming on stream in the Twelfth Plan. It is absolutely essential to ensure that domestic production of coal increases from 540 million tonnes in 2011–12 to the target of 795 million tonnes at the end of the Plan. This increase of 255 million tonnes assumes an increase of 64 million tonnes of captive capacity with the rest being met by Coal India Limited. However, even with this increase, we will need to import 185 million tonnes of coal in 2016–17. Environmental and forest clearances of coal projects have presented problems. A special mechanism for inter-Ministerial coordination needs to be set up to accelerate processing of

these projects in a time bound manner. Unless this is done, India's energy needs will be in jeopardy and investor sentiment will weaken irreversibly, at least for the duration of the Twelfth Plan. Taking a longer-term view, the policy of nationalisation of coal itself needs to be reviewed as was pointed out in the Eleventh Plan. If private sector producers are allowed in petroleum, which is a more valuable resource, there is no reason why they should not be allowed in coal. They are allowed to a small extent in the State of Meghalaya, which has private ownership of coal, because the tribal land there is not government land.

#### Petroleum Price Distortions

1.162. The petroleum sector suffers from a serious distortion in product prices which lead to huge under-recoveries and discourage private investment. Domestic prices for diesel charged by Oil Marketing Companies (OMCs) was 35.3 per cent lower than trade parity prices before the recent price adjustment. Prices for kerosene and LPG are 72.6 per cent and 53.6 per cent lower than they should be.

1.163. Continuation of these systems indefinitely, without provision of a budgetary subsidy, would seriously damage the petroleum industry, limiting its ability to invest in the discovery and development of new oil sources and discouraging all new private investment. If on the other hand, the gap is covered by a budgetary subsidy, it will impose an impossible burden on the budget, necessitating either a sharp cut in other government expenditures or a highly destabilising increase in the fiscal deficit. It is in this context that the diesel prices had to be raised to reduce the gap or a cap was placed on the number of subsidised cylinders. The Twelfth Plan must ensure a move to more rational petroleum product pricing. It may not be possible to remove all distortions immediately, but a phased price adjustment is needed that would reduce subsidy to manageable levels. As a general rule small increases in prices effected over time can help reduce the gap by manageable levels.

#### Natural Gas Pricing

1.164. Natural gas also faces problems of price misalignment. At present, the price of gas paid to

domestic producers is \$4.25 per MMBtu, whereas the spot imported liquefied natural gas (LNG) price is around \$11–14 per MMBtu. Producers argue that unless they are assured of prices linked to world prices, no investment will take place in this sector. The government has appointed an expert committee under Dr. C. Rangarajan to advise on the form of NELP contracts. The Committee is expected to submit its report very shortly and it is hoped that it will recommend steps to introduce clarity about the policy regarding pricing of gas without which new investment may be inhibited.

### Urbanisation

1.165. More effective management of the process of urbanisation in the country will be critical for more inclusive, more sustainable and faster economic growth. Urbanisation is a natural part of the development process because cities provide substantial economics of scale and of agglomeration. In India the cities are also effective drivers of inclusiveness because barriers of caste, creed, and language are bridged in interconnected efforts by residents to earn better livelihoods. At present, about 31 per cent of the population, that is, about 380 million, live in urban areas and this will increase to about 600 million by 2030. Providing reasonable quality services to the growing urban population presents a major challenge. Urban services are very poor, particularly sanitation, solid waste removal, water, roads and public transportation. Affordable, decent housing is woefully inadequate in all Indian cities, leading to the formation of slums, health and living conditions in which are aggravated by poor water and sanitation services.

1.166. The Jawaharlal Nehru National Urban Renewal Mission-II (JNNURM-II) was a landmark initiative because it put India's urban agenda centre stage. It set about providing resources to the States linked to incentives for reforms which would trigger to focus on improvements to cities and towns. The seven years' experience with JNNURM has been a substantial learning experience which has also revealed weaknesses in the governance systems and

the capabilities of cities, States and even the Centre to manage the process of urbanisation. Urban governance is very weak, with poor coordination amongst the many agencies that must work together to create and maintain good functioning habitats. Personnel and institutional capabilities for urban management have to be developed on a massive scale across the country. Capabilities for planning locally are woefully inadequate, which is leading to projects not aligned with local priorities and poor coordination amongst separate initiatives.

1.167. Since overall government resources are limited and must be applied to other priority sectors such as health and education, it is necessary that cities, especially the larger ones, and progressively even the smaller ones, are encouraged and enabled to draw resources from the market and the private sector. For this, they must improve their governance and ability to implement projects. They will also have to manage their land resources more strategically, both to ensure better land use and to secure what will be a principal resource for their future financial needs. They must become able to recover adequate service charges, and equitably, from their inhabitants, which will require them to demonstrate an ability to deliver better and more reliable services. The concept of PPPs, which systematically put local citizens into the partnership framework must be applied.

1.168. The strategies for improving the management of urbanisation are explained in Chapter 14. A new JNNURM-II incorporating the learning from JNNURM-I will be a major feature of the Twelfth Plan. It must give priority to the strengthening of human and institutional capabilities, local planning and improvements in governance, which are the foundations for a more financially and environmentally sustainable and a more inclusive process of governance.

### MONITORABLE TARGETS FOR THE PLAN

1.169. The aspirations and challenges that guide the Twelfth Plan have been discussed in the body of this chapter and strategies for meeting these aspirations

are spelt out in detail in the individual Chapters of the Plan. To focus the energies of the government and other stakeholders in development, it is desirable to identify monitorable indicators, which can be used to track the progress of our efforts. Given the complexity of the country and the development process, there are a very large number of targets that can and should be used. Most of these are discussed in the sectoral chapters. However, there is a core set of indicators which could form the objectives towards which all development partners can work, which includes not only the Central and State Governments, but also local governments, CSOs and international agencies.

1.170. Twenty-five core indicators that are listed below reflect the vision of rapid, sustainable and more inclusive growth:

#### **Economic Growth**

1. Real GDP Growth Rate of 8 per cent.
2. Agriculture Growth Rate of 4.0 per cent.
3. Manufacturing Growth Rate of 10.0 per cent.
4. Every State must have an average growth rate in the Twelfth Plan preferably higher than that achieved in the Eleventh Plan.

#### **Poverty and Employment**

5. Head-count ratio of consumption poverty to be reduced by 10 percentage points over the preceding estimates by the end of Twelfth Five Year Plan.
6. Generate 50 million new work opportunities in the non-farm sector and provide skill certification to equivalent numbers during the Twelfth Five Year Plan.

#### **Education**

7. Mean Years of Schooling to increase to seven years by the end of Twelfth Five Year Plan.
8. Enhance access to higher education by creating two million additional seats for each age cohort aligned to the skill needs of the economy.
9. Eliminate gender and social gap in school enrolment (that is, between girls and boys, and between

SCs, STs, Muslims and the rest of the population) by the end of Twelfth Five Year Plan.

#### **Health**

10. Reduce IMR to 25 and MMR to 1 per 1,000 live births, and improve Child Sex Ratio (0–6 years) to 950 by the end of the Twelfth Five Year Plan.
11. Reduce Total Fertility Rate to 2.1 by the end of Twelfth Five Year Plan.
12. Reduce under-nutrition among children aged 0–3 years to half of the NFHS-3 levels by the end of Twelfth Five Year Plan.

#### **Infrastructure, Including Rural Infrastructure**

13. Increase investment in infrastructure as a percentage of GDP to 9 per cent by the end of Twelfth Five Year Plan.
14. Increase the Gross Irrigated Area from 90 million hectare to 103 million hectare by the end of Twelfth Five Year Plan.
15. Provide electricity to all villages and reduce AT&C losses to 20 per cent by the end of Twelfth Five Year Plan.
16. Connect all villages with all-weather roads by the end of Twelfth Five Year Plan.
17. Upgrade national and state highways to the minimum two-lane standard by the end of Twelfth Five Year Plan.
18. Complete Eastern and Western Dedicated Freight Corridors by the end of Twelfth Five Year Plan.
19. Increase rural tele-density to 70 per cent by the end of Twelfth Five Year Plan.
20. Ensure 50 per cent of rural population has access to 40 lpcd piped drinking water supply, and 50 per cent *gram panchayats* achieve Nirmal Gram Status by the end of Twelfth Five Year Plan.

#### **Environment and Sustainability**

21. Increase green cover (as measured by satellite imagery) by 1 million hectare every year during the Twelfth Five Year Plan.
22. Add 30,000 MW of renewable energy capacity in the Twelfth Plan.

23. Reduce emission intensity of GDP in line with the target of 20 per cent to 25 per cent reduction over 2005 levels by 2020.

**Service Delivery**

24. Provide access to banking services to 90 per cent Indian households by the end of Twelfth Five Year Plan.
25. Major subsidies and welfare related beneficiary payments to be shifted to a direct cash transfer

by the end of the Twelfth Plan, using the Aadhar platform with linked bank accounts.

1.171. States are encouraged to set state-specific targets corresponding to the above, taking account of what is the reasonable degree of progress given the initial position. Sector-wise growth targets for each State are given in Chapter 11.



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## Macroeconomic Framework

### INTRODUCTION

2.1. The Eleventh Plan (2007–12) had targeted an average annual growth of 9 per cent, significantly higher than the realised rate of 7.6 per cent in the Tenth Plan (2002–07), but broadly in line with the acceleration of economic activity and growth experienced after 2004–05. The Plan began well, with 9.3 per cent growth in 2007–08, but the global financial crisis of 2008 reduced growth to 6.7 per cent in 2008–09. The economy rebounded well initially, to record 8.6 per cent growth in 2009–10, and then 9.3 per cent in 2010–11. However, the downturn in the global economy in 2011 due to the sovereign debt crisis in Europe combined with the emergence of domestic constraints on investment in infrastructure reduced gross domestic product (GDP) growth to 6.2 per cent in 2011–12. As a result, the average growth over the five years of the Eleventh Plan was 8.0 per cent.

2.2. Achieving 8.0 per cent growth in a period which saw two global crises, one in 2008 and another in 2011 is commendable. However, the deceleration is also a matter of concern, especially since growth in 2011–12 showed a continuous deceleration quarter by quarter during the year, with the last quarter of 2011–12 registering a year on year growth rate of only 5.3 per cent. The preliminary estimates for the first half of 2012–13 show a growth of 5.4 per cent, which is only marginally higher, suggesting that the first year of the Twelfth Plan will see relatively low growth momentum. However, weak short-term performance should not lead to pessimism about the medium term. There is good reason to believe that the fundamentals of the Indian economy remain

strong, and the economy can return to 8–9 per cent growth path depending on the state of the global economy and the domestic policy response to overcome growth constraints.

### THE DETERMINANTS OF GROWTH

2.3. The growth potential of the economy over a five year period depends upon a number of factors. These include the capacity of the economy to maintain high rates of investment, while also ensuring productive use of capital. This in turn depends upon investor expectations and the ability to mobilise financing for investment. The existence of a dynamic entrepreneurial and managerial class capable of taking risks and dealing with competitive pressure is an important positive feature of our economy. It also depends upon the quality of public sector managers responsible for investment and productivity in the public sector, which remains important in many areas of the economy. We have good reason to be optimistic on all these counts as evidenced by the fact that we grew rapidly between 2003–04 and 2008–09, and the Indian enterprise has also begun to expand its global presence.

2.4. Growth also depends on the availability of labour in adequate quantities, and with the right kind of skills to support rapid growth. We have the benefit of a demographic dividend because the age structure of the population ensures that the labour force will be growing in India even as it is falling in most industrialised countries, and even in China. However, the level of skills of the labour force needs to be enhanced. Skill shortages did emerge during

our period of high growth and this is an area to which the government is according high priority.

2.5. The external environment also affects the growth potential since it determines the scope for exports to grow and thus contribute to the expansion of domestic economic activity. It also determines the extent to which the economy can finance a current account deficit through non-debt flows, especially Foreign Direct Investment (FDI), which often serves as an instrument for technological up-gradation and modernisation.

2.6. The acceleration of economic growth has been examined in detail in many studies. The accumulation of capital and labour stocks, as well as the manner in which these stocks are used, that is productivity, has been the subject of intensive study. Global experience suggests that different countries have drawn their growth acceleration in somewhat different proportions from factor accumulation and from Total Factor Productivity (TFP). The latter is the residual that is not explained by factor accumulation and represents an array of elements from technology (both that embodied in capital and that which is disembodied), to education and skills, to institutions and public policy.

2.7. It is well known that emerging market countries have the potential to accelerate growth substantially by accelerating growth in TFP because they are generally not at the productivity frontier, though their ability to do so is not independent of the rate of investment. The higher the TFP, the better is the use of labour and capital stock. Economic reforms have also increased efficiency of resource use in many sectors and studies show that there has been an increase in TFP in the Indian economy over time, and that this improvement was greater in the past two decades, especially in the past decade as compared to the previous periods. There is also considerable scope for further efficiency gains especially from use of IT-based technology, such as geographic information system (GIS) based systems, to increase the efficiency with which we create and operating public investments. These are important reasons for being optimistic about future growth in India.

### Growth Prospects in the Twelfth Plan

2.8. Ideally, we should be able to explore the interaction of different determinants of growth through the use of quantitative economic models, which could illustrate the effect of different policy alternatives. However, it is well recognised that no single model will capture all possible interactions. The Planning Commission, therefore, relies upon a number of different models constructed by different research institutions which emphasise different aspects of the interaction between growth variables. The synthesis view that emerges from this exercise, and, from internal discussions within the Commission, is that it is possible for the economy to work its way out of the current slowdown and restore high growth, but this will take time and a number of hard policy decisions. The macroeconomic conclusions which emerge from this exercise are summarised in this Chapter.

2.9. Since the growth in the first year of the Plan is likely to range around 6 per cent, and the international economy is also expected to remain weak for the next two years, we need to plan for a gradual build up to high growth in the succeeding two years, accelerating thereafter to take the economy back to 9 per cent growth in the last years of the Plan. This backloaded trajectory of acceleration implies that growth in the Twelfth Plan period as a whole will at best average around 8.0 per cent. Any target that may be set now is bound to be subject to some uncertainty and downside risks, but it can be said that given the past record of growth, a target of 8.0 per cent is certainly feasible provided the worse case assumptions about the global economy do not materialise, and positive assumptions about our own ability to take hard decisions necessary to achieve a rapid and inclusive growth does.

2.10. The need to take hard decisions to return to high growth follows from the fact that we cannot assume the earlier rapid growth will readily re-emerge in the future. This is because several critical constraints, which emerged as the economy accelerated, and which visibly constrain our growth potential, have to be effectively tackled. Among these constraints are macroeconomic constraints that

limit our ability to increase investment and savings, and to finance the current account deficit, which is the difference between the two. These are discussed in greater detail in this Chapter. There are also sectoral constraints relating to the availability of energy, transport, water, land and employable skills, and constraints relating to the business environment. These are discussed in other chapters of the Plan document.

2.11. Before discussing the macroeconomic constraints or achieving 8.0 per cent growth, it is useful to point out that growth is also affected by social and political forces, which are not easy to quantify. These forces determine the acceptability of economic policies and consequently the pace at which they can be implemented, all of which affect the determinants of growth such as investment rates and the pace of productivity improvement. Indeed, the decline in investment and growth in recent years is attributed to the country's internal social and political environment, which is preventing India from realising what pure economics would suggest is its full growth potential. These influences are not easy to build into quantitative models. However, the Planning Commission has attempted, for the first time, to reflect the impact of these forces by using the technique of 'scenario planning'.

### Defining Alternative Scenarios

2.12. Scenario planning is designed to make a qualitative assessment of the forces that affect the economy, but cannot be easily quantified, such as social and political forces and conditions of institutions. Scenario planning cannot predict exact numerical outcomes of different scenarios, but it can project the trends of the economy, depending on how the principal sociopolitical forces take shape.

2.13. Figure 2.1 is a graphic presentation of some of the interconnections that were analysed to explain the principal forces shaping India's economy in different scenarios. The arrows indicate the primary direction of influence, though in many cases, the influence is circular over time generating 'feedback loops' within a system. Consider the interactions between 'Lack of Trust in Institutions', 'Impatience and Protest' and 'Political LogJam'. Lack of trust

in institutions can cause increasing impatience in the country, especially amongst younger people, and leads to protests, sometimes turning violent. (The increasing impatience and protest is fuelled by the ubiquity of media and the explosion of information.) The lack of trust can create a political logjam, which makes reforms that the system needs that much more difficult. This reduces performance which in turn increases impatience and further reduces the credibility of the country's institutions, and trust in them.

2.14. This type of systems' analysis helps locate the 'leverage points' at which decision-makers can act to break the system out of its negatively reinforcing loops. For example, merely asking citizens to be more patient and trust their leaders will not increase trust and patience. However, credible improvement in the conduct of government (and business) institutions can increase citizens' trust, dampen protest, ease the political logjam and enable policy reforms that are required to improve the condition of government's finances and induce economic growth. Thus, analysis locates the leverage points as also the forces on which action can be taken to influence the condition of others. These are seen in the middle of Figure 2.1.

2.15. Figure 2.1 shows that in the present situation one of the key leverage points lie in the design and conduct of institutions of governance and business, including the policy framework with which business works and the signals to which it responds. Change at these leverage points can affect other conditions of the system positively, generating positive feedback loops. Economists, such as Nobel Laureates Douglass North and Elinor Ostrom have explained that 'institutions' are both the guiding ideas and norms of societies as also the 'organisations' with significant roles in governance. In our analysis, we have described these combinations as 'Governance Models' and 'Business Models'. The analysis of scenarios for India has revealed three critical features of governance and business models that are impacting the pace of inclusion, equitable use of our natural resources, environmental sustainability and economic growth. These are:

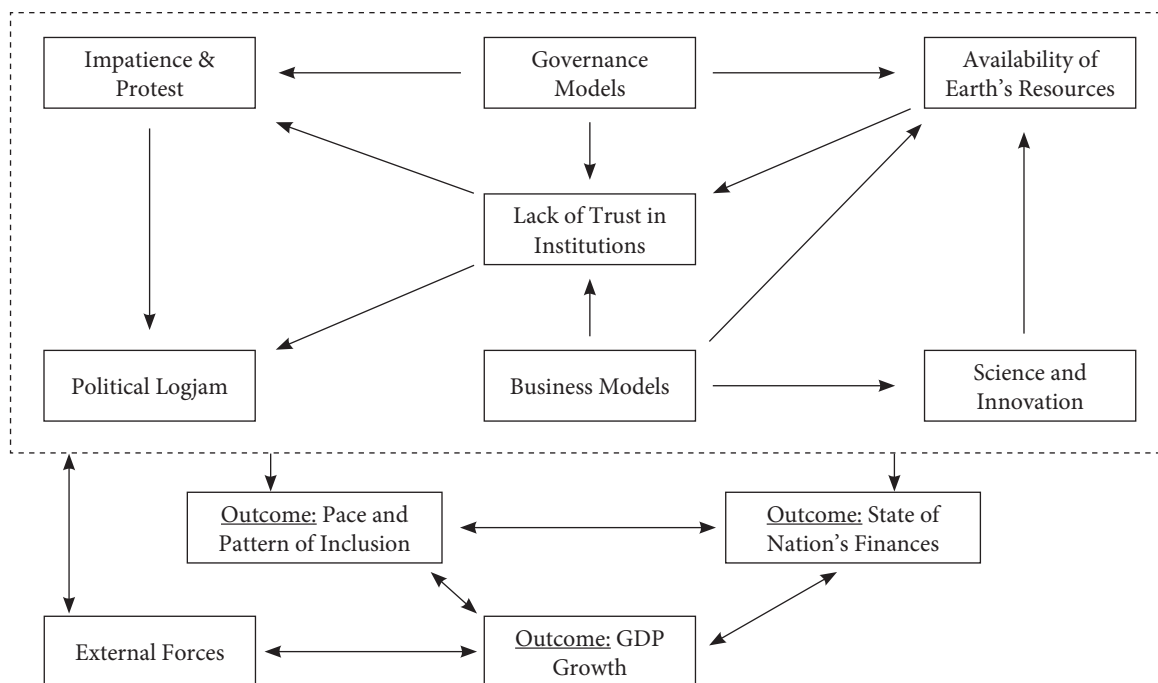


FIGURE 2.1: Systems Analysis for Twelfth Plan Scenarios

1. The approach we take to 'Inclusion': More subsidies or more widespread generation of opportunities for better livelihoods?
2. The approach we take to 'Governance': Will we strengthen local, community-based and collaborative governance rapidly?
3. The strategies we adopt towards energy and environment (as well as structure of programmes and enterprises): Big projects and centralised programmes, or more community-based solutions and enterprises?

2.16. Scenarios are not predictions. They are projections of plausible outcomes of alternative courses of action. They point to strategies that have more likelihood of producing the desired results. Therefore, depending on the strategies we choose and implement, we can envisage different outcomes for the country's progress. Three alternative scenarios are described in the following paragraphs.

#### Scenario 1

2.17. *Strong Inclusive Growth*: This is the future of India if we can implement a well-designed

strategy addressing the key constraints holding back the economy. With appropriate steps taken to deal with implementation and governance problems, the wheels of government at all levels begin to move more smoothly. Local governance institutions and small enterprises are nurtured and have an opportunity to grow effectively, along with larger enterprises. Livelihood opportunities, along with community-based solutions and enterprises for addressing environmental issues, are seen to be sprouting. Many virtuous circles begin to operate in this scenario, raising confidence and trust. In this scenario, growth could average 8.0 per cent and inclusiveness would be assured.

#### Scenario 2

2.18. *Insufficient Action*: This scenario reflects the outcome of insufficient policy action. While broad direction of policy may be endorsed at different levels, action is incomplete or implementation is poor, with the result that outcomes are weaker than anticipated. Centralised government systems do not provide sufficient flexibility to cope with demands for decentralisation. Small enterprises and new

entrepreneurs need to be encouraged, but unless the business environment necessary for them to flourish is effectively transformed, the outcome will fall short of expectations. The policy conflict between subsidies and financial stability of the economy remains unresolved. In this scenario, growth of 8.2 per cent is not feasible. Growth could decline to between 6 per cent and 6.5 per cent, and inclusiveness would suffer.

### Scenario 3

**2.19. Policy Logjam:** This scenario reflects a situation where very little can be done for whatever reason on many of the policy fronts identified in the Twelfth Plan. It will be difficult to build growth momentum if critical supply constraints relating to energy and transport are not overcome. Investor confidence is likely to be severely eroded, and the lack of inclusiveness that results will lead to increased impatience and political logjam, putting the economy under severe stress. Vicious cycles begin to operate and the growth rate can drift down to 5–5.5 per cent with serious loss on the inclusiveness front. In some ways, there is a danger of insufficient action scenario degenerating into a policy logjam scenario, if it persists too long.

**2.20.** Clearly, Scenario 1: Strong inclusive growth is the only way for the country to go and the policy agenda laid out in the Plan is designed to achieve this objective. The outcomes of the three scenarios, in terms of the pace of inclusion, the confidence of people in country's institutions, as also the government's finances and the GDP, are not easily quantified, but their broad direction can be clearly seen. More information is available in the document, 'Scenarios: Shaping India's Future', that accompanies this Plan document, and is posted on the Planning Commission's website.

**2.21.** It is difficult to predict what the precise impact of different scenarios on poverty will be. However, past trends indicate what 'strong inclusive growth' can achieve on this front. Consumption Poverty in India is measured on the basis of Household Consumption Survey, conducted quinquennially (after a gap of every five years). Evidence suggests decline in poverty headcount ratio between 2004–05

and 2009–10 was twice as fast as that between 1993–94 and 2004–05. For details see the analytic note on 'Poverty—Measures and Changes Therein' in Annexure 2.1.

### Sectoral Pattern of Growth

**2.22.** The sectoral pattern of growth associated with the 8.0 per cent growth scenario is summarised in Table 2.1. The Agriculture Forestry and Fishing Sector is projected to grow at 4 per cent, an improvement over the 3.7 per cent rate achieved in the Eleventh Plan. A detailed analysis of the constraints on growth and policy imperatives in the sector is given in Chapter 12 which concludes that 4 per cent growth is feasible.

**2.23.** The Mining and Quarrying Sector grew by only 3.2 per cent in the Eleventh Plan, the growth rate being pushed down by negative growth of 0.6 per cent in 2011–12 reflecting problems in the iron ore sector, gas production and also coal. The Twelfth Plan assumes a substantial improvement with the growth rate averaging 5.7 per cent. This will require serious attention to the many constraints that have bedevilled growth in this sector.

**2.24.** The manufacturing sector decelerated in the course of the Eleventh Plan with a growth rate of only 2.7 per cent in 2011–12. A robust reversal of this trend is essential for a return to rapid growth and especially the growth with inclusiveness since the growth of manufacturing job opportunities depends critically on this revival. The Plan projects a steady acceleration with the growth rate close to 10 per cent in the last two years. The average growth rate in the Twelfth Plan period is projected at over 7 per cent which is a significant improvement over the situation in 2011–12 and 2012–13. An average growth rate of 7 per cent in manufacturing is relatively low, but it reflects the fact that the Twelfth Plan begins with a base year growth of only 2.7 per cent in 2011–12 and perhaps lower in 2011–12. Over the longer run, the aim should be to achieve a sustained double digit growth in manufacturing sector.

**2.25.** Electricity, gas and water supply are projected to grow at 7.3 per cent on an average compared with 6.1

**TABLE 2.1**  
**Annual Growth Rate of GDP by Industry of Origin at Constant (2004–05) Prices**

(Unit: Per Cent)

|   | Eleventh Plan period                                    |         |         |         |         |         |         |         |         |         |         |         | Twelfth Plan period |      |      |  |  |
|---|---|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------------------|------|------|--|--|
|   | 2007–08   | 2008–09 | 2009–10 | 2010–11 | 2011–12 | Average | 2012–13 | 2013–14 | 2014–15 | 2015–16 | 2016–17 | Average |                     |      |      |  |  |
|   |   |         |         |         |         |         |         |         |         |         |         |         |                     |      |      |  |  |
| 1 | Agriculture, forestry and fishing                       | 5.8     | 0.1     | 0.8     | 7.9     | 3.6     | 3.7     | 2.0     | 4.5     | 4.5     | 4.5     | 4.5     | 4.5                 | 4.5  | 4.0  |  |  |
| 2 | Mining and quarrying                                    | 3.7     | 2.1     | 5.9     | 4.9     | -0.6    | 3.2     | 1.0     | 5.0     | 7.0     | 7.0     | 7.0     | 7.0                 | 8.5  | 5.7  |  |  |
| 3 | Manufacturing   | 10.3    | 4.3     | 11.3    | 9.7     | 2.7     | 7.7     | 2.2     | 6.0     | 8.5     | 9.5     | 8.5     | 9.5                 | 9.5  | 7.1  |  |  |
| 4 | Electricity, gas and water supply                       | 8.3     | 4.6     | 6.2     | 5.2     | 6.5     | 6.1     | 5.2     | 7.5     | 8.0     | 8.0     | 8.0     | 8.0                 | 8.0  | 7.3  |  |  |
| 5 | Construction  | 10.8    | 5.3     | 6.7     | 10.2    | 5.6     | 7.7     | 8.0     | 8.0     | 8.5     | 10.0    | 8.5     | 10.0                | 11.0 | 9.1  |  |  |
| 6 | Trade, hotels and restaurant                            | 10.1    | 5.7     | 7.9     | 11.5    | 6.2     | 8.3     | 5.5     | 6.0     | 8.0     | 8.7     | 8.0     | 8.7                 | 8.7  | 7.4  |  |  |
| 7 | Transport, storage and communication                    | 12.5    | 10.8    | 14.8    | 13.8    | 8.4     | 12.0    | 7.3     | 11.1    | 13.0    | 13.6    | 13.0    | 13.6                | 14.1 | 11.8 |  |  |
| 8 | Financing, insurance, real estate and business services | 12.0    | 12.0    | 9.7     | 10.1    | 11.7    | 11.1    | 9.8     | 9.5     | 10.0    | 10.0    | 10.0    | 10.0                | 10.0 | 9.9  |  |  |
| 9 | Community, social and personal services                 | 6.9     | 12.5    | 11.7    | 4.3     | 6.0     | 8.3     | 7.3     | 7.2     | 7.2     | 7.2     | 7.2     | 7.2                 | 7.2  | 7.2  |  |  |
|   | Total GDP   | 9.3     | 6.7     | 8.6     | 9.3     | 6.2     | 8.0     | 5.8     | 7.3     | 8.5     | 9.0     | 8.5     | 9.0                 | 9.2  | 8.0  |  |  |
|   | Industry (2–5)  | 9.7     | 4.4     | 9.2     | 9.2     | 3.5     | 7.2     | 4.0     | 6.6     | 8.4     | 9.4     | 8.4     | 9.4                 | 9.8  | 7.6  |  |  |
|   | Services (6–9)  | 10.3    | 10.0    | 10.5    | 9.8     | 8.2     | 9.7     | 7.6     | 8.3     | 9.4     | 9.7     | 9.4     | 9.7                 | 9.9  | 9.0  |  |  |

per cent achieved in the Eleventh Plan. Construction, which grew at 7.7 per cent in the Eleventh Plan, is projected to grow at an average rate of 9.1 per cent. The other service sectors are projected to grow fairly robustly with Trade Hotels and Restaurants at 7.4 per cent; Transport, Storage and Communication at 11.8 per cent; Insurance and Business Service at 9.9 per cent, and, finally, Community and Personal Services at 7.2 per cent.

**INVESTMENT**

2.26. The ability to raise the rate of investment (ratio of gross fixed capital formation [GFCF]) to GDP is widely regarded as critical for the achievement of high growth. As shown in Figure 2.2, the period when the economy grew rapidly after 2003–04 and up to 2007–08 was a period when the investment rate increased. The fixed investment rate (at current prices) rose steadily after 2003–04 and was close to 34 per cent in 2007–08. Total capital formation—which includes inventories and investment in valuables—was higher at 39 per cent in that year, but for growth what matters is the fixed investment.

2.27. The fixed investment rate fell after 2007–08, initially on account of global factors, and later also owing to difficulties in the domestic arena which affected the pace of implementation of projects. The estimate for the GFCF rate in 2011–12 at constant prices is 33.7 per cent. The rate of gross domestic capital formation (GDCF), which includes stocks and valuables, but not other errors and omissions, is 37.9 per cent, of which valuables is 2.4 per cent of GDP.

2.28. For annual output growth to average 8.0 per cent in the Twelfth Plan period, and to cross 9 per cent in the closing year, it is estimated that the fixed investment rate will have to increase by about 1.5 percentage points of GDP over the level in 2011–12. The resulting trajectory of fixed investment over the Plan period is shown in Table 2.2. The fixed investment rate should increase to 35 per cent of GDP (at constant prices) by the end of the Twelfth Plan, yielding an average fixed investment rate of over 34 per cent of GDP for the Twelfth Plan period as a whole. These levels are marginally higher than what was achieved in the Eleventh Plan but they are broadly consistent with achieving an average

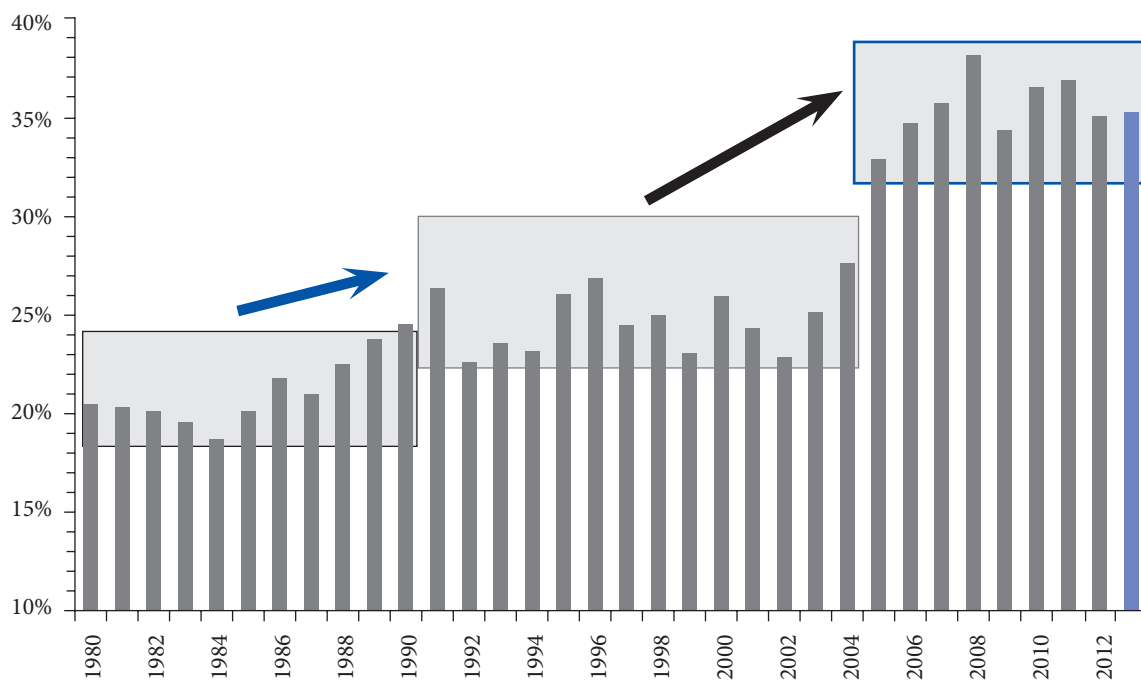


FIGURE 2.2: Fixed Investment Rate—Ratio to GDP at Current Prices—Over the Years

**TABLE 2.2**  
**Investment and Consumption Expenditure as Proportion of GDP at Constant 2004–05 Prices**

|                          | Eleventh Plan period                    |         |         |         |         | Twelfth Plan period |         |         |         |         | Average |
|--------------------------|---|---------|---------|---------|---------|---------------------|---------|---------|---------|---------|---------|
|                          | 2007–08                                 | 2008–09 | 2009–10 | 2010–11 | 2011–12 | 2012–13             | 2013–14 | 2014–15 | 2015–16 | 2016–17 |         |
|                          | <b>Ratio to GDP in Per Cent</b>         |         |         |         |         |                     |         |         |         |         |         |
| Fixed investment rate    | 33.7                                    | 33.5    | 33.3    | 34.3    | 33.7    | 33.7                | 33.9    | 34.4    | 34.5    | 35.0    | 34.2    |
| Public                   | 8.2                                     | 8.8     | 8.6     | 8.1     | 7.8     | 8.3                 | 8.4     | 8.4     | 8.5     | 8.5     | 8.4     |
| Private corporate        | 15.0                                    | 11.3    | 11.3    | 12.8    | 11.6    | 12.4                | 12.5    | 14.0    | 14.5    | 15.0    | 13.5    |
| Household                | 10.5                                    | 13.5    | 13.4    | 13.4    | 14.3    | 13.0                | 13.0    | 12.0    | 11.5    | 11.5    | 12.3    |
| Stocks                   | 4.1                                     | 1.9     | 3.0     | 3.5     | 2.3     | 3.0                 | 2.9     | 3.1     | 3.1     | 3.1     | 2.9     |
| Valuables                | 1.1                                     | 1.4     | 2.0     | 2.4     | 2.4     | 1.8                 | 1.9     | 1.6     | 1.6     | 1.6     | 1.8     |
| GDCF                     | 38.9                                    | 36.8    | 38.3    | 40.2    | 38.4    | 38.5                | 38.7    | 39.1    | 39.2    | 39.7    | 38.8    |
| Errors and omissions     | 0.1                                     | -1.3    | 0.2     | -0.2    | -0.5    | -0.3                |         |         |         |         |         |
| Investment rate          | 39.0                                    | 35.6    | 38.4    | 40.0    | 37.9    | 38.2                | 38.7    | 39.1    | 39.2    | 39.7    | 38.8    |
|                          | <b>Annual Real Growth Rate Per Cent</b> |         |         |         |         |                     |         |         |         |         |         |
| Private consumption exp. | 9.4                                     | 7.2     | 7.4     | 8.6     | 8.0     | 8.1                 | 7.5     | 7.5     | 8.0     | 8.0     | 7.5     |
| Govt consumption exp.    | 9.6                                     | 10.4    | 13.9    | 5.9     | 8.6     | 9.7                 | 5.5     | 5.5     | 5.5     | 5.5     | 5.4     |
| Total consumption exp.   | 9.7                                     | 7.7     | 8.4     | 8.1     | 8.1     | 8.3                 | 6.8     | 7.3     | 7.8     | 7.8     | 7.2     |
|                          | <b>Ratio to GDP in Per Cent</b>         |         |         |         |         |                     |         |         |         |         |         |
| Private consumption exp. | 58.1                                    | 60.0    | 59.4    | 58.3    | 59.2    | 59.0                | 59.1    | 58.8    | 58.3    | 57.8    | 58.7    |
| Govt consumption exp.    | 10.3                                    | 11.0    | 11.5    | 11.0    | 11.3    | 11.0                | 10.9    | 10.6    | 10.3    | 10.0    | 10.6    |
| Total consumption exp.   | 68.5                                    | 71.0    | 70.9    | 69.4    | 70.5    | 70.0                | 70.0    | 69.4    | 68.6    | 67.8    | 69.3    |



real growth rate of little above 8 per cent, allowing for acceleration in growth in the course of the Plan period, and implying a significant relaxation in the physical constraints that limit the economy in infrastructure and other key sectors.

2.29. Over the past decade and a half, price inflation in capital goods has lagged that in the overall economy. As a consequence, the rates of capital formation at constant prices have tended to exceed that when measured at current prices. In the base year of the Twelfth Plan, the investment rate at constant prices is about 1.2 percentage points higher than in current prices. The savings investment balancing must of course be achieved at current prices.

### Composition of Investment

2.30. The composition of fixed investment by source is also shown in Table 2.2. The public fixed investment rate (mostly investment by public enterprises) averaged 8.3 per cent in the Eleventh Plan, with a range of 8.2–8.8 per cent. It is projected to remain roughly in this range in the Twelfth Plan period averaging 8.4 per cent. Household fixed investment (which includes unincorporated business) averaged 12.4 per cent in the Eleventh Plan, with a range of 10.5–13.4 per cent. For the Twelfth Plan, household fixed investment is projected to average 12.3 per cent for the Plan period as a whole, it begins higher at 13.5 per cent in the first two years, slowly reducing to 11.5 per cent in the final two years of the Plan as the corporate sector expands its share.

2.31. Private corporate investment has been the major driver of investment in recent years. In 2003–04 private corporate fixed investment (at constant 1999–2000 prices) was only 6.2 per cent of GDP, while the overall fixed investment rate was 27.1 per cent. It rose to 9.1 per cent (at constant 2004–05 prices) in 2004–05 and 11.9 per cent in 2005–06. The overall fixed investment rate increased to 28.7 per cent in 2004–05 and to 30.5 per cent in 2005–06. Private corporate investment averaged 12.4 per cent in the Eleventh Plan but it was at a peak of 15.0 per cent in 2007–08, that is, the first year of the Eleventh Plan and declined in subsequent years to 11.6 per cent in 2011–12. If the overall fixed

investment rate has to pick up in the Twelfth Plan, there has to be a recovery in private corporate fixed investment. Table 2.2 shows a gradual build-up in private corporate investment from 11.5 per cent in 2012–13 rising steadily to touch 15.0 per cent—the peak value achieved in 2007–08—in the last year of the Twelfth Plan. This would produce an average of 13.5 per cent for the Twelfth Plan as a whole; higher than the average of 12.4 per cent in the Eleventh Plan.

2.32. It must be noted that a large part of private corporate investment is now in the field of infrastructure—power generation, roads, ports, airports and telecommunications—and a lot of it is in the Public–Private Partnership (PPP) mode. The robust growth in private corporate investment is in part a reflection of the strategy of increasing the share of investment devoted to infrastructure and the recognition that private investment has to play a large part in this. Higher investment in infrastructure is critical for the revival of the investment climate as it would lead to enhanced investment in manufacturing.

### Gross Capital Formation

2.33. To move from GFCF to gross capital formation we need to add increase in inventory and investment in valuables. Increase in inventory averaged 3.0 per cent of GDP in the Eleventh Plan, at constant (2004–05) prices. If the crisis year of 2008–09 is excluded (there is very large drawing down of inventories in crisis periods, as indeed had occurred in 2008–09), the average for the Eleventh Plan period is 3.2 per cent of GDP. For the Twelfth Plan period the increase in inventories is projected to account for close to 3.0 per cent.

2.34. Investment by households in valuables refers mainly to gold and silver. Import of gold and silver aggregated about \$60 billion in 2011–12, most of which was ‘investment’ made by households. Until 2007–08, this represented around 1.0–1.3 per cent of GDP and even in the crisis year of 2008–09 the ratio was 1.4 per cent. Thereafter, it has increased very sharply perhaps reflecting the assessment that inflation had increased and the rupee was likely to come under pressure, combined with a fall in the

penetration of other financial savings products, thereby making gold an attractive asset. It is estimated at constant prices to be 2.5 per cent of GDP in 2011–12. With the exchange rate depreciation that has occurred, and the initiatives to improve the availability of financial savings products and expected moderation in inflation, the proportion of investments in valuables is expected to steadily decline to 1.6 per cent of GDP in 2016–17. The average for the Twelfth Plan period is projected to be around 1.8 per cent, about the same as in the Eleventh Plan period.

2.35. As shown in Table 2.2, the aggregate GDCF in the Eleventh Plan at constant 2004–05 prices amounted to 37.5 per cent of GDP (including errors and omissions item of (-)0.3 per cent). The projections as outlined above for the Twelfth Plan would result in a higher average of 38.8 per cent of GDP. However, in the first year of the Plan, the ratio is likely to be lower than the Eleventh Plan average, but it is then expected to move up close to 40 per cent by the end of the Twelfth Plan. At current prices, the increase in GDCF would be somewhat less, moving up from 36.1 per cent of GDP in the Eleventh Plan to 36.9 per cent in the Twelfth Plan period. It is this ratio that is relevant for financing.

#### *The Role of Infrastructure Investment in Accelerating Growth*

2.36. A key component of the overall strategy for raising the rate of fixed investment is an increase in public and private investment in infrastructure. This is because enhanced investment in infrastructure will ease some of the key supply constraints on growth and it is also the area where progress is most likely to increase investor confidence. Several things need to be accomplished in order to facilitate this.

2.37. The most important sector in infrastructure is the power sector. There is about 90 GW of capacity under various stages of construction and attending to the outstanding issues facing these projects must be given a high priority. However, given the time lag involved in implementing power projects, it is necessary to ensure that projects which will be commissioned only in the Thirteenth Plan can also move

ahead satisfactorily. Almost half the capacity in the Twelfth Plan is projected to come from the private sector and the position is likely to be the same in the Thirteenth Plan. Private sector investors in power generation have faced many problems in recent times. They include (i) inadequate supply of domestic coal and unanticipated increase in prices of imported coal; (ii) difficulties with clearances for captive mines, as well as for generating stations; (iii) land availability; (iv) poor financial health of some state electricity distribution companies which are the main customers, and which suffer from insufficient tariff adjustment plus inefficiencies in collection; (v) inadequate availability of domestic natural gas; (vi) inadequate fuel supply agreements for coal and (vii) more recently, difficulties in obtaining finance from both external and domestic sources. Several steps have been taken to resolve the problems that are negatively impacting fresh private investment in the power sector. A strict timeline needs to be maintained to achieve all of these measures. These issues are discussed in detail in Chapter 14.

2.38. Investment in road development has seen successes in both the Central and State Sectors. There was a return to buoyancy in 2011–12, with contracts awarded for nearly 8,000 km as against the target of 7,300 km. We need to be able to accelerate the pace of progress in the coming years. The Railways also require considerable investment to achieve the expansion in capacity needed and also to modernise and improve safety. The Delhi Mumbai Freight Corridor has external funding, but other investments are constrained by inadequacies of internal resources of the Railways, largely the consequence of frozen and uneconomic tariffs on passenger routes. On the freight side, Railways make a surplus, but transport services need to adapt more to customer requirements. There is a lot of potential and need for constructive change.

2.39. Many ocean port projects are pending due to clearances and other decisions that are in the domain of government. It is vital that we smoothen out the path ahead for the port sector. The New Mumbai International Airport is yet to be bid out. There are several problems involved, but we need to get the

process off the ground. There are many other airports, small and big, that need to be developed in the Twelfth Plan. The Airport Authority has completed several terminal buildings and modernised these airports. The rest need to be taken up, if possible with private partners. In addition, there are many small airports and landing strips which hold potential for the purpose of extending connectivity and spreading of business opportunities. However, we have to work out a framework for executing of these projects and also develop a sub-model for air transport linkages to these dispersed and smaller airports.

2.40. Inland water transport has been neglected and needs to be accelerated. There are large gains to be had in terms of efficiency, if we can get some of the river-ways to become meaningfully functional. Coastal shipping also has considerable potential.

2.41. Connectivity is especially crucial to our north-eastern region, both between themselves and to Myanmar and Bangladesh. We are working on a multi-modal connection through Ashuganj in Bangladesh to Tripura and the Sithwe–Kaladan River Project to Lunglei in Mizoram. We need to energise the reconditioning and reconnections of the other road networks through Moreh (Manipur) and Ledo (Assam) to Myanmar. This can then link up further to Thailand and to the road network system in South East Asia. Our development partners including Association of Southeast Asian Nations (ASEAN) and Asian Development Bank (ADB) are likely to be supportive of this.

2.42. Infrastructure capacity creation has suffered from implementation problems. It is vitally important that government makes strenuous efforts to ensure that buoyancy of private investment in infrastructure is returned. If that is achieved, it will catalyse balancing investments in a host of manufacturing activities and enable the economy's fixed investment rate to slowly return to its pre-2008 trajectory (as also the overall growth rate of the Indian economy). Investment in infrastructure is sometimes seen as running into environmental problems. The reconciliation of these objectives may require higher levels of investment than otherwise but this

additional cost of compliance is perhaps a necessary cost that will have to be borne and can be partly offset by greater efficiency elsewhere.

## SAVINGS

2.43. The high levels of investment projected for the Twelfth Plan have to be financed through a combination of domestic savings and net foreign inflow. The prospects of each of these components playing their expected role in the Twelfth Plan period and facilitating the level of investment projected are discussed in the following sections.

### Trends in Domestic Savings

2.44. A strong domestic savings performance has been one of the strengths of the Indian economy for several years. As evident from Figure 2.2, the savings rate has undergone deep transformation rising from less than 20 per cent of GDP in 1980 to around 25 per cent in the 1990s and to over 30 per cent in the second half of the last decade. It reached a peak value of 36.8 per cent in 2007–08, after which it dropped to 33.7 per cent in 2009–10, but picked up a bit to 34.0 per cent in 2010–11. It has come down to 30.8 per cent in 2011–12. Thus the aggregate savings rate declined by 6.0 percentage points between 2007–08 and 2011–12.

2.45. Two factors were principally responsible for raising the domestic savings rate in the period up to 2007–08. One was the big improvement in government finances and the other was the improvement in the level of retained earnings of the private corporate sector. Between 2001–02 and 2007–08, the savings of government administration improved from *minus* 6.0 per cent of GDP to *plus* 0.5 per cent of GDP—an improvement of 6.5 percentage points. This was equal to almost half of the 13.4 percentage point improvement in the overall savings rate. The retained earnings of the private corporate sector improved from 3.4 to 9.4 per cent of GDP—an increase of about 6.0 percentage points. There were also small increases in the savings by households and that by public sector enterprises. Household savings comprise financial savings as well as physical savings that are directly made by households and unincorporated enterprises such as house building,

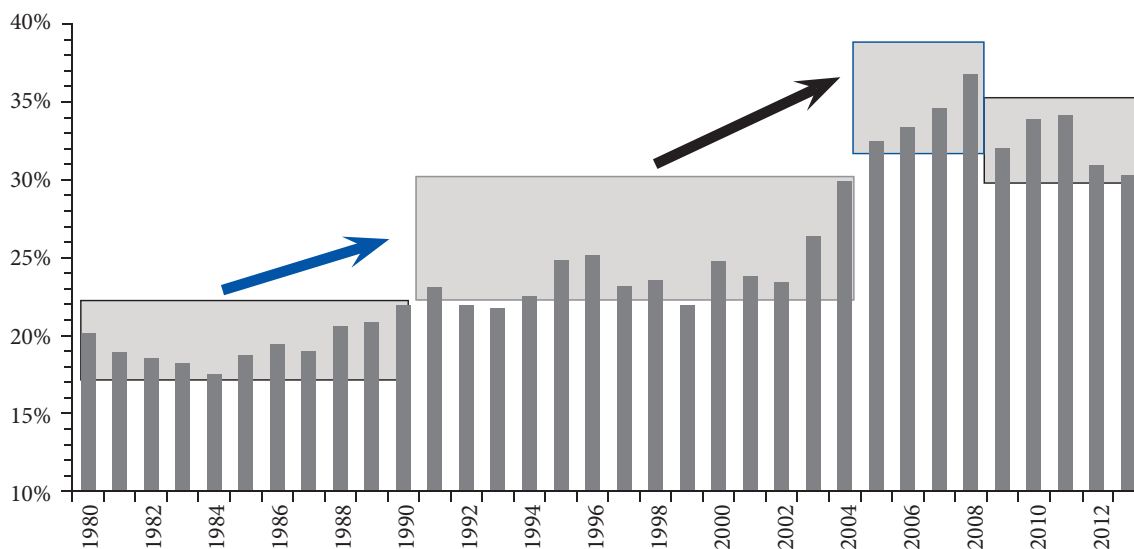


FIGURE 2.3.: Domestic Savings Rate—Ratio to GDP—Over the Years

farm improvement and asset creation by unincorporated businesses. Gross financial savings by households improved by 2.3 percentage points, but then so did the sector's liabilities (mortgage, automobile and other kinds of borrowing), so that net financial savings of the household sector increased by just 0.7 percentage points. However, the savings made by the household sector directly in physical assets declined by about 0.5 percentage points. The total savings of this sector therefore, remained more or less unchanged during this period as a percentage of GDP.

2.46. The decline in domestic savings rates after the crisis of 2008 reflects deterioration in precisely the two elements, which had accounted for the increase earlier. Between 2007–08 and 2011–12 the deterioration in the savings of government—flowing from the fiscal stimulus given in the wake of the crisis—amounted to 2.5 percentage points. Combined with lower retained earnings by departmental and non-departmental enterprises, this reduced the savings of the public sector by as much as 3.7 percentage points of GDP accounting for nearly two-thirds of the fall of 6.0 percentage points in the domestic savings rate. Savings by the private corporate sector declined by

2.2 percentage points while households savings remained largely unchanged.

#### A Savings Strategy for the Twelfth Plan

2.47. The savings strategy in the Twelfth Plan must be to reverse the decline in savings that occurred after 2007–08 in order to finance the increase in the rate of investment projected for the Twelfth Plan period. The Working Group on Savings for the Twelfth Plan had made several projections based on alternative values for economic growth and inflation. It had projected the gross domestic savings rate to range between 36–37 per cent of GDP for the Twelfth Plan period, depending on whether GDP growth is 8 per cent or 9 per cent. On reviewing these estimates, it was felt that it would suffice if the savings rate reaches 36.0 per cent in the last year of the Plan as shown in Table 2.3. The projected average level of the domestic savings rate for the Twelfth Plan is 33.6 per cent, slightly higher than the 33.5 per cent recorded in the Eleventh Plan.

2.48. Factoring in capital inflows from abroad to cover the projected current account deficit of 3.4 per cent of GDP, the average investment rate for the Twelfth Plan period that can be sustained

**TABLE 2.3**  
**Domestic Savings and Components Thereof in Per Cent of GDP at Current Prices**

|   | Eleventh Plan period |         |         |         |         |         |         |         |         |         | Twelfth Plan period |         |  |  |  |
|---|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------------------|---------|--|--|--|
|   | 2007-08              | 2008-09 | 2009-10 | 2010-11 | 2011-12 | Average | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17             | Average |  |  |  |
| Gross Savings in Financial Assets       | 15.4                 | 13.0    | 15.1    | 13.9    | 11.1    | 13.7    | 12.4    | 13.8    | 15.0    | 16.1    | 16.4                | 14.7    |  |  |  |
| Increase in Financial Liabilities       | 3.8                  | 2.9     | 3.1     | 3.6     | 3.1     | 3.3     | 3.4     | 3.8     | 4.2     | 4.5     | 4.5                 | 4.1     |  |  |  |
| Net Household Financial Savings         | 11.6                 | 10.1    | 12.0    | 10.4    | 8.0     | 10.4    | 9.0     | 10.0    | 10.8    | 11.6    | 11.9                | 10.7    |  |  |  |
| Household saving in physical assets     | 10.5                 | 13.5    | 13.4    | 13.4    | 14.3    | 13.0    | 13.2    | 12.7    | 12.2    | 11.7    | 11.7                | 12.3    |  |  |  |
| Household savings total                 | 22.4                 | 23.6    | 25.2    | 23.5    | 22.3    | 23.4    | 22.8    | 22.7    | 23.0    | 23.3    | 23.6                | 23.0    |  |  |  |
| Savings by the private corporate sector | 9.4                  | 7.4     | 8.1     | 7.9     | 7.2     | 8.1     | 7.3     | 7.7     | 8.0     | 8.5     | 8.5                 | 8.2     |  |  |  |
| Savings by the public sector            | 5.0                  | 1.0     | 0.2     | 2.6     | 1.3     | 2.0     | 1.5     | 2.0     | 2.5     | 3.1     | 3.9                 | 2.7     |  |  |  |
| Savings of government administration    | 0.5                  | -2.8    | -3.1    | -0.6    | -2.0    | -1.6    | -1.8    | -1.5    | -1.2    | -0.9    | -0.3                | -1.2    |  |  |  |
| Savings of departmental enterprises     | 0.6                  | 0.4     | 0.4     | 0.3     | 0.4     | 0.4     | 0.3     | 0.4     | 0.4     | 0.5     | 0.5                 | 0.4     |  |  |  |
| Savings of non-departmental enterprises | 3.9                  | 3.3     | 2.8     | 2.9     | 3.0     | 3.2     | 3.0     | 3.1     | 3.3     | 3.5     | 3.7                 | 3.3     |  |  |  |
| Gross Domestic Savings                  | 36.8                 | 32.0    | 33.7    | 34.0    | 30.8    | 33.5    | 31.0    | 32.4    | 33.5    | 34.9    | 36.0                | 33.6    |  |  |  |
| Net Savings from Abroad                 | 1.3                  | 2.3     | 2.8     | 2.8     | 4.2     | 2.7     | 4.8     | 3.8     | 3.0     | 2.8     | 2.5                 | 3.4     |  |  |  |
| Finance for Investment                  | 38.1                 | 34.3    | 36.5    | 36.8    | 35.0    | 36.1    | 35.8    | 36.2    | 36.5    | 37.7    | 38.5                | 36.9    |  |  |  |

comes to about 36.9 per cent of GDP. This is roughly equal to the rate of GDCF in current prices, of 36.8 per cent.

#### *Household Savings*

2.49. The gross financial savings of the household sector is expected to average 14.7 per cent in the Twelfth Plan going up from 13.7 per cent in 2010–11 (and 11.1 per cent in 2011–12), to 16.4 per cent at the end of the Twelfth Plan (2016–17). The borrowings of the household sector from the financial system are expected to increase from 3.6 per cent in 2010–11, and 3.1 per cent in 2011–12 to 4.5 per cent in 2016–17. Thus, the net financial savings of the household sector is expected to go up from 10.4 per cent in 2010–11, and 8.0 per cent in 2011–12 to 11.9 per cent in 2016–17, while the average for the Plan period is likely to be 10.7 per cent. Investment by households in physical assets is expected to average 12.3 per cent of GDP in the Twelfth Plan. Thus, the total household savings including both net financial and physical assets are projected to average 23.0 per cent for the Twelfth Plan period, about the same as in the Eleventh Plan period.

#### *Private Corporate Savings*

2.50. Savings of the private corporate sector reached a peak of 9.4 per cent of GDP in 2007–08, from which it came down as profits came under pressure from the crisis, growth slowed down and input costs rose. The average for the Eleventh Plan period was 8.1 per cent. It is expected that a gradual recovery in the savings of the private corporate sector from 7.9 per cent in 2010–11 to 8.0–8.5 per cent in the final three years of the Plan would give an average of 8.2 per cent for the full Plan period. This is about the same as that in the Eleventh Plan.

#### *Public Sector Savings*

2.51. The savings of the public sector comprise of the savings of government administration, surpluses of departmental undertakings and retained earnings of public sector enterprises. The first two are a function of the extent of operating deficit in government finance, and the third has been adversely impacted by losses arising from selling prices not increasing in line with rising costs. More specifically, this has been the case with government-owned petroleum

companies and state owned electricity distribution companies. The Working Group on Savings had projected that savings of the public sector would be around 2 per cent in 2012–13, and would average 3.5 per cent over the Twelfth Plan period. However, it now appears that savings in the public sector would be significantly lower at about 1.1 per cent in 2012–13, which would improve gradually to over 4 per cent in 2016–17, yielding a Plan average of 2.7 per cent. A better performance would yield large positive potential results since the government borrowing needs could be curtailed freeing resources for productive uses in the economy. This is only possible if we can curb the subsidy bill, particularly that associated with refined petroleum products, which has become so large that it is undermining the financial capacity of the government to spend on more socially worthwhile activities.

2.52. The overall domestic savings rate is projected to increase from an estimated 30.8 per cent in 2011–12 to 36.0 per cent in 2016–17, and average 33.6 per cent for the Twelfth Plan period. This would be slightly higher than the 33.5 per cent recorded in the Eleventh Plan period. Since the projected average investment rate (GDCF, including errors and omissions) in the Twelfth Plan (at current prices) is 36.9 per cent and the projected gross domestic savings is 33.6 per cent, the net external financing needed for macroeconomic balance should average 3.4 per cent. This would be a significant reduction over the course of the Plan period from 4.2 per cent reported in 2011–12, the last year of the Eleventh Plan and the anticipated higher level in 2012–13.

#### *Projected Current Account Deficit*

2.53. In this section, we review trends in the external sector to see whether the financing gap viewed from the balance of payments side is broadly consistent with the investment savings gap described above. The opening up of the Indian economy has greatly increased the role of trade in the economy. The ratio of merchandise exports to GDP in 1999–2000 was 8.3 per cent and that of import was 12.3 per cent, while the net service export was 0.9 per cent. The sum of these three items in that year (which has sometimes been used as a measure

of openness) was 21.5 per cent. The extent of trade integration with the rest of the world has expanded very significantly since 1999–2000. For the Tenth Plan (2002–07) period as a whole, merchandise exports and imports rose to 11.7 and 15.7 per cent of GDP respectively, and net service exports to 2.1 per cent, taking the aggregate of external trade activities to 29.5 per cent of GDP. In the Eleventh Plan the share of merchandise exports and imports rose further to 16.3 and 26.1 per cent respectively. Adding in net service export, the proportion of external trade to GDP rose to 40.3 per cent of GDP for the Eleventh Plan period as a whole. In the final year of the Eleventh Plan, that is 2011–12, this figure touched 45.8 per cent of GDP.

2.54. India is greatly dependant on import of crude petroleum and more recently of Liquefied Natural Gas and hence our external payments are seen to be particularly vulnerable on this count. Though crude oil prices have more than quadrupled over the past decade (from \$25 per barrel to \$115 per barrel at present), our merchandise exports and other imports have tended to keep pace. On the import side, the value of total oil imports as a ratio of aggregate merchandise imports have risen from less than 27 per cent in 2003–04 and 2004–05 to 31.7 per cent in 2007–08, before easing up a bit, before once again hitting 31.7 per cent in 2011–12 and perhaps exceed 34 per cent in 2012–13. India exports a large volume of refined petroleum products and it is the net oil import bill (after reducing the value of exported refined petroleum products from the oil import bill) that should be germane. The net oil import bill was less than 21 per cent of total merchandise imports in 2004–05 and increased only slightly to 22 per cent in 2008–09 and is expected to be around 23 per cent in 2012–13.

2.55. However, the key issue from the point of view of sustainability is the proportion that these oil imports bear in relation to merchandise exports. The value of net oil imports to that of merchandise exports excluding refined petroleum products was 28 to 30 per cent in 2003–04 and 2004–05 and steadily rose thereafter to peak at 40 per cent in 2007–08 and 2008–09. It dipped slightly, but was back up close to this level in 2011–12. In the current year (2012–13) the ratio has risen to 48.7 per cent in the first ten

months. Clearly the adverse situation in our balance of trade is significantly on account of the stress arising from the rising proportion of net oil imports relative to our capacity to export other products.

2.56. As trade integration has increased, the merchandise trade deficit has widened from 4.7 per cent of GDP in 2004–05 to 6.5 per cent in 2006–07, and further to 7.1 per cent and 9.5 per cent in the two succeeding years. It declined a little in subsequent years, but hit 9.9 per cent in 2011–12. This high trade deficit was offset by a growing net balance on service trade, and a high level of remittances. In the Eleventh Plan period, the average merchandise trade deficit was 8.3 per cent of GDP, the net services export was 3.2 per cent, and private remittances 3.5 per cent of GDP. The sum of the net services export and private remittances thus averaged 6.7 per cent of GDP, which funded 80 per cent of the merchandise trade deficit. However, it must be kept in mind that as the stock of foreign investment builds up in India, the net investment income is increasingly becoming a larger negative number, going from (–)0.6 per cent of GDP in 2004–05 to (–)0.9 per cent in 2011–12. It should, however, be noted that this negative item does not necessarily result in an actual outflow. In Balance of Payments accounting, if the income accrues, but is not remitted abroad and is retained in the enterprise, it will show up as positive FDI inflow.

2.57. The net effect of all these developments has been an expansion of the current account deficit from 1.2 per cent of GDP in 2005–06 and 1.3 per cent in 2007–08, before going to over 2.5 per cent in each of the years after 2008–09. In 2011–12 the current account deficit was at a record high of 4.2 per cent of GDP though this reflects abnormally high gold imports. For the Eleventh Plan as a whole the average current account deficit was 2.7 per cent of GDP.

2.58. Projections of trade and other balances for the Twelfth Plan period are presented in Table 2.4. Merchandise exports as a proportion of GDP are expected to remain around 16.0 per cent GDP during the course of the Twelfth Plan. In 2016–17, exports would be over \$570 billion. The average of the Twelfth Plan would be 16 per cent. Merchandise imports are expected to stabilise a proportion of

**TABLE 2.4**  
**External Payments—Current and Capital Account**

(All Figures as Per Cent of GDP at Current Prices)

|   | Eleventh Plan period |         |         |         |         |         |         |         |         |         |         | Twelfth Plan period |  |  |  |  |
|---|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------------------|--|--|--|--|
|   | 2007-08              | 2008-09 | 2009-10 | 2010-11 | 2011-12 | Average | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | Average             |  |  |  |  |
| Merchandise Exports                       | 13.2                 | 14.9    | 13.1    | 14.7    | 16.3    | 14.4    | 15.7    | 16.0    | 16.1    | 16.0    | 15.9    | 16.0                |  |  |  |  |
| Merchandise Imports                       | 20.3                 | 24.4    | 21.1    | 21.6    | 26.1    | 22.7    | 26.5    | 25.8    | 25.1    | 24.5    | 24.0    | 25.2                |  |  |  |  |
| Merchandise Trade Deficit                 | -7.1                 | -9.5    | -8.0    | -6.9    | -9.9    | -8.3    | -10.8   | -9.7    | -9.0    | -8.5    | -8.1    | -9.2                |  |  |  |  |
| Net Service export                        | 3.1                  | 4.4     | 2.6     | 2.6     | 3.4     | 3.2     | 3.5     | 3.5     | 3.5     | 3.4     | 3.4     | 3.5                 |  |  |  |  |
| Merchandise, Exports (X)<br>+ Imports (M) | 33.4                 | 39.3    | 34.1    | 36.3    | 42.4    | 37.1    | 42.2    | 41.8    | 41.2    | 40.5    | 39.9    | 41.1                |  |  |  |  |
| Total of X, M and Net<br>Services Export  | 36.6                 | 43.8    | 36.7    | 38.8    | 45.8    | 40.3    | 45.7    | 45.3    | 44.7    | 43.9    | 43.3    | 44.6                |  |  |  |  |
| Private remittances                       | 3.4                  | 3.6     | 3.8     | 3.1     | 3.4     | 3.5     | 3.6     | 3.6     | 3.5     | 3.4     | 3.4     | 3.4                 |  |  |  |  |
| Net Investment Income                     | -0.4                 | -0.5    | -0.4    | -0.9    | -0.9    | -0.6    | -1.2    | -1.1    | -1.1    | -1.1    | -1.0    | -1.1                |  |  |  |  |
| Current Account Balance                   | -1.3                 | -2.3    | -2.8    | -2.8    | -4.2    | -2.7    | -4.8    | -3.8    | -3.0    | -2.8    | -2.5    | -3.4                |  |  |  |  |
| FDI Net                                   | 1.3                  | 2.1     | 1.4     | 0.4     | 1.2     | 1.3     | 1.4     | 1.4     | 1.3     | 1.1     | 1.0     | 1.3                 |  |  |  |  |
| FDI Inward                                | 2.8                  | 4.2     | 2.4     | 1.4     | 1.8     | 2.5     | 2.0     | 1.9     | 1.8     | 1.7     | 1.6     | 1.8                 |  |  |  |  |
| FDI Outward                               | 1.5                  | 2.1     | 1.0     | 0.9     | 0.6     | 1.2     | 0.5     | 0.5     | 0.5     | 0.5     | 0.6     | 0.5                 |  |  |  |  |
| Portfolio equity                          | 2.4                  | -1.7    | 2.4     | 1.8     | 0.9     | 1.2     | 1.3     | 1.2     | 0.9     | 0.6     | 0.5     | 0.9                 |  |  |  |  |
| Loans                                     | 3.4                  | 0.5     | 1.0     | 1.6     | 1.0     | 1.5     | 1.3     | 1.3     | 1.1     | 0.9     | 0.8     | 1.1                 |  |  |  |  |
| Banking                                   | 0.9                  | -0.4    | 0.1     | 0.3     | 0.9     | 0.4     | 1.3     | 1.1     | 0.9     | 0.7     | 0.5     | 0.9                 |  |  |  |  |
| Other                                     | 0.7                  | 0.5     | -1.0    | -0.6    | -0.4    | -0.1    | -0.3    | -0.2    | -0.2    | -0.1    | -0.1    | -0.2                |  |  |  |  |
| Capital Account Balance                   | 8.7                  | 1.0     | 3.9     | 3.6     | 3.7     | 4.2     | 4.9     | 4.8     | 3.9     | 3.2     | 2.7     | 3.9                 |  |  |  |  |



GDP at average about 25 per cent of GDP during the Plan period. The merchandise trade deficit would therefore average a little over 9 per cent of GDP.

2.59. The net positive balance on trade in services is expected to increase only slightly to 3.5 per cent of GDP from 3.2 per cent in the Eleventh Plan. Private remittances averaged 3.1 per cent of GDP in the Tenth Plan, which increased to 3.5 per cent in the Eleventh Plan. Net investment income was (-)0.4 per cent in the Tenth Plan and (-)0.6 per cent in the Eleventh Plan, but as pointed out previously, has gone up to nearly (-)0.9 per cent in 2010–11 and 2011–12. In the Twelfth Plan, private remittances are expected to average an almost unchanged level of 3.4 per cent of GDP, while net investment income is expected to grow to a slightly larger negative number of (-)1.1 per cent.

2.60. The resultant current account deficit emerging from these projections average 3.4 per cent of GDP for the Twelfth Plan period as a whole. It is projected to be higher in the first two years and moderate slightly thereafter towards the end of the period. The projected current account deficit is higher than the normal comfort level, according to which it should be restricted to less than 2.5 per cent of GDP. This would reduce the risk of non-availability of external financing conditions for both domestic and overseas investors. Having a higher than comfort level of current amount deficit, for at least the first two years, has implications for the way the capital amount is managed to facilitate capital inflows.

### Prospects for Mobilising External Finance

2.61. The capital inflow required to finance a projected average current account deficit of 3.4 per cent of GDP can take several forms including FDI, Foreign Institutional Investor (FII) flows, and various types of debt including short-term trade credit and official external assistance. Our objective should be to finance the deficit as much as possible through stable foreign inflows. This means emphasising FDI and minimising short-term debt in particular. The pattern of capital flows in the Eleventh Plan period and projection for the Twelfth Plan are summarised in Table 2.3.

2.62. In the Eleventh Plan, inflows by way of FDI ranged between 1.4 and 2.8 per cent of GDP, averaging 2.2 per cent of GDP. In the same period, there were also outflows as Indian companies acquired overseas assets and this ranged between 1.0 and 1.5 per cent in various years, being much higher in 2007–08 and 2008–09, averaging 1.2 per cent for the Eleventh Plan period as a whole. In 2011–12, outbound FDI flows were much lower at 0.6 per cent of GDP.

2.63. Portfolio equity inflows fluctuated to a greater extent, from (-)1.7–2.4 per cent of GDP in the Eleventh Plan period, and averaged 1.3 per cent of GDP for the Plan period as a whole. It is worth noting that they were lowest at (-)1.7 per cent in 2008–09, the year of the financial crisis but otherwise they were positive and sizeable in every year. This suggests that while FII flows are more volatile, than FDI, they are not the same as ‘hot money’.

2.64. Loan capital inflows occur mostly through external commercial borrowings (ECBs) of Indian private and public sector companies and non-resident bank deposits. Short-term trade loans as well as FII investment in Indian government and corporate debt securities are also significant. Net inbound official assistance now forms a relatively small component of capital inflows. These sources taken together accounted for 1.5 per cent of GDP in the course of the Eleventh Plan. Net inflow through the banking channels was just 0.4 per cent of GDP during the course of the Eleventh Plan.

2.65. Total capital inflows from all sources thus averaged 4.2 per cent of GDP in the Eleventh Plan period. This volume of capital inflows was significantly higher than the financing required for the 2.7 per cent current account deficit, and the excess was accumulated in the foreign currency assets (including special drawing rights [SDRs] and gold) of the Reserve Bank of India (RBI).

2.66. The baseline projections made for the Twelfth Plan, as presented in Table 2.4, are based on conservative assumptions, keeping in mind the current uncertain conditions in the global economic

environment. This uncertainty is bound to lead to risk aversion, and also conservative assessment of the relative attractiveness of India as a destination for global capital in present circumstances. On this basis, the inbound FDI flows are projected to be slightly less than that in the Eleventh Plan, to average 1.8 per cent of GDP. It is likely that outbound FDI will also be lower than in the Eleventh Plan level, and is projected to be 0.5 per cent of GDP, and as a result the net inflow of FDI will remain almost unchanged at 1.3 per cent of GDP.

2.67. Portfolio equity inflows are volatile and given the global conditions that have been prevalent for some time, our projections assume that the total of such inflows would be only around 0.9 per cent of GDP, lower than the 1.2 per cent recorded in the Eleventh Plan. This assumption is almost certainly unduly cautious. Early resolution of some of the uncertainties that have arisen in the mind of foreign investors in India, combined with a visible resumption of growth momentum in 2013–14, could easily lead to stronger inflows in the remaining years. An average of over 1 per cent of GDP over the Plan period is not at all infeasible.

2.68. Loan and banking capital inflows (including NRI deposits), net of repayments, taken together are expected to be 1.1 per cent of GDP, lower than that the 1.3 per cent recorded in the Eleventh Plan. Taking all the flows together, the total of capital inflows in the Twelfth Plan is expected to be 3.9 per cent of GDP, lower than the 4.2 per cent experienced in the Eleventh Plan, but about adequate to finance the current account deficit of 3.4 per cent. This only reinforces the lack of slack on the external payments side.

2.69. To summarise, the capital inflow, projection on which the Twelfth Plan is based is deliberately conservative. It is not at all unreasonable to conclude that if growth proceeds as planned in Scenario 1, and policies towards foreign investment are seen to be positive, is encouraged, we could expect additional flows of at least 0.5 per cent of GDP. This would allow us some build up foreign exchange reserves in line with rising levels of trade and external liabilities. However, to achieve this outcome, it is imperative to improve investment conditions at home and to

encourage more capital inflows, while at the same time work on ways to contain the current account deficit.

### The Importance of Fiscal Consolidation

2.70. Since the Twelfth Plan strategy involves mobilising external finance to meet a current account deficit, which is likely to significantly exceed the comfort level of 2.5 per cent of GDP, it is important to emphasise that international analysts focus on the fiscal situation as a key indicator of macroeconomic balance. India's domestic macroeconomic balances must be seen to inspire confidence in the international market. The key indicator in this context is the fiscal deficit. Table 2.5 presents the fiscal position of both the Centre and the States.

2.71. The deficit of the Centre has risen from 2.5 per cent of GDP in the first year of the Eleventh Plan to 5.9 per cent in the last year, with the Plan average at 5.2 per cent. Taking the fiscal deficit of the Centre and the States together, it has increased from just under 4 per cent of GDP in 2007–08 to a little over 8 per cent, a deterioration of 4 percentage points.

2.72. The initial increase in the fiscal deficit in 2007–08 seemed justified on the grounds that all countries were embarking on a fiscal expansion as a countercyclical move. However, India's fiscal deficit expansion continued even after the crisis, and although a reversal was attempted in 2011–12, the projected fiscal deficit target of 5.1 per cent of GDP in 2011–12 was considerably overshoot. The increase in the Centre's

**TABLE 2.5**  
**Fiscal Position of Centre and States and Subsidy Quanta**

|                            | Gross Fiscal Deficit % GDP |             |             |
|----------------------------|----------------------------|-------------|-------------|
|                            | Centre                     | States      | Total       |
| 2007–08                    | 2.54                       | 1.49        | 3.97        |
| 2008–09                    | 5.99                       | 2.26        | 8.17        |
| 2009–10                    | 6.48                       | 3.02        | 9.46        |
| 2010–11                    | 4.87                       | 2.15        | 6.99        |
| 2011–12 (LE) <sup>a</sup>  | 5.68                       | 2.32        | 8.00        |
| <b>Total Eleventh Plan</b> | <b>5.29</b>                | <b>2.25</b> | <b>7.54</b> |

*Note:* <sup>a</sup>LE: The figures for 2011–12 are provisional actual for Centre and RE for States.

fiscal deficit after 2008–09 has been shaped by a combination of two factors. The first is the slowing down of growth that has adversely impacted tax collections along with fiscal concessions in the form of lower excise duty and service tax rates given by the government at the time of the global crisis. The second factor has been the build-up in subsidies. The subsidy burden is a matter of particular concern because a substantial part of the subsidy on petroleum products is not reflected in the budget of the Centre as indeed the real losses of the power sector are not reflected in the budgets of the State Governments.

2.73. Table 2.6 presents a comparison between India's fiscal deficit and debt to GDP ratio with that of other major industrialised and developing countries. India's fiscal deficit, though not as high as some industrialised countries, is much higher than the other emerging markets. India's debt to GDP ratio is also lower than that of many industrialised countries but is higher than that of emerging market countries.

**TABLE 2.6**  
**General Government Balance and Government Debt as Per Cent of GDP**

|              | General Government Balance | General Government Debt |
|--------------|----------------------------|-------------------------|
|              | % of GDP                   | % of GDP                |
|              | 2011                       | 2011                    |
| All Advanced | -7.2                       | 110.3                   |
| Euro Area    | -4.1                       | 88.1                    |
| Spain        | -8.5                       | 68.5                    |
| Germany      | -1.0                       | 81.5                    |
| UK           | -8.7                       | 82.5                    |
| France       | -5.3                       | 86.3                    |
| US           | -9.6                       | 102.9                   |
| Ireland      | -9.9                       | 105.0                   |
| Portugal     | -4.0                       | 106.8                   |
| Italy        | -3.9                       | 120.1                   |
| Japan        | -10.1                      | 229.8                   |
| All Emerging | -2.2                       | 37.0                    |
| Brazil       | -2.6                       | 66.2                    |
| Russia       | 1.6                        | 9.6                     |
| India        | -8.7                       | 68.1                    |
| China        | -1.2                       | 25.8                    |

Source: *Fiscal Monitor* (IMF, April 2012).

To some extent, the extent of fiscal stress in India is less than it seems because India's likely growth rate is much higher than expected by other countries except China. However, considering that the fiscal position had improved in the years before 2008, and there is need to release resources for investment in infrastructure, there can be no doubt that the Twelfth Plan must aim at a credible fiscal consolidation path that would bring the central government's fiscal deficit back to tolerable levels.

2.74. The compression in the deficit does not have to be brought about immediately. The Finance Ministry's original fiscal consolidation path envisaged reducing the fiscal deficit from the targeted 5.1 per cent of GDP in 2011–12 to 3 per cent of GDP by 2014–15, that is, an adjustment of a little over 0.6 percentage points per year. The end point envisaged may no longer be feasible in present circumstances, but it should be possible to get to 3 per cent of GDP by the end of the Plan period. As pointed out in Chapter 3, this will require a substantial increase in tax revenues, and also a reduction in subsidies as a percentage of GDP.

2.75. The ratio of Central Government revenues to GDP declined by over 2 percentage points of GDP over the Eleventh Plan period. The increase in tax revenues needed to accelerate growth, therefore, requires the tax revenue to GDP ratio to rise by the same percentage points, taking it a little above the level that prevailed in 2007–08. This should not be onerous and can be achieved primarily through efforts to improve tax administration. The implementation of Good and Services Tax (GST) is the most promising prospect in this regard. It will not only modernise the indirect tax system, greatly increasing efficiency and the ease of doing business, but also that will increase the revenues of both the Centre and the States.

2.76. As far as subsidies are concerned, it requires a reduction in subsidies from about 2.4 per cent of GDP in 2011–12 to around 1.5 per cent of GDP in the terminal year of the Twelfth Plan. It is important to emphasise that subsidies are not being abolished, but only reduced as a percentage of GDP in order to accommodate Plan expenditure which is now largely

directed at inclusiveness promoting schemes, and can be better targeted than most of the existing subsidies.

2.77. The consequences of not achieving fiscal consolidation need to be carefully considered. It is important to avoid complacency that the concern with fiscal consolidation is a purely technical concern, which can be ignored if the corrective steps needed are politically difficult. It needs to be kept in mind that global perceptions about our macroeconomic stability are critical for maintaining access to capital flows and, as pointed out above, the fiscal deficit is a performance parameter of critical importance. Failure to take credible action towards fiscal consolidation risks an erosion of confidence leading to lower capital inflows and greater exchange rate depreciation, which will either force large adjustments in petroleum prices, or would lead to a further worsening of the fiscal deficit.

#### EFFICIENT FINANCIAL INTERMEDIATION

2.78. While availability of savings in the aggregate is an important part of macroeconomic balance, it is also important to have an efficient financial system that can channel savings to the most productive uses, and also ensure inclusiveness. The past two decades have seen far-reaching change in the character and structure of the country's banking system and the capital markets. These changes have addressed the management of credit risk, provisioning against delinquent loans and a greater focus on fee-based income. The interest rate regime that used to be highly regulated was systematically replaced by a commercially determined framework that helped price-in credit quality, duration and diversification of risk. The kind of loan products available and the servicing of these for the commercial sector have also become more efficient. Retail banking, that is, personal loans for buying homes and other durable assets, and payment and settlement facilities, have become an important and rapidly growing component of banking. Lending to small borrowers typified by the self-help group (SHG) and microfinance has come some distance towards making financial inclusion meaningful.

2.79. These changes have also changed the behaviour of corporate borrowers. In many ways, financial

risk was not meaningful in the years before 1991. It changed subsequently, and with it the incentives to maintain a clean credit record and a lower leverage. Dismantling of the production licensing system, lower import tariffs and the end of quantitative restrictions on imports made competition a reality in India, that is, both domestic competition and competition vis-à-vis the global producers. Finally, the decline in the ownership functions of government and quasi-governmental agencies, and the enhanced role of capital markets in raising finance has given new importance to the interests of shareholders, especially minority shareholders. Associated with this is the challenge of corporate control, which now has to face up to proactive mergers, acquisition and sale.

2.80. The combination of all of these developments was in full play between 1997 and 2003. The large-scale expansion by Indian corporates in the immediate follow-up of the economic liberalisation was subject to some weaknesses. As these assets came into production, commodity prices worldwide came under pressure, first on account of low-priced supply from the former USSR, and later on account of the Asian Currency Crisis. For the first time, starting 1997 there were large-scale corporate defaults in India. This led to a round of restructuring, with assets being sold and corporate ownership changing hands. Once the process was complete, the corporate manufacturing sector came out well-equipped to deal with business and financial risk, challenges to corporate control, and became more competitive globally. The Information Technology Sector evolved post-liberalisation and has focused on export business, with funding secured mostly from equity. It has, therefore, developed in an entirely different environment than did the manufacturing sector, and was therefore always globally competitive, receptive to new ideas, with very little leverage on its balance sheet.

2.81. A large number of today's manufacturing units (and some service sector ones too) originally began as small scale industries (SSI), and have grown into much larger establishments, including many in engineering, chemicals, pharmaceuticals and textiles. In many ways, the emergence of a modern corporate establishment in India gained from the horizontal expansion of SSI units in years past. Small and

medium scale enterprises (SMEs)—which do exceed even the current definitions of SSI by a wide margin—will nevertheless be a continuing source of entrepreneurial talent and a source of great strength for the Indian economy in the years to come.

### Banking and Finance

2.82. Although the financial sector in India has grown fairly rapidly in recent years, in terms of the conventional metrics of financial deepening—such as a ratio of total financial claims or bank loans to GDP—India appears to be considerably behind other emerging markets. It is not entirely certain whether the data can be interpreted thus, and whether we should necessarily follow the contours of bigger the better. Capital, unlike labour, is perpetually recycled, and the shorter the cycle, the more efficient is the use of such capital. The loan to GDP ratio, which is used as a measure of the role of banking, reflects end balance sheet totals, and does not tell us anything about the extent of turnover during the year.

2.83. However, this is not to say that there are no challenges facing the development of the Indian financial sector. Possibly, the most troubling in the present context is the manner in which gold has resurfaced as a vehicle of choice for households to invest their savings in. Gold and land were the only vehicles of investment in the past. Since Independence, we have striven to encourage not just thrift, but the confidence of the Indian citizen in financial products so that their savings become available for productive use by the rest of the economy. That over six decades later, gold would resurface to such an important extent as a preferred mode of holding savings, speaks of the serious deficiencies in the distribution and perhaps regulatory structure of our financial framework that channels household savings.

2.84. This is closely related to the larger issue of instruments of long-term savings—life insurance, pensions, provident funds and so on. As both personal disposable incomes and life expectancy increases, the need for perceived safe instruments that offer a reasonable real return has, and will continue to play an increasingly important role in the financial life of the nation and its citizens. The

development of this industry has to be seen in an appropriately longer time frame, inherent financial sustainability and the quality of assurance that it gives investors with regard to their concerns. The government has been considering steps to increase the scale of FDI permitted in the insurance sector but a lack of political consensus has held back change.

2.85. The need for long-term savings products is the mirror image of the other important need—that of long-term finance for long gestation products, namely physical infrastructure. Without the first, the latter becomes hard. Commercial banks mostly hold short-term liabilities and their assets ought to reflect this duration too. However, in the absence of adequate sources of long-term finance, much of infrastructure lending has been coming from banks. A secondary market for bank loans through conversion to securities offers an exit to banks without excessively stretching their asset–liability mismatch. That is an important objective of the policy to promote infrastructure debt funds, which is now close to being in place.

2.86. The secondary market for corporate bonds has yet to take off in a significant manner, especially in the medium to long term. This has been a matter long identified as a priority and several regulatory issues have since been resolved. Possibly the non-development of ancillary markets or the continued excess of supply of gilts is preventing this market from taking off. The market for infrastructure debt generically belongs to the corporate bond market and without movement on the latter, movement in the former is not likely. In the financial sector, deep markets reduce the market (duration, illiquidity and so on) risk, and thus in the final analysis, total risks, which eventually lower the cost of capital to the borrower. For several independent and interrelated reasons, in the Twelfth Plan, special efforts must be made to ensure that the corporate bond market takes off.

2.87. There is also an issue of access. Small businesses find it hard to raise finance, and poorer households find it hard to access the organised savings and credit industry. These are not problems of India alone or for that matter of developing countries only. Even

in developed economies these challenges are in evidence. In some contrast to most of the world, Indian banks actually have much greater exposure to small credits and experience in dealing with such exposure. This has arisen from the mandates with regard to lending to the farm sector and to SSI.

2.88. The banking system, with its larger overheads, is perhaps not best suited to deal with small credits. This is where SHGs and similar collective guarantee credit schemes have a big role to play. Microfinance institutions are another vehicle. There have been some unfortunate developments in the case of microfinance, but we must be alive to the danger of throwing the baby out with the bathwater. The Microfinance Regulation Act which has been introduced in Parliament will establish a regulatory framework which would allay suspicions and allow the industry to develop unhindered with due regulatory oversight. We do need other kinds of mezzanine financial agencies—SHG, microfinance, cooperative—which permit the banks an easier way to fund the capital needs of small creditors.

2.89. The well-intentioned Know Your Customer (KYC) requirements have made it even harder for the poor to enter our banks. This is not acceptable. The Aadhar number must become a passport for ordinary people to be able to use the savings and payments facilities of our banking system, or for that matter, all other regulated savings products—mutual funds, insurance and so on.

2.90. The financing of small businesses is an intrinsic challenge because of heightened perception of credit risks. The system of refinancing through government agencies like SIDBI, in conjunction with the use of credit information databases, offers some solutions. Raising the cost to wilful defaulters is intrinsic to combat moral hazard that may creep in from well-intentioned official compassion. Otherwise the cost to the competent small businesspersons from the indiscipline of their competitors is debilitating.

2.91. However, a large part of the problem lies with the inadequacy of equity in the sector. To increase access to equity—especially for small businesses—venture capital, private equity finance and similar

agencies have been encouraged. However, notwithstanding the sharp increase in the extent of this kind of activity, only the surface has been scratched. Regulatory encouragement to the providers of equity to small business is therefore essential.

### Venture Capital

2.92. One of the most important gaps in our existing financial structure is the lack of a sufficiently large venture capital and angel investor community, who play a very important role in financing start-ups, especially in areas where technology is the key to success and risk capital is needed. To explore ways of filling this gap, Planning Commission had constituted a Committee on Angel Investment and Early Stage Venture Capital under the Chairmanship of Shri Sunil Mitra, former Finance Secretary. The committee included members from traditional financing bodies, venture/PE capital, consulting firms and National Association of Software and Services Companies (NASSCOM). The report of the committee is available at the Planning Commission website under the link 'reports'. The committee has made a number of recommendations that would help to create a strong ecosystem for innovation and early stage entrepreneurship to flourish. The recommendations include tax-related incentives and various relaxations on the regulatory side that would enable banks and insurance companies to be a little more active in this area. It also makes recommendations for setting up, technology parks and incubators of various types through PPP.

### THE EXTERNAL ENVIRONMENT

2.93. Macroeconomic balance in an open economy is powerfully affected by the external environment. This is particularly relevant at the start of the Twelfth Plan because the Indian economy is now much more globally integrated and the global economy is experiencing serious short term difficulties in the midst of some fundamental longer term changes.

2.94. As shown in Table 2.6 the rate at which the world economy expanded did not change much in the decade of the 1990s vis-à-vis the 1980s. However, in the period after 2000 and just before the global crisis broke out, the average annual rate of increase in world output increased by 1.2 percentage

points: This increase in global growth, in the period 2000–07 reflected an interesting asymmetry. The advanced economies slowed marginally from 2.7 per cent in the 1990s to an average growth of 2.6 per cent per year in 2000–07. However, the developing world growth accelerated sharply from 3.6 per cent in the 1990s to 6.5 per cent per year. Although the bulk of the growth occurred in Asia alone, the rest of the developing world in Africa and Latin America also benefited. This period represents the extension of economic opportunity to the world as a whole, and almost every country raised itself up to seize these opportunities. This favourable period come to an end in 2008.

2.95. Between 2008 and 2011, the US and the Eurozone economies have virtually stagnated. While the US economy is picking up, the recovery is weaker than what was expected, and is certainly disproportionate to the size of the fiscal and monetary stimulus that was used. The problems inherent in the European Monetary Union, and fiscally overweight governments, were prised open by the crisis. Though economic conditions seem to have stabilised for the moment, it is clear that it will take several years for the Eurozone economy to return to health. The trends in global growth are shown in Table 2.7.

**TABLE 2.7**  
**Trends in Global GDP Growth**

| GDP Growth<br>(Constant Prices)      | 1980s | 1990s | 2000–<br>2007 | 2008–<br>2011 |
|--------------------------------------|-------|-------|---------------|---------------|
| World                                | 3.2   | 3.0   | 4.2           | 2.8           |
| Advanced economies                   | 3.1   | 2.7   | 2.6           | 0.3           |
| Emerging and<br>developing economies | 3.5   | 3.6   | 6.5           | 5.6           |
| Developing Asia                      | 6.7   | 7.2   | 8.4           | 8.1           |
| India                                | 5.4   | 5.6   | 7.1           | 7.7           |
| Brazil                               | 3.0   | 1.7   | 3.5           | 3.8           |
| China                                | 9.8   | 10.0  | 10.5          | 9.6           |
| Russia                               | –     | –     | 7.2           | 1.5           |

Source: WEO database (IMF, October 2012).

2.96. A positive feature of the global scene is that many developing economies, and a handful of strong developed economies, have developed an autonomous momentum of their own. However, they

are obviously not immune to what happens in the United States and Eurozone—on account of trade effects, the likely turbulence in the world’s financial markets and the effect of all this on business confidence. It is therefore prudent to look at the general global economic outlook in terms of different time segments—the short term (up to two years), then the medium to longer term (3–15 years).

### The Short-Term Prospects

2.97. The IMF World Economic Outlook of October 2012, continues to emphasise the downside risks that can emerge, primarily from the Eurozone. It is our view that while there continues to be serious problems in the developed world and that these will persist, the downside risks have reduced significantly compared to 2011. The manner in which matters have been handled in Europe in 2012 reflects the learning from the difficulties of dealing in an atmosphere of excessive public scrutiny and unduly high expectations. Issues have crystallised to a much greater extent, and notwithstanding the change in political leadership in France, the direction of Franco-German cooperative leadership does not appear to have shifted significantly. The European Central Bank (ECB) has provided large amount of finance to the banking system through the Longer-Term Refinancing Operations (LTROs) and together with the IMF appears to have constructed a ‘firewall’ in excess of \$1 trillion. The explicit determination to intervene on such a large scale is indeed important. This offsets the potential risks that emanate from de-leveraging of an estimated \$2.6 trillion mostly by European banks. Many adaptive changes that limit the damage can reasonably be expected to transpire. The Fiscal Deficits and Public Debt, in general, remain high in the developed countries, as would be evident from Table 2.6.

2.98. The Eurozone member countries seem to recognise the need for a coordinated move towards a fiscal union though it is unclear whether, in the final analysis, this fiscal union will indeed materialise. However, they are most likely to tread this path for the next few years, in which period the two other large Eurozone economies—Italy and Spain—are expected to stabilise. It is possible that Greece will have to leave the monetary union, but it will not

imperil the Eurozone as long as they can stabilise Italy and Spain.

2.99. In the United States, the recovery has been weaker than projected. However, there are clear signs that the economy is on the mend, and the IMF has raised its growth estimate for 2012 to 2.3 per cent. Going forward, conditions are likely to stabilise in 2013. However, the United States will continue to have the problem of adopting an internally consistent and non-disruptive path for fiscal consolidation, and for rolling back the enormously extended monetary stance.

2.100. It is possible that the unprecedented loose monetary stance in the United States and in the European Union may continue for some years, and this, may create problems for others, as indeed has been the case with commodity prices. However, the main concern is shocks—not persistent weaknesses in these economies. The shocks, are not likely to happen because: (i) In the Eurozone, the direction that member countries, under the leadership of Germany and France, have taken, are expressly designed to keep things on hold for the next few years; (ii) the large amount of liquidity that has been created by the US Federal Reserve, and more recently by the ECB, will prevent any recurrence of the financial crisis. However, conditions in the European Union will continue to negatively impact the European bank financing, which has been significant for the Indian private sector infrastructure projects in the past.

2.101. It is difficult to assess how this environment will affect us. The slower growth in the United States and in the European Union will undoubtedly have an adverse impact on expansion of our markets for exports—of both goods and services—to these countries. In the short run, therefore, we are likely to face continuing pressure on the balance of payments in the form of high trade deficits and higher than comfortable current account deficit estimated at about 3.4 per cent of GDP on average.

### The Medium and Longer Term

2.102. The medium- and longer-term perspective is better. It is reasonable to assume that the economies of the United States and Eurozone will recover

over a period of time and disastrous outcomes, that is, shocks, are unlikely to happen, because the major players have too much to lose and a lot of preparation has gone into creating the ground to expressly avoid such an event. However, there will be periodical upheavals in the financial markets because certain things will go wrong, and some unexpected developments will happen. While these will be managed and contained, it is reasonable to expect sporadic volatility continuing in financial markets and investment sentiments, on account of bad news that will come out from time to time from the advanced economies.

2.103. China, India and other emerging markets in Asia and also in Africa are posed to grow more rapidly. The twenty-first Century has been referred to as the ‘Asian Century’ and it could well be, but it is imperative to underscore that this is not pre-ordained. It will depend on whether the emerging market economies of Asia are able to make the effort to overcome obstacles, to where they have got to, by dint of their own efforts. The opportunities exist, but it is always possible to fail to make the best of opportunity. It is vitally important that we show the resolve not to miss the opportunity by taking the outcome for granted.

2.104. It is relevant in this context, to recall what happened at the end of the Multifibre Agreement (MFA) in 2004. Before the end of MFA there was a belief in informed policy circles that India and China would reap the whole of the benefit and that the least developed economies may gain little. In fact, China was the principal beneficiary: Share of exports of apparel was 18.3 per cent in 2000 and this doubled to 36.9 per cent in 2010. The less-developed economies such as Bangladesh, Vietnam and Cambodia gained significantly<sup>1</sup> in line with what was desired by policy. However, India’s share increased from 3.0 per cent in 2000 to only 3.2 per cent in 2010. In other words, opportunities do arise, but countries can fail to seize them.

### Changing Global Economic Structure

2.105. India, China and other Asian economies, are poised to reverse the huge declines in their relative share in world economic output. Between 1500 and 1700, India and China had each accounted for



about one quarter of world economic output, while the share of Asia as a whole was over 60 per cent.<sup>2</sup> At the end of the colonial era in 1950, the shares in world output of India, China and the rest of Asia (excluding Japan) were 5.1 per cent, 4.8 per cent and 3.6 per cent respectively.<sup>3</sup> Between 1950 and 1980, there was not much that changed in output shares—except of course for the post-war boom in Japan, and later rapid export led growth in Korea, Hong Kong, Taiwan and Singapore. In the two decades between 1980 and 2000, while East and South East Asian economies expanded at a rapid pace and successfully improved their respective shares of world economic activity, the developed world as a whole, also gained ground, with the share of world output originating in the advanced economies increased from 73 per cent to 80 per cent. This was largely at the expense of the former Soviet bloc. There was, however, a sharp pick up in the rate of growth in the advanced economies of the West flowing for the most part from the deep changes in economic policies adopted by these economies in the 1980s which reinvigorated them. There were also small declines in the relative shares of Latin America, Middle East and sub-Saharan Africa in addition to the substantial decline in the former Soviet bloc.

**2.106.** Post-2000, it has been an altogether different story. The share of the advanced economies fell from 80 per cent in 2000 to 64 per cent in 2011, while that of the developing world increased from 20 to 36 per cent. Not only is this a development of enormous moment in the economic polarity of the world, but there is every reason to believe that it will progress further. Some projections envisage an equally balanced split between the advanced and developing economies around 2025–30.

**2.107.** The underlying trend of shifting economic polarity will continue. As mentioned previously, the share of developed economies in world GDP is likely to fall further towards 50 per cent by 2025–30. China which has been the biggest gainer in terms of altered share of world GDP is likely to see her share of world output rise to about 15 per cent by 2020 and to around 18 per cent by around 2025. This would bring her close to the projected GDP of the USA.

**2.108.** India's share of world GDP was 1.5 per cent in 2000, which increased to 2.4 per cent in 2011. By 2017, we may be at 3.5 per cent (\$3.3 trillion), 4.2–4.5 per cent (\$4.5–5.0 trillion) by 2020 and 5.5–6.0 per cent (\$8 trillion) by 2025. This is based on somewhat modest assumptions. It is self-evident that projections made over this kind of time horizon are likely to come up short. However, in the absence of any cataclysmic event, the broad contour of future economic geography is most likely to approximate this.

**2.109.** It is important to emphasise that even if developing countries are able to harvest their economic potential, they will still not become rich economies in the next 10 or even 20 years. China, for instance, has made the greatest advance in terms of income and output experiencing 34 years of rapid economic growth (average annual rate of 10 per cent) that has propelled her from being the sixth-largest in 2000 to being the second largest economy in the world. Nevertheless, China in 2012 had a per capita income of \$6,000, much ahead of India at \$1,600 but still far behind middle-income economies in Eastern Europe and Latin America. Even if she is able to sustain a rapid pace of expansion, by 2025 China will still at best be able to secure a position in the highest 60–65 economies, but yet be lower in per capita income compared to many economies in East Europe, Latin America and Asia. India will at best be a middle-income country, but with the important difference that problems of poverty as currently defined will be well behind us.

### Change in the Character of Capital Flows

**2.110.** The structure of the international capital market has changed considerably and this has implications for India's strategy in the years ahead. The developed world, particularly the USA, has run persistent current account deficits, which have been matched by persistent current account surpluses in the oil exporting nations, Japan, China and several other East and South East Asian economies.

**2.111.** The aggregate of the absolute values of current account deficits and surpluses amounted to 2.2 per cent of world GDP in 1990, which then went on

to a peak value of 5.8 per cent in 2006; from where it declined to 4.1 per cent in 2010. In absolute terms the sum of the global aggregate of current account deficits and surpluses has increased from \$1.2 trillion in 2000 to \$2.8 trillion in 2006 and 2007 and now stands at \$2.9 trillion in 2011.<sup>4</sup> This represents the sum of the net flows between surplus and deficit national economies. However, the volume of gross flows is much greater than represented by these net flows. Further, cross-border capital flows over the years have accumulated and the stock of cross-border capital has been estimated to be as large as \$100 trillion today.<sup>5</sup>

2.112. One of the interesting developments in international capital markets is the emergence of a much wider array of instruments, both debt and non-debt. Bond issuance and risk capital in the form of equity, as also some kinds of hybrid instruments have come to form a very significant component of capital flows. Further, the nature and direction of these capital flows no longer follow the traditional North–South contours and are also not unidirectional. Capital flows from the advanced to the developing economies and also from developing to advanced economy and indeed amongst the developing economies themselves.

2.113. In 1990, as much as 95 per cent of the FDI outflows originated in advanced economies. In 2011 this share had fallen to 73 per cent, even as the total value of flows rose from \$242 billion to \$1.7 trillion. The volume of FDI outflows peaked at \$2.2 trillion or almost 4 per cent of world GDP in 2007, the year before the global crisis. On the destination side, the share of developing economies saw a rapid increase from 17 per cent in 1990 to 45 per cent in 2011, of which the inflow into Asia increased over the two decades from 11 to 28 per cent. The large increase in the proportion of total FDI originating in the developing world from 4.5 per cent in 1990 to 23 per cent in 2011, translates in absolute terms to an increase from \$11 billion to \$384 billion, of which \$280 billion was from developing Asia.<sup>6</sup> It must be noted that while there was understandably a sizeable decline in the FDI flow from advanced economies, after 2008 that from developing Asia continued to rise without interruption.

2.114. The regional difference in current account balances is a manifestation of major differences in the national savings rates in the respective countries. It is quite possible that there will be some mitigation in the magnitude of these differentials. However, it is rather likely that in the foreseeable future, the magnitude of incremental savings arising in Asia and other developing economies will be proportionately larger than that which may reasonably be expected to arise in the advanced economies. To a great extent Asia has come to be a major locus of capital flows with several centres acquiring considerable significance as the focus of financial intermediation.

2.115. The shift in the polarity and geography of both capital flows and of their intermediation will be as powerful and notable as the shift in the geography of production and international trade. The dominance of conventional centres in New York, London and Frankfurt will yield to a growing role for centres in the developing world—most particularly in Asia. Hong Kong and Singapore have already acquired increasingly important roles as centres of financial mobilisation. Asia is simultaneously a major source of savings as also of demand for investment financing. Skills have gradually become internalised, and regulation and market structures seem to be supportive of these two island centres to expand very much more. It is not certain to what extent mainland centres like Shanghai, or for that matter Mumbai, will be able to keep pace. In any event a financial network within Asia is already there and will take on a much greater role. Increasingly larger increments of the stock of savings of the developed economies are entering into this network, and this process too will continue and deepen.

2.116. The changing structure of global capital markets and India's need for financing capital flows raises the issue of what should be India's policy towards capital flows. India has followed a policy of calibrated opening to capital inflows, which has served the country well. FDI is regarded as the most stable form of capital inflow and one that brings with it technology, productivity enhancement and international market linkage. Portfolio flows are more volatile than FDI but past experience shows that they are much less so than commonly feared. The real

area of vulnerability is debt denominated in foreign exchange, especially short-term debt. India's policy has reflected this hierarchical preference with the greatest openness to FDI and the strongest control over short-term debt. This basic policy of calibrated opening up of the capital account should continue.

2.117. Looking ahead, it needs to be kept in mind that as Indian industry globalises, and acquires assets abroad; Indian firms will need much more flexibility in capital transactions including especially access to risk management instruments. Unwillingness to allow such instruments to be developed in domestic market only pushes this activity abroad, and in the longer run this weakens India's ability to serve as a potential centre for financial transaction. There is a case for comprehensively reviewing the present policy and laying out a clearer road map of calibrated liberalisation over the Twelfth Plan period and beyond.

### Changes in Trade Patterns

2.118. The large ongoing changes in the pattern of economic activity described above have expectedly been mirrored in the changes in the pattern of trade in merchandise and services. In the decades following the end of colonial rule, the share of developing economies in world merchandise exports fell from 34 per cent in 1948 to 24 per cent in 1973, as exports of manufactures from the developed world increased rapidly. Thereafter, as many developing countries turned into increasingly important exporters of manufactured goods, their shares in aggregate merchandise exports recovered to 33 per cent in 2003 and further to 44 per cent by 2010.<sup>7</sup>

2.119. Most dramatic has been the increase in the share of global merchandise imports accounted for by Asia (excluding Japan) which has risen from 17 to 25 per cent between 1993 and 2010. If we take Asia (excluding Japan), Latin America, Africa and the Middle East together, we will find that their share of global merchandise imports increased from 28 to 38 per cent between 1993 and 2010. The share of the developed western economies and Japan dropped from 71 to 59 per cent in the same period. This process will only deepen further in the coming decades. The market for services—which includes

transportation, travel, financial and telecommunication, besides IT-related businesses—is actually more evenly spread out than that for merchandise, with developing economies accounting for almost half of the import market. However, even here there will be proportionately more rapid expansion in the IT-related business in the developing economies.

2.120. The other notable development in international trade is the increasing regional concentration of merchandise trade. In 2010, the second-largest regional trade was located in Asia (excluding Middle East) amounting in value to \$2.9 trillion or 63 per cent of the regional trade concentration of Europe, which amounted to \$4.7 trillion. Expectedly, the proportion of Asian origin exports to other Asian markets has increased from 47 per cent in 1999 to 53 per cent in 2011. Not only is the developing world as a whole and Asia in particular, becoming proportionately more important in international trade, but the trade within the region, and potentially with Africa and Latin America holds the promise of further expansion in future.

2.121. This has implications for our longer-term trade strategy. Although our markets in the industrialised world may not grow rapidly, other markets will expand to a greater extent and we need to be present in these markets to take the advantage.

### Four Lessons

2.122. Several lessons emerge from this brief review which are relevant for developing economies as a whole:

- First, a window of opportunity exists and domestic conditions have supportive so far, and, therefore, may reasonably be expected to continue to support a rapid pace of expansion.
- Second, the initial conditions are so disparate that many decades of sustained high economic growth can bridge, but only a part of the gap.
- Third, with almost all developing economies expanding at a fast pace, even with a rapid and sustained pace, an individual country may fail to do as well as many of her comparators.
- Fourth, some kind of end state may emerge within a few decades and there is a strong probability that

this will in some sense become the new economic hierarchy. Thereafter, flexibility and opportunity may become diminished. We need to hasten to make as much use of these opportunities, while they are still open.

### Strategy for Trade and Commerce

2.123. The long-term vision of the government is to make India a major player in world trade by 2020, and assume a role of leadership in the international trade organisations commensurate with India's growing economic and demographic profile. In consonance with its vision of ensuring sustained accelerated growth of exports and making India a major player of world trade, the government announces a Foreign Trade Policy (FTP) every five years. FTP is annually reviewed to incorporate changes necessary to take care of emerging economic scenarios both domestically and globally.

2.124. The underlying philosophy of India's FTP is based on seven broad principles:

1. Give a focused thrust to exports of employment-intensive industries.
2. Encourage domestic manufacturing for inputs to export industry and reduce the dependence on imports.
3. Promote technological up-gradation of exports to retain a competitive edge in global markets.
4. Persist with a strong market diversification strategy to hedge the risks against global uncertainty.
5. Encourage exports from the North-Eastern Region given its special place in India's economy.
6. Provide incentives for manufacturing of green goods recognising the imperative of building capacities for environmental sustainability.
7. Endeavour to reduce transaction cost through procedural simplification and reduction of human interface.

2.125. To boost exports, supportive measures are necessary as is adequate infrastructure. Simultaneously, concerted efforts need to be directed at creating domestic capacity in production of goods where India's import dependency is high and increasing. Given this background, the objectives on exports for the Twelfth Plan are:

- Substantial increase in exports to balance the Trade Deficit
- Enhancing the proportion of Manufacturing in the export basket (61.5 per cent at present) to realise higher value addition

These objectives entail drawing up of country and commodity specific strategies, with a medium- and long-term perspective. The products strategies are discussed in Chapter 9.

### Territorial Strategy for Exports

2.126. Trade flows within the South has increased substantially. However, the share of India, though increasing rapidly, is still much lower as compared to countries like China and those in South East Asia in particular. Thus, there is substantial potential for increasing India's trade with the South and with Latin America, Africa and CIS.

2.127. During the Eleventh Plan, America and Europe continued to be important destinations of Indian exports although their combined share declined from 39.8 to 35.4 per cent. India is negotiating a Broad-based Trade and Investment Agreement (BTIA) with European Union and on its completion it would result in increase bilateral trade and flows of investment between the two trading partners. The share of Asia and ASEAN after showing steady increase have shown some decline during the last two years of Eleventh Plan and the region still accounted for more than half of India's exports during the Plan period. Exports to Africa also registered a steady increase after showing some decline in initial years of the plan.

2.128. India has been pursuing a policy of market diversification directing her export promotion efforts at Asia and ASEAN, Latin America and Africa through Focus Market initiatives and bilateral trade agreements.

### Commercial Relations and Trade Agreements

2.129. While the multilateral trade negotiations progressed slowly, India pursued regional and bilateral trade negotiations with vigour. In pursuance of its 'Look East Policy', a continuous dialogue

is maintained with the ASEAN and the countries of South East Asia at summit-level engagements. Having signed the India–ASEAN Trade in Goods Agreement, negotiations on Agreements on Trade in Services and Investment continued with a view to be concluded by end 2012.

2.130. Some of the Major bilateral agreements which have been concluded in the recent past include: Comprehensive Economic Partnership Agreement (CEPA) with Republic of Korea, Comprehensive Economic Cooperation Agreement (CECA) with Malaysia, India–Thailand Free Trade Agreement, conclusion of CEPA with Japan, continuing relations with the United States, USA remains one of India’s major trade partner and India–EU BTIA Negotiations and so on; so far as, the focus areas are concerned, these are:

#### *South Asian Association of Regional Cooperation (SAARC)*

2.131. In a major initiative the Government of India (GOI) completely eliminated negative list for less developed countries (LDCs) in South Asia Free Trade Area (SAFTA) leaving only tobacco and alcohol on the list. This is expected to give a big boost to exports from SAARC LDC countries to India. India further reduced 30 per cent (264 tariff lines) of the SAFTA Sensitive list maintained by it for non-least developed countries (NLDCs) allowing the peak tariff rates to reduce to 5 per cent within three years, as per SAFTA process of tariff liberalisation. This shall reduce India’s Sensitive list for Pakistan from 878 to 614 tariff lines. Agreement on SAFTA, inter alia, prescribes a phased Tariff Liberalization Programme (TLP) according to which peak tariff rate maintained by India for all items other than those included in the sensitive list is 8 per cent which will reduce to 5 per cent with effect from 1 January 2013.

2.132. *India–Bangladesh Trade Relations:* India–Bangladesh relations intensified during the year. A Memorandum of Understanding (MoU) on establishment of border haats at Balamari-Kalaichar (Pillar No. 1,072) and Lauwaghar-Balat (Pillar No. 1,213) at Meghalaya, India–Bangladesh border was signed on 2010. The first border haat at Kalaichar

was inaugurated on 2011 and both the border haats are now operational.

2.133. *India–Nepal Trade Relations:* India and Nepal have special relations and regular consultations take place between the governments. Double Taxation Avoidance Agreement (DTAA) with Nepal was signed, which will help exporters and investors of both the countries in further improving mutual business engagements.

#### *Focus Latin American Countries Programme*

2.134. An integrated programme ‘Focus: LAC’ which was launched in November 1997 has been extended up to March 2014 in order to consolidate the gains of the previous years and significantly enhance India’s trade with the Latin America and the Caribbean (LAC) region. Latin America has been given special ‘focus’ status to diversify our trade basket and offset the inherent disadvantages for our exporters such as credit risk, higher freight cost and so on. The new FTP (2009–2014), pays special attention to LAC and 16 new markets of LAC region have been incorporated under Focus Market Scheme (FMS) bringing the total 231. Under the Market-Linked Focus Product Scheme (MLFPS), 13 markets have been identified, includes Brazil. The Preferential Trade Agreements (PTAs) with Mercosur and Chile are being expanded.

#### *‘Focus Africa’ Programme*

2.135. The ‘Focus Africa’ Programme was initially launched with focus on seven countries of Sub-Saharan African (SSA) Region, namely South Africa, Nigeria, Mauritius, Tanzania, Kenya, Ghana and Ethiopia. With a view to further widen and deepen India’s trade with Africa, the scope of this Programme was further extended to include Angola, Botswana, Ivory Coast, Madagascar, Mozambique, Senegal, Seychelles, Uganda, Zambia, Namibia and Zimbabwe, along with the six countries of North Africa, namely Egypt, Libya, Tunisia, Sudan, Morocco and Algeria. *India and Southern African Customs Union (SACU)* are also negotiating a PTA. SACU consists of a group of five countries, namely Botswana, Lesotho, Namibia, Swaziland and South Africa.

2.136. Till now, three 'India Show' events have been held in Africa. The first India Show was in South Africa in 2010, Next one was held in Addis Ababa, Ethiopia in 2011 and in the current year, 'India Show' was organised at Accra, Ghana.

2.137. India hosted the first ever *India-Africa Forum Summit* in 2008 at New Delhi. The second Africa-India Forum Summit was held at Addis Ababa from 24-25 May 2011. These Summits have been built upon the foundations of the historical relationship that exists between India and Africa, and designed a new architecture for a structured engagement, interaction and co-operation between India and Africa in the twenty-first century.

2.138. The first India-Africa Trade Ministers Meet was convened at Addis Ababa in May 2011, just ahead of the second India-Africa Forum Summit. The second meeting of the Trade Ministers from India and Africa was held on March 2012 at New Delhi, which was attended by 12 ministers from African countries. During this meeting, the Ministers launched the *India-Africa Business Council (IABC)*. The Council will suggest the way forward on enhancing economic and commercial relations between India and Africa and also identify and address issues which hinder growth of economic partnership between India and Africa.

#### *WTO Negotiations*

2.139. The Doha Round of negotiations at the World Trade Organization (WTO), which began in 2001, is still under way. The scope of the negotiations includes agriculture, market access for non-agricultural products, services trade, trade-related aspects of intellectual property rights (TRIPS), rules (covering anti-dumping and subsidies), trade facilitation and so on. The conduct, conclusion and entry into force of the outcome of the negotiations are parts of a single undertaking, that is, 'nothing is agreed until everything is agreed'.

2.140. Progress has been very slow due to wide gaps in the expectations of the members. There have been several attempts to bring the talks back on track and

to build on the results already achieved in the negotiations. There have been constant attempts in the WTO and in other forums like the G20 to resolve the impasse. During the Ministerial Conference of the WTO held in December 2011, members once again reaffirmed their belief in rules based multilateral trade and their commitment to resolve the issues in a transparent way through consensus.

2.141. In keeping with its commitment towards the legitimate interests of developing economies, LDCs and vulnerable economies, India has been working closely with various coalition groups in the WTO towards an early development-oriented conclusion of the Doha Round.

2.142. However, developed countries no longer appear interested in concluding the Round as a single undertaking. They are using the prolonged financial and economic crisis and the relatively better performance of a few developing countries to justify their demands for a change in mandate of the Doha talks and for new issues such as food security and climate change to be brought into the negotiations. Over the last several months, they have been making efforts to selectively conclude areas of the Doha negotiations in which they have a particular interest, for example trade facilitation and services.

2.143. The prolonged hiatus in the Doha Round talks in a matter of concern. It is not for want of willingness on the part of developing countries to engage, but is the result of an apparent perception among some developed countries that they will not gain much from the Round. The neglect of the Doha Round is unfortunate and jeopardises an opportunity to strengthen multilateral trade rules. Trade liberalisation will take place in any case driven by global market dynamics. Many countries, including India, have autonomously lowered tariffs and simplified border procedures. However, the multilateral trading regime treats trade as a tool of economic growth and development and not merely as a tool to serve commercial interests. The Doha Round offers a chance to strengthen this regime.

## ANNEXURE 2.1

### Poverty—Measures and Changes Therein

Household consumption expenditure surveys of the National Sample Survey Office (NSSO) have formed the basis of our analysis and conclusions about family consumption baskets and from that of consumption poverty. Till recently, the official estimates of poverty was based on the recommendations of the expert committee chaired by the late Professor D.T. Lakdawala which had submitted its recommendations in 1993. Over the years the findings on poverty made in line with the methodology of the Lakdawala Committee began to be criticised as being ‘too low’ and not in line with the general advancement of the economy.

In 2005, the Planning Commission appointed a new expert committee chaired by the late Professor Suresh Tendulkar which submitted its recommendations in late 2009. The Tendulkar Committee made several deep-rooted changes in the methodology for adjusting poverty lines to price changes and substantially revised upward the rural poverty line vis-à-vis the Lakdawala Committee, both for 1993–94 as well as for 2004–05, which was the latest large survey of the NSSO on household consumption expenditures then available.

What constitutes a ‘fair’ poverty line has always been a contentious issue. This primarily flows from the fact that poverty and in a broader sense deprivation is a cultural construct specific to a point in time. It is inconceivable that the sense of what constitutes poverty would remain unchanged as society becomes wealthier, incomes rise and modern amenities become widely available. Progress by its very nature inherently does and should recalibrate the very notion of what constitutes poverty and deprivation.

The recommendations of the Expert Committee chaired by the late Professor Suresh Tendulkar were adopted by the Planning Commission. Applying this methodology to the NSSO large survey of 2009–10 showed that the poverty ratio had declined by 7 percentage points for the country as a whole between 2004–05 and 2009–10. The annual rate of decline in this period was double that for previous periods.

This finding was criticised by some for using a poverty line that was variously described as being too ‘low’. Some points need to be made in this regard. First, what we have is the NSSO data which is collected on the basis of household surveys that seek to assess family expenditure budgets. Since households are of different sizes, the NSSO normalises the data by expressing their finding in per capita terms. These neither relate to single member households nor to family income.

Second, the finding that poverty has declined much faster in the period 2004–05 to 2009–10 is valid irrespective of where we choose to draw the poverty line. If we use the Tendulkar poverty line (PL), the decline in the period is found to be 7.3 percentage points. If we use a poverty line 30 per cent higher, the decline would be 7.8 percentage points. Likewise at 50 per cent higher the decline is 6.5 percentage points.

In fact, the decline in the poverty ratio for different levels higher and lower than the Tendulkar PL shows that the decline not only occurs at every level higher or lower than the Tendulkar PL, but that the decline is noticeably faster at lower levels of PL, particularly in rural areas, namely within the range of  $\pm 30$  per cent of the Tendulkar PL, that is amongst the lower end of the consumption distribution (Figure 2.4).

At the left hand tail of the distribution it appears that the pace of reduction is lower both for rural and urban areas. However, this is because the reduction is being measured as the annualised rate of decline in percentage points of poverty. If the initial poverty ratio is low, then the decline in terms of percentage points cannot be other than small. To see what the pace of decline at the lowest income groups, the rate of decline has been normalised by expressing it in terms of a ratio of the initial percentage of persons falling under that PL or expenditure class. This is depicted at Figure 2.5.

From the charts in Figure 2.5, it is clear that the rate of decline has if anything been faster amongst the lowest income groups in rural areas and this phenomenon is even more marked in the urban areas. The positive distributive implications of the reduction of poverty at the overall level, and even more so the greater impact on the relatively poor at the lower end of the income distribution, is a matter of satisfaction.

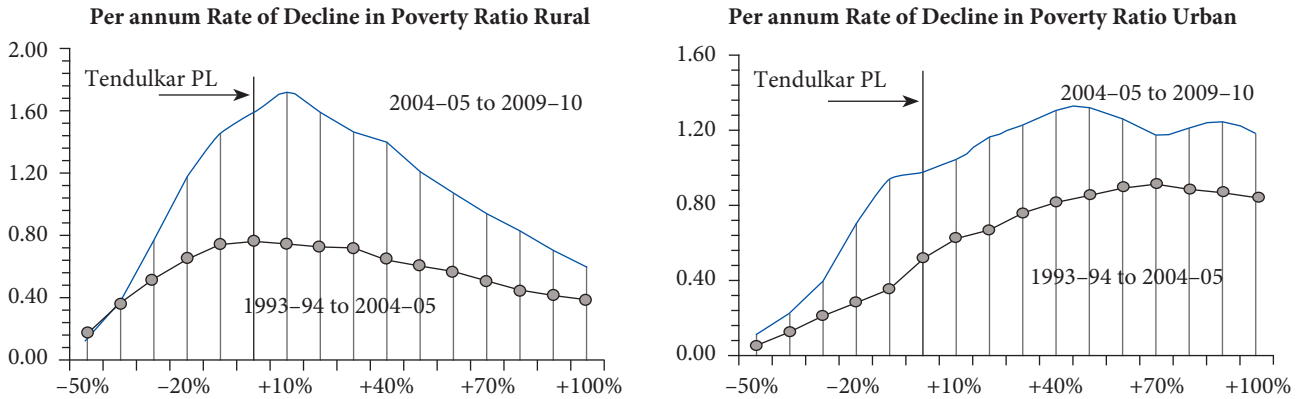


FIGURE 2.4: Annualised Reduction in Poverty Ratio between 1993-94, 2004-05 and 2009-10 for Alternate Measures of PL in Percentage Points

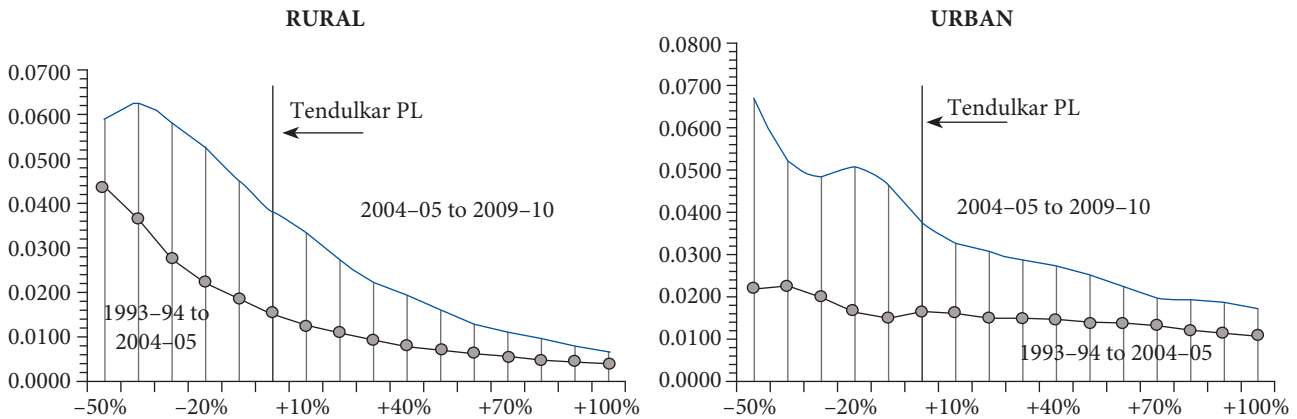


FIGURE 2.5: Annualised Rate of Decline as Proportion of the Initial Ratio in that Expenditure Class

Third, is that the difference in the NSSO consumption expenditure total and that of the private final consumption expenditure estimate of National Accounts Statistics (NAS) has been large and widening, from being over 90 per cent of the latter in the 1970s to less than 50 per cent now. Some of this is explicable, some not. In any case, the data available is the NSSO data as reported has been used without making any adjustment. Finally, these are actual data and about actual families who live below these consumption expenditure levels.

In view of the debate on the issue of measuring poverty, it has been decided to (i) de-link the benefits that are intended for the poor from the PLs computed from the NSSO household consumption surveys using the Tendulkar methodology; and (ii) set up a fresh Committee to go into every aspect of the issue.

The 68th Round of the NSSO Household Consumption Expenditure for 2011-12 has been just completed. Detailed household unit wise data will only become available after some time. The NSSO has however released some preliminary summary estimates on Uniform Recall Period (URP) both at current and at constant prices. The methodology now in use follows the Tendulkar Committee which is based on Mixed Recall Period (MRP). However, the URP distribution by decile categories is available. From the NSSO summary data release it appears that Monthly Per Capital Consumption Expenditure (MPCE) at constant (2004-05) prices increased in the two year period between 2009-10 and 2011-12 by 18.1 per cent and 13.3 per cent in rural and urban areas. This corresponds to an annualised rate of increase of 8.7 and 6.5 in rural and urban areas respectively, which is much higher than the 1.4 per cent and 2.7 per cent respective annual increases in rural and urban households between 2004-05 and 2009-10.



The 30th percentile (that is the third decile from the bottom of the distribution) of MPCE (URP) in the 68th Round show that at constant prices the increase between 2009–10 and 2011–12 was 14.5 per cent and 15.3 per cent for rural and urban households respectively, which translate to annualised rates of increase of 7.0 per cent and 7.4 per cent for urban and rural households. These are much higher than the corresponding values for the period 2004–05 to 2009–10 which was 1.7 per cent and 1.9 per cent respectively.

A large part of the reason for the much higher growth in real MPCE in the most recent period may well have been that conditions in 2009–10 was unusually depressed on account of the combination of the global crisis that had occurred a year earlier and the very poor monsoon of 2009. The initial findings of the 68th Round fully justifies the decision that was taken to go in for a large sample survey in 2011–12 (before the results for the 2009–10 survey was available) instead of the normal five-year interval.

From this, the inference is that the rate of decline in poverty in the period 2009–10 to 2011–12 would be much higher than that which emerged from the NSSO surveys for the periods 2004–05 to 2009–10. Or to put it another way the rate of decline in poverty in the period 2004–05 to 2011–12 would be much higher than that for the period 1993–94 to 2004–05.

Decile-wise annual growth in real MPCE for the periods 1993–94 to 2004–05 and 2004–05 to 2011–12 as given in Table 2.8 shows that growth in consumption across deciles was much more inclusive in the period 2004–05 to 2011–12 as compared to the period 1993–94 to 2004–05.

**TABLE 2.8**  
**Decile-wise annual growth in MPCE<sub>URP</sub> at constant prices (2004–05)**

| Deciles<br>(% of population) | (%)                |                    |                    |                    |
|------------------------------|--------------------|--------------------|--------------------|--------------------|
|                              | Rural              |                    | Urban              |                    |
|                              | 1993–94 to 2004–05 | 2004–05 to 2011–12 | 1993–94 to 2004–05 | 2004–05 to 2011–12 |
| First (0–10)                 | 0.70               | 2.91               | 0.66               | 2.96               |
| Second (10–20)               | 0.49               | 3.00               | 0.54               | 3.28               |
| Third (20–30)                | 0.56               | 3.15               | 0.66               | 3.39               |
| Fourth (30–40)               | 0.55               | 3.17               | 0.91               | 3.42               |
| Fifth (40–50)                | 0.54               | 3.17               | 1.00               | 3.41               |
| Sixth (50–60)                | 0.55               | 3.30               | 1.24               | 3.35               |
| Seventh (60–70)              | 0.52               | 3.40               | 1.36               | 3.30               |
| Eighth (70–80)               | 0.61               | 3.45               | 1.35               | 3.40               |
| Ninth (80–90)                | 0.71               | 3.48               | 1.47               | 3.45               |
| Tenth (90–100)               | 1.61               | 3.71               | 2.30               | 4.52               |
| Average                      | 0.85               | 3.40               | 1.49               | 3.72               |

## NOTES

1. The shares of Bangladesh, Vietnam and Cambodia rose from 2.6 per cent, 0.9 per cent and 0.5 per cent in 2000 to 4.5 per cent, 3.1 per cent and 0.9 per cent respectively (*International Trade Statistics 2011*, WTO).
2. Angus Maddison, *Contours of the World Economy 1-2030 AD* (Oxford University Press, 2007). The regional identifier 'Asia' does not include Middle East/West Asia in conformity with conventional practice.
3. For purposes of comparison, India in 1950 is the sum of India, Pakistan and Bangladesh (then East Pakistan) and

that of China the sum of mainland China, Hong Kong and Taiwan.

4. Computed from balance of payment data in the *World Economic Outlook* database of the IMF.
5. Stephen G. Cecchetti, *Global Imbalances: Current Accounts and Financial Flows* (Myron Scholes Global Markets Forum, University of Chicago, September 2011).
6. *World Investment Report* (UNCTAD, 2012).
7. Data on trade flows in this sections are from *International Trade Statistics* (WTO, 2011).

# 3

## Financing the Plan

### PUBLIC SECTOR RESOURCES

3.1. This Chapter presents projections of the public sector resources for the Twelfth Plan period given the target Gross Domestic Product (GDP) growth rate of 8.2 per cent. The estimates show resource availability for the Twelfth Plan of ₹80,50,123 crore at current prices for the Centre and States taken together.

3.2. These projections imply that public sector resources for the Plan will be at 11.80 per cent of GDP in the Twelfth Plan as against 10.96 per cent realised in the Eleventh Plan. However, the outcome will depend critically on achievement of buoyancy in tax revenue, effective control over subsidies and an improvement in the resource mobilising capacity of Public Sector Enterprises (PSEs) both at the Central and State levels.

### PUBLIC SECTOR RESOURCES IN THE ELEVENTH PLAN

3.3. This section presents an overview of the resources of the Centre and States in the Eleventh Plan period.

#### Centre's Plan Resources

3.4. The Gross Budgetary Support (GBS) in Eleventh Plan was projected at ₹14,21,711 crore at 2006–07 prices. This included ₹3,24,851 crore of Central Assistance (CA) to the States and Union Territories (UTs). With the Eleventh Plan resources of Central Public Sector Enterprises (CPSEs) projected at ₹10,59,711 crore, total resources available for the Central Plan was fixed at ₹21,56,571 crore.

3.5. As shown in Table 3.1, the realised GBS for the Plan was 89.23 per cent of the projected amount. Realised CA to States and UTs at ₹3,38,913 crore was 104.33 per cent of the projected level. As a percentage of GBS, this increased from 22.85 per cent to 26.72 per cent. This increase in the share of CA to States and UTs is a reflection of the stimulus packages offered by the Government as counter-cyclical measures, resulting in increased resource transfers to States through CSS in health, education and rural development, which expanded well beyond what was originally projected. Central Public Sector Enterprises (CPSEs) achieved 64.57 per cent of resources projected in the Plan. A large part of the shortfall is accounted for by under-recoveries of the public sector enterprises (PSEs) due to market price controls imposed by the Government.

3.6. The total resources available for the Central Plan, consisting of GBS for the Central Plan plus PSEs' resources, worked out to be 74.84 per cent of the projected level, that is, ₹16,13,882 crore at 2006–07 prices.

3.7. The composition of the GBS in the Eleventh Plan as actually realised reflects a significant deterioration of non-debt contribution compared to the Plan projections. The share of Balance from Current Revenues (BCRs) in GBS was projected to be 46 per cent, but deteriorated sharply to (-)14.01 per cent. Therefore, to bridge the gap, the realised share of borrowings had to increase to 108.92 per cent as against the projected share of 54.00 per cent.

**TABLE 3.1**  
**Projected vis-à-vis Realised Financing Pattern of the Plan Outlay of the Centre**

(₹ Crore at 2006–07 Prices)

| Sources of Funding Projection |  | Eleventh Plan (2007–12) |                       |               |
|-------------------------------|--|-------------------------|-----------------------|---------------|
|                               |  | Projection              | Realisation           | % Realisation |
| 1                             | BCR  | 6,53,989<br>(46.00)     | -1,77,679<br>(-14.01) | -27.17        |
| 2                             | Borrowings including net MCR*                    | 7,67,722<br>(54.00)     | 13,81,639<br>(108.92) | 179.97        |
| 3                             | Net flow from abroad                             | 0                       | 64,563                |               |
| 4                             | Gross Budgetary Support for the Plan (1 + 2 + 3) | 14,21,711               | 12,68,523             | 89.23         |
| 5                             | CA to States and UTs' Plan                       | 3,24,851<br>(22.85)     | 3,38,913<br>(26.72)   | 104.33        |
| 6                             | GBS for Central Plan (4 – 5)                     | 10,96,860<br>(77.15)    | 9,29,610<br>(73.28)   | 84.75         |
| 7                             | Resources of PSEs                                | 10,59,711               | 6,84,272              | 64.57         |
| 8                             | Resources for Central Plan (6 + 7)               | 21,56,571               | 16,13,882             | 74.84         |

*Note:* Figures in parentheses are percentages of GBS to Plan (S. No. 4). \* MCR: Miscellaneous Capital Receipts.

3.8. The overall negative BCR during the Eleventh Plan as against the projection of substantial positive BCR was partly due to global financial crisis slowing down economic growth and partly due to counter cyclical fiscal measures and Sixth Pay Commission awards. The BCR, which turned out to be positive in the last year of the Tenth Plan, had improved further in the first year of the Eleventh Plan. However, BCR turned negative in next two years, as well as in the last year of the Eleventh Plan.

#### Revenue Receipts

3.9. Gross Tax Revenue of the Centre which grew at an Average Annual Growth Rate (AAGR) of 20.5 per cent in the Tenth Plan, declined to 14.23 per cent in the Eleventh Plan. Net of the share of the States, the tax revenues of the Centre grew at 13.31 per cent. Non-tax revenue has grown at an AAGR of 16.55 per cent in the Eleventh Plan as against 4.31 per cent in the Tenth Plan. However, much of the increase was due to one off nature of proceeds of 3G/BWA Telecom Spectrum auction in 2010–11. The average annual growth of revenue receipts of the Central Government during the Eleventh Plan was 13.08 per cent.

3.10. An important factor underlying the poor resource mobilisation performance in the Eleventh

Plan was the fact that revenue receipts of the Centre decreased by 2.20 percentage points of GDP from 10.87 per cent in 2007–08 to 8.66 per cent in 2011–12. Between 2007–08 and 2011–12, gross tax revenue as a proportion of GDP decreased by about 1.71 percentage points, of which 0.16 percentage points was the decrease in the share of the States. The gross tax GDP ratio continuously declined from 11.89 per cent in 2007–08 to 10.33 per cent in 2010–11 and further to 10.18 per cent in 2011–12. Tax revenues (net of States' shares) decreased by about 1.56 percentage points from 8.81 per cent in 2007–08 to 7.25 per cent in 2011–12. Non-tax revenue fell by about 0.64 percentage points from 2.05 per cent of GDP in 2007–08 to 1.41 per cent of GDP in 2011–12. The decline in non-tax revenue has been largely due to a steep decline in interest receipts by about two percentage points owing to debt consolidation and resetting of interest rates, and disintermediation in borrowings arising from the award of the 12th Finance Commission (FC).

#### Non-Plan Revenue Expenditure

3.11. The Non-Plan Revenue Expenditure (NPRE) increased by 0.77 percentage points from 8.44 per cent of GDP in 2007–08 to 9.21 per cent of GDP in 2011–12 (refer to Table 3.2). This was mainly because

**TABLE 3.2**  
**NPRE and Its Components**

| Items          | 2007–08            | 2011–12            |
|----------------|--------------------|--------------------|
|                | Actual             | RE                 |
| 1 Interest     | 1,71,030<br>(3.43) | 2,75,618<br>(3.11) |
| 2 Pension      | 24,261<br>(0.49)   | 56,190<br>(0.63)   |
| 3 Salary       | 44,361<br>(0.89)   | 99,716<br>(1.13)   |
| 4 Subsidies    | 70,926<br>(1.42)   | 2,16,297<br>(2.44) |
| 5 Other NPRE   | 1,10,283<br>(2.21) | 1,67,919<br>(1.90) |
| 6 (Total) NPRE | 4,20,861<br>(8.44) | 8,15,740<br>(9.21) |

*Source:* Planning Commission.

*Note:* Figures in parentheses are percentages of GDP.

of an increase in salary payments due to Sixth Pay Commission award and sharp increase in subsidies by 1.02 per cent of GDP. Subsidies increased sharply from 1.42 per cent of GDP in 2007–08 to 2.44 per cent of GDP in 2011–12.

3.12. During the Eleventh Plan, expenditure on subsidies increased by 205 per cent from ₹70,926 crore in 2007–08 to ₹2,16,297 crore in 2011–12. The food subsidy and petroleum subsidy increased by about 139 per cent and 1,445 per cent respectively over this period. The sharp increase in petroleum subsidies was due to rise in international crude oil prices, rupee depreciation and inadequate passing of the increase in retail prices. The abolition of the practice of providing subsidies in securities and bringing subsidies transparently into budget accounting by cash subsidies, particularly for petroleum and fertilisers is another important factor for increase in subsidy expenditure. Subsidy rationalisation, including direct transfer of cash subsidy to the poor, is a priority policy objective of the Government and some initiatives are under consideration.

3.13. The borrowings of the Central Government have been much higher than the projected borrowing

by the Centre due to economic slowdown caused by global financial crisis. The percentage of interest payments to revenue receipts increased from 31.56 per cent in 2007–08 to 37.2 per cent in 2009–10 and only marginally declined to 35.94 per cent in 2011–12. However, the debt burden of the Centre has declined by almost 2 percentage points from 46.2 per cent in 2007–08 to 44.2 per cent of GDP as per 2011–12 (BE).

#### *Fiscal Deficit*

3.14. The gross fiscal deficit of the Centre, as a per cent of GDP, increased from 2.54 per cent in 2007–08 to 5.89 per cent in 2011–12 (RE). The Fiscal position at the State level, on the other hand, was stable primarily because borrowing of the States are controlled by the Centre. The gross fiscal deficit of the States, as a per cent of GDP, has been within the projected level, except in 2009–10. Nevertheless, the combined fiscal deficit of the Centre and States increased from 3.97 per cent in 2007–08 to 8.09 per cent in 2011–12 (RE). The average combined fiscal deficit for the Eleventh Plan, as a percentage of GDP, was 7.34 per cent with 5.15 per cent for the Centre, and 2.23 per cent for the States. The year-wise figures of fiscal deficit are provided in Table 3.3.

3.15. The net flow from abroad for externally aided projects is another source of plan financing. The share of the net inflow from abroad, through this route was 2.2 per cent of GBS in the Tenth Plan. This was expected to decline due to early repayment of costlier debt. No specific target was fixed for the

**TABLE 3.3**  
**Gross Fiscal Deficit**

| Year                               | Centre | States | Combined |
|------------------------------------|--------|--------|----------|
| 2007–08                            | 2.54   | 1.49   | 3.97     |
| 2008–09                            | 5.99   | 2.26   | 8.17     |
| 2009–10                            | 6.48   | 3.02   | 9.46     |
| 2010–11                            | 4.87   | 2.15   | 6.99     |
| 2011–12 (RE)                       | 5.89   | 2.21   | 8.09     |
| Eleventh Plan Average<br>(2007–12) | 5.15   | 2.23   | 7.34     |

*Source:* Indian Public Finance Statistics 2010–11 (Ministry of Finance) and Annual Financial Statement 2012–13.

*Note:* RE stands for Revised Estimates.

Eleventh Plan. But net inflow from abroad contributed about 5.09 per cent of the GBS in the Eleventh Plan, which was 0.24 per cent of the GDP.

### Central Public Sector Enterprises

3.16. The Internal and Extra Budgetary Resources (IEBR) of the CPSEs was projected to provide ₹10,59,711 crore, but the actual realisation was only ₹6,84,272 crore which was 64.57 per cent of the projected amount. As a result, the realised share of IEBR in the Central Plan resources was only 42.4 per cent, much lower than the projected share of 49.14 per cent.

3.17. The investment by CPSEs is financed through budgetary support provided by the Central Government, which is a part of GBS and IEBR raised by CPSEs on their own. IEBR comprises of Internal Resources (IR) and Extra-Budgetary Resources (EBR). IR comprise retained profits—net of dividend paid to Government, depreciation provision, carried forward reserves and surpluses. EBR consist of receipts from the issue of bonds, debentures, External Commercial Borrowings (ECB), suppliers' credit, deposit receipts and term loans from financial institutions.

3.18. IEBR contributed 64.3 per cent of the Plan outlay of CPSEs during the Eleventh Plan, the rest being budgetary support. Of this, IR contributed 55.28 per cent and EBR 44.72 per cent. In the original projections, IR were to contribute 45.53 per cent and EBR were to contribute only about 54.47 per cent. The Eleventh Plan realisation of IR has been relatively better than the EBR. Consequently, EBR have been well within the Eleventh Plan target of 54.47 per cent.

### States Resources in the Eleventh Plan

3.19. The Eleventh Plan resources of the States and UTs were projected at ₹14,88,147 crore at 2006–07 prices. The realisation at 2006–07 prices is placed at ₹13,47,842 crore which is 90.57 per cent of the projected level. The realised pattern of funding shows a considerable shortfall over the projected levels (as shown in Table 3.4). BCR was realised only at about 71.26 per cent over the projected level. With resources of the PSEs being slightly higher by about 4.2 per cent and borrowings restricted to 92.44 per cent of the projected level, the share of States' own resources in the aggregate plan resources has shown

**TABLE 3.4**  
**Eleventh Plan Resources of States and UTs**

| (₹ Crore at 2006–07 Prices)         |                      |                      |               |
|-------------------------------------|----------------------|----------------------|---------------|
| Sources of Funding                  | Projection           | Realisation          | % Realisation |
| 1 Balance from current revenues     | 3,85,050<br>(25.87)  | 2,74,400<br>(20.36)  | 71.26         |
| 2 Resources of PSEs                 | 1,28,824<br>(8.66)   | 1,34,234<br>(9.96)   | 104.20        |
| 3 Borrowings including net MCR      | 6,49,422<br>(43.64)  | 6,00,295<br>(44.54)  | 92.44         |
| 4 State's own resources (1 + 2 + 3) | 11,63,296<br>(78.17) | 10,08,929<br>(74.86) | 86.73         |
| 5 CA to States' and UTs' Plan       | 3,24,851<br>(21.83)  | 3,38,913<br>(25.14)  | 104.33        |
| 6 Aggregate plan resources (4 + 5)  | 14,88,147            | 13,47,842            | 90.57         |
| 7 GBS to Plan (6 – 2)               | 13,59,323            | 12,13,608            | 89.28         |
| 8 GBS as percentage of GDP          | <b>5.06</b>          | <b>4.51</b>          |               |

Source: Planning Commission.

Note: Figures in parentheses are percentages of Aggregate Plan Resources.

marginal decline to 74.86 per cent against the projection of 78.17 per cent.

3.20. Performance of the States can be analysed, broadly, in terms of three components, namely the BCR reflecting non-debt resources, States' borrowings reflecting debt-based funding, and CA, which is now all grant.

3.21. The BCR of the States was expected to be ₹3,85,050 crore and the actual realisation was only 71.26 per cent of the amount. The States' own tax revenues have increased due to improvements made possible through the introduction of value-added tax (VAT). The share of Central taxes devolved to the States has also improved owing to increased share recommended by 13th FC. However, compression of Non-Plan expenditure has not been as expected. This was largely due to salary increase of State/UT Government employees following the Sixth Pay Commission award.

3.22. As a consequence, reliance on borrowing increased marginally. Against a projected contribution of 43.64 per cent of the Plan resources, borrowing in the Eleventh Plan was marginally higher at 44.54 per cent. CA to States and UTs in the Eleventh Plan was 104.33 per cent of the projected level, and its contribution to Plan resources has been 25.14 per cent as against the projection of about 21.83 per cent. This has been the consequence of the increased expenditure on social sector through stimulus package offered by the Central Government.

## PUBLIC SECTOR RESOURCES IN THE TWELFTH PLAN

### Centre's Resources

3.23. There have been several important developments during the Eleventh Plan that have implications for financing of the Twelfth Plan. The Indian Economy resiliently faced the global financial crisis of 2008. However, slower growth adversely impacts growth in Centre's resources, particularly taxes. The Sixth Central Pay Commission award has been implemented. The 13th FC award for 2011–15 is under implementation with some changes in the fiscal responsibility and budget management

framework targets. Service tax has emerged as a very promising source of revenue. Efforts are being made to introduce unified Goods and Service Tax (GST) in consultation with States. This will be a major reform of the indirect tax system.

### *Effect of Fiscal Responsibility and Budget Management Act (FRBMA)*

3.24. FRBMA, 2003 and the associated rules which came into force with effect from 5 July 2004, enjoined the Central Government to lay down before the Parliament, the Medium Term Fiscal Policy Statement. During 2011–12, the fiscal deficit target of the Centre could not be met due to decline in economic growth impacting tax collection and high international crude prices leading to increase in subsidy-related expenditure. With proposal for additional mobilisation of indirect tax resource, fiscal deficit is estimated to decline during the Twelfth Plan. The gradual scaling down of the fiscal deficit will inevitably restrict the Government from making larger public investments through borrowing, but it will certainly pay in the long run. Borrowings which increase resource availability also increase the outstanding debt, and thereby increase the interest burden. High fiscal deficits also lead to other undesirable consequences such as uncertainty about macro-fundamentals which can affect investor confidence and make the climate unsuitable for private investment with adverse effects upon economic growth.

3.25. The projection of fiscal deficits based on Medium Term Fiscal Policy Statement 2012–13 indicates that debt resources for funding of GBS for the Twelfth Plan will be higher initially but is projected to decline gradually. The Centre's net borrowing which was 5.9 per cent of GDP in 2011–12 (RE) is estimated to decline to 5.1 per cent of GDP in 2012–13 (BE). The fiscal deficit as percent of GDP is further projected to decline to 4.5 per cent in 2013–14, 3.9 per cent in 2014–15, 3.2 per cent in 2015–16 and 3.0 per cent of GDP in the last year of the Twelfth Plan.

### *Effect of the 14th FC*

3.26. The recommendations of the 13th FC had important implications for Plan financing. The 13th FC Award increased the devolution to the States

from 30.5 per cent to 32 per cent of divisible pool. This has increased the State Share to Gross Tax Revenue of the Centre (exclusive of cesses, surcharge and cost of collection which does not constitute shareable pool) from about 26 per cent to more than 28 per cent, thereby increasing their capacity to finance the Plan. This increased capacity is kept in mind when determining the Plan resources of the States/UTs.

3.27. The 13th FC recommendations cover the period up to 2014–15, which includes the first three years of the Twelfth Plan. The projections of resources for the Twelfth Plan have been made assuming 28.45 per cent of tax devolutions of the Gross Tax revenue. This has been assumed by factoring in the surcharges being phased out and keeping the same ratio beyond 13th FC period till the terminal year of the Twelfth Plan. This might change later after the recommendations of 14th FC are available.

#### *Effect of Service Tax and GST*

3.28. The introduction of service tax has provided a promising source of revenue, but there are some caveats which have to be kept in mind before making projections for the Twelfth Plan. First, the scope for expanding the service tax net to more and more services gets narrower as the net is widened. The contribution of the expanding net will, therefore, reduce over time. Second, the preponderance of small service providers below the taxable limit of turnover constrains the scope of revenue mobilisation beyond a certain level. The introduction of GST will usher in major reforms of indirect taxes in the Centre and States. The Central Government is working with Empowered Committee of States to work out a consensus in this regard. The Twelfth Plan assumptions on tax resources of the Centre and States envisage revenue neutrality of GST although there might be positive spin-off effects of GST mainly through better tax compliance.

3.29. Keeping in mind the implication of the Mid-Term Fiscal Policy Statement and also the prospects for higher collection of taxes including service tax, an assessment has been made of the likely GBS of the Centre. The resource projection based on the estimates made by the Working Group on the Centre's resources with some changes given the changed

economic scenario, yields a projection of GBS of the Centre, which indicates that it will grow from 5.13 per cent of GDP in 2012–13 to 5.22 per cent of GDP in 2016–17. The average GBS for the Central Plan in the Twelfth Plan period stands at 5.23 per cent of GDP as against 4.69 per cent of GDP realised in the Eleventh Plan.

3.30. The Gross Tax Revenue as a percentage of GDP is estimated to increase from 10.62 per cent in 2012–13 (BE) to at least the levels achieved in 2007–08. The tax revenue (net of States' share) increases from 7.60 per cent of GDP in 2012–13 to 8.79 per cent of GDP in 2016–17, averaging 8.27 per cent during the Twelfth Plan. Collection of direct tax has remained higher than the indirect tax collection since 2008–09 and projected to have similar trend during Twelfth Plan. Corporate tax collection averages 69.37 per cent of direct tax collection during the Twelfth Plan. It increases from 4.25 per cent of GDP in 2012–13 to 4.83 per cent of GDP in 2016–17 averaging 4.57 per cent of GDP, that is, 0.76 percentage points increase over the average Eleventh Plan realisation.

3.31. Subsidies in the first year of the Twelfth Plan have been taken as per 2012–13 (BE), which is likely to be somewhat higher when the final figures become available. With the reforms being undertaken, the total subsidies, as a proportion of GDP, are projected to decline to 1.5 per cent by 2016–17. Inability to pass on increases in global oil prices to the consumers would have a substantial impact on resources for the Plan, if this situation is not rectified urgently. The realised subsidies in the Eleventh Plan and projection for the Twelfth Plan are shown graphically in Figure 3.1.

3.32. Twelfth Plan resources for the Centre and its funding are summarised in Table 3.5. The GBS available for the Plan is estimated at ₹35,68,626 crore at current prices. CA to the States' and UTs' Plan works out to be ₹8,57,786 crore. IEBR of Central public sector enterprises (CPSEs) is estimated at ₹16,22,899 crore. The total resources available for the Central Plan outlay are, therefore, projected at ₹43,33,739 crore. This is only an indicative outlay. The actual realisation can change depending on how

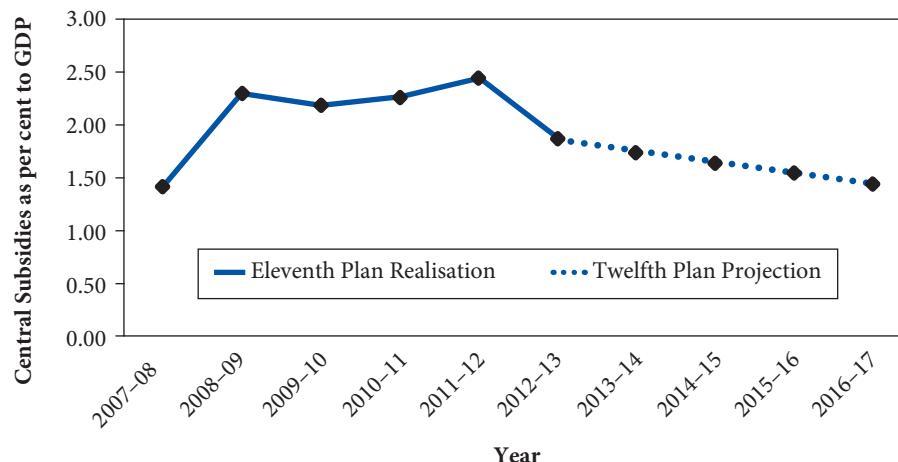


FIGURE 3.1: Central Subsidies as Per Cent to GDP

**TABLE 3.5**  
**Projection of the Twelfth Plan Resources of the Centre**

|                    |   | (₹ Crore at Current Prices) |
|--------------------|---|-----------------------------|
| Sources of Funding |   | Projection                  |
| 1                  | Balance from current revenues                   | 13,87,371<br>(38.88)        |
| 2                  | Borrowings including net MCR                    | 21,81,255<br>(61.12)        |
| 3                  | Gross Budgetary Support to Plan (1 + 2)         | 35,68,626<br>(100)          |
| 4                  | CA to States and UTs' Plan                      | 8,57,786<br>(24.04)         |
| 5                  | Total GBS for Central Plan (3 - 4)              | 27,10,840<br>(75.96)        |
| 6                  | Resources of PSEs including Borrowed Resource   | 16,22,899<br>(45.48)        |
| 7                  | <b>Total Resources for Central Plan (5 + 6)</b> | <b>43,33,739</b>            |

Source: Planning Commission.

Note: Figures in parentheses are percentages of GBS to Plan (S. No. 3).

the resource position evolves from year to year. The financial position will be reviewed at the time of Mid-term Appraisal.

3.33. Table 3.6 compares the funding pattern in the Twelfth Plan with the Eleventh Plan realisation as percentages of GDP. The BCR as percent of GDP

was projected at 2.31 per cent for the Eleventh Plan which turned negative by (-)0.61 per cent. However, with good buoyancy in tax revenue and a decline in non-plan expenditure, BCR is estimated to be 1.88 per cent of the GDP for the Twelfth Plan. The imposition of the fiscal deficit ceiling ensures that borrowings, including net miscellaneous capital receipts, decline from 5.06 per cent of GDP in Eleventh Plan to 3.35 per cent in the Twelfth Plan.

### States' Resources

3.34. The fiscal deficit of the States as a whole remained below 3 per cent of GDP during the Eleventh Plan period. While prescribing different fiscal paths for individual States, the 13th FC has also set the fiscal deficits target of 3 per cent of GDP to be achieved by 2014-15 by all the States. Accordingly, the fiscal deficit limit of all States which has been a little over 3 per cent of the GDP in 2012-13 is projected to remain around 2.22 per cent during the Twelfth Plan period. This inevitably limits the scope for mobilising debt resources of the States, therefore, have to look at improving revenue realisation and controlling non-Plan expenditure.

3.35. The Aggregate Plan resources of the States and UTs including PSE resources have been projected to be ₹37,16,385 crore at current prices (see Table 3.7). This comprises of ₹28,58,599 crore of own resources (including borrowings) and ₹8,57,786 crore of CA.



**TABLE 3.6**  
**Resources of the Centre in Eleventh and Twelfth Plan**

| Sources of Funding |  | (as % of GDP)                |                             |                                   |
|--------------------|--|------------------------------|-----------------------------|-----------------------------------|
|                    |  | Eleventh Plan<br>Realisation | Twelfth Plan<br>Projections | % Increases (+)/<br>Decreases (-) |
| 1                  | Balance from Current Revenues            | -0.61                        | 1.88                        | 2.49                              |
| 2                  | Borrowings including net MCR             | 5.06                         | 3.35                        | -1.71                             |
| 3                  | Net Flow from Abroad                     | 0.24                         | 0.00                        | -0.24                             |
| 4                  | Gross Budgetary Support to Plan (1 to 3) | <b>4.69</b>                  | <b>5.23</b>                 | 0.54                              |
| 5                  | CA to States and UTs' Plan               | 1.26                         | 1.26                        | 0.00                              |
| 6                  | GBS for Central Plan (4 - 5)             | <b>3.43</b>                  | <b>3.97</b>                 | 0.54                              |
| 7                  | Resources of PSEs                        | 2.53                         | 2.38                        | -0.15                             |
| 8                  | Resources for Central Plan (6 + 7)       | <b>5.96</b>                  | <b>6.35</b>                 | 0.39                              |

Source: Planning Commission.

**TABLE 3.7**  
**Twelfth Plan Resources of States and UTs**

| Sources of Funding |   | Projection                   |                             |                              |
|--------------------|---|------------------------------|-----------------------------|------------------------------|
|                    |   | State                        | UTs                         | Total                        |
| 1                  | Balance from Current Revenues           | 8,85,939<br>(24.80)          | 74,040<br>(51.39)           | 9,59,979<br>(25.83)          |
| 2                  | Resources of PSEs                       | 3,76,043<br>(10.53)          | 4,276<br>(2.97)             | 3,80,319<br>(10.23)          |
| 3                  | Borrowings                              | 14,94,258<br>(41.83)         | 24,043<br>(16.69)           | 15,18,301<br>(40.85)         |
| 4                  | <b>State's Own Resources (1 to 3)</b>   | <b>27,56,240</b><br>(77.16)  | <b>1,02,359</b><br>(71.05)  | <b>28,58,599</b><br>(76.92)  |
| 5                  | CA to States' and UTs' Plan             | 8,16,083<br>(22.84)          | 41,703<br>(28.95)           | 8,57,786<br>(23.08)          |
| 6                  | <b>Aggregate Plan Resources (4 + 5)</b> | <b>35,72,323</b><br>(100.00) | <b>1,44,062</b><br>(100.00) | <b>37,16,385</b><br>(100.00) |

Source: Planning Commission.

Note: Percentage of Total is in the parentheses.

UTs account for 3.88 per cent of the combined aggregate Plan resources of the States and UTs.

3.36. As a proportion of GDP, aggregate Plan resources of the States and UTs are projected at 5.45 per cent of GDP, registering an increase of 0.44 percentage points over the Eleventh Plan realisation (refer to Table 3.8). The BCR, which was

₹2,74,400 crore at 2006–07 prices in the Eleventh Plan, is projected to increase to ₹9,59,979 crore at current prices. This represents an increase of 0.39 percentage points of GDP over the Eleventh Plan. However, projections of resources of PSEs show a growth of 0.06 percentage points as compared with the Eleventh Plan. CA to the States remains almost at the same level as percentage of GDP.

**TABLE 3.8**  
**Eleventh Plan Realisation and Twelfth Plan Projection of Resources of States and UTs**

| Sources of Funding |   | Eleventh Plan<br>Realisation | Twelfth Plan<br>Projections | (% of GDP)<br>% Increases (+)/<br>Decreases (-) |
|--------------------|---|------------------------------|-----------------------------|---|
| 1                  | Balance from Current Revenues           | 1.02                         | 1.41                        | <b>0.39</b>                                     |
| 2                  | Resources of PSEs                       | 0.50                         | 0.56                        | 0.06  |
| 3                  | Borrowings                              | 2.23                         | 2.22                        | 0.01  |
| <b>4</b>           | <b>States' Own Resources (1 to 3)</b>   | <b>3.75</b>                  | <b>4.19</b>                 | <b>0.44</b>                                     |
| 5                  | CA to States' and UTs' Plan             | 1.26                         | 1.26                        | 0.00  |
| <b>6</b>           | <b>Aggregate Plan Resources (4 + 5)</b> | <b>5.01</b>                  | <b>5.45</b>                 | <b>0.44</b>                                     |

*Source:* Planning Commission.

3.37. Mobilisation of resources of such a magnitude for the Twelfth Plan is contingent upon significant improvement in the States' own resources, mainly through improved BCR. The States will have to step up efforts to increase their own tax and non-tax revenue collections through better tax administration, plugging the scope for leakages and levying of cost-based user charges. It is assumed that there would not be any additional burden on account of Pay-Commission related salary increase for majority of the States during the Plan period. Further, the devolution of taxes have been assumed at the 13th FC level for the last two years of the Plan.

3.38. As shown in Table 3.8, the CA being transferred to the States in the Twelfth Plan amounts to 1.26 per cent of GDP which is same as the Eleventh Plan. However, CA is not the only means of Plan transfer. Substantial plan transfers take place through the Centrally Sponsored Schemes (CSS) which have been greatly expanded in the Twelfth Plan. Accordingly, the States will receive larger transfer of total plan resources from the Centre.

3.39. Table 3.9 compares the structure of financing projected in the Twelfth Plan for the Centre and States, combined with that actually realised in the Eleventh Plan. The most notable feature is that the Twelfth Plan projections show relatively modest dependence on borrowings amounting to 45.96 per cent of the total Plan resources compared with 66.77 per cent in the Eleventh Plan realisation. The higher dependence on borrowings during the Eleventh Plan

was the outcome of expansionary fiscal measures of the Centre to counter economic slowdown affected by global financial crisis and inevitable increase in expenditure. With sharp fall in revenue collection, the Centre had to mobilise more resources through borrowings. As against this, tighter fiscal discipline is envisaged both for Centre and States during the Twelfth Plan period. Assuming that the economy will return to a higher growth trajectory and with good revenue buoyancies, the revenue collection is projected to grow annually by about 17 per cent on average. This is reflected in the large improvement in BCR which is projected to increase from 3.71 per cent of the total public sector plan resources in the Eleventh Plan to 29.16 per cent of the total public sector plan resources for Centre and States taken together in the Twelfth Plan.

3.40. The financing plan outlined above will pose major challenges. As shown in Table 3.10, the total resources for the Central and State Plans taken together have to increase from an average of 10.96 per cent of GDP in the Eleventh Plan to an average of 11.80 per cent of GDP in the Twelfth Plan. The increase of 0.84 per cent of GDP in total resources for the Plan has to be achieved keeping borrowing within the stipulated limit and reducing the fiscal deficit of the Centre and States to 3 per cent on each account in the last year of the Twelfth Plan. Taking account of the resources mobilised by the public sector, the combined BCR of the Centre and the States has to increase by more than the projected increase in Plan resources.

**TABLE 3.9**  
**Overall Financing Pattern: Eleventh and Twelfth Plans**

(₹ Crore at Current Prices)

| Sources of Funding  | Eleventh Plan Realisation |                      |                      | Twelfth Plan Projection |                      |                      |
|---|---------------------------|----------------------|----------------------|-------------------------|----------------------|----------------------|
|   | Centre                    | States and UTs       | Total                | Centre                  | States and UTs       | Total                |
| 1 Balance from Current Revenues                           | -2,42,390<br>(-11.97)     | 3,81,536<br>(22.11)  | 1,39,146<br>(3.71)   | 13,87,371<br>(32.01)    | 9,59,979<br>(25.83)  | 23,47,350<br>(29.16) |
| 2 Borrowings including net MCR                            | 17,51,691<br>(86.50)      | 7,52,815<br>(43.62)  | 25,04,506<br>(66.77) | 21,81,255<br>(50.33)    | 15,18,301<br>(40.85) | 36,99,556<br>(45.96) |
| 3 Net Inflow from Abroad                                  | 80,043<br>(3.95)          | 0.00                 | 80,043<br>(2.13)     | -                       | -                    | -                    |
| 4 Centre's GBS (1 + 2 + 3)                                | 15,89,344<br>(78.48)      | -                    | 15,89,344<br>(42.37) | 35,68,626<br>(82.35)    | -                    | 35,68,626<br>(44.33) |
| 5 Resources of PSEs/Local Bodies                          | 8,57,244<br>(42.33)       | 1,70,039<br>(9.85)   | 10,27,283<br>(27.39) | 16,22,899<br>(37.45)    | 3,80,319<br>(10.23)  | 20,03,218<br>(24.88) |
| 6 State's Own Resources (1 + 2 + 5)                       | -                         | 13,04,390<br>(75.58) | 13,04,390<br>(34.77) | -                       | 28,58,599<br>(76.92) | 28,58,599<br>(35.51) |
| 7 CA to States and UTs' Plan                              | -4,21,458<br>(-20.81)     | 4,21,458<br>(24.42)  | -                    | -8,57,786<br>(-19.79)   | 8,57,786<br>(23.08)  | -                    |
| 8 Resources of the Public Sector Plan (1 + 2 + 3 + 5 + 7) | 20,25,130                 | 17,25,848            | 37,50,978            | 43,33,739               | 37,16,385            | 80,50,123            |

Source: Planning Commission.

Note: Figures in parentheses are percentages of Resources of the Public Sector Plan.

**TABLE 3.10**  
**Plan Resources as Per Cent of GDP**

| S. No.    | Item                                 | Eleventh Plan | Twelfth Plan | Increase over Eleventh Plan |
|-----------|--------------------------------------|---------------|--------------|-----------------------------|
| <b>I</b>  | <b>Aggregate Plan Resources</b>      |               |              |                             |
|           | Centre                               | 5.96          | 6.35         | 0.39                        |
|           | States                               | 5.00          | 5.45         | 0.45                        |
|           | Centre and States                    | 10.96         | 11.80        | 0.84                        |
| <b>II</b> | <b>Balance from Current Revenues</b> |               |              |                             |
|           | Centre                               | -0.61         | 1.88         | 2.49                        |
|           | States                               | 1.02          | 1.41         | 0.39                        |
|           | Centre and States                    | 0.41          | 3.29         | 2.88                        |

Source: Planning Commission.

3.41. The Centre's BCR, realised in the Eleventh Plan, averaged (-)0.61 per cent of GDP. It is projected to average 1.88 per cent of GDP in the Twelfth Plan, that is, an improvement of 2.49 percentage points of GDP. Similarly, the BCR of the States is also

expected to improve from 1.02 per cent of GDP as realised in the Eleventh Plan to 1.41 per cent of GDP in the Twelfth Plan. As can be seen from Table 3.10, the projected improvement required in the combined BCR of the Centre and States taken together is,

therefore, 2.88 percentage points of GDP. It must be emphasised that achievement of these BCR targets is a key element in the financing of the Plan.

3.42. Underlying the projected BCR is a projection that tax revenues (net to Centre) would grow from 7.60 per cent of GDP in 2012–13 to 8.79 per cent of GDP in 2016–17. NPRE is expected to decline from 8.53 per cent of GDP in 2012–13 to 7.09 per cent in 2016–17. Thus the projected improvement of 2.49 per cent of GDP in BCR of the Centre is expected to come slightly more from contraction in NPRE than growth in taxes.

3.43. The assumption of growth in tax revenues of the Centre and the States built into the projections is not unreasonable. Tax revenues recorded in the recent past has shown a lot of swings due to economic slowdown affected by the global financial crisis. The annual growth of gross tax revenue collection which dipped to 2–3 per cent in 2008–09 and 2009–10, returned to a healthy growth of 27 per cent in 2010–11 followed by 13.69 per cent in 2011–12 (RE). With the recovery of the economy and proposal to mobilise additional tax revenues, gross tax revenue is estimated to grow by about 19.5 per cent in 2012–13 (BE) over the previous year. Efforts will continue in the Twelfth Plan period towards achieving the targeted tax-to-GDP ratios. However, the BCR projections are equally dependent upon the ability to moderate the growth in NPRE and this aspect of the projections deserves focused attention.

3.44. There are several factors which could make it difficult to contain expenditures to the projected level. There is inevitable upward pressure of increasing expenditure on subsidies, particularly on fertiliser and petroleum due to increasing international crude oil prices, and also on food owing to proposed food security legislation. The subsidy regime needs to be urgently reformed to keep the total subsidy within the ceiling of 1.5 per cent of GDP in 2016–17 that the resources projections have built in.

#### Allocation of Public Sector Resources

3.45. The projection of the overall resources for the Twelfth Plan has been presented in the preceding

section. This section focuses on the allocation of Public Sector Resources for the Twelfth Plan between the Centre and the States/UTs and the proposed sectoral distribution of the resources in keeping with the objective of achieving faster and more inclusive growth.

3.46. The projected assessment of resources of the public sector for the Twelfth Plan at ₹80,50,123 crore at current prices comprises of the Centre's share at ₹43,33,739 crore and the States/UTs share at ₹37,16,385 crore. The resources for the Central Plan includes the GBS component of ₹27,10,840 crore and the IEBR component of ₹16,22,899 crore at current prices. Resource allocation in the Central sector according to different Heads of Development is indicated in Annexure 3.1 and the Ministry/Department-wise details of budgetary support and IEBR are indicated in Annexure 3.2. Table 3.11 indicates the sources of funding public sector outlays for Centre and States for the Twelfth Plan.

3.47. The Twelfth Plan resources of the States and UTs are projected at ₹37,16,385 crore at current prices, out of which States' own resources are ₹28,58,599 crore and the CA to States and UTs is ₹8,57,786 crore at current prices. Head of Development-wise allocation for the States/UTs with States/UTs-wise core plan details are furnished in Annexure 3.3. These allocations would be finalised in consultation with the States.

3.48. A comparison of the distribution of the total GBS in the Eleventh and the Twelfth Plan has been shown in Table 3.12. In comparison to the Eleventh Plan realisation, there is an increase of 132.12 per cent in the projected GBS for the Centre for the Twelfth Plan. CA to State/UT Plans for State sector programmes is about 103.53 per cent higher than the grant component realised during the Eleventh Plan. The share of the projected grant component of the CA to States/UTs plan in the total GBS for Twelfth Plan has slightly decreased from the level realised in the Eleventh Plan (from 26.52 per cent to 24.04 per cent).

3.49. The projection of GBS allocation to different sectors, Ministries/Departments and the support to

**TABLE 3.11**  
**Public Sector Allocation for Twelfth Plan**

(₹ Crore at Current Prices)

| Centre                     |                              | Allocation |
|----------------------------|------------------------------|------------|
| Sources of Funding         |                              |            |
| 1                          | Budgetary Support            | 27,10,840  |
| 2                          | IEBR                         | 16,22,899  |
| 3                          | Total Centre (1 + 2)         | 43,33,739  |
| States and UTs             |                              | Allocation |
| Sources of Funding         |                              |            |
| 4                          | States' Own Resources        | 28,58,599  |
| 5                          | CA to State/UT Plan          | 8,57,786   |
| 6                          | Total States and UTs (4 + 5) | 37,16,385  |
| Total Public Sector Outlay |                              |            |
| 7                          | Grand Total (3 + 6)          | 80,50,123  |

Source: Planning Commission.

**TABLE 3.12**  
**GBS Allocation in Eleventh and Twelfth Plans**

(₹ Crore at Current Prices)

| Items   | Eleventh Plan Realisation |                      | Twelfth Plan Projections |                      |                               |
|---|---------------------------|----------------------|--------------------------|----------------------|-------------------------------|
|   | Amount                    | % Share in Total GBS | Amount                   | % Share in Total GBS | % Increase over Eleventh Plan |
| Central Plan (Central Sector and Centrally Sponsored Schemes) | 11,67,886                 | 73.48                | 27,10,840                | 75.96                | 132.12                        |
| CA to State Plan  | 4,21,458                  | 26.52                | 8,57,786                 | 24.04                | 103.53                        |
| <b>Total</b>  | <b>15,89,344</b>          | <b>100.00</b>        | <b>35,68,626</b>         | <b>100.00</b>        | <b>124.53</b>                 |

Source: Planning Commission.

the State/UT Plan has been made in tune with the approach adopted for the Twelfth Plan for 'faster, sustainable and inclusive growth'. The Twelfth Plan aims at putting the economy on a sustainable growth trajectory with a growth rate of 9.1 per cent by the end of the Plan period by targeting robust growth in agriculture at 4 per cent per year and by creating productive employment at a faster pace than before. The Twelfth Plan focuses on poverty reduction, ensuring access to basic physical infrastructure, health and education facilities to all while giving importance to bridging the regional/social/gender disparities and attending to the marginalised and the weaker social groups. Accordingly, a major structural shift across sectors has been proposed by allocating more

resources to the priority areas identified for ensuring inclusiveness. A broad picture of the structural change in terms of sectoral allocation of Centre's budgetary resources (GBS including CA to State Plans for major sectoral programmes) in Twelfth Plan as compared to Eleventh Plan has been shown in the Table 3.13.

3.50. It may be noted that the biggest increase in allocation of Centre's GBS is for Health and Child Development, Urban Development and Education. The share of Health and Child Development in Centre's GBS goes up to 11.45 per cent as compared to 7.09 per cent in the Eleventh Plan. The share of Urban Development increases from

**TABLE 3.13**  
**Allocation of Centre's GBS by Major Sectors—Eleventh Plan Realisation and Twelfth Plan Projection**

(₹ Crore in Current Prices)

| S. No. | Major Sectors                        | Eleventh Plan    |               | Twelfth Plan     |               | % Increase over Eleventh Plan |
|--------|--------------------------------------|------------------|---------------|------------------|---------------|-------------------------------|
|        |                                      | Realisation      | % Share       | Projection       | % Share       |                               |
| 1      | Agriculture and Water Resources      | 1,16,554         | 7.33          | 2,84,030         | 7.96          | 143.69                        |
| 2      | Rural Development and Panchayati Raj | 3,97,524         | 25.01         | 6,73,034         | 18.86         | 69.31                         |
| 3      | Scientific Departments               | 58,690           | 3.69          | 1,42,167         | 3.98          | 142.23                        |
| 4      | Transport and Energy                 | 2,04,076         | 12.84         | 4,48,736         | 12.57         | 119.89                        |
| 5      | Education                            | 1,77,538         | 11.17         | 4,53,728         | 12.71         | 155.57                        |
| 6      | Health and Child Development         | 1,12,646         | 7.09          | 4,08,521         | 11.45         | 262.66                        |
| 7      | Urban Development                    | 63,465           | 3.99          | 1,64,078         | 4.60          | 158.53                        |
| 8      | Others                               | 4,58,849         | 28.87         | 9,94,333         | 27.86         | 116.70                        |
|        | <b>Total Plan Allocation</b>         | <b>15,89,342</b> | <b>100.00</b> | <b>35,68,626</b> | <b>100.00</b> | <b>124.53</b>                 |

Source: Planning Commission.

3.99 per cent in the Eleventh Plan to 4.60 per cent in the Twelfth Plan. The share of Education goes up to 12.71 per cent in Twelfth Plan. The percentage increase in GBS for Scientific Departments, Agriculture and Water Resources is also substantial. The increase in budgetary support for Infrastructure in Transport and Energy Sectors is impressive considering that a large proportion of investments in these sectors would be made from the resources of CPSEs (IEBR) and through Public-Private Partnerships (PPPs). The resources for Rural Development Programmes in the areas of Housing, Employment and livelihood had been substantially increased during the Eleventh Plan as compared to the initial allocations. Even a moderate increase in resources for these programmes proposed in the Twelfth Plan over this high base means a substantial budgetary support for these programmes.

3.51. The Twelfth Plan proposes to provide ₹8,57,786 crore at current prices as CA to State/UT Plans. Table 3.14 indicates the details of sector-wise CA component of the resources of the States/UTs. Out of the total CA to States/UTs of ₹8,57,786 crore at current prices, 20.84 per cent (that is, ₹1,78,739 crore) has been earmarked for the Gadgil-Mukherjee Formula driven NCA. Special Plan Assistance (SPA) for Special Category States and Special Central Assistance (SCA) for the Border Areas Development Programme (BADP)/Hill Area Development

Programme (HADP)/North East Council (NEC) accounts for 14.31 of the total CA. The remaining 64.85 per cent of CA to the States is assigned to Additional Central Assistance (ACA) for various flagship programmes and other schemes in accordance with the priority set for the Twelfth Plan, such as the AIBP, National Social Assistance Programme (NSAP), BRGF, RKVY and JNNURM including MP's Local Area Development Programme.

3.52. The overall plan outlay of all the States and UTs is projected to increase from ₹17,25,848 crore in the Eleventh Plan to ₹37,16,385 crore in the Twelfth Plan (both at current prices), an increase of 115.34 per cent on a comparable basis. The aggregate picture indicates that the States would be allocating more than proportionate increase to social services (41.68 per cent), transport (11.53 per cent) and agriculture and allied activities (6.85 per cent). The aggregate picture, it must be noted, conceals wide inter-State variations in terms of Plan sizes relative to GSDP, per capita plan expenditure and percentage sectoral outlays.

#### ISSUES IN PLAN FINANCING

3.53. Several conceptual issues that have a bearing on the structure of the Plan financing and public expenditure management were discussed in the Eleventh Plan document. These issues included

**TABLE 3.14**  
**Projected CA to States/UTs' Plan for Twelfth Plan**

(₹ Crore at Current Prices)

| Sectors                       | Programme   | Allocation      |
|-------------------------------|---|-----------------|
| State Development Plan        | Normal CA   | 1,78,739        |
| Special Category States       | Special Plan Assistance   | 36,436          |
|                               | Special CA (Untied to any project)  | 63,858          |
|                               | Central Pool for North East and Sikkim  | 6,218           |
| Agriculture                   | Rashtriya Krishi Vikas Yojana   | 63,246          |
| SCA                           | Border Area Development Programme/Hill Area Development Programme/North Eastern Council | 10,122          |
|                               |   | 6,108           |
| Irrigation                    | Accelerated Irrigation Benefit Programme  | 91,435          |
| Urban/Local Area Development  | Jawaharlal Nehru Urban Renewal Mission  | 1,01,917        |
|                               | MPs' Local Area Development Programme   | 19,775          |
| Balanced Regional Development | Backward Region Grant Fund  | 76,677          |
|                               | Bodoland Territory Council  | 340             |
| Elderly and Weaker Section    | National Social Assistance Programme  | 48,642          |
| Infrastructure                | Roads and Bridges   | 12,410          |
| Externally Aided Projects     | Various EAPs  | 81,912          |
| E-Governance                  | National e-Governance Action Plan   | 3,537           |
| Tribal Development            | Tribal Sub-Plan   | 7,787           |
|                               | Grants-in-aid under Article 275 (1)   | 6,924           |
| UT Plans                      |   | 41,073          |
| <b>Total</b>                  |   | <b>8,57,786</b> |

the classification of expenditure into Plan and Non-Plan, Revenue and Capital, fund transfers of Centrally Sponsored Schemes (CSS) as Central Plan rather than as CA to State Plans, mode of fund transfer to States (consolidated fund versus societies route), monitoring of plan expenditure, scope of the Public Sector Plan and the problems posed by the FRBM framework to constrain grants for capital assets.

3.54. A High Level Expert Committee (HLEC) on Efficient Management of Public Expenditure was constituted by the Planning Commission under the Chairmanship of Dr. C. Rangarajan to look into various issues mentioned above and suggest measures for efficient management of public expenditure. The HLEC has made 25 recommendations across the 5 terms of reference.

3.55. The HLEC has recommended abolition of Plan and Non-Plan distinction in the Budget and a shift in the approach of public expenditure management to a more holistic view, from one year horizon to a multi-year horizon, and from input-based budgeting to the budgeting linked to outputs and outcomes. The HLEC has also outlined broad redefinition of roles of Ministry of Finance, Planning Commission, Administrative Ministries of the Central Government and State Governments. It has proposed a change in the annual budgeting process.

3.56. The HLEC has supported the proposal to introduce a new multidimensional budget and accounting classification for Union and State Governments in respect of functions, programmes and schemes. It has recommended extension of Central Plan Scheme Monitoring System (CPSMS) through interfaces with

State treasuries and Core Banking Solution (CBS) to enable real-time tracking of all Schemes for which resources are transferred to States and their agencies. These measures will enable a comprehensive view of the resources transferred to States and their agencies as well as utilisation across different Schemes.

3.57. The HLEC has recommended phase out of direct mode of transfer to autonomous societies/agencies so as to fully ensure treasury mode of transfer of Central Plan funds for better accountability. In the transition period, till the complete switch over to treasury mode, several measures have been recommended in respect of accounting, auditing and submission of utilisation reports by the societies/agencies.

3.58. The HLEC is in favour of continuing the Revenue-Capital categorisation. It recommends that all transfers should be treated as revenue expenditure in accounts, but there was a merit in excluding the grants for capital assets for the purpose of FRBM compliance. The Committee recommends that aggregate control for FRBM compliance may shift from the conventional Revenue Deficit to 'Adjusted Revenue Deficit' (revenue deficit adjusted to the extent of grants for capital assets). This should, however, be subject to rigid compliance to the definitional requirements of capital assets as well as maintenance of asset records/registers available in public domain.

3.59. As regards the scope of the Public Sector Plan, the HLEC has recommended inclusion of investment outlays funded by IEBR of PSEs. The scope of Public Sector Plan, according to the Committee, should also include the resources of local bodies. As regards the PPP projects, the Committee recommends that only the annuity commitments or Viability Gap Funding (VGF) should be a part of the Plan, but there should be a separate supplement to the Central/State budgets providing comprehensive information on PPPs.

3.60. Some recommendations of the HLEC have been accepted. The ongoing CPSMS would be expanded to facilitate better tracking and utilisation of funds. The amendments have been made in the FRBM Act of the Centre to give statutory

recognition to the concept of 'Effective Revenue Deficit' and to introduce medium-term expenditure framework statement along with the other three statements envisaged under the FRBMA. This would help Ministries/Departments to reallocate resources on priority schemes and weed out those which have outlived their utility. The Committee constituted to review the list of the Heads of Accounts of Union and States has submitted its Report. The recommendation on transfer of Plan resources to States only through the Consolidated Fund (Treasury) route will be implemented along with other recommendations to improve accountability of resources. The recommendation of the HLEC relating to abolition of Plan and Non-Plan classification is under consideration to determine its feasibility, especially in so far as it relates to interaction with the States.

## FINANCING INFRASTRUCTURE: THE SHIFT TO PPP

3.61. It is widely recognised that adequate investment in the development of infrastructure is a prerequisite for higher growth. In this context, steps have been taken by the government to create an enabling environment to promote investment in infrastructure.

## ACHIEVEMENTS OF THE ELEVENTH PLAN

3.62. To meet the infrastructure deficit at the beginning of the Eleventh Plan, an increase in investment in physical infrastructure was envisaged from about 5 per cent of GDP witnessed during the Tenth Plan to about 9 per cent of GDP by 2011-12 (terminal year of the Eleventh Plan). This was estimated to require an investment of ₹20,56,150 crore during the Eleventh Plan as compared to an estimated investment of ₹9,16,176 crore during the Tenth Plan. Further, the contribution of the private sector in infrastructure investment was expected to rise from about 22 per cent in the Tenth Plan to about 30 per cent in the Eleventh Plan.

## Sector-Wise Investments

3.63. On the basis of the figures of actual investment for the first four years of the Eleventh Plan and provisional figures for the fifth year, it is expected that the total investment in infrastructure during the Eleventh Plan would be ₹19,35,058 crore (as against projected



investment of ₹20,56,150 crore) at 2006–07 prices. The contribution of the private sector would be about 36 per cent compared to 30 per cent originally projected for the Eleventh Plan which is much higher than 22.04 per cent realised in the Tenth Plan. The details of investment over the Tenth Plan and Eleventh Plan periods are shown in Table 3.15. The investment realised during the Eleventh Plan period has been about 94 per cent of the original projections, with the public sector under-performing at

86 per cent of the target and the private sector over-performing to reach 113 per cent. The achievement was not uniform across all sectors. While Telecommunication, Oil and Gas Pipelines, Roads and Bridges sectors exceeded their investment targets, investment in Ports, Railways, Water Supply and Sanitation and Storage was much below expectations. The share of private investment in different sectors over the Eleventh Plan period is given in Figure 3.2.

**TABLE 3.15**  
**Sector-Wise Investments: Tenth Plan and Eleventh Plan**

(₹ Crore at 2006–07 Prices)

| Sectors                       | Tenth Plan | Total Eleventh Plan  |             |   |                                       |
|-------------------------------|------------|----------------------|-------------|---|---------------------------------------|
|                               | Actual     | Original Projections | Anticipated | % Increase of Eleventh Plan Anticipated over Tenth Plan Actuals | Anticipated % of Original Projections |
| <b>Electricity (incl. RE)</b> | 2,74,661   | 6,66,525             | 6,45,835    | 135.14  | 96.90                                 |
| Centre                        | 1,03,431   | 2,55,316             | 1,93,619    | 87.20   | 75.84                                 |
| States                        | 1,02,054   | 2,25,697             | 1,48,819    | 45.94   | 65.94                                 |
| Private                       | 69,176     | 1,85,512             | 3,03,396    | 338.59  | 163.55                                |
| <b>Roads and Bridges</b>      | 1,52,616   | 3,14,152             | 3,61,822    | 137.08  | 115.17                                |
| Centre                        | 71,536     | 1,07,359             | 1,55,367    | 117.19  | 144.72                                |
| States                        | 68,143     | 1,00,000             | 1,34,246    | 97.01   | 134.25                                |
| Private                       | 12,937     | 1,06,792             | 72,209      | 458.14  | 67.62                                 |
| <b>Telecommunications</b>     | 1,44,669   | 2,58,439             | 3,09,271    | 113.78  | 119.97                                |
| Centre                        | 50,626     | 80,753               | 68,628      | 35.56   | 84.99                                 |
| Private                       | 94,042     | 1,77,686             | 2,40,643    | 155.89  | 135.43                                |
| <b>Railways (incl. MRTS)</b>  | 1,03,493   | 2,61,808             | 1,95,340    | 88.75   | 74.61                                 |
| Centre                        | 1,00,077   | 2,01,453             | 1,72,113    | 71.98   | 85.44                                 |
| States                        | 2,743      | 10,000               | 11,727      | 327.44  | 117.27                                |
| Private                       | 672        | 50,354               | 11,501      | 1,610.14  | 22.84                                 |
| <b>Irrigation (incl. WS)</b>  | 1,21,475   | 2,53,301             | 1,95,688    | 61.09   | 77.26                                 |
| Centre                        | 9,661      | 24,759               | 11,629      | 20.37   | 46.97                                 |
| States                        | 1,11,814   | 2,28,543             | 1,84,059    | 64.61   | 80.54                                 |
| <b>Water Supply and SN</b>    | 60,577     | 1,43,730             | 97,351      | 60.71   | 67.73                                 |
| Centre                        | 21,508     | 42,003               | 37,243      | 73.16   | 88.67                                 |
| States                        | 37,958     | 96,306               | 59,989      | 58.04   | 62.29                                 |
| Private                       | 1,111      | 5,421                | 119         | -89.33  | 2.20                                  |
| <b>Ports (incl. ILW)</b>      | 22,351     | 87,995               | 35,536      | 58.99   | 40.38                                 |
| Centre                        | 2,630      | 29,889               | 4,398       | 67.24   | 14.71                                 |
| States                        | 916        | 3,627                | 2,216       | 141.95  | 61.10                                 |
| Private                       | 18,805     | 54,479               | 28,922      | 53.80   | 53.09                                 |

(Contd)

(Table 3.15 Contd)

| Sectors                               | Tenth Plan      | Total Eleventh Plan  |                  |   |                                       |
|---------------------------------------|-----------------|----------------------|------------------|---|---------------------------------------|
|                                       | Actual          | Original Projections | Anticipated      | % Increase of Eleventh Plan Anticipated over Tenth Plan Actuals | Anticipated % of Original Projections |
| <b>Airports</b>                       | 7,354           | 30,968               | 29,282           | 298.20  | 94.56                                 |
| Centre                                | 3,855           | 9,288                | 9,708            | 151.85  | 104.52                                |
| States                                | 717             | 50                   | 929              | 29.64   | 1,858.00                              |
| Private                               | 2,782           | 21,630               | 18,644           | 570.20  | 86.20                                 |
| <b>Storage</b>                        | 5,591           | 22,378               | 14,203           | 154.03  | 63.47                                 |
| Centre                                | 3,065           | 4,476                | 4,709            | 53.64   | 105.21                                |
| States                                | 124             | 6,713                | 1,669            | 1,250.17  | 24.86                                 |
| Private                               | 2,402           | 11,189               | 7,825            | 225.72  | 69.93                                 |
| <b>Oil and Gas pipelines</b>          | 23,389          | 16,855               | 50,730           | 116.90  | 300.98                                |
| Centre                                | 21,088          | 10,327               | 27,818           | 31.91   | 269.37                                |
| States                                | 2,279           | –                    | 3,335            | 46.35   | –                                     |
| Private                               | 23              | 6,528                | 19,578           | 85,737.54   | 299.91                                |
| <b>Grand Total</b>                    | <b>9,16,176</b> | <b>20,56,150</b>     | <b>19,35,058</b> | <b>111.21</b>   | <b>94.11</b>                          |
| Centre                                | 3,87,477        | 7,65,622             | 6,85,234         | 76.84   | 89.50                                 |
| States                                | 3,26,748        | 6,70,937             | 5,46,989         | 67.40   | 81.53                                 |
| Private                               | 2,01,951        | 6,19,591             | 7,02,836         | 248.02  | 113.43                                |
| <b>Grand Total</b>                    | <b>9,16,176</b> | <b>20,56,150</b>     | <b>19,35,058</b> | <b>111.21</b>   | <b>94.11</b>                          |
| Public                                | 7,14,225        | 14,36,559            | 12,32,222        | 72.53   | 85.78                                 |
| Private                               | 2,01,951        | 6,19,591             | 7,02,836         | 248.02  | 113.43                                |
| GDPmp                                 | 1,82,46,267     | 2,70,44,506          | 2,69,34,373      | –   | –                                     |
| <b>Investment as % of GDP con. mp</b> | <b>5.02</b>     | <b>7.60</b>          | <b>7.18</b>      | <b>–</b>  | <b>–</b>                              |

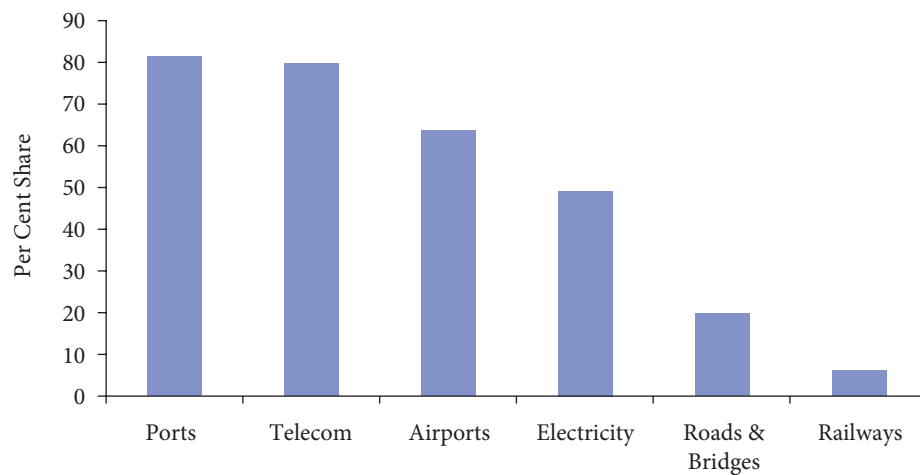


FIGURE 3.2: Private Sector Investment in Infrastructure (Per Cent Share)

### Infrastructure Investment and GDP

3.64. Table 3.16 depicts the share of infrastructure as a percentage of GDP. This has increased from 5.04 per cent in the Tenth Plan to about 7.21 per cent of GDP in the Eleventh Plan. It can also be seen that the share of private sector as percentage of GDP has gone up from 1.12 per cent to 2.64 per cent during the same period.

3.65. Starting from a base of 5.61 per cent of GDP in 2006–07, infrastructure investment reached an all-time high of 8.41 per cent of GDP in 2010–11, part of which was contributed by telecom operators investing in the auction of 3G spectrum. The percentage

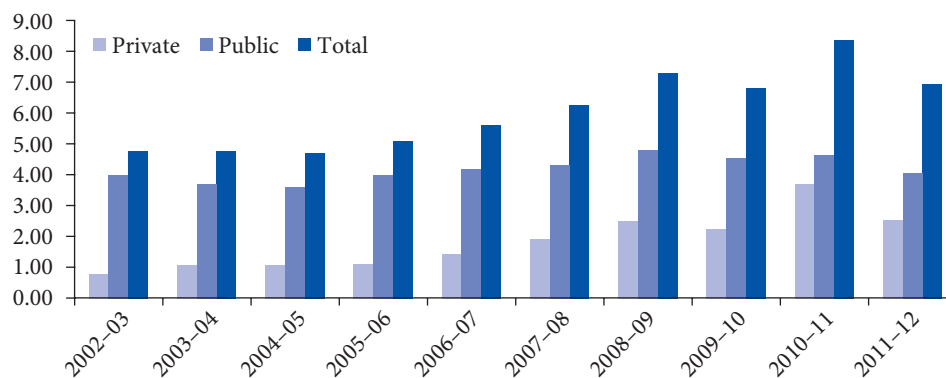
dipped to 6.90 per cent of GDP in the terminal year of the Eleventh Plan period primarily due to slowdown in the Telecommunication sector. The Eleventh Plan as a whole is likely to see an increase of about 2.17 per cent of GDP in infrastructure investment as compared to the Tenth Plan. About 70 per cent of this increase is because of higher private participation. The relative share of public and private investment as percentage of GDP is given in Figure 3.3.

### STRATEGY FOR THE TWELFTH PLAN

3.66. The strategy for the Twelfth Plan encourages private sector participation directly as well as through various forms of PPPs, wherever desirable

**TABLE 3.16**  
Investment during the Eleventh Plan as Percentage of GDP

| Years                         | (₹ Crore at Current Prices) |   |                     |                     |                     |                     |                 |                           |
|-------------------------------|-----------------------------|---|---------------------|---------------------|---------------------|---------------------|-----------------|---------------------------|
|                               | Tenth Plan<br>(Actual)      | Base Year<br>of Eleventh<br>Plan<br>(2006–07)<br>(Actual) | 2007–08<br>(Actual) | 2008–09<br>(Actual) | 2009–10<br>(Actual) | 2010–11<br>(Actual) | 2011–12<br>(RE) | Total<br>Eleventh<br>Plan |
| GDPmp                         | 1,65,98,847                 | 42,94,706   | 49,87,090           | 56,30,063           | 64,57,352           | 76,74,148           | 88,55,797       | 3,36,04,450               |
| Public Investment             | 6,51,136                    | 1,79,415  | 2,16,178            | 2,73,796            | 2,96,924            | 3,59,185            | 3,90,689        | 15,36,773                 |
| Private Investment            | 1,86,023                    | 61,621  | 96,177              | 1,40,568            | 1,44,665            | 2,85,990            | 2,20,104        | 8,87,504                  |
| <b>Total Investment</b>       | <b>8,37,159</b>             | <b>2,41,116</b>   | <b>3,12,355</b>     | <b>4,14,364</b>     | <b>4,41,590</b>     | <b>6,45,175</b>     | <b>6,10,793</b> | <b>24,24,277</b>          |
| Investment as Per Cent of GDP |                             |   |                     |                     |                     |                     |                 |                           |
| Public Investment             | 3.92                        | 4.18  | 4.33                | 4.86                | 4.60                | 4.68                | 4.41            | 4.57                      |
| Private Investment            | 1.12                        | 1.43  | 1.93                | 2.50                | 2.24                | 3.73                | 2.49            | 2.64                      |
| <b>Total Investment</b>       | <b>5.04</b>                 | <b>5.61</b>   | <b>6.26</b>         | <b>7.36</b>         | <b>6.84</b>         | <b>8.41</b>         | <b>6.90</b>     | <b>7.21</b>               |



**FIGURE 3.3:** Investment in Infrastructure as a Per Cent of GDP

and feasible. The share of private sector in infrastructure investment will have to rise substantially from about 36.61 per cent anticipated in the Eleventh Plan to about 48 per cent in the Twelfth Plan. It is expected that competition and private investment will not only expand capacity, but also improve the quality of service, besides minimising cost and time overruns in implementation of infrastructure projects. The year and Sector-wise projections for the Twelfth Plan are given in Table 3.17.

3.67. The Central share in the overall infrastructure investment is likely to decline from 35.34 per cent in the Eleventh Plan to 28.72 per cent in the Twelfth Plan, and the States' share is likely to decline to 23.13 per cent compared to 28.05 per cent in the Eleventh Plan. The share of the private sector is expected to increase from 36.61 per cent in the Eleventh Plan to 48.14 per cent in the Twelfth Plan.

### Financing Infrastructure Investment in the Twelfth Plan

3.68. The total public sector investment in infrastructure envisaged in the Twelfth Plan is ₹16,01,061 crore by the Centre and ₹12,89,762 crore by the States. Investment by the private sector, which includes PPP projects, makes up the balance of ₹26,83,840 crore, which is 48.14 per cent of the required investment during the Twelfth Plan, a much higher share than the anticipated 36.61 per cent during the Eleventh Plan. Of the projected investment of ₹16,01,061 crore by the Central Government, ₹9,47,083 crore is likely to be funded out of IEBR. In the case of States, ₹7,30,569 crore is expected from budgetary resources, while about ₹5,59,194 crore is expected from their IEBR, as per details in Table 3.18. This would require a much higher scale of effort by the public sector undertakings, especially for raising debt on commercial terms.

3.69. The total requirement of debt by the public and private sectors is likely to be ₹27,75,641 crore. However, the availability of debt financing for infrastructure during the Twelfth Plan is estimated at ₹22,65,171 crore. There is a likely funding gap of about ₹5,00,000 crore for the debt component, the details of which are given in Table 3.19. Measures would have to be taken for addressing this gap.

3.70. The projected investment in infrastructure over the Twelfth Plan would be possible only if there is a substantial expansion in internal generation and extra-budgetary resources of the public sector, in addition to a significant rise in private investment. The scale of private investment would require a significant reinforcement of the enabling policy and regulatory environment.

### Institutional Framework for PPP

#### *Cabinet Committee on Infrastructure*

3.71. The approach to PPPs must remain firmly grounded in principles which ensure that PPPs are formulated and executed in public interest with a view to achieving additional capacity and delivery of quality public services at reasonable costs. These partnerships must ensure investment for supplementing scarce public resources while improving efficiencies. The government's current initiatives in the area of PPPs are designed to achieve these objectives.

3.72. The following steps have been taken to promote private investment in infrastructure sector:

1. Setting up robust institutional structure for appraising and approving PPP projects
2. Developing standardised documents such as model concession agreements across infrastructure sectors
3. Increasing availability of finance by creating dedicated institutions and providing viability gap funding

3.73. The Committee on Infrastructure (CoI) was constituted in August 2004 under the Chairmanship of the Prime Minister, with the objectives of initiating policies that would ensure time-bound creation of world class infrastructure, delivering services matching international standards, developing structures that maximise the role of PPPs and monitoring the progress of key infrastructure projects to ensure that targets are achieved. In July 2009, the CoI was replaced by a Cabinet Committee on Infrastructure (CCI) under the Chairmanship of the Prime Minister. CCI reviews and approves policies and projects across

**TABLE 3.17**  
**Projected Investment in Infrastructure—Twelfth Plan**

(₹ Crore at Current Prices)

| Sectors                               | Total Eleventh Plan | Twelfth Plan Projections |                 |                 |                 |                 | Total Twelfth Plan    |
|---------------------------------------|---------------------|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------------|
|                                       |                     | 2012-13                  | 2013-14         | 2014-15         | 2015-16         | 2016-17         |                       |
| <b>Electricity</b>                    | <b>7,28,494</b>     | <b>2,28,405</b>          | <b>2,59,273</b> | <b>2,94,274</b> | <b>3,33,470</b> | <b>3,86,244</b> | <b>15,01,666</b>      |
| Centre                                | 2,33,501            | 69,059                   | 77,650          | 87,228          | 97,616          | 1,09,242        | 4,40,796 <sup>1</sup> |
| States                                | 1,84,696            | 56,338                   | 62,337          | 68,909          | 75,888          | 83,572          | 3,47,043              |
| Private                               | 3,10,297            | 1,03,008                 | 1,19,286        | 1,38,137        | 1,59,966        | 1,93,429        | 7,13,827              |
| <b>Renewable Energy</b>               | <b>89,220</b>       | <b>31,199</b>            | <b>42,590</b>   | <b>58,125</b>   | <b>79,075</b>   | <b>1,07,637</b> | <b>3,18,626</b>       |
| Centre <sup>1</sup>                   | 9,630               | 3,631                    | 4,739           | 6,179           | 8,027           | 10,427          | 33,003                |
| States                                | 1,018               | 744                      | 886             | 1,056           | 1,253           | 1,487           | 5,425                 |
| Private                               | 78,572              | 26,825                   | 36,965          | 50,890          | 69,795          | 95,724          | 2,80,198              |
| <b>Roads and Bridges</b>              | <b>4,53,121</b>     | <b>1,50,466</b>          | <b>1,64,490</b> | <b>1,80,415</b> | <b>1,98,166</b> | <b>2,21,000</b> | <b>9,14,536</b>       |
| Centre <sup>2</sup>                   | 1,94,678            | 61,920                   | 64,567          | 67,272          | 69,833          | 72,502          | 3,36,094              |
| States                                | 1,65,903            | 47,844                   | 51,222          | 54,786          | 58,377          | 62,204          | 2,74,433              |
| Private                               | 92,540              | 40,702                   | 48,702          | 58,357          | 69,955          | 86,294          | 3,04,010              |
| <b>Telecommunications<sup>3</sup></b> | <b>3,84,962</b>     | <b>1,05,949</b>          | <b>1,36,090</b> | <b>1,76,489</b> | <b>2,30,557</b> | <b>2,94,814</b> | <b>9,43,899</b>       |
| Centre                                | 86,375              | 15,203                   | 14,827          | 14,446          | 14,023          | 13,611          | 72,110                |
| Private                               | 2,98,586            | 90,746                   | 1,21,263        | 1,62,042        | 2,16,535        | 2,81,203        | 8,71,789              |
| <b>Railways</b>                       | <b>2,01,237</b>     | <b>64,713</b>            | <b>78,570</b>   | <b>96,884</b>   | <b>1,21,699</b> | <b>1,57,355</b> | <b>5,19,221</b>       |
| Centre                                | 1,92,147            | 59,988                   | 70,202          | 82,078          | 95,601          | 1,11,351        | 4,19,221              |
| Private                               | 9,090               | 4,725                    | 8,368           | 14,806          | 26,098          | 46,003          | 1,00,000              |
| <b>MRTS</b>                           | <b>41,669</b>       | <b>13,555</b>            | <b>17,148</b>   | <b>22,298</b>   | <b>29,836</b>   | <b>41,322</b>   | <b>1,24,158</b>       |
| Centre                                | 21,469              | 5,889                    | 6,784           | 7,808           | 8,953           | 10,266          | 39,700                |
| States                                | 14,786              | 4,732                    | 5,451           | 6,274           | 7,194           | 8,249           | 31,901                |
| Private                               | 5,414               | 2,934                    | 4,912           | 8,215           | 13,688          | 22,806          | 52,557                |
| <b>Irrigation (incl. Watershed)</b>   | <b>2,43,497</b>     | <b>77,113</b>            | <b>87,386</b>   | <b>99,178</b>   | <b>1,12,506</b> | <b>1,28,186</b> | <b>5,04,371</b>       |
| Centre                                | 14,426              | 4,679                    | 5,952           | 7,713           | 10,161          | 13,666          | 42,171                |
| States                                | 2,29,071            | 72,434                   | 81,434          | 91,466          | 1,02,346        | 1,14,520        | 4,62,200              |
| <b>Water Supply and Sanitation</b>    | <b>1,20,774</b>     | <b>36,569</b>            | <b>42,605</b>   | <b>49,728</b>   | <b>58,084</b>   | <b>68,333</b>   | <b>2,55,319</b>       |
| Centre <sup>4</sup>                   | 46,003              | 13,999                   | 16,423          | 19,248          | 22,473          | 26,240          | 98,382                |
| States <sup>5</sup>                   | 74,607              | 22,335                   | 25,732          | 29,617          | 33,959          | 38,939          | 1,50,582              |
| Private                               | 164                 | 235                      | 451             | 864             | 1,651           | 3,154           | 6,355                 |
| <b>Ports (+ILW)</b>                   | <b>44,536</b>       | <b>18,661</b>            | <b>25,537</b>   | <b>35,260</b>   | <b>49,066</b>   | <b>69,256</b>   | <b>1,97,781</b>       |
| Centre                                | 5,480               | 2,888                    | 3,415           | 4,034           | 4,747           | 5,586           | 20,670                |
| States                                | 2,759               | 794                      | 930             | 1,089           | 1,269           | 1,480           | 5,563                 |
| Private                               | 36,298              | 14,979                   | 21,192          | 30,138          | 43,050          | 62,189          | 1,71,548              |
| <b>Airports</b>                       | <b>36,311</b>       | <b>7,691</b>             | <b>10,716</b>   | <b>15,233</b>   | <b>21,959</b>   | <b>32,116</b>   | <b>87,714</b>         |
| Centre                                | 11,873              | 2,456                    | 2,710           | 2,988           | 3,282           | 3,605           | 15,041                |
| States                                | 1,030               | 268                      | 351             | 458             | 596             | 776             | 2,449                 |
| Private                               | 23,408              | 4,967                    | 7,655           | 11,787          | 18,081          | 27,735          | 70,224                |

(Contd)

(Table 3.17 Contd)

| Sectors                         | Total Eleventh Plan | Twelfth Plan Projections |                 |                  |                  |                  | Total Twelfth Plan |
|---------------------------------|---------------------|--------------------------|-----------------|------------------|------------------|------------------|--------------------|
|                                 |                     | 2012-13                  | 2013-14         | 2014-15          | 2015-16          | 2016-17          |                    |
| <b>Oil and Gas pipelines</b>    | <b>62,534</b>       | <b>12,211</b>            | <b>16,604</b>   | <b>23,833</b>    | <b>36,440</b>    | <b>59,845</b>    | <b>1,48,933</b>    |
| Centre                          | 35,179              | 9,335                    | 11,367          | 13,827           | 16,757           | 20,308           | 71,594             |
| States                          | 4,070               | 832                      | 985             | 1,164            | 1,372            | 1,616            | 5,969              |
| Private                         | 23,284              | 2,044                    | 4,253           | 8,842            | 18,311           | 37,921           | 71,370             |
| <b>Storage</b>                  | <b>17,921</b>       | <b>4,480</b>             | <b>6,444</b>    | <b>9,599</b>     | <b>14,716</b>    | <b>23,202</b>    | <b>58,441</b>      |
| Centre                          | 5,956               | 1,711                    | 2,026           | 2,396            | 2,823            | 3,326            | 12,280             |
| States                          | 2,116               | 623                      | 717             | 826              | 947              | 1,085            | 4,198              |
| Private                         | 9,850               | 2,146                    | 3,701           | 6,377            | 10,947           | 18,791           | 41,963             |
| <b>Grand Total</b>              | <b>24,24,277</b>    | <b>7,51,012</b>          | <b>8,87,454</b> | <b>10,61,316</b> | <b>12,85,573</b> | <b>15,89,308</b> | <b>55,74,663</b>   |
| Centre                          | 8,56,717            | 2,50,758                 | 2,80,662        | 3,15,217         | 3,54,296         | 4,00,129         | 16,01,061          |
| States                          | 6,80,056            | 2,06,944                 | 2,30,045        | 2,55,645         | 2,83,201         | 3,13,928         | 12,89,762          |
| Private                         | 8,87,504            | 2,93,310                 | 3,76,747        | 4,90,455         | 6,48,077         | 8,75,251         | 26,83,840          |
| <b>Grand Total</b>              | <b>24,24,277</b>    | <b>7,51,012</b>          | <b>8,87,454</b> | <b>10,61,316</b> | <b>12,85,573</b> | <b>15,89,308</b> | <b>55,74,663</b>   |
| Public                          | 15,36,773           | 4,57,702                 | 5,10,707        | 5,70,862         | 6,37,497         | 7,14,057         | 28,90,823          |
| Private                         | 8,87,504            | 2,93,310                 | 3,76,747        | 4,90,455         | 6,48,077         | 8,75,251         | 26,83,840          |
| GDPmp                           | 3,36,04,450         | 1,01,50,618              | 1,16,45,987     | 1,33,58,028      | 1,53,47,089      | 1,76,61,485      | 6,81,63,208        |
| <b>Investment as % of GDPmp</b> | <b>7.21</b>         | <b>7.40</b>              | <b>7.62</b>     | <b>7.95</b>      | <b>8.38</b>      | <b>9.00</b>      | <b>8.18</b>        |

1. Excludes projections for DAE (Power) and NLC (Power) but these are included in the Eleventh Plan.

2. Includes PMGSY.

3. Includes spectrum auction charges.

4. Includes projections for Integrated Low Cost Sanitation (ILCS) Scheme.

5. Includes JnNURM.

**TABLE 3.18**  
**Source-Wise Projected Investment**

|                            | (₹ Crore at Current Prices) |          |           |           |           |                    |
|----------------------------|-----------------------------|----------|-----------|-----------|-----------|--------------------|
|                            | 2012-13                     | 2013-14  | 2014-15   | 2015-16   | 2016-17   | Total Twelfth Plan |
| Centre                     | 2,50,758                    | 2,80,662 | 3,15,217  | 3,54,296  | 4,00,129  | 16,01,061          |
| Central budget             | 1,07,664                    | 1,17,805 | 1,29,245  | 1,42,220  | 1,57,044  | 6,53,978           |
| Internal generation        | 68,200                      | 75,519   | 83,919    | 93,145    | 1,03,931  | 4,24,713           |
| Borrowings                 | 74,894                      | 87,338   | 1,02,052  | 1,18,931  | 1,39,154  | 5,22,370           |
| States                     | 2,06,944                    | 2,30,045 | 2,55,645  | 2,83,201  | 3,13,928  | 12,89,762          |
| States budget              | 1,27,290                    | 1,36,027 | 1,45,413  | 1,55,499  | 1,66,340  | 7,30,569           |
| Internal generation        | 23,429                      | 27,652   | 32,422    | 37,560    | 43,409    | 1,64,472           |
| Borrowings                 | 56,225                      | 66,365   | 77,810    | 90,142    | 1,04,179  | 3,94,722           |
| Private                    | 2,93,310                    | 3,76,747 | 4,90,455  | 6,48,077  | 8,75,251  | 26,83,840          |
| Internal accruals/Equity   | 87,992                      | 1,13,024 | 1,52,042  | 2,00,904  | 2,71,328  | 8,25,291           |
| Borrowings                 | 2,05,318                    | 2,63,723 | 3,38,413  | 4,47,172  | 6,03,923  | 18,58,549          |
| Total projected investment | 7,51,012                    | 8,87,454 | 10,61,316 | 12,85,573 | 15,89,308 | 55,74,663          |
| Non-debt                   | 4,14,575                    | 4,70,027 | 5,43,041  | 6,29,328  | 7,42,052  | 27,99,022          |
| Debt                       | 3,36,437                    | 4,17,426 | 5,18,275  | 6,56,246  | 8,47,256  | 27,75,641          |

**TABLE 3.19**  
**Likely Sources of Debt**

(₹ Crore at Current Prices)

|  | 2012-13  | 2013-14  | 2014-15  | 2015-16  | 2016-17  | Total Twelfth Plan |
|--|----------|----------|----------|----------|----------|--------------------|
| Domestic Bank Credit                         | 1,19,066 | 1,62,663 | 2,16,015 | 2,85,513 | 3,81,389 | 11,64,646          |
| NBFCs  | 56,973   | 81,027   | 1,12,014 | 1,54,124 | 2,14,325 | 6,18,462           |
| Pension/Insurance funds                      | 21,681   | 25,694   | 29,602   | 33,941   | 39,331   | 1,50,248           |
| ECBs   | 46,799   | 56,020   | 65,182   | 75,484   | 88,349   | 3,31,834           |
| Likely Total Debt Resources                  | 2,44,519 | 3,25,231 | 4,22,590 | 5,49,007 | 7,23,823 | 22,65,171          |
| Estimated Requirement of Debt                | 3,36,437 | 4,17,426 | 5,18,275 | 6,56,246 | 8,47,256 | 27,75,641          |
| Gap between Estimates and Likely Requirement | 91,918   | 92,195   | 95,685   | 1,07,239 | 1,23,433 | 5,10,470           |

infrastructure sectors. It considers and decides on financial, institutional and legal measures required to enhance investment in infrastructure sectors.

#### *PPP Appraisal Committee and Empowered Institution*

3.74. A Public-Private Partnership Appraisal Committee (PPPAC) consisting of the Secretary, Department of Economic Affairs, as Chairman, and Secretaries of the Planning Commission, Department of Expenditure, Department of Legal Affairs and the Administrative Department concerned, as Members was constituted for speedy approval of PPP projects. The project proposals are appraised by the Planning Commission and approved by the PPPAC. The Empowered Institution (EI) approves projects for providing Viability Gap Funding to the infrastructure projects at the State level.

#### *Regulatory Framework*

3.75. In recent years, independent regulatory authorities have been established in the power, telecom, and civil aviation sectors. Tariffs in the port sector are also fixed by an independent authority. These authorities discharge numerous responsibilities, which were earlier in the domain of the government. For initiating further improvements in the regulatory structures and practices, Regulatory Reforms Bill is under consideration of the Government.

#### *Advisory Services*

3.76. PPP projects are based on long-term contracts and may involve delegation of governmental

authority such as for toll collection, besides enabling private control over monopolistic services. Implementation of PPP projects, therefore, requires appropriate advisory services in terms of preparation of project agreements, structuring of projects and so on. Planning Commission has operationalised a scheme for technical assistance to project authorities by providing consultants for projects. The Ministry of Finance has also created an India Infrastructure Project Development Fund (IIPDF) to provide loans for meeting development expenses, including the cost of engaging consultants for PPP projects.

#### *Viability Gap Funding*

3.77. The VGF Scheme was notified in 2006 to enhance the financial viability of competitively bid infrastructure projects, which are justified by economic returns, but do not pass the standard thresholds of financial returns. Under the scheme, grant assistance of up to 20 per cent of capital costs is provided by the Central Government to PPP projects undertaken by any Central Ministry, State Government, statutory entity or local body, thus leveraging budgetary resources to access a larger pool of private capital. An additional grant of up to 20 per cent of project costs can be provided by the sponsoring Ministry, State Government or project authority.

#### *India Infrastructure Finance Company Limited (IIFCL)*

3.78. IIFCL was incorporated by the Ministry of Finance in consultation with the Planning

### Box 3.1 Infrastructure Debt Fund

Infrastructure projects are capital intensive and have long payback periods, and, therefore, require long-term funds at comparatively low costs. Infrastructure projects in India are financed mainly by commercial banks, as insurance and pension funds do not normally lend for new projects. The present bond market lacks depth to address the needs for a long-term debt. With a view to overcoming these shortcomings, Infrastructure Development Funds (IDFs) are being set up for channelising long-term debt from domestic and foreign pension and insurance funds, as well as from other sources. These IDFs will also carry adequate credit enhancement in terms of implicit government guarantees for repayment of debt. The Reserve Bank of India, and the Securities and Exchange Board of India have already laid down regulatory framework for the IDFs.

Besides augmenting debt resources for financing infrastructure, the IDFs would refinance PPP projects after their construction is completed and operations have stabilised. By refinancing bank loans of existing projects, the IDFs are expected to take over a significant volume of the existing bank debt, and this will release an equivalent volume of fresh lending for infrastructure projects.

Commission in 2006 for providing long-term loans for financing infrastructure projects that typically involve long gestation periods. IIFCL provides financial assistance up to 20 per cent of the project cost both through direct lending to project companies, and by refinancing banks and financial institutions. IIFCL raises funds from both domestic and overseas markets on the strength of government guarantees. IIFCL has sanctioned loans aggregating ₹40,373 crore for 229 projects involving a total investment of ₹3,52,047 crore and disbursed ₹20,377 crore till 31 March 2012.

3.79. IIFCL is expected to graduate in the Twelfth Plan from the existing role of a normal lender to that of a catalyst mobilising additional resources for financing of infrastructure. This could be achieved by IIFCL providing guarantees for bonds issued by private infrastructure companies rather than expanding its direct lending operations. This would enable mobilisation of insurance and pension funds, external debt and household savings. IIFCL would also make subordinated debt available as an additional source of finance. Further, IIFCL may also substitute its take-out financing scheme with an Infrastructure Debt Fund. Please refer to Box 3.1.

#### *High Level Committee on Financing Infrastructure*

3.80. In order to review the existing framework for financing of infrastructure and to make recommendations in this regard, a High Level Committee on Financing Infrastructure has been constituted.

The Committee is expected to give its report by 31 March 2013.

#### *Standardised Documents and Processes*

3.81. The government has decided to formulate standard documents for bidding and award of PPP concessions. Adoption of a standardised framework ensures transparency in the allocation of risks, costs and obligations while minimising the potential for disputes and malfeasance.

3.82. The Model Concession Agreements (MCAs) published by the Secretariat for PPP and Infrastructure at the Planning Commission for various sectors are listed in Box 3.2. MCAs for PPPs in electricity distribution, power generation, modern storage facilities, hospitals, school education, drip

### Box 3.2 Model Concession Agreements for PPP

- National Highways
- State Highways
- Operation and Maintenance of Highways
- National Highways (six laning)
- Operation of Container Trains
- Re-development of Railway Stations
- Procurement-cum-Maintenance Agreement for Locomotives
- Non-metro Airports
- Greenfield Airports
- Port Terminals
- Transmission of Electricity
- Urban Metro Rail



irrigation and Industrial Training Institutes are under preparation.

3.83. Standardised guidelines and model documents that incorporate key principles relating to the bid process for PPP projects have also been developed. These are indicated in Box 3.3.

**Box 3.3**  
**Model Bidding Documents for PPP Projects**

- Model Request for Qualification (RFQ) Document for PPP projects
- Model Request for Proposal (RFP) Document for PPP projects
- Model RFP Document for Selection of Technical Consultants
- Model RFP Document for Selection of Legal Advisers
- Model RFP Document for Selection of Financial Consultants and Transaction Advisers
- Model RFP Document for Selection of Transmission Consultants

3.84. The government has identified several areas for reform of policies and processes. A number of Guidelines and Manuals have been issued in pursuance of the initiatives described above. These are listed in Box 3.4.

3.85. The government has recently issued Guidelines for Monitoring of PPP Projects. These Guidelines seek to establish a two-tier institutional mechanism

**Box 3.4**  
**Guidelines and Manuals**

- Guidelines for Financial Support to PPPs in Infrastructure (VGF Scheme)
- Guidelines on Formulation, Appraisal and Approval of PPP Projects (PPPAC)
- Guidelines for Establishing Joint Ventures in Infrastructure
- Guidelines for Monitoring of PPP Projects
- Scheme for Financing Infrastructure Projects through the IIFCL
- Manual of Specifications and Standards for Two-laning of Highways
- Manual of Specifications and Standards for Four-laning of Highways

for monitoring of PPP projects that would ensure compliance of the contractual framework contained in the concession agreements with a view to safeguarding the interests of the public exchequer and the users. The Central Ministries are expected to submit quarterly reports relating to defaults on the part of the concessionaires and the project authorities which would be placed before the Cabinet Committee on Infrastructure for review.

*Engineering, Procurement, Construction (EPC) Contract*

3.86. The conventional item-rate contracts are generally prone to time and cost overruns, particularly in the national highway sector, resulting in enhanced cost to the exchequer, as also considerable delays in the completion of projects. Developed countries have moved to Engineering, Procurement and Construction (EPC) contracts where the contractor is responsible for design and construction on a turnkey basis and for a fixed price. The Planning Commission has published a model EPC contract for Highways. It is expected that about 20,000 km of two-lane National Highways would be developed under this model. A similar document is also being prepared for Dedicated Freight Corridor of the Indian Railways.

**PPPs in Infrastructure**

3.87. Private investment in infrastructure is being encouraged in an environment which ensures competition and transparency. Protection of public interest is being ensured by institutionalising the necessary frameworks and processes for due diligence, checks and balances. However, it is recognised that unless governance issues, such as those related to competition in service provision, collection of user charges, institutional capacity, regulation, and dispute resolution continue to be adequately addressed, mobilisation of sufficient resources for the requisite infrastructure investment may not be possible.

3.88. Till 31 March 2012, the PPPAC had approved 285 PPP projects involving an investment of ₹2,47,300 crore. The Empowered Institution has approved 105 projects involving an investment of ₹57,710 crore (for global ranking in PPP, refer to Box 3.5).

### **Box 3.5 Global Ranking in PPP**

According to a World Bank Report on Private Participation in Infrastructure, private participation in the first semester of 2011 was highly concentrated in just one country, India. The Report further states that India has been the top recipient of PPI activity since 2006 and has implemented 43 new projects which attracted total investment of US\$20.7 billion in 2011. India alone accounted for almost half of the investment in new PPI projects in developing countries implemented in the first semester of 2011. The Report maintained that India remained the largest market for PPI in the developing world. In the South Asian region, India attracted 98 per cent of regional investment and implemented 43 of the 44 new projects in the region.

#### **PPP in Highways**

**3.89.** The National Highway network of the country spans about 70,548 km. The National Highway Development Project (NHDP), covering a length of about 54,000 km of highways, is India's largest road development programme in its history. The government has encouraged increased private sector participation in upgrading the arterial road network of the country to world class standards. More than 60 per cent of the estimated investment requirement is expected to be financed through PPP. With several key projects on the anvil spanning a length of about 45,000 km (including six-laning of four-laned roads, expressways and port connectivity projects) and a large number of projects in States, there are increasing opportunities for the domestic and foreign players in the sector. The government has decided to widen 20,000 km of less than two-lane National Highways to two-lane standard in the EPC mode.

#### **PPP in Civil Aviation**

**3.90.** During the Eleventh Plan, the private sector played a major role in the development of metro airports through PPP. The development of greenfield international airports at Hyderabad and Bengaluru along with the redevelopment of the Delhi International airport was successfully completed during this period. The redevelopment of Mumbai International airport, which was also taken up through PPP, is at an advanced stage of completion. Investment by the private sector on the four metro airports during the Eleventh Plan period

was ₹23,187 crore. Further, it was observed that introduction of PPP has led to a significant rise in the collection of revenues, especially non-aviation revenues.

**3.91.** Airports Authority of India has identified 15 operational Airports for taking up operation and maintenance of both terminal and air side through PPP. This would be taken up in two phases. In the first phase, nine airports, namely Guwahati, Jaipur, Ahmedabad, Bhubhaneshwar, Lucknow, Gaya, Udaipur, Khajuraho and Amritsar would be taken up; and in the second phase, six airports would be taken up for operation and maintenance through PPP. Kolkata and Chennai airports have been constructed by AAI with an investment of about ₹4,200 crore. PPP in management and operation of airports is not only preferable for reasons of efficiency and superior services but also important for keeping passenger charges low, because of the ability of private entities to raise non-aviation revenues that cross-subsidise airport charges. This proposition is borne out by the international experience and the experience of PPP metro airports in India. It is, therefore, recommended that these large airports should be awarded under the PPP mode for their management and operation.

**3.92.** Five green field airports including Navi Mumbai, Goa, Kannur, Chandigarh and Kota have been identified for development through PPP. For building and operating a Greenfield airport on PPP basis, a precise policy and regulatory framework has now been spelt out in the Model Concession Agreement for Greenfield Airports.

#### **PPP in Urban Infrastructure**

**3.93.** Private sector participation needs to be encouraged in urban infrastructure sectors like water supply and sewerage and solid waste management. In urban transport, private sector can provide more efficient transport services, construct and maintain modern bus terminals with commercial complexes, over bridges, city roads and so on. PPP initiatives are also being undertaken to develop metro rail systems in Indian cities (refer to Box 3.6 for details on Hyderabad Metro Rail Project).

### Box 3.6 Hyderabad Metro Rail Project

Hyderabad Metro Rail Project is presently under construction on PPP mode with a total project cost of ₹12,132 crore. The project is spread over three high density traffic corridors of Hyderabad with total length of 71 km and is being developed on Design, Build, Finance, Operate and Transfer (DBFOT) mode. The project was awarded to the successful bidder for a VGF of ₹1,458 crore which will be provided by the Central Government while the remaining investment will be made by the concessionaire. This will be the single largest private investment in a PPP project in India. It is also one of the largest metro rail projects built and operated by a private entity anywhere in the world. The project demonstrates how large volumes of private capital can be deployed in public projects in a transparent, efficient and competitive manner. The concession has been awarded on the basis of the Model Concession Agreement for Urban Transit developed by the Planning Commission.

#### *PPP in Ports*

3.94. The government has encouraged private sector participation in port development and operations. Foreign direct investment up to 100 per cent is permitted under the automatic route for port development projects. Private investment has been envisaged on PPP basis in ports of Kolkata, Haldia, Paradip, Vizag, Ennore, Chennai, Tuticorin, Cochin, New Mangalore, Mormugao, Mumbai, JNPT and Kandla.

#### *PPP in Power*

3.95. To attract private sector participation, government has permitted the private sector to set up coal, gas or liquid-based thermal, hydel, wind or solar projects with foreign equity participation up to 100 per cent under the automatic route. The government has also launched Ultra Mega Power Projects (UMPPs) with an initial capacity of 4,000 MW to attract ₹160–200 billion of private investment. Out of the total nine UMPPs, four UMPPs at Mundra (Gujarat), Sasan (Madhya Pradesh), Krishnapatnam (Andhra Pradesh) and Tilaiya Dam (Jharkhand) have already been awarded. The remaining five UMPPs, namely in Sundergarh District (Orissa), Cheyyur (Tamil Nadu), Girye (Maharashtra), Tadri (Karnataka) and Akaltara (Chhattisgarh) are yet to be

awarded. To create Transmission Super Highways, the government has allowed private sector participation in the transmission sector. A PPP project at Jhajjar in Haryana for transmission of electricity was awarded under the PPP mode. Further, to enable private participation in distribution of electricity, especially by way of PPP, a model framework is being developed by the Planning Commission.

#### *PPP in Railways*

3.96. Dedicated Freight Corridor Corporation of India Limited (DFCCIL) has been set up for implementing the Dedicated Freight project and the Ministry of Railways would explore the possibilities of attracting private investment in some segments of this project. Indian Railways has decided to redevelop 50 railway stations in the metropolitan cities and major tourist centers like Delhi, Jaipur, Chandigarh, Patna, Bypanahalli, Bhubneshwar, Mumbai CST, Howrah and so on as world-class stations through PPP. The proposal to set up of production units for manufacturing of electric and diesel locomotives at Madhepura and Marhowra respectively and passenger coaches at Kanchrapara through PPP has already been approved. Further, movement of container trains has already been opened to the private sector, and this has acquired more than 25 per cent share of the market. Construction of an elevated metro rail project in Mumbai is being undertaken through PPP.

#### *PPP in Sports Infrastructure*

3.97. The Planning Commission, in consultation with the Ministry of Sports and Youth Affairs, is developing a model for operation and management of sports infrastructure through PPP. Large public funds were invested to create world class facilities in the stadia for CWG Delhi in 2010. It is proposed to take up management and operation of existing stadia as well as development of new stadia through PPP. The objective is to utilise these facilities optimally throughout the year and also generate revenues for their operation and maintenance.

#### *PPP in Micro Irrigation*

3.98. A scheme for setting up Micro Irrigation Systems (MIS) through PPP will be launched in pursuance of the government's objective to enhance irrigation efficiency, productivity and farm incomes

by employing more efficient means of irrigation in integrated clusters. The absence of organised operations in the farm sector would be overcome by farmers coming together for the purpose of implementing this scheme through a single entity in every village. The existing subsidies which are provided by the Central and State Governments for on-farm MIS equipment and solar systems would be availed of under this scheme. Similarly, budgetary support would continue to be provided for the development of infrastructure. PPP in MIS would help in doubling the irrigation efficiency as compared to flow irrigation.

#### *PPP in Storage of Foodgrains*

**3.99.** A scheme for setting up modern storage facilities through PPP under the VGF has been formulated in pursuance of the Government decision to create 2MMT of modern storage facilities in the form of silos. This would enhance food security, reduce wastage and improve the quality of stored foodgrains.

**3.100.** Silos will be constructed and operated under the PPP mode across several states. Land for construction and operation of silos would be provided on licence to the private entity and up to 20 per cent of the total project cost will be provided as VGF. For storage of foodgrains at the Silos, the Concessionaire will be entitled to receive a recurring storage charge which shall be payable on adherence to performance and maintenance standards. It is expected that in the first phase, a capacity of 2 million MT of silo capacity would be created under the PPP mode.

#### *PPPs in Social Sectors*

**3.101.** The Twelfth Plan lays special emphasis on the development of social sectors in view of their impact on human development and quality of life, especially of the underprivileged sections. The physical targets set in the Plan cannot be met out of public resources alone. It is, therefore, imperative that resources have to be attracted from the private sector to ensure that targets, in physical and financial terms, are met by the end of the Twelfth Plan period.

**3.102.** In the social sectors, it may not be possible to adopt the user-charge-based concessions,

although they may not be completely ruled out. However, concessions which would provide reimbursement of service costs could attract considerable private investment. The main advantages of adopting the PPP approach in the social sectors would be enhanced investment, reduction in time and cost over-runs, improvement in efficiencies and better quality of performance.

#### *PPP in Education*

**3.103.** A scheme for setting up 2,500 schools under PPP mode is being rolled out in the Twelfth Plan. The purpose of the scheme is to meet the government's objective of establishing world-class schools for providing quality education to underprivileged children who cannot afford to pay the tuition fee that good private schools charge. It is expected that the scheme will help in creating capacity for providing quality education to 40 lakh children, out of which 25 lakh will be from the underprivileged category.

**3.104.** The respective rights and obligations of the private entity and the government will be codified in an agreement with the former undertaking to deliver the agreed service on the payment of a unitary charge by the government. Recurring tuition support would be provided for up to 1,000 students from under privileged categories at par with the amount that the Central Government spends on a student in Kendriya Vidyalaya. There would be no capital support and land would have to be procured by the private entity. Infrastructure support shall be made available by the government for the underprivileged students at the rate of 25 per cent of the recurring tuition support. The concession would be for a period of 10 years. There will be no financial bidding. Predetermined criteria relating to capacity and track record of the respective applicants will be taken into account in selection of the private entities.

**3.105.** The scheme for 2,500 PPP schools should be viewed as an opportunity to evolve innovative ways to empower and enable non-government players to engage in providing world-class education, especially to children from low-income families. The objective should be to combine the respective strengths of the public and private sectors to complement each other

in pursuit of the shared goal of good education for all. In particular, adoption of the PPP mode would lead to rapid expansion of access to world-class education by low-income families.

#### *PPP in Health Care Services*

3.106. Several State Governments are experimenting with delivery of health services through different models. Planning Commission is also in the process of preparing a scheme for setting up secondary and tertiary care hospitals through PPPs at various District Headquarters. The principle objective of the scheme is to create a health care delivery mechanism comprising multi-specialty hospital to meet the growing health care needs of the poor, and for supplementing human resources in the sector by setting up nursing schools and medical colleges.

3.107. It is expected that in the Twelfth Plan, the proposed scheme will be rolled out by the Government, and a 200-bed district-level hospital would serve a catchment area of about 8–10 lakh of population (20 lakh for a 300-bed tertiary care hospital). This will help families from the economically disadvantaged groups get access to quality health care through hospitals set up under this scheme, especially those who are covered under the Rashtriya Swasthya Bima Yojna (RSBY).

#### *PPP in Skill Development*

3.108. As part of the government's initiative to augment the programmes for skill development, the Prime Minister had announced setting up of 1,500 ITIs through PPP in unserved blocks. The objective is to create centres of excellence in vocational education especially for the youth from low-income families in order to improve their prospects of gainful employment. The programme will be expanded to cover a total of 3,000 blocks during the Twelfth Plan.

3.109. A major proportion of the costs incurred by an ITI are of a recurring nature, and it is therefore, proposed to provide support for the recurring expenditure incurred by an ITI towards training students from underprivileged families. Further, it is proposed to provide capital grant to meet a part of the cost of creating the infrastructure for setting up

the ITIs. It is expected that 30 lakh youth, including 15 lakh youth from socially and economically disadvantaged groups would be initiated into vocational training and will acquire skills through the ITIs set up under this scheme.

#### *Financial Support to PPPs in Social Sectors*

3.110. A scheme for financial support to PPPs in the social sectors is being formulated as part of the Twelfth Plan initiative to enhance investments and coverage in social sectors, and also to expand the role of private participation.

3.111. The scheme envisages that capital investment and recurring costs to be incurred by a non-government entity on the delivery of services to EWS families, based on a concession agreement between government (or a statutory authority) and a non-government entity, will be provided by the respective State Governments, who in turn will be eligible for Viability Support Funding (VSF) from the Central Government.

#### *Capacity Building in the States*

3.112. The State Governments generally do not have dedicated staff resources for handling PPP projects or for building the requisite capacity. Such capacity is critical for conceptualising project proposals, engaging consultants, interacting with and supervising consultants, analysing and processing their advice for government approvals, interacting with prospective investors, executing the project documents and monitoring implementation. Therefore, the Planning Commission may need to provide financial assistance (ACA) to the State Governments for the setting up a nodal Secretariat for PPP in each State.

3.113. The aforesaid PPP Secretariat in each State would be responsible for identifying areas in the respective States amenable to PPP, conceptualise the projects, initiate and approve feasibility studies, appraise and approve bid documentation, guide the process and so on. This would enable capacity building in the States. The total expenditure on this scheme over the next five years would be limited to about ₹100 crore.

**Box 3.7****India Front-Runner in the PPP Race: ADB**

According to a study by the Economic Intelligence Unit of the Economist commissioned by Asian Development Bank (ADB), while UK and Australia have been categorised as mature economies, India is positioned in the league of developed economies like Republic of Korea and Japan on implementation of PPP projects for infrastructure development. India has outscored China and Japan to rank second on PPP projects performance among the Asian nations and fourth in the Asia-Pacific nations. As per the Report, PPP development in India has been driven by strong political will and advances in public capacity and processes.

The Report states that PPP projects have a huge level of overall acceptance and use in India. It states that government agencies have a relatively high level of proficiency in PPP projects and that as a result of introduction of Model Concession Agreements, the risk allocation has been improving. In terms of finance, matters have improved, with a variety of initiatives (such as the creation of the Viability Gap Funding and the India Infrastructure Finance Company Limited) enabling greater participation of private finance in infrastructure.

3.114. *To conclude*, the gains of private participation in meeting the policy objectives of the Government have been significant during the Eleventh Plan. These initiatives will be expanded and reinforced during the Twelfth Plan, especially in social sectors such as health, education, skill development and so on with a view to meeting the investment

targets, while also ensuring inclusiveness. It is envisaged that by the end of the Twelfth Plan, not only will there be ₹55,74,663 crore worth of investment in infrastructure sectors, but also that PPPs would have successfully forayed into the social sectors to promote universal access, while ensuring quality in the delivery of services.

**ANNEXURE 3.1**  
**Sectoral Allocation for Public Sector's Resources—Eleventh Plan (2007–12) Realisation and Twelfth Plan (2012–17) Projections**

| S. No.        | Heads of Development                | (in ₹ Crore)      |                  |               |                 |                     |                           |                  |                  |                     |                  |                         |               |                  |                  |               |
|---------------|-------------------------------------|-------------------|------------------|---------------|-----------------|---------------------|---------------------------|------------------|------------------|---------------------|------------------|-------------------------|---------------|------------------|------------------|---------------|
|               |                                     | Centre            |                  |               |                 |                     | States and UT's           |                  |                  |                     |                  | Centre, States and UT's |               |                  |                  |               |
|               |                                     | Budgetary Support |                  | Total Outlay  |                 | Budgetary Resources |                           | Total Outlay     |                  | Budgetary Resources |                  | Total Outlay            |               |                  |                  |               |
| Eleventh Plan | Twelfth Plan                        | % Increase        | Eleventh Plan    | Twelfth Plan  | % Increase      | Eleventh Plan*      | Twelfth Plan <sup>s</sup> | % Increase       | Eleventh Plan    | Twelfth Plan        | % Increase       | Eleventh Plan           | Twelfth Plan  | % Increase       |                  |               |
| 1             | Agriculture and Allied Activities   | 60,339            | 1,33,965         | 122.02        | 344             | 671                 | 95.04                     | 60,683           | 1,34,636         | 121.87              | 1,02,422         | 2,28,637                | 123.23        | 1,63,105         | 3,63,273         | 122.72        |
| 2             | Rural Development                   | 1,79,925          | 2,67,047         | 48.42         | 0               | 0                   | 0                         | 1,79,925         | 2,67,047         | 48.42               | 1,08,284         | 1,90,417                | 75.85         | 2,88,209         | 4,57,464         | 58.73         |
| 3             | Special Area Programmes             | 0                 | 0                | 0             | 0               | 0                   | 0                         | 0                | 0                | 0                   | 42,817           | 80,370                  | 87.71         | 42,817           | 80,370           | 87.71         |
| 4             | Irrigation and Flood Control        | 2,325             | 17,212           | 640.30        | 1               | 0                   | 0                         | 2,326            | 17,212           | 639.98              | 2,27,008         | 4,04,800                | 78.32         | 2,29,334         | 4,22,012         | 84.02         |
| 5             | Energy                              | 43,374            | 98,541           | 127.19        | 4,60,709        | 9,87,456            | 114.33                    | 5,04,083         | 10,85,997        | 115.44              | 1,80,188         | 3,52,468                | 95.61         | 6,84,271         | 14,38,466        | 110.22        |
| 6             | Industry and Minerals               | 50,452            | 1,20,372         | 138.59        | 97,058          | 1,71,718            | 76.92                     | 1,47,510         | 2,92,090         | 98.01               | 38,143           | 85,212                  | 123.40        | 1,85,653         | 3,77,302         | 103.23        |
| 7             | Transport                           | 2,27,637          | 4,91,713         | 116.01        | 1,82,232        | 3,27,769            | 79.86                     | 4,09,869         | 8,19,482         | 99.94               | 2,03,316         | 3,84,690                | 89.21         | 6,13,185         | 12,04,172        | 96.38         |
| 8             | Communications                      | 5,308             | 29,699           | 459.51        | 53,208          | 51,285              | -3.61                     | 58,516           | 80,984           | 38.40               | 0                | 0                       | 0             | 58,516           | 80,984           | 38.40         |
| 9             | Science, Technology and Environment | 50,615            | 1,30,054         | 156.95        | 0               | 0                   | 0                         | 50,615           | 1,30,054         | 156.95              | 18,682           | 37,296                  | 99.64         | 69,297           | 1,67,350         | 141.50        |
| 10            | Economic Services                   | 45,706            | 1,81,321         | 296.71        | 18              | 155                 | 761.11                    | 45,724           | 1,81,476         | 296.89              | 43,652           | 1,24,136                | 184.38        | 89,376           | 3,05,612         | 241.94        |
| 11            | Social Services                     | 4,92,408          | 11,90,416        | 141.75        | 63,672          | 83,845              | 31.68                     | 5,56,080         | 12,74,261        | 129.15              | 6,41,496         | 13,90,582               | 116.77        | 11,97,576        | 26,64,843        | 122.52        |
| 12            | General Services                    | 9,795             | 50,500           | 415.57        | 2               | 0                   | 0                         | 9,797            | 50,500           | 415.46              | 45,800           | 57,459                  | 25.46         | 55,597           | 1,07,959         | 94.18         |
|               | <b>Total</b>                        | <b>11,67,884</b>  | <b>27,10,840</b> | <b>132.12</b> | <b>8,57,244</b> | <b>16,22,899</b>    | <b>89.32</b>              | <b>20,25,128</b> | <b>43,33,739</b> | <b>114.00</b>       | <b>16,51,808</b> | <b>33,36,068</b>        | <b>101.96</b> | <b>36,76,936</b> | <b>76,69,807</b> | <b>108.59</b> |

*Note:* \* Sectoral outlays for states/UTs are based on data given by states. The total of all states arrived from sectoral outlays differs from the total given in Table 3.9 due to several reasons including accounting differences for some scheme of Central Assistance and differences in data provided by states on resources side and outlay side.  
<sup>s</sup> Excludes IEBR of SPSEs and Local Bodies.

### ANNEXURE 3.2

#### Budget Support, IEBR and Outlay for Central Ministry/Department—Eleventh Plan (2007–12) Realisation and Twelfth Plan (2012–17) Projections

(₹ Crore in Current Prices)

| S. No. | Ministry/Department   | Budgetary Support |              |            |              | IEBR          |              |            |              | Total Outlay  |              |            |              |
|--------|---|-------------------|--------------|------------|--------------|---------------|--------------|------------|--------------|---------------|--------------|------------|--------------|
|        |   | Eleventh Plan     |              | % Increase |              | Eleventh Plan |              | % Increase |              | Eleventh Plan |              | % Increase |              |
|        |   | Plan              | Twelfth Plan | Plan       | Twelfth Plan | Plan          | Twelfth Plan | Plan       | Twelfth Plan | Plan          | Twelfth Plan | Plan       | Twelfth Plan |
| 1      | Department of Agriculture and Cooperation   | 38,003            | 71,500       | 88.14      | 0            | 0             | 0            | 0          | 38,003       | 71,500        | 88.14        | 88.14      |              |
| 2      | Department of Agriculture Research and Education                                    | 9,989             | 25,553       | 155.81     | 0            | 0             | 0            | 0          | 9,989        | 25,553        | 155.81       | 155.81     |              |
| 3      | Department of Animal Husbandry, Dairying and Fisheries                              | 4,970             | 14,179       | 185.29     | 0            | 0             | 0            | 0          | 4,970        | 14,179        | 185.29       | 185.29     |              |
| 4      | Department of Health and Family Welfare   | 84,339            | 2,68,551     | 218.42     | 0            | 0             | 0            | 0          | 84,339       | 2,68,551      | 218.42       | 218.42     |              |
| 5      | Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) | 3,032             | 10,044       | 231.27     | 0            | 0             | 0            | 0          | 3,032        | 10,044        | 231.27       | 231.27     |              |
| 6      | Department of Health Research   | 1,894             | 10,029       | 429.51     | 0            | 0             | 0            | 0          | 1,894        | 10,029        | 429.51       | 429.51     |              |
| 7      | Department of Aids Control  | 1,500             | 11,394       | 659.60     | 0            | 0             | 0            | 0          | 1,500        | 11,394        | 659.60       | 659.60     |              |
| 8      | Department of School Education and Literacy   | 1,37,734          | 3,43,028     | 149.05     | 0            | 0             | 0            | 0          | 1,37,734     | 3,43,028      | 149.05       | 149.05     |              |
| 9      | Department of Higher Education  | 39,804            | 1,10,700     | 178.12     | 0            | 0             | 0            | 0          | 39,804       | 1,10,700      | 178.12       | 178.12     |              |
| 10     | Ministry of Power   | 31,102            | 54,279       | 74.52      | 1,75,090     | 3,86,517      | 120.75       | 2,06,192   | 2,06,192     | 4,40,796      | 113.78       | 113.78     |              |
| 11     | Ministry of Road Transport and Highways   | 77,498            | 1,44,769     | 86.80      | 17,891       | 64,834        | 262.38       | 95,389     | 95,389       | 2,09,603      | 119.73       | 119.73     |              |
| 12     | Department of Rural Development*  | 2,81,438          | 4,12,965     | 46.73      | 17,707       | 0             | 0            | 2,99,146   | 4,12,965     | 38.04         | 38.04        |            |              |
| 13     | Department of Land Resources  | 10,244            | 30,296       | 195.75     | 0            | 0             | 0            | 10,244     | 30,296       | 195.75        | 195.75       |            |              |
| 14     | Ministry of Drinking Water and Sanitation   | 45,711            | 98,015       | 114.42     | 0            | 0             | 0            | 45,711     | 98,015       | 114.42        | 114.42       |            |              |
| 15     | Department of Science and Technology  | 8,636             | 21,596       | 150.07     | 0            | 0             | 0            | 8,636      | 21,596       | 150.07        | 150.07       |            |              |
| 16     | Department of Scientific and Industrial Research                                    | 6,941             | 17,896       | 157.85     | 0            | 0             | 0            | 6,941      | 17,896       | 157.85        | 157.85       |            |              |
| 17     | Department of Biotechnology   | 4,840             | 11,804       | 143.89     | 0            | 0             | 0            | 4,840      | 11,804       | 143.89        | 143.89       |            |              |
| 18     | Department of Space   | 15,836            | 39,750       | 151.01     | 0            | 0             | 0            | 15,836     | 39,750       | 151.01        | 151.01       |            |              |
| 19     | Ministry of Women and Child Development   | 47,396            | 1,17,707     | 148.35     | 0            | 0             | 0            | 47,396     | 1,17,707     | 148.35        | 148.35       |            |              |



|    |   |        |          |          |          |          |        |          |          |          |
|----|---|--------|----------|----------|----------|----------|--------|----------|----------|----------|
| 20 | Railways  | 75,976 | 1,94,221 | 155.64   | 1,13,863 | 2,25,000 | 97.61  | 1,89,838 | 4,19,221 | 120.83   |
| 21 | Ministry of Urban Development                     | 25,133 | 54,311   | 116.09   | 11,002   | 11,489   | 4.43   | 36,135   | 65,800   | 82.10    |
| 22 | Department of Posts                               | 1,714  | 5,527    | 222.55   | 0        | 0        | -      | 1,714    | 5,527    | 222.55   |
| 23 | Department of Telecommunications                  | 3,416  | 20,825   | 509.54   | 53,208   | 51,285   | -3.61  | 56,625   | 72,110   | 27.35    |
| 24 | Department of Information Technology              | 9,634  | 36,078   | 274.49   | 1,810    | 3,944    | 117.90 | 11,444   | 40,022   | 249.72   |
| 25 | Ministry of Home Affairs                          | 10,323 | 52,839   | 411.83   | 0        | 0        |        | 10,323   | 52,839   | 411.83   |
| 26 | Ministry of Housing and Urban Poverty Alleviation | 3,537  | 7,850    | 121.92   | 41,465   | 71,355   | 72.09  | 45,002   | 79,205   | 76.00    |
| 27 | Ministry of Micro, Small and Medium Enterprises   | 9,175  | 24,124   | 162.93   | 1,072    | 1,890    | 76.34  | 10,247   | 26,014   | 153.87   |
| 28 | Ministry of Tribal Affairs                        | 4,558  | 7,746    | 69.93    | 0        | 0        |        | 4,558    | 7,746    | 69.93    |
| 29 | Ministry of Social Justice and Empowerment        | 16,271 | 32,684   | 100.87   | 0        | 0        |        | 16,271   | 32,684   | 100.87   |
| 30 | Ministry of Minority Affairs                      | 7,283  | 17,323   | 137.85   | 0        | 0        |        | 7,283    | 17,323   | 137.85   |
| 31 | Ministry of Labour & Employment                   | 4,321  | 13,223   | 205.98   | 0        | 0        |        | 4,321    | 13,223   | 205.98   |
| 32 | Ministry of Information & Broadcasting            | 2,873  | 7,583    | 163.95   | 0        | 1,000    |        | 2,873    | 8,583    | 198.75   |
| 33 | Department of Atomic Energy                       | 19,211 | 41,615   | 116.62   | 12,601   | 65,572   | 420.36 | 31,812   | 1,07,187 | 236.94   |
| 34 | Department of Chemicals and Petrochemicals        | 2,629  | 2,890    | 9.93     | 12       | 3        | -74.61 | 2,641    | 2,893    | 9.53     |
| 35 | Department of Pharmaceuticals                     | 249    | 2,968    | 1,090.72 | 0        | 127      |        | 249      | 3,095    | 1,141.48 |
| 36 | Department of Fertilisers                         | 728    | 1,484    | 103.78   | 6,027    | 15,437   | 156.14 | 6,755    | 16,921   | 150.50   |
| 37 | Ministry of Civil Aviation                        | 4,353  | 16,983   | 290.15   | 28,525   | 16,215   | -43.15 | 32,877   | 33,198   | 0.97     |
| 38 | Ministry of Coal                                  | 1,454  | 4,617    | 217.59   | 25,169   | 1,08,244 | 330.07 | 26,623   | 1,12,861 | 323.92   |
| 39 | Department of Commerce                            | 7,743  | 15,133   | 95.43    | 0        | 0        |        | 7,743    | 15,133   | 95.43    |
| 40 | Department of Industrial Policy and Promotion     | 4,457  | 12,601   | 182.74   | 0        | 0        |        | 4,457    | 12,601   | 182.74   |
| 41 | Department of Consumer Affairs                    | 761    | 1,260    | 65.63    | 0        | 0        |        | 761      | 1,260    | 65.63    |
| 42 | Department of Food and Public Distribution        | 323    | 1,523    | 370.88   | 345      | 671      | 94.53  | 668      | 2,194    | 228.27   |
| 43 | Ministry of Corporate Affairs                     | 211    | 233      | 10.57    | 0        | 0        |        | 211      | 233      | 10.57    |
| 44 | Ministry of Culture                               | 3,098  | 7,275    | 134.85   | 0        | 0        |        | 3,098    | 7,275    | 134.85   |
| 45 | Ministry of Development of North Eastern Region   | 459    | 955      | 108.02   | 0        | 0        |        | 459      | 955      | 108.02   |

(Contd)

## (Annexure 3.2 Contd)

| S. No. | Ministry/Department                                   | Budgetary Support |                  |               | IEBR            |                  |              | Total Outlay     |                  |               |
|--------|---|-------------------|------------------|---------------|-----------------|------------------|--------------|------------------|------------------|---------------|
|        |   | Eleventh Plan     | Twelfth Plan     | % Increase    | Eleventh Plan   | Twelfth Plan     | % Increase   | Eleventh Plan    | Twelfth Plan     | % Increase    |
| 46     | Ministry of Earth Sciences                            | 3,226             | 9,506            | 194.67        | 0               | 0                | 0            | 3,226            | 9,506            | 194.67        |
| 47     | Ministry of Environment and Forests                   | 8,545             | 17,874           | 109.17        | 0               | 0                | 0            | 8,545            | 17,874           | 109.17        |
| 48     | Ministry of External Affairs                          | 3,347             | 18,467           | 451.80        | 0               | 0                | 0            | 3,347            | 18,467           | 451.80        |
| 49     | Department of Economic Affairs                        | 7,675             | 21,379           | 178.54        | 0               | 0                | 0            | 7,675            | 21,379           | 178.54        |
| 50     | Department of Financial Services                      | 23,530            | 1,03,261         | 338.85        | 0               | 0                | 0            | 23,530           | 1,03,261         | 338.85        |
| 51     | Department of Expenditure                             | 24                | 23               | -4.33         | 0               | 0                | 0            | 24               | 23               | -4.33         |
| 52     | Ministry of Food Processing Industries                | 1,615             | 5,990            | 270.79        | 0               | 0                | 0            | 1,615            | 5,990            | 270.79        |
| 53     | Department of Heavy Industry                          | 1,153             | 4,680            | 305.78        | 7,636           | 17,543           | 129.74       | 8,790            | 22,223           | 152.84        |
| 54     | Department of Public Enterprises                      | 45                | 50               | 11.41         | 0               | 0                | 0            | 45               | 50               | 11.41         |
| 55     | Ministry of Law & Justice                             | 1,555             | 5,802            | 273.22        | 0               | 0                | 0            | 1,555            | 5,802            | 273.22        |
| 56     | Ministry of Mines                                     | 1,070             | 2,332            | 117.95        | 5,535           | 18,221           | 229.22       | 6,605            | 20,553           | 211.19        |
| 57     | Ministry of New and Renewable Energy                  | 3,605             | 19,113           | 430.17        | 6,025           | 13,890           | 130.55       | 9,630            | 33,003           | 242.72        |
| 58     | Ministry of Panchayati Raj                            | 636               | 6,437            | 912.41        | 0               | 0                | 0            | 636              | 6,437            | 912.41        |
| 59     | Ministry of Personnel, Public Grievances and Pensions | 788               | 1,385            | 75.65         | 0               | 0                | 0            | 788              | 1,385            | 75.65         |
| 60     | Ministry of Petroleum and Natural Gas                 | 126               | 5,147            | 3,984.92      | 2,58,953        | 4,36,541         | 68.58        | 2,59,079         | 4,41,688         | 70.48         |
| 61     | Ministry of Planning                                  | 1,808             | 14,717           | 714.21        | 0               | 0                | 0            | 1,808            | 14,717           | 714.21        |
| 62     | Ministry of Shipping                                  | 2,146             | 6,960            | 224.33        | 15,718          | 21,990           | 39.90        | 17,864           | 28,950           | 62.05         |
| 63     | Ministry of Statistics and Programme Implementation   | 792               | 3,709            | 368.20        | 0               | 0                | 0            | 792              | 3,709            | 368.20        |
| 64     | Ministry of Steel                                     | 134               | 200              | 49.04         | 57,572          | 90,975           | 58.02        | 57,706           | 91,175           | 58.00         |
| 65     | Ministry of Textiles                                  | 19,922            | 25,931           | 30.16         | 0               | 0                | 0            | 19,922           | 25,931           | 30.16         |
| 66     | Ministry of Tourism                                   | 4,913             | 15,190           | 209.14        | 18              | 155              | 761.11       | 4,932            | 15,345           | 211.13        |
| 67     | Ministry of Water Resources                           | 2,603             | 18,118           | 595.98        | 0               | 0                | 0            | 2,603            | 18,118           | 595.98        |
| 68     | Ministry of Youth Affairs and Sports                  | 7,830             | 6,648            | -15.10        | 0               | 0                | 0            | 7,830            | 6,648            | -15.10        |
|        | <b>Grand Total</b>                                    | <b>11,67,885</b>  | <b>27,10,840</b> | <b>132.12</b> | <b>8,57,244</b> | <b>16,22,899</b> | <b>89.32</b> | <b>20,25,129</b> | <b>43,33,739</b> | <b>114.00</b> |

Note: \* Includes ₹28,000 crore as central share of Rural Development Flexi Fund (DoRD + DoLR + DoDWS).

### ANNEXURE 3.3 Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan

| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                   |                  |                    |               |               |
|-------------|--|---|-------------------|------------------|--------------------|---------------|---------------|
|             |  | Andhra Pradesh  | Arunachal Pradesh | Assam            | Bihar              | Chhattisgarh  | Goa           |
| 1           | 2  | 3   | 4                 | 5                | 6                  | 7             | 8             |
| I           | Agriculture and Allied Activities          | 17,137.88   | 1,113.93          | 3,272.60         | 15,612.62          | 5.90          | 6.83          |
| II          | Rural Development                          | 33,706.50   | 203.57            | 3,674.63         | 12,774.42          | 6.62          | 5.59          |
| III         | Special Area Programmes                    | 91.98   | 855.25            | 10,755.61        | 7,515.45           | 19.39         | 3.29          |
| IV          | Irrigation and Flood Control               | 75,000.00   | 544.40            | 8,050.63         | 21,784.52          | 14.51         | 9.54          |
| V           | Energy                                     | 40,000.00   | 1,332.00          | 4,408.27         | 17,381.47          | 7.95          | 7.61          |
| VI          | Industry and Minerals                      | 10,000.00   | 104.50            | 1,169.89         | 4,077.45           | 2.11          | 1.78          |
| VII         | Transport                                  | 22,351.89   | 1,511.70          | 5,285.66         | 41,437.54          | 9.53          | 18.14         |
| VIII        | Communication                              | 0.00  | 0.00              | 0.00             | 0.00               | -             | -             |
| IX          | Science, Technology and Environment        | 64.39   | 106.80            | 1,126.07         | 2,418.15           | 2.03          | 1.06          |
| X           | General Economic Services                  | 8,736.86  | 12,996.92         | 2,259.49         | 19,729.70          | 4.07          | 8.64          |
| XI          | Social Services                            | 1,33,247.35   | 2,165.43          | 13,369.39        | 79,595.51          | 24.10         | 34.84         |
| 1           | <i>Education</i>                           | 24,084.32   | 539.10            | 4,125.29         | 29,957.34          | 7.44          | 13.11         |
| 2           | <i>Medical and Public Health</i>           | 11,795.20   | 275.00            | 1,332.45         | 5,125.57           | 2.40          | 2.24          |
| 3           | <i>Water Supply and Sanitation</i>         | 6,505.30  | 500.00            | 865.45           | 4,334.34           | 1.56          | 1.90          |
| 4           | <i>Housing</i>                             | 11,755.24   | 268.43            | 91.50            | 10,116.31          | 0.17          | 4.43          |
| 5           | <i>Urban Development</i>                   | 40,000.00   | 401.85            | 3,951.50         | 7,749.48           | 7.12          | 3.39          |
| 6           | <i>Others Social Services</i>              | 39,107.29   | 181.05            | 3,003.20         | 22,312.47          | 5.41          | 9.77          |
| XII         | General Services                           | 2,505.15  | 191.50            | 2,108.11         | 6,125.16           | 3.80          | 2.68          |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>3,42,842.00</b>  | <b>21,126.00</b>  | <b>55,480.35</b> | <b>2,28,452.00</b> | <b>100.00</b> | <b>100.00</b> |
| XIV         | Local Bodies Resources                     | 0.00  | 0.00              | 0.00             | 0.00               | -             | -             |
| XV          | PSEs Resources                             | 0.00  | 0.00              | 0.00             | 0.00               | -             | -             |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>3,42,842.00</b>  | <b>21,126.00</b>  | <b>55,480.35</b> | <b>2,28,452.00</b> | <b>100.00</b> | <b>100.00</b> |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and UTs in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                  |                    |                    |               |                    |               |                    |               |                              |
|-------------|--|---|------------------|--------------------|--------------------|---------------|--------------------|---------------|--------------------|---------------|------------------------------|
|             |  | Chhattisgarh  | Goa              | Gujarat            | Haryana            | 2             | 7                  | 8             | 9                  | 10            | %age of Total Budgetary Plan |
| I           | Agriculture and Allied Activities          | 8,283.74  | 1,045.52         | 19,711.80          | 6,287.97           | 3.87          | 19,711.80          | 7.79          | 6,287.97           | 5.36          |                              |
| II          | Rural Development                          | 3,668.52  | 881.04           | 10,919.49          | 8,086.95           | 3.26          | 10,919.49          | 4.32          | 8,086.95           | 6.90          |                              |
| III         | Special Area Programmes                    | 3,313.50  | 83.50            | 1,276.30           | 263.14             | 0.31          | 1,276.30           | 0.50          | 263.14             | 0.22          |                              |
| IV          | Irrigation and Flood Control               | 11,952.26   | 1,586.05         | 51,502.27          | 10,030.53          | 5.88          | 51,502.27          | 20.35         | 10,030.53          | 8.56          |                              |
| V           | Energy                                     | 7,337.03  | 2,235.14         | 7,890.21           | 9,661.88           | 6.17          | 7,890.21           | 3.12          | 9,661.88           | 8.24          |                              |
| VI          | Industry and Minerals                      | 1,972.32  | 403.96           | 8,926.81           | 842.83             | 1.66          | 8,926.81           | 3.53          | 842.83             | 0.72          |                              |
| VII         | Transport                                  | 13,017.31   | 2,341.05         | 29,064.04          | 12,844.29          | 10.95         | 29,064.04          | 11.49         | 12,844.29          | 10.96         |                              |
| VIII        | Communication                              | 0.00  | 0.00             | 0.00               | 0.00               | —             | 0.00               | —             | 0.00               | —             |                              |
| IX          | Science, Technology and Environment        | 2,840.14  | 727.98           | 2,268.98           | 1,528.03           | 2.39          | 2,268.98           | 0.90          | 1,528.03           | 1.30          |                              |
| X           | General Economic Services                  | 5,206.92  | 1,685.53         | 9,075.94           | 2,286.18           | 4.38          | 9,075.94           | 3.59          | 2,286.18           | 1.95          |                              |
| XI          | Social Services                            | 61,260.26   | 13,377.88        | 1,12,103.55        | 64,448.52          | 51.54         | 1,12,103.55        | 44.31         | 64,448.52          | 54.97         |                              |
| 1           | <i>Education</i>                           | 30,013.19   | 3,842.29         | 15,201.10          | 19,581.16          | 25.25         | 15,201.10          | 6.01          | 19,581.16          | 16.70         |                              |
| 2           | <i>Medical and Public Health</i>           | 5,948.67  | 1,042.33         | 16,706.00          | 4,868.07           | 5.01          | 16,706.00          | 6.60          | 4,868.07           | 4.15          |                              |
| 3           | <i>Water Supply and Sanitation</i>         | 2,376.07  | 1,264.96         | 14,435.90          | 6,773.87           | 2.00          | 14,435.90          | 5.71          | 6,773.87           | 5.78          |                              |
| 4           | <i>Housing</i>                             | 786.88  | 224.60           | 9,448.61           | 1,094.24           | 0.66          | 9,448.61           | 3.73          | 1,094.24           | 0.93          |                              |
| 5           | <i>Urban Development</i>                   | 10,442.26   | 2,320.38         | 31,906.01          | 10,291.07          | 8.79          | 31,906.01          | 12.61         | 10,291.07          | 8.78          |                              |
| 6           | <i>Others Social Services</i>              | 11,693.19   | 4,683.32         | 24,405.99          | 21,840.12          | 9.84          | 24,405.99          | 9.65          | 21,840.12          | 18.63         |                              |
| XII         | General Services                           | 0.00  | 2,624.35         | 283.62             | 959.67             | 0.00          | 283.62             | 0.11          | 959.67             | 0.82          |                              |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>1,18,852.00</b>  | <b>26,992.00</b> | <b>2,53,023.00</b> | <b>1,17,240.00</b> | <b>100.00</b> | <b>2,53,023.00</b> | <b>100.00</b> | <b>1,17,240.00</b> | <b>100.00</b> |                              |
| XIV         | Local Bodies Resources                     | 4,421.00  | 540.00           | 0.00               | 13,190.00          | —             | 0.00               | —             | 13,190.00          | —             |                              |
| XV          | PSEs Resources                             | 8,455.00  | 1,067.00         | 30,600.00          | 73,570.00          | —             | 30,600.00          | —             | 73,570.00          | —             |                              |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>1,31,728.00</b>  | <b>28,599.00</b> | <b>2,83,623.00</b> | <b>2,04,000.00</b> | <b>—</b>      | <b>2,83,623.00</b> | <b>—</b>      | <b>2,04,000.00</b> | <b>—</b>      |                              |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                              |                    |                              |               |                              |               |                              |
|-------------|--|---|------------------------------|--------------------|------------------------------|---------------|------------------------------|---------------|------------------------------|
|             |  | Himachal Pradesh  | %age of Total Budgetary Plan | Jammu and Kashmir  | %age of Total Budgetary Plan | Jharkhand     | %age of Total Budgetary Plan | Karnataka     | %age of Total Budgetary Plan |
|             |  | 11  | 12                           | 13                 | 14                           |               |                              |               |                              |
| 1           | 2  |   |                              |                    |                              |               |                              |               |                              |
| I           | Agriculture and Allied Activities          | 2,173.83  | 2,843.09                     | 4,157.42           | 19,824.01                    | 9.68          | 6.45                         | 3.77          | 8.94                         |
| II          | Rural Development                          | 1,084.93  | 1,541.78                     | 10,657.89          | 7,170.73                     | 4.83          | 3.50                         | 9.67          | 3.23                         |
| III         | Special Area Programmes                    | 153.36  | 1,959.49                     | 5,507.82           | 29,66.35                     | 0.68          | 4.45                         | 5.00          | 1.34                         |
| IV          | Irrigation and Flood Control               | 1,661.50  | 1,914.33                     | 13,620.18          | 39,430.95                    | 7.40          | 4.35                         | 12.36         | 17.78                        |
| V           | Energy                                     | 3,549.83  | 11,195.82                    | 8,372.10           | 23,165.55                    | 15.81         | 25.41                        | 7.59          | 10.45                        |
| VI          | Industry and Minerals                      | 227.34  | 1,066.82                     | 1,346.77           | 3,649.23                     | 1.01          | 2.42                         | 1.22          | 1.65                         |
| VII         | Transport                                  | 4,734.45  | 4,428.87                     | 17,281.89          | 28,426.51                    | 21.09         | 10.05                        | 15.68         | 12.82                        |
| VIII        | Communication                              | 0.00  | 0.00                         | 0.00               | 0.00                         | —             | —                            | —             | —                            |
| IX          | Science, Technology and Environment        | 841.38  | 268.39                       | 1,285.66           | 2,296.95                     | 3.75          | 0.61                         | 1.17          | 1.04                         |
| X           | General Economic Services                  | 585.20  | 3,216.63                     | 9,610.32           | 5,971.63                     | 2.61          | 7.30                         | 8.72          | 2.69                         |
| XI          | Social Services                            | 7,088.23  | 13,196.14                    | 36,293.06          | 85,428.94                    | 31.57         | 29.95                        | 32.92         | 38.52                        |
| 1           | <i>Education</i>                           | 2,905.73  | 6,434.76                     | 10,709.36          | 17,331.06                    | 12.94         | 14.61                        | 9.71          | 7.82                         |
| 2           | <i>Medical and Public Health</i>           | 131.79  | 2,991.54                     | 3,816.28           | 7,899.31                     | 0.59          | 6.79                         | 3.46          | 3.56                         |
| 3           | <i>Water Supply and Sanitation</i>         | 1,777.52  | 1,473.40                     | 2,093.32           | 12,606.59                    | 7.92          | 3.34                         | 1.90          | 5.68                         |
| 4           | <i>Housing</i>                             | 339.78  | 71.81                        | 147.38             | 7,031.07                     | 1.51          | 0.16                         | 0.13          | 3.17                         |
| 5           | <i>Urban Development</i>                   | 395.30  | 600.09                       | 6,586.83           | 16,620.80                    | 1.76          | 1.36                         | 5.97          | 7.49                         |
| 6           | <i>Others Social Services</i>              | 1,538.11  | 1,624.55                     | 12,939.89          | 23,940.11                    | 6.85          | 3.69                         | 11.74         | 10.80                        |
| XII         | General Services                           | 349.96  | 2,423.63                     | 2,106.89           | 3,433.15                     | 1.56          | 5.50                         | 1.91          | 1.55                         |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>22,450.00</b>  | <b>44,055.00</b>             | <b>1,10,240.00</b> | <b>2,21,764.00</b>           | <b>100.00</b> | <b>100.00</b>                | <b>100.00</b> | <b>100.00</b>                |
| XIV         | Local Bodies Resources                     | 0.00  | 0.00                         | 0.00               | 0.00                         | —             | —                            | —             | —                            |
| XV          | PSEs Resources                             | 350.00  | 0.00                         | 0.00               | 33,486.00                    | —             | —                            | —             | —                            |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>22,800.00</b>  | <b>44,055.00</b>             | <b>1,10,240.00</b> | <b>2,55,250.00</b>           | <b>—</b>      | <b>—</b>                     | <b>—</b>      | <b>—</b>                     |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                              |                    |                              |                    |                              |                  |                              |
|-------------|--|---|------------------------------|--------------------|------------------------------|--------------------|------------------------------|------------------|------------------------------|
|             |  | Kerala  | %age of Total Budgetary Plan | Madhya Pradesh     | %age of Total Budgetary Plan | Maharashtra        | %age of Total Budgetary Plan | Manipur          | %age of Total Budgetary Plan |
| 1           | 2  | 15  | 16                           | 17                 | 18                           |                    |                              |                  |                              |
| I           | Agriculture and Allied Activities          | 8,831.00  | 11.47                        | 17,076.50          | 8.46                         | 19,324.87          | 7.03                         | 642.98           | 3.08                         |
| II          | Rural Development                          | 3,339.00  | 4.34                         | 12,946.70          | 6.41                         | 9,089.07           | 3.31                         | 946.89           | 4.54                         |
| III         | Special Area Programmes                    | 2,031.00  | 2.64                         | 8,356.90           | 4.14                         | 1,140.70           | 0.41                         | 338.58           | 1.62                         |
| IV          | Irrigation and Flood Control               | 3,327.00  | 4.32                         | 27,313.50          | 13.53                        | 47,990.34          | 17.45                        | 3,219.66         | 15.44                        |
| V           | Energy                                     | 8,323.00  | 10.81                        | 20,941.90          | 10.37                        | 20,694.87          | 7.53                         | 1,563.00         | 7.50                         |
| VI          | Industry and Minerals                      | 3,912.00  | 5.08                         | 5,839.70           | 2.89                         | 2,174.94           | 0.79                         | 435.31           | 2.09                         |
| VII         | Transport                                  | 8,540.00  | 11.09                        | 24,641.00          | 12.21                        | 33,854.78          | 12.31                        | 1,126.12         | 5.40                         |
| VIII        | Communication                              | 0.00  | —                            | 0.00               | —                            | 0.00               | —                            | 0.00             | —                            |
| IX          | Science, Technology and Environment        | 3,189.00  | 4.14                         | 569.00             | 0.28                         | 2,761.04           | 1.00                         | 1,148.29         | 5.51                         |
| X           | General Economic Services                  | 1,975.00  | 2.56                         | 3,501.49           | 1.73                         | 3,351.45           | 1.22                         | 401.97           | 1.93                         |
| XI          | Social Services                            | 33,207.00   | 43.13                        | 79,820.22          | 39.54                        | 1,19,699.61        | 43.53                        | 10,755.50        | 51.59                        |
| I           | Education                                  | 4,731.00  | 6.14                         | 20,217.00          | 10.02                        | 14,612.18          | 5.31                         | 754.73           | 3.62                         |
| 2           | Medical and Public Health                  | 3,534.00  | 4.59                         | 6,314.20           | 3.13                         | 10,200.86          | 3.71                         | 1,301.04         | 6.24                         |
| 3           | Water Supply and Sanitation                | 4,656.00  | 6.05                         | 3,116.40           | 1.54                         | 6,073.25           | 2.21                         | 3,664.02         | 17.57                        |
| 4           | Housing                                    | 412.00  | 0.54                         | 2,002.30           | 0.99                         | 9,376.97           | 3.41                         | 248.45           | 1.19                         |
| 5           | Urban Development                          | 6,920.00  | 8.99                         | 8,767.30           | 4.34                         | 23,960.91          | 8.71                         | 620.98           | 2.98                         |
| 6           | Others Social Services                     | 12,954.00   | 16.82                        | 39,403.02          | 19.52                        | 55,475.44          | 20.17                        | 4,166.29         | 19.98                        |
| XII         | General Services                           | 326.00  | 0.42                         | 855.09             | 0.42                         | 14,918.34          | 5.42                         | 269.72           | 1.29                         |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>77,000.00</b>  | <b>100.00</b>                | <b>2,01,862.00</b> | <b>100.00</b>                | <b>2,75,000.00</b> | <b>100.00</b>                | <b>20,848.00</b> | <b>100.00</b>                |
| XIV         | Local Bodies Resources                     | 25,000.00   | —                            | 0.00               | —                            | 0.00               | —                            | 0.00             | —                            |
| XV          | PSEs Resources                             | 0.00  | —                            | 8,291.00           | —                            | 0.00               | —                            | 0.00             | —                            |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>1,02,000.00</b>  | <b>—</b>                     | <b>2,10,153.00</b> | <b>—</b>                     | <b>2,75,000.00</b> | <b>—</b>                     | <b>20,848.00</b> | <b>—</b>                     |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

| S.No.       | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                              |                  |                              |                  |                              |                    |                              |
|-------------|--|---|------------------------------|------------------|------------------------------|------------------|------------------------------|--------------------|------------------------------|
|             |  | Meghalaya   | %age of Total Budgetary Plan | Mizoram          | %age of Total Budgetary Plan | Nagaland         | %age of Total Budgetary Plan | Odisha             | %age of Total Budgetary Plan |
|             | 2  | 19  | 20                           | 21               | 22                           |                  |                              |                    |                              |
| I           | Agriculture and Allied Activities          | 2,114.47  | 10.74                        | 346.35           | 2.85                         | 1,795.13         | 13.81                        | 8,387.40           | 7.40                         |
| II          | Rural Development                          | 1,116.94  | 5.68                         | 178.69           | 1.47                         | 492.07           | 3.79                         | 2,214.07           | 1.95                         |
| III         | Special Area Programmes                    | 101.94  | 0.52                         | 238.06           | 1.96                         | 834.18           | 6.42                         | 9,964.07           | 8.79                         |
| IV          | Irrigation and Flood Control               | 755.79  | 3.84                         | 460.20           | 3.78                         | 1,142.08         | 8.79                         | 17,597.77          | 15.53                        |
| V           | Energy                                     | 2,679.50  | 13.62                        | 656.20           | 5.40                         | 748.89           | 5.76                         | 14,086.59          | 12.43                        |
| VI          | Industry and Minerals                      | 213.34  | 1.08                         | 1,817.44         | 14.95                        | 341.70           | 2.63                         | 478.96             | 0.42                         |
| VII         | Transport                                  | 1,489.01  | 7.57                         | 3,658.71         | 30.09                        | 1,271.74         | 9.78                         | 14,139.76          | 12.48                        |
| VIII        | Communication                              | 0.00  | —                            | 0.00             | —                            | 0.00             | —                            | 0.00               | —                            |
| IX          | Science, Technology and Environment        | 335.67  | 1.71                         | 162.70           | 1.34                         | 83.39            | 0.64                         | 2,283.38           | 2.01                         |
| X           | General Economic Services                  | 4,231.86  | 21.50                        | 1,154.40         | 9.49                         | 1,585.58         | 12.20                        | 2,374.24           | 2.10                         |
| XI          | Social Services                            | 6,124.98  | 31.12                        | 3,270.95         | 26.90                        | 3,932.85         | 30.25                        | 40,335.83          | 35.59                        |
| 1           | <i>Education</i>                           | 2,512.03  | 12.77                        | 1,379.61         | 11.35                        | 831.32           | 6.39                         | 15,107.90          | 13.33                        |
| 2           | <i>Medical and Public Health</i>           | 1,427.12  | 7.25                         | 269.77           | 2.22                         | 208.43           | 1.60                         | 2,723.77           | 2.40                         |
| 3           | <i>Water Supply and Sanitation</i>         | 873.75  | 4.44                         | 363.42           | 2.99                         | 231.69           | 1.78                         | 3,410.99           | 3.01                         |
| 4           | <i>Housing</i>                             | 67.72   | 0.34                         | 643.53           | 5.29                         | 361.73           | 2.78                         | 1,365.53           | 1.21                         |
| 5           | <i>Urban Development</i>                   | 997.53  | 5.07                         | 399.65           | 3.29                         | 980.07           | 7.54                         | 2,634.32           | 2.32                         |
| 6           | <i>Others Social Services</i>              | 246.83  | 1.25                         | 214.96           | 1.77                         | 1,319.61         | 10.15                        | 15,093.32          | 13.32                        |
| XII         | General Services                           | 515.51  | 2.62                         | 216.29           | 1.78                         | 772.39           | 5.94                         | 1,459.92           | 1.29                         |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>19,679.00</b>  | <b>100.00</b>                | <b>12,160.00</b> | <b>100.00</b>                | <b>13,000.00</b> | <b>100.00</b>                | <b>1,13,322.00</b> | <b>100.00</b>                |
| XIV         | Local Bodies Resources                     | 0.00  | —                            | 0.00             | —                            | 0.00             | —                            | 0.00               | —                            |
| XV          | PSEs Resources                             | 2,321.00  | —                            | 0.00             | —                            | 0.00             | —                            | 11,051.00          | —                            |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>22,000.00</b>  | <b>—</b>                     | <b>12,160.00</b> | <b>—</b>                     | <b>13,000.00</b> | <b>—</b>                     | <b>1,24,373.00</b> | <b>—</b>                     |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                    |                              |                  |                              |                    |                              |
|-------------|--|---|--------------------|------------------------------|------------------|------------------------------|--------------------|------------------------------|
|             |  | Punjab  | Rajasthan          | %age of Total Budgetary Plan | Sikkim           | %age of Total Budgetary Plan | Tamil Nadu         | %age of Total Budgetary Plan |
| 1           | 2  | 23  | 24                 | 25                           | 26               |                              |                    |                              |
| I           | Agriculture and Allied Activities          | 1,524.19  | 7,254.82           | 5.58                         | 469.30           | 4.14                         | 20,680.00          | 10.04                        |
| II          | Rural Development                          | 4,733.82  | 10,436.99          | 8.02                         | 1,302.98         | 11.51                        | 23,870.00          | 11.59                        |
| III         | Special Area Programmes                    | 0.00  | 2,891.62           | 2.22                         | 161.02           | 1.42                         | 0.00               | 0.00                         |
| IV          | Irrigation and Flood Control               | 2,985.06  | 4,097.46           | 3.15                         | 912.50           | 8.06                         | 8,700.00           | 4.22                         |
| V           | Energy                                     | 13,850.09   | 48,692.80          | 37.43                        | 681.27           | 6.02                         | 24,258.00          | 11.78                        |
| VI          | Industry and Minerals                      | 1,437.62  | 665.22             | 0.51                         | 412.63           | 3.64                         | 5,470.00           | 2.66                         |
| VII         | Transport                                  | 5,215.42  | 7,042.65           | 5.41                         | 65.29            | 0.58                         | 20,850.00          | 10.12                        |
| VIII        | Communication                              | 0.00  | 0.00               | —                            | 0.00             | —                            | 0.00               | —                            |
| IX          | Science, Technology and Environment        | 259.95  | 1,245.18           | 0.96                         | 455.02           | 4.02                         | 410.00             | 0.20                         |
| X           | General Economic Services                  | 829.16  | 2,467.21           | 1.90                         | 681.53           | 6.02                         | 3,880.00           | 1.88                         |
| XI          | Social Services                            | 20,529.21   | 44,126.56          | 33.92                        | 5,241.30         | 46.28                        | 97,400.00          | 47.28                        |
| I           | Education                                  | 6,647.36  | 9,886.80           | 7.60                         | 2,014.56         | 17.79                        | 18,090.00          | 8.78                         |
| 2           | Medical and Public Health                  | 1,598.75  | 4,999.62           | 3.84                         | 812.43           | 7.17                         | 10,830.00          | 5.26                         |
| 3           | Water Supply and Sanitation                | 3,671.84  | 9,786.27           | 7.52                         | 1,319.69         | 11.65                        | 11,310.00          | 5.49                         |
| 4           | Housing                                    | 34.47   | 1,588.22           | 1.22                         | 93.25            | 0.82                         | 3,380.00           | 1.64                         |
| 5           | Urban Development                          | 1,192.42  | 10,469.87          | 8.05                         | 978.45           | 8.64                         | 10,690.00          | 5.19                         |
| 6           | Others Social Services                     | 7,384.36  | 7,395.77           | 5.69                         | 22.93            | 0.20                         | 43,100.00          | 20.92                        |
| XII         | General Services                           | 769.47  | 1,164.48           | 0.90                         | 942.16           | 8.32                         | 470.00             | 0.23                         |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>52,134.00</b>  | <b>1,30,085.00</b> | <b>100.00</b>                | <b>11,325.00</b> | <b>100.00</b>                | <b>2,05,988.00</b> | <b>100.00</b>                |
| XIV         | Local Bodies Resources                     | 5,863.00  | 5,978.00           | —                            | 0.00             | —                            | 2,000.00           | —                            |
| XV          | PSEs Resources                             | 27,362.00   | 60,929.00          | —                            | 0.00             | —                            | 3,262.00           | —                            |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>85,359.00</b>  | <b>1,96,992.00</b> | <b>—</b>                     | <b>11,325.00</b> | <b>—</b>                     | <b>2,11,250.00</b> | <b>—</b>                     |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.



| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                              |                    |                              |                  |                              |                    |                              |
|-------------|--|---|------------------------------|--------------------|------------------------------|------------------|------------------------------|--------------------|------------------------------|
|             |  | Tripura   | %age of Total Budgetary Plan | Uttar Pradesh      | %age of Total Budgetary Plan | Uttarakhand      | %age of Total Budgetary Plan | West Bengal        | %age of Total Budgetary Plan |
|             | 2  | 27  | 28                           | 29                 | 30                           |                  |                              |                    |                              |
| I           | Agriculture and Allied Activities          | 980.78  | 6.84                         | 24,354.83          | 8.51                         | 2,672.88         | 5.93                         | 8,582.90           | 5.52                         |
| II          | Rural Development                          | 425.67  | 2.97                         | 8,322.73           | 2.91                         | 3,082.42         | 6.84                         | 11,142.45          | 7.16                         |
| III         | Special Area Programmes                    | 899.49  | 6.27                         | 7,753.24           | 2.71                         | 68.11            | 0.15                         | 10,849.50          | 6.97                         |
| IV          | Irrigation and Flood Control               | 583.54  | 4.07                         | 30,080.39          | 10.51                        | 3,604.40         | 8.00                         | 13,385.80          | 8.60                         |
| V           | Energy                                     | 398.28  | 2.78                         | 39,532.33          | 13.81                        | 6,036.17         | 13.39                        | 4,513.00           | 2.90                         |
| VI          | Industry and Minerals                      | 197.25  | 1.38                         | 20,520.35          | 7.17                         | 177.99           | 0.39                         | 5,934.70           | 3.81                         |
| VII         | Transport                                  | 732.03  | 5.10                         | 30,197.92          | 10.55                        | 6,923.99         | 15.36                        | 10,484.10          | 6.74                         |
| VIII        | Communication                              | 0.00  | —                            | 0.00               | —                            | 0.00             | —                            | 0.00               | —                            |
| IX          | Science, Technology and Environment        | 317.49  | 2.21                         | 2,603.71           | 0.91                         | 1,615.59         | 3.58                         | 1,859.80           | 1.20                         |
| X           | General Economic Services                  | 4,921.19  | 34.32                        | 6,644.83           | 2.32                         | 1,207.22         | 2.68                         | 1,079.60           | 0.69                         |
| XI          | Social Services                            | 4,658.13  | 32.48                        | 11,4863.17         | 40.11                        | 18,522.50        | 41.09                        | 84,511.75          | 54.31                        |
| 1           | <i>Education</i>                           | 848.83  | 5.92                         | 36,876.85          | 12.88                        | 4,973.78         | 11.03                        | 22,353.60          | 14.37                        |
| 2           | <i>Medical and Public Health</i>           | 1,048.22  | 7.31                         | 16,647.76          | 5.81                         | 3,132.16         | 6.95                         | 6,925.45           | 4.45                         |
| 3           | <i>Water Supply and Sanitation</i>         | 278.45  | 1.94                         | 7,390.37           | 2.58                         | 3,093.75         | 6.86                         | 5,183.00           | 3.33                         |
| 4           | <i>Housing</i>                             | 176.55  | 1.23                         | 4,529.59           | 1.58                         | 0.00             | 0.00                         | 5,534.25           | 3.56                         |
| 5           | <i>Urban Development</i>                   | 680.69  | 4.75                         | 15,326.69          | 5.35                         | 3,278.18         | 7.27                         | 20,425.25          | 13.13                        |
| 6           | <i>Others Social Services</i>              | 1,625.39  | 11.33                        | 34,091.92          | 11.91                        | 4,044.62         | 8.97                         | 24,090.20          | 15.48                        |
| XII         | General Services                           | 226.15  | 1.58                         | 1,466.50           | 0.51                         | 1,168.74         | 2.59                         | 3,257.40           | 2.09                         |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>14,340.00</b>  | <b>100.00</b>                | <b>2,86,340.00</b> | <b>100.00</b>                | <b>45,080.00</b> | <b>100.00</b>                | <b>1,55,601.00</b> | <b>100.00</b>                |
| XIV         | Local Bodies Resources                     | 0.00  | —                            | 0.00               | —                            | 100.00           | —                            | 0.00               | —                            |
| XV          | PSEs Resources                             | 0.00  | —                            | 40,613.00          | —                            | 1,400.00         | —                            | 16,194.00          | —                            |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>14,340.00</b>  | <b>—</b>                     | <b>3,26,953.00</b> | <b>—</b>                     | <b>46,580.00</b> | <b>—</b>                     | <b>1,71,795.00</b> | <b>—</b>                     |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                 |                                       |                              |                                       |                  |
|-------------|--|---|-----------------|---------------------------------------|------------------------------|---------------------------------------|------------------|
|             |  | Andaman<br>and Nicobar<br>Islands   | Chandigarh      | %age of<br>Total<br>Budgetary<br>Plan | Dadra<br>and Nagar<br>Haveli | %age of<br>Total<br>Budgetary<br>Plan | Daman and<br>Diu |
| 1           | 2  | 31  | 32              | 33                                    | 34                           |                                       |                  |
| I           | Agriculture and Allied Activities          | 331.80  | 7.01            | 45.88                                 | 205.49                       | 1.04                                  | 4.97             |
| II          | Rural Development                          | 497.42  | 27.26           | 160.95                                | 298.27                       | 3.64                                  | 7.21             |
| III         | Special Area Programmes                    | 0.00  | 0.00            | 0.00                                  | 0.00                         | 0.00                                  | 0.00             |
| IV          | Irrigation and Flood Control               | 145.26  | 1.60            | 356.51                                | 93.82                        | 8.05                                  | 2.27             |
| V           | Energy                                     | 296.67  | 420.26          | 893.11                                | 325.25                       | 20.18                                 | 7.87             |
| VI          | Industry and Minerals                      | 40.05   | 4.77            | 8.86                                  | 100.75                       | 0.20                                  | 2.44             |
| VII         | Transport                                  | 5,093.78  | 454.42          | 660.32                                | 937.77                       | 14.92                                 | 22.68            |
| VIII        | Communication                              | 0.00  | 0.00            | 0.00                                  | 0.00                         | —                                     | —                |
| IX          | Science, Technology and Environment        | 900.96  | 95.98           | 94.34                                 | 182.69                       | 2.13                                  | 4.42             |
| X           | General Economic Services                  | 277.55  | 35.22           | 168.49                                | 103.92                       | 3.81                                  | 2.51             |
| XI          | Social Services                            | 3,967.65  | 4,287.80        | 1,921.02                              | 1,741.28                     | 43.40                                 | 42.11            |
| I           | Education                                  | 1,357.25  | 1,026.11        | 481.79                                | 413.88                       | 10.89                                 | 10.01            |
| 2           | Medical and Public Health                  | 672.92  | 660.33          | 653.35                                | 850.41                       | 14.76                                 | 20.57            |
| 3           | Water Supply and Sanitation                | 508.04  | 199.96          | 224.48                                | 211.55                       | 5.07                                  | 5.12             |
| 4           | Housing                                    | 251.59  | 276.50          | 240.89                                | 14.46                        | 5.44                                  | 0.35             |
| 5           | Urban Development                          | 796.17  | 2,007.89        | 263.67                                | 170.19                       | 5.96                                  | 4.12             |
| 6           | Others Social Services                     | 381.69  | 117.01          | 56.83                                 | 80.80                        | 1.28                                  | 1.95             |
| XII         | General Services                           | 823.86  | 49.69           | 116.53                                | 145.75                       | 2.63                                  | 3.52             |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>12,375.00</b>  | <b>5,384.00</b> | <b>4,426.00</b>                       | <b>4,135.00</b>              | <b>100.00</b>                         | <b>100.00</b>    |
| XIV         | Local Bodies Resources                     | 0.00  | 0.00            | 0.00                                  | 0.00                         | —                                     | —                |
| XV          | PSEs Resources                             | 0.00  | 0.00            | 0.00                                  | 0.00                         | —                                     | —                |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>12,375.00</b>  | <b>5,384.00</b> | <b>4,426.00</b>                       | <b>4,135.00</b>              | <b>—</b>                              | <b>—</b>         |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

| S. No.      | Head of Development                        | Proposed Sectoral Allocations for States and Union Territories in the Twelfth Plan<br>(Current Prices) (₹ in Crore) |                 |                  |                              |                              |                              | Total All States and UTs |
|-------------|--|---|-----------------|------------------|------------------------------|------------------------------|------------------------------|--------------------------|
|             |  | Delhi   | Lakshadweep     | Puducherry       | %age of Total Budgetary Plan | %age of Total Budgetary Plan | %age of Total Budgetary Plan |                          |
| 1           | 2  | 35  | 36              | 37               |                              |                              |                              |                          |
| I           | Agriculture and Allied Activities          | 0.00  | 227.91          | 1,316.07         | 7.84                         | 6.40                         | 2,28,636.99                  |                          |
| II          | Rural Development                          | 882.00  | 48.84           | 491.22           | 1.68                         | 2.39                         | 1,90,416.89                  |                          |
| III         | Special Area Programmes                    | 0.00  | 0.00            | 0.00             | 0.00                         | 0.00                         | 80,370.15                    |                          |
| IV          | Irrigation and Flood Control               | 400.00  | 37.21           | 532.29           | 1.28                         | 2.59                         | 4,04,799.79                  |                          |
| V           | Energy                                     | 4,820.20  | 130.23          | 1,397.47         | 4.48                         | 6.80                         | 3,52,468.37                  |                          |
| VI          | Industry and Minerals                      | 199.00  | 26.74           | 1,015.14         | 0.92                         | 4.94                         | 85,212.39                    |                          |
| VII         | Transport                                  | 21,954.62   | 777.91          | 1,853.20         | 26.76                        | 9.01                         | 3,84,689.75                  |                          |
| VIII        | Communication                              | 0.00  | 0.00            | 0.00             | —                            | —                            | 0.00                         |                          |
| IX          | Science, Technology and Environment        | 546.50  | 238.37          | 164.99           | 8.20                         | 0.80                         | 37,295.98                    |                          |
| X           | General Economic Services                  | 992.50  | 118.61          | 791.94           | 4.08                         | 3.85                         | 1,24,136.27                  |                          |
| XI          | Social Services                            | 57,185.50   | 1,223.27        | 11,680.82        | 42.08                        | 56.82                        | 13,90,581.23                 |                          |
| I           | Education                                  | 12,240.50   | 422.10          | 2,674.40         | 14.52                        | 13.01                        | 3,45,178.28                  |                          |
| 2           | Medical and Public Health                  | 13,500.00   | 186.05          | 2,052.44         | 6.40                         | 9.98                         | 1,52,481.29                  |                          |
| 3           | Water Supply and Sanitation                | 11,000.00   | 86.05           | 1,100.55         | 2.96                         | 5.35                         | 1,32,760.24                  |                          |
| 4           | Housing                                    | 2,700.00  | 284.89          | 1,169.13         | 9.80                         | 5.69                         | 76,127.87                    |                          |
| 5           | Urban Development                          | 8,700.00  | 143.02          | 2,308.37         | 4.92                         | 11.23                        | 2,53,977.19                  |                          |
| 6           | Others Social Services                     | 9,045.00  | 101.16          | 2,375.93         | 3.48                         | 11.56                        | 4,30,056.38                  |                          |
| XII         | General Services                           | 3,019.68  | 77.91           | 1,315.86         | 2.68                         | 6.40                         | 57,458.63                    |                          |
| <b>XIII</b> | <b>Total Budgetary Plan (I to XII)</b>     | <b>90,000.00</b>  | <b>2,907.00</b> | <b>20,559.00</b> | <b>100.00</b>                | <b>100.00</b>                | <b>33,36,066.44</b>          |                          |
| XIV         | Local Bodies Resources                     | 0.00  | 0.00            | 0.00             | —                            | —                            | 57,092.00                    |                          |
| XV          | PSEs Resources                             | 4,275.52  | 0.00            | 0.00             | —                            | —                            | 3,23,226.52                  |                          |
| <b>XVI</b>  | <b>Total Plan Outlay (XIII + XIV + XV)</b> | <b>94,275.52</b>  | <b>2,907.00</b> | <b>20,559.00</b> | <b>—</b>                     | <b>—</b>                     | <b>37,16,384.96</b>          |                          |

Note: Sectoral allocations in respect of some States/UTs are provisional and may undergo changes in consultation with concerned States/UTs.

# 4

## Sustainable Development

### INTRODUCTION

4.1. Sustainable Development, as defined by the Brundtland Commission in 1987, ‘*is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*’. Economic growth and development have to be guided by the compulsion of sustainability, because none of us has the luxury, any longer, of ignoring the economic as well as the environmental threat, that a fast-deteriorating ecosystem poses to our fragile planet. None of us is immune to the reality of climate change, ecological degradation, depletion of the ozone layer and contamination of our freshwater.

4.2. India has been actively involved in international fora relating to environmental protection, and has been part of 94 Multilaterals Environmental Agreements such as the Ramsar Convention on Wetlands, Convention on International Trade in Endangered Species of Fauna and Flora (CITES), Convention on Biological Diversity (CBD), among many others. India has also signed the United Nations Framework Convention on Climate Change, and has acceded to the Kyoto Protocol in 2002. Despite not having binding mitigation commitments as per the United Nations Framework Convention on Climate Change (UNFCCC), India has communicated its voluntary mitigation goal of reducing the emissions intensity of its Gross Domestic Product (GDP) by 20–25 per cent, over 2005 levels, by 2020. The Indian Government is committed to the

UNFCCC principle of *Common but Differentiated Responsibility* (CBDR). The Government has also formulated the National Action Plan on Climate Change that provides for eight missions to help the country adapt to the effects of climate variability and change.

### SUSTAINABLE ECONOMIC GROWTH

4.3. It is often said that Gross Domestic Product is not the best way of measuring the true well-being of nations, because the pursuit of growth can be at the cost of the environment. There is obviously a two-way relationship between environment and economic growth. Natural resources and raw materials such as water, timber and minerals directly provide inputs for the production of goods and services. However, Industrial growth, which plays a major role in boosting the GDP, can cause some environmental damage. Manufacturing sector can lead to environmental degradation during all stages of production cycle, namely, (i) procurement and use of natural resources, (ii) industrial processes and activities and (iii) product use and disposal. Another important sector of the economy—agriculture—also has certain practices which harm the environment. For instance, activities like the use of chemical fertilisers result in both water pollution and soil deterioration. Unregulated withdrawal of ground water plays havoc with water balance in the ecosystem.

4.4. Conventional ways of measuring GDP in terms of production do not take into account the

environmental damage caused by production of goods and services. Only after GDP is adjusted for environmental costs that growth of adjusted GDP can be called a measure of the increase in total production in the economy. Recognising this problem, the Planning Commission has commissioned an Expert Group under Professor Partha Dasgupta to prepare a template for estimating green national accounts, which would measure national production while allowing for the negative effects on national resources.

4.5. Environment is a public good that is rival and non-excludable. It is not owned by any one individual, and one person's consumption affects its quality available for others. Several economic activities generate negative externalities through the environment. Pricing natural resources properly, making pollution more costly and removing fossil fuel subsidies should be good for preservation of environment, and for sustaining growth in the long run. Better regulation can help protect human health and environment, support green technologies, and boost green private investment and jobs. This section first makes a business case for sustainable development, and then deals with financial and non-monetary incentives.

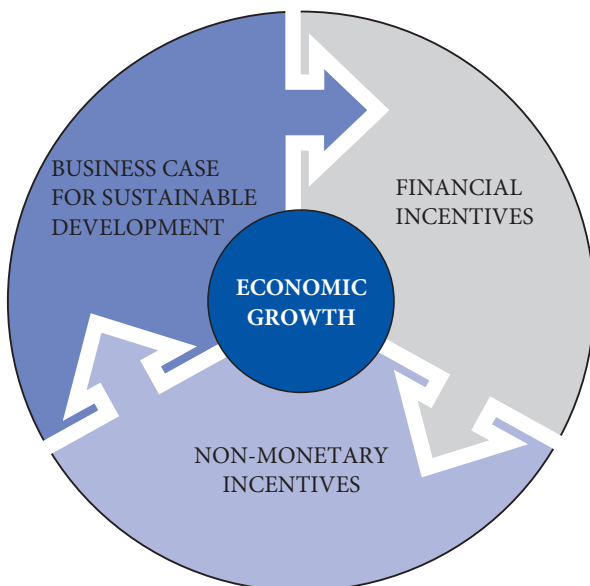


FIGURE 4.1: Policy Alternatives for Sustainable Growth

## A Business Model for Sustainable Development

4.6. While in the mid 1990s, local authorities were probably the most active players trying to achieve sustainable development, the focus has recently shifted to business as a major actor. Many responsible business managers and their firms have opted for eco-efficiency as their guiding principle. Eco-efficiency is the economic value added by a firm in relation to its aggregated ecological impact. The World Business Council for Sustainable Development (WBCSD) has defined eco-efficiency as follows:

*'Eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle, to a level at least in line with the earth's carrying capacity.'*

4.7. Similar to the concept of eco-efficiency, but so far less explored in corporate sustainability is the concept of socio-efficiency, that is, the relation between a firm's value added and its social impact. While it can be assumed that corporate impact on environment is usually negative, this may not be true for the social impact. Depending on the type of socio-efficiency, one can either try to minimize the negative social impact, or maximize the positive social impact while pursuing the value-added activity. Both eco-efficiency and socio-efficiency promote economic sustainability of the businesses in the long run.

## Financial Incentives

4.8. The role of economic instruments in financing and promoting sustainable development is well recognised. The following economic instruments can help achieve sustainable development through their influence on behavioural patterns leading to sustainable consumption and production in the economy:

### Environmental Taxes

4.9. An 'environment' or 'green' tax is imposed on a product (or a complementary product) that damages the environment, in an attempt to reduce its production or consumption. Well-designed environmental

taxes and other economic instruments can play an important role in ensuring that prices reflect environmental costs, in line with the 'polluter pays principle'. Environmental taxes can be simple and efficient financial instruments for improving the productivity of natural resources. Environmental taxes on water and fossil fuels need not be part of the general revenues of the Government; rather they should be directly ploughed back into environmentally sustainable action on these fronts. Coal Cess is a good example of environment tax imposed by Government of India in recent times, whose proceeds are channelled to the National Clean Energy Fund. Some benefits of environment taxation are enumerated below:

- They provide incentives for measures that protect the environment, and deter actions that lead to environmental damage.
- Economic instruments such as taxes can enable environmental goals to be achieved at the lowest cost, and in the most efficient way.
- By internalizing environmental costs into prices, they help signal the structural economic changes needed to move to a more sustainable economy.
- They can encourage innovation and development of new technology.
- The revenue raised by environmental taxes can be used to reduce the level of other taxes. This could help reduce distortions, while raising the efficiency with which resources are used in the economy.

#### *Subsidies*

4.10. There has been a growing recognition of fiscal and environmental implications of the subsidy policies in energy, water and agriculture sectors. Most of these subsidies pose a threat to the environment. In the energy sector, for example, with the dismantling of the Administered Pricing Mechanism (APM) in April 2002, subsidies on all oil products were removed, barring liquid petroleum gas and kerosene, which are used by households. However, the policy has subsequently been reversed leading to a large and regressive subsidy on diesel that has distorted the use of energy in transport and industrial sectors, and worsened the problem of hazardous air pollution.

Similarly, excessive use of nitrogenous fertilizers and over-drawing of water, backed by subsidies at both Centre and State levels, is playing havoc with the sustainability of soil and water ecosystem.

#### *Funds and Technology Transfers*

4.11. A major stumbling block in making green business widespread is the lack of financial resources. The primary objective of developing green technology is to replace the obsolete and inefficient systems with more energy-efficient and clean technologies. Research & Development (R&D) funding assistance paves the way for leveraging the knowledge of educational and research institutions to create technologies that can be viewed as cutting-edge and advanced. Micro, Small and Medium Enterprises (MSMEs) have limited financial resources, and therefore tend to employ cheap, yet inefficient, technologies that invariably lead to non-compliance with regulations. Funds need to be made available to assist the industry adopt green technologies within their own premises, and also for building common environmental protection infrastructure within the industrial clusters. Funds need to be allocated in a manner that both existing and infant institutions can be continuously upgraded.

4.12. The Government of India (GoI) has already set up a National Clean Energy Fund (NCEF) in 2010 by imposing a cess on coal at an effective rate of ₹50 per tonne. The Government expects to collect ₹10,000 crore under the Clean Energy Fund by 2015. The NCEF will support projects, programmes and policies that promote clean energy technologies. This fund can be used to establish a focused investment vehicle for companies investing in green technology, and environmentally supportive businesses such as renewable energy, green transport, and water and waste management among others.

4.13. Compensatory Afforestation Fund is an innovative mechanism for attracting additional resources to the forestry sector. Money is collected for compensatory afforestation from user agencies in lieu of the land granted for non-forestry purpose, presently at the rate of ₹0.8 million per hectare.

4.14. Another fund, the National Gene Fund, has been established, which will be used to build capacity at Panchayat level for in situ conservation of genetic diversity of indigenous crop varieties. The Twelfth Plan should facilitate such initiatives.

#### *Certificates and Obligations*

4.15. The mounting pressure on conventional energy sources has made energy conservation a focus area for the Government. The Perform, Achieve and Trade (PAT) scheme is an example of a certificate based trading scheme promoting energy efficiency. Similarly, Renewable Energy Certificate (REC) mechanism is a market-based instrument introduced to promote renewable energy, and facilitate renewable purchase obligations, which legally mandate a percentage of electricity to be procured by distribution companies from renewable energy sources. REC mechanism aims to address the mismatch between availability of renewable energy resources in a State and the requirement of the obligated entities to meet their renewable purchase obligations.

#### *Non-monetary Incentives*

4.16. Non-monetary incentives are policy instruments that typically do not have a monetary value, but definitely have a financial impact that promotes sustainability. These incentives can be used as a bargaining tool by the Government to encourage conservation of resources in an economy. Activities such as those encouraging judicious use of water, planting trees, car pooling and avoiding use of plastic bags can be rewarded so that it encourages the practice, and acts as an example for others. Through the initiation of innovative policies and awards, the Government can provide recognition, which will encourage sustainable development amongst the citizens and the firms.

#### *Setting an Agenda for Sustainable Development*

4.17. There is a general impression that India is consuming more than what its ecosystem can sustain, and hence there is a need for programmatic interdisciplinary planning and inter-agency efforts at all levels. A number of national strategies and policies, which inculcate the principle of sustainability,

have already been put into place. The National Environmental Policy (NEP), 2006 articulates that only such development is sustainable which respects ecological constraints and the imperatives of social justice. The National Policy for farmers focuses on sustainable development of agriculture, by promoting technically sound, economically viable, environmentally non-degrading and socially acceptable use of the country's natural resources. The Policy also states that improving the quality of land and soil, its rational utilisation, conservation of water and sensitising the farming community to environmental concerns should receive high priority. The National Electricity Policy (NEP) underscores the use of renewable sources of energy, as does the Integrated Energy Policy (IEP) of 2010. The National Urban Sanitation Policy, 2008 seeks to generate awareness, eliminate open defecation, promote integrated city-wide sanitation, safe disposal and efficient operation of all sanitary installations. However, we need to tackle upfront the looming water crisis, made worse by the supply of free water and electricity; and the health and environmental hazards posed by excessive use of very cheap nitrogenous fertiliser. Some important perspectives for achieving sustainable development in our country are listed below:

#### *Greenhouse Gas Emissions*

4.18. India's sustained efforts towards reducing the emission intensity of its GDP will ensure that country's per capita emissions will continue to be lower than developed countries. It is estimated that India's per capita emission in 2031 will still be lower than the global per capita emission in 2005 (in 2031, India's per capita GHG emissions will be under 4 tonnes of Carbon Dioxide equivalent (CO<sub>2</sub>eq.) which is lower than the global per capita emission of 4.22 tonnes of CO<sub>2</sub>eq. in 2005). Even then India has taken upon itself the voluntary target of reducing the emission intensity of its GDP by 20–25 per cent, over the 2005 levels, by 2020.

#### *Sustainable Agriculture Development*

4.19. The major thrust of the agricultural development programmes is on improving the efficiency of use of scarce natural resources, namely, land, water and energy. This can be achieved through improved

productivity, which in turn will improve the welfare of farmers and agricultural labour, and help eradicate rural poverty. Conservation of land resources can promote a sound land use, matching the land capabilities with development alternatives. Pricing water and electricity appropriately will help recharge the depleting aquifers. Shifting urea to a nutrient-based subsidy regime is also the need of the hour, which cannot be neglected any longer.

#### *Industrial Development and Urbanisation*

4.20. Industry plays a critical role in technology innovations, which are crucial for economic and social development of the country. It is also important to facilitate diffusion and transfer of environmentally sound technologies and management techniques, which are a key element of any sustainable development strategy.

4.21. A major environmental concern in urbanising India relates to high levels of water pollution due to poor waste disposal, inadequate sewerage and drainage, and improper disposal of industrial effluents. The dumping of solid waste in low-lying areas contributes to both land and groundwater pollution. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) needs a more focused approach over the Twelfth Plan period so that we resolve these issues at the earliest.

#### *Eco-Industrial Hubs*

4.22. An eco-industrial park (EIP) or estate is a community of manufacturing and service businesses located together on a common property. Member businesses seek enhanced environmental, economic and social performance through collaboration in managing environmental and resource issues. By working together, the community of businesses seeks a collective benefit that is greater than the sum of individual benefits each company would realise by only optimizing its individual performance.<sup>1</sup>

4.23. The goal of an EIP is to improve the economic performance of the participating companies while minimizing their environmental impacts. Components of this approach include green design of the park infrastructure (new or retrofitted); cleaner

production; prevention of pollution; energy efficiency and inter-company partnering. An EIP also seeks benefits for neighbouring communities to assure the net impact of its development is positive. In particular, we should consider converting our Special Economic Zones (SEZ) and townships along the Mumbai-Delhi Industrial Corridor into Eco-industrial hubs as outlined above.

#### *Sustainable Management of Himalayan Ecosystem and Western Ghats*

4.24. The Hill Area Development Programme (HADP) and the Western Ghats Development Programme (WGDP) need to be continued in the Twelfth Plan with renewed vigour so that natural resources of these fragile areas can be preserved and used in a more sustainable manner. These programmes also need to be continued because most of the hill areas lack infrastructure, particularly roads, power, educational institutions and health care centres. These areas deserve high priority under the flagship programmes, particularly Sarva Shiksha Abhiyan (SSA) and the National Health Mission (NHM). It has also been observed that many nationwide programmes are not suitable for hilly areas, for example, wages should be higher than the wages prescribed under wage employment programmes. This also holds true for the norms set out for some other programmes, as settlements are often small hamlets, which do not qualify for coverage or are too expensive to cover. Local solutions and people's participation in decision-making need to be encouraged. The ecological and biodiversity issues should be dealt with on high priority. The programme should therefore have a twofold objective of preserving ecological balance and creating sustainable livelihood opportunities for the local communities. Further, most of these areas lack political power and consequently adequate funding. The highly fragile and backward pockets of the Western Ghats should be allocated more funds by the respective State Governments.

4.25. The Bill to include the Darjeeling Gorkha Hill Council Area in the Sixth Schedule needs to be expeditiously considered. Moreover, the G.B. Pant Institute for Himalayan Environment and Development (GBPIHED) should reorient its activities to



evolve as a centre of excellence and as a resource base for advice on sustainable development of the Himalayan States. The focus of research should include socio-economic development of the mountain habitations. An Indian Alpine Initiative should also be started for tracking the dynamics of alpine biomes in the context of climate change.

### *Coastal Zone Management*

4.26. The Coastal Regulation Zone notification regulates activities based on vulnerability of coastal areas to human activity. Coastal areas are currently classified into four categories (CZ 1 to 4) with different levels of permissivity for development activities. Category 1 includes ecologically sensitive areas, category 4 includes islands, while categories 2 and 3 permit construction activities based on vulnerability.

4.27. The Swaminathan Committee has recommended that local circumstances and vulnerabilities should be the basis of coastal zone management and regulations. For this purpose, scientific and local information should be used in preparation of environmental plans for coastal areas. Conservation of life forms (and their habitats such as nesting/ spawning sites), and integration of their environment with human well-being is important. Participation of civil society and local fishing/coastal communities in the coastal zone management committees should be ensured for building a better consensus for coastal zone environment regulation issues.

### *Public Participation for Sustainable Development*

4.28. Effective management of resources requires participation by all stakeholders. As part of the national sustainable development agenda, the Indian Government has taken measures to develop policy instruments that encourage the active participation of stakeholders and environmental NGOs in national development programmes at the grass-roots level. The engagement of multi-stakeholder platforms such as Green Rating for Integrated Habitat Assessment (GRIHA), Joint Forest Management (JFM), women empowerment under Integrated Infrastructure Development (IID), National Knowledge Network (NKN) and Waste Minimization Circles (WMC) have

led to innovations in the areas of poverty eradication, green city development initiatives, entrepreneurship development, empowerment of women and management of forest and water resources. Common-pool natural resources must be managed rationally to improve availability and to ensure equity in access and benefit-sharing. At the local level, strengthening democratic institutions will lead to better and more sustained management of natural resources.

4.29. Biodiversity and ecosystem services are freely available public goods and all of humankind, particularly the poor, depend on them for their livelihood. Environmental education and awareness programmes can be used to influence economic behaviour and encourage the formation of voluntary agreements between firms and local authorities/communities. Public disclosure of information on polluting activities of industries can promote environmental/green labelling of products, which can create pressure in the market to manufacture environment-friendly products. The GoI launched the eco-labelling scheme known as Ecomark in 1991 for easy identification of environment-friendly products. The Ecomark label is awarded to consumer goods which meet the specified environmental criteria and the quality requirements of Indian Standards.

### **LOW CARBON STRATEGIES FOR INCLUSIVE GROWTH**

4.30. India needs to adopt low carbon strategy for inclusive growth in order to improve the sustainability of its growth process, while carbon mitigation will be an important co-benefit. Any such strategy must ensure that the focus is not just on low carbon development, but on increasing productivity that effectively lowers the use of fossil fuels.

4.31. An Expert Group on Low Carbon Strategies for Inclusive Growth was appointed by the Planning Commission. It has submitted its interim report, which outlines the low carbon strategy for major carbon emitting sectors, namely, Power, Transport, Industry, Buildings and Forestry. It has also computed the emission reduction numbers bottom-up using the inventory building approach in a way similar to the official greenhouse gas (GHG) inventory

building system. The ‘determined effort’ scenario assumes effective implementation of mitigation policies that require continuous upgradation of technology as well as finance from both public and private sources. The ‘aggressive effort’ scenario requires, in addition to the ‘determined effort scenario’, design and implementation of new policies that need to be supported through technology and finance from international sources.

4.32. The final report of the Expert Group will include an economy-wide modelling, and an analysis of co-benefits in a cross-cutting framework. It will spell out the policy actions required to implement low carbon strategies up to 2030, and also suggest some finance strategies for the same. To evaluate the alternative policy instruments, a four-pronged strategy of ‘growth, inclusion, carbon mitigation and local environment benefits’ has been formulated. Taken together, the economy-wide modelling and co-benefits analysis will provide the analytic tools for formulating the low carbon strategies for sustainable and inclusive growth.

**The Expert Group has identified twelve focus areas for the Twelfth Plan:**

#### Box 4.1

##### Twelve Focus Areas for the Twelfth Plan

1. Advanced Coal Technologies
2. National Wind Energy Mission
3. National Solar Mission
4. Technology Improvement in Iron and Steel Industry
5. Technology Improvement in Cement Industry
6. Energy Efficiency Programmes in the Industry
7. Vehicle Fuel Efficiency Programme
8. Improving the Efficiency of Freight Transport
9. Better Urban Public and Non-motorized Transport
10. Lighting, Labelling and Super-efficient Equipment Programme
11. Faster Adoption of Green Building Codes
12. Improving the Stock of Forest and Tree Cover

#### Co-benefits Framework

4.33. Annex 4.2 provides an indicative and qualitative analysis of the co-benefits that may be associated with each of the twelve policy thrust areas identified by the Expert Group. This initial analysis only

examines the direct effects. In the final report, a more detailed analysis will assess the direct as well as indirect effects, the pathways through which policy actions operate, and the interactions among them which will lead to a more informed analysis of synergies and trade-offs.

The focus areas identified by the Expert Group are discussed sector-wise below:

#### Power

4.34. In the business-as-usual scenario, India would rely heavily on coal to meet its surging power demand. However, this poses an enormous environmental and natural resource challenge, as the Power Sector is the highest contributor (38 per cent) to India’s GHG emissions. There are several initiatives which would improve efficiency, and reduce pollution and carbon footprints from this sector. These are discussed in greater detail in the chapter on energy, and therefore, only the main points are summarised here:

#### Advanced Coal Technologies

4.35. It has already been announced that 50 per cent of the Twelfth Plan target and the coal-based capacity addition in the Thirteenth Plan would be through super-critical units, which reduce the use of coal per unit of electricity produced. Super-critical (SC) power plants, which operate at steam conditions 560°C/250 bars, can achieve a heat rate of 2,235 kCal/kWh as against a heat rate of 2,450 kCal/kWh for sub-critical power plants. The specific CO<sub>2</sub> emission for super-critical plants is 0.83 kg/kWh as against 0.93 kg/kWh for sub-critical plants. Super-critical technology is now mature and is only marginally more expensive than sub-critical power plants. Determined efforts are needed to achieve these results, and prioritisation of coal linkages will be necessary to incentivise adoption of super-critical technology.

4.36. It is also necessary to invest in research and development of ultra-supercritical (USC) units (Box 4.2). These operate at USC steam conditions (620°C/300 bars) and can achieve a much lower heat rate of 1,986 kCal/kWh, while the specific CO<sub>2</sub> emissions are only 0.74 kg/kWh. This technology

**Box 4.2****Importance of Clean Coal Technology: Ultra-super Critical Power Plants**

An Ultra Super Critical (USC) coal-based power plant has an efficiency of 46 per cent compared with 34 per cent for a sub-critical plant and 40 per cent for a Super Critical (SC) plant. Thus, with an USC or SC plant, the savings in coal consumption and reduction in CO<sub>2</sub> emission can be substantial. A 10,000 MW power plant will generate 60 billion units of electricity per year at around 70 per cent load factor. It has a specific heat of 1,870 kcal/kwh compared to 2,530 kcal/kwh for a sub-critical plant. Thus, every unit generated with USC will save 0.165 kg  $[(2,530-1,870)/4,000]$  coal of 4,000 kcal/kg; and 60 billion units will save 9.9 million tonnes of coal per year.

When we substitute a sub-critical coal plant with solar plants, for every kwh generated we save 0.63 kg of coal (2,530/4,000). Thus, 15.6 billion units (1,000\*9.9/0.63) will have to be generated by solar plants to save the equivalent 9.9 million tonnes of coal. Since a solar plant generates 1,500 units per KW of installed capacity, the matching installed capacity needed will be nearly 100,000 MW (15.6\*1,000/15,000). *To put it simply, faster adoption of USC and SC technology can save as much coal as would be saved by installation of ten times the solar power capacity.* While from a long term perspective we need the solar option, from a medium term perspective, development of USC and SC technology should be pursued vigorously.

also requires the development of special materials that can withstand very high temperature and pressure. The government should support research and development to promote indigenous manufacturing of USC units. The first USC plant, which is a joint effort of BHEL, NTPC and IGCAR, is expected to be operational in 2017. Deployment of USC plants may be suitably incentivised and targeted during the Thirteenth Plan period.

**4.37.** Coal gasification provides opportunities for higher efficiency. However, Indian coal has a very high ash content and initial results suggest that efficiency gain over sub-critical units is only marginal. Underground coal gasification is an important technology that will enable utilisation of deep coal deposits, which cannot be mined using conventional means, or because they are located in environmentally fragile regions. It also allows the possibility of in situ carbon capture. Given India's coal shortage, there should be greater research in this technology, including execution of a few pilot projects. Another potentially promising technology is coal bed methane and it may be desirable to undertake some pilot projects in this regard.

**Wind Power**

**4.38.** India has a potentially large capacity for adding generation capacity based on wind power. Since the power generated by a wind turbine is highly sensitive to wind speeds, the global practice is now to build towers in the range of 80–120 m, which significantly

increases the power generation potential. At the same time, the size of wind turbines has increased—while the earlier turbines were typically less than 1 MW, the recent designs go up to over 5 MW. Taking these into consideration, the wind potential in India is now estimated at about 1,03,000 MW for 80 m hub height. This is based on meso-scale weather models and a land utilization rate at 2 per cent thought to be reasonable for Indian conditions. Some recent studies have estimated India's wind potential to be over 5,00,000 MW based on still higher hub heights and more land availability. However, this assessment is yet to be validated by experts working under Indian conditions.

**4.39.** Recent technological innovations, including raising the height of the tower, could make wind a major renewable source of power generation for India and we could safely target a wind capacity addition of 30,000 MW by 2020. However, as noted in Chapter 12, wind potential is unevenly distributed across the country; only Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra and Gujarat have significant potential. Therefore, realisation of wind potential requires careful regional level planning and coordination.

**4.40.** Wind power has significant seasonal and even intra-day variations. Therefore, setting targets for wind power capacity addition, without making a careful assessment of the capacity of the regional grid to balance its intermittency with alternative sources,

may lead to a situation where either the wind generation cannot be utilised, or when the wind suddenly dies down, the loss of generation could impact grid stability and operation. Wind capacity addition needs to be complemented by other energy sources, which have a quick ramp-up time. There are several possible options to handle this intermittency—pumped storage hydro, open-cycle gas turbines, compressed air and high power density batteries. Till recently, these were not considered necessary since total wind capacity was only about 13,000 MW. However, if wind power has to reach 1,00,000 MW and more, the balancing issues will be critical. These variations are a result of technical factors associated with the wind resource, as well as non-technical factors including land policy among others. It will become increasingly necessary to address these factors, if the resource potential of wind energy is to be realised.

4.41. To summarise, achieving ambitious wind generation targets requires careful coordination between multiple Central and State agencies, particularly transmission and distribution utilities, financial institutions and so on. We need to set up a National Wind Energy Mission, similar to the National Solar Mission for effective formulation and implementation of policies both at the National and State levels. The objectives of the Mission should also include, but not be limited to the following:

- Incentivising the industry to invest in indigenous design and manufacture of turbines suited for India's low wind speed regimes. Presently, Indian wind farms use turbines that are designed for global markets.
- Land tenure policies that will encourage mixed land use for wind generation and agriculture (without having to pay commercial rents that will increase the cost of wind power). These powers must be delegated to the local sub-divisional officer.
- The bidding models currently being pursued need to be revisited, so that farmers, wherever willing, are able to benefit from mixed land use and a cost-plus approach can be used to determine feed-in tariffs provided it is done through an independent regulator.

- Mechanisms for using the National Clean Energy Fund (NCEF) to finance development of local grids by state distribution companies that will help evacuate wind power and solve the load curve problems on the supply side.
- Prioritise the development of pumped hydro storage, which may be suitable for complementing wind power.
- Invest in R&D in energy storage options that can provide backup for longer durations, like compressed air and high power density batteries among others.

4.42. India also has considerable off-shore wind potential, particularly in Tamil Nadu and Andhra Pradesh. It is also important to undertake studies to examine the economic viability and risks associated with off-shore wind in the Indian conditions.

#### *Solar Power*

4.43. The Jawaharlal Nehru National Solar Mission (JNNSM) envisages grid parity for solar power by 2022 and sets an ambitious target of setting up 20,000 MW for solar power with phased scale-up of capacity, coupled with technological innovation. Solar photovoltaic and solar thermal are each expected to contribute 50 per cent of the above target, in addition to a 2,000 MW target for off-grid solar power. The Government has facilitated generous financial incentives for grid-connected solar plants in the form of feed-in tariffs valid for 25 years. The Government has also incentivized state-level utilities to accelerate solar capacity addition by mandating a three per cent solar power target by 2022 (under the National Tariff Policy) and by providing opportunity for additional revenue streams through instruments such as Renewable Energy Certificates (RECs).

4.44. The feed-in tariff is determined through a competitive (bidding) process. In the two rounds of bidding so far, developers have bid at prices substantially lower than the nominal tariffs specified by Central Electricity Regulatory Commission (CERC). There are indications that the cost of solar cells could reduce further. Solar photovoltaic technologies have several advantages: they can provide distributed power, enable quick capacity addition and work with

diffused solar radiation. Solar thermal technologies are conducive for utility-scale power generation, and have the advantage of energy storage and hybridization with biomass/gas to achieve greater capacity-utilisation. This can be used to provide base load power. However, solar thermal technologies only work on direct beam radiation and utility-scale plants require large amount of land and water, which could be potential impediments in scaling it up.

4.45. Amongst all the power generation sources, solar presents a unique opportunity for inclusive growth by providing clean off-grid electricity to the rural communities. The NSM has targeted 2,000 MW of off-grid solar power by 2022. Current guidelines limit a solar micro-grid to 100 kW per site and provide a capital subsidy of 30 per cent. The concept of micro-grid, even though attractive, has so far not been effective in augmenting rural power generation. This is mainly because the developers have found it difficult to get reasonable returns on their investments and they are unable to collect adequate revenues to cover operating expenses despite the initial capital subsidy.

4.46. Since the capital subsidy mechanism is not sufficient to incentivise developers to take the risk of setting up micro-grids, there is a need to examine other options given that rural electricity supply causes loss to the power utilities and it could take several years before reliable grid power reaches all the villages. First, there is a need for relaxing the cap on total and site-based project capacity. This could help rural industrial consumers who have high load requirements, but are constrained by guideline restrictions. Second, there is merit in providing a generation-based incentive, similar to that provided for grid-connected systems. This would make the off-grid solar projects bankable and assure the developers of steady revenue stream.

4.47. The rapidly growing telecom sector provides an excellent synergy for augmenting solar power in rural areas. At present there are close to 0.2 million telecom towers and about 40 per cent of these are in the rural areas. This number is expected to double in the next few years. The electricity supply being

erratic in the rural areas, most of them rely on diesel for back-up power. Rural micro-grids can not only be used to meet the requirements of the telecom towers, but also to provide power to the rural communities for lighting and irrigation water pumping.

4.48. Currently, several national and state level agencies are involved with implementation of solar power projects, and it is difficult to coordinate and align their efforts. The solar industry is likely to attract large investments in the coming decade, and it is important that a single nodal agency is made responsible for the overall monitoring and implementation of the JNNSM.

4.49. The off-grid and even grid-connected solar power projects under National Solar Mission have taken a long time for financial closure. This is because of the reluctance of local banks to provide financing, due to lack of stability of policies and possibility of default by the utilities. The government should immediately classify solar power projects as 'priority lending' so that banks start giving it due importance in their credit plans.

4.50. Further discussion is needed in designing the institutional structures for ownership and operation of decentralised off-grid solar power systems. For example, enabling local panchayats with a stake in ownership could ensure local maintenance and operation, as also community-ownership leading to improved payment collection. An alternative model would be to have entrepreneurs bid for setting up of a cluster of such plants in a contiguous area, and then maintain and operate them on cluster basis.

4.51. In order to encourage indigenous manufacturing of components used in solar power generation, GoI has mandated for all the projects allotted in 2010–11 that 100 per cent PV modules should be manufactured in India. It has been further mandated that from 2011–12 onwards, 100 per cent of cells used in indigenous modules should be manufactured in India.

4.52. There is a need to review these policies. Crystalline silicon and thin films are the two proven

technologies for solar photovoltaic systems. Of these, crystalline silicon dominates the global market; however, there is considerable interest in thin-film systems, given the potential for lower costs. The global manufacturing capacity is several times that of India, and several institutions around the world are pursuing cutting-edge research leading to a rapid decrease in solar cell costs. India needs easy access to the best available global technology to ensure rapid adoption of solar power. At the same time, developing domestic industry for manufacturing solar cells is important. The manufacturing policy should strike a balance between these two objectives, and mandate a more gradual indigenisation of cell and module manufacture. The following steps need to be taken:

1. Our customs duty structure should not be inverted along solar industry's value chain (basic and intermediate inputs should not attract higher tariffs than finished products).
2. The electricity tariff policy of the Government should be neutral to the type of solar technology being deployed in the approved projects.
3. Export subsidies (explicit and implicit) available to foreign manufacturers must be matched by tariff/domestic policy to the extent it provides a level playing field to the domestic solar manufacturers.
3. R&D efforts for indigenous manufacturers should be incentivised by permitting them to compete with government laboratories for research funding through the budgetary sources.

**4.53. Nuclear and hydro power** are also important for emissions reduction, but they face some critical challenges, which are briefly summarised below:

**4.54.** Nuclear power is considered an important source for low carbon and base-load power generation. India has ambitious plans in nuclear power through a combination of Light Water Reactors, Heavy Water Reactors and Fast Breeder Reactors. However, global concerns regarding safety of nuclear power following the Fukushima nuclear accident in 2011 have slowed down nuclear power capacity addition. Future growth will require addressing public concerns about safety of nuclear power, and

consensus-building at the national and local levels. It is unlikely that large nuclear capacity could be added over the Twelfth Plan period.

**4.55.** Accelerated development of hydro-power potential is critical for our economy. Apart from the need to harness the country's water resources for irrigation and flood control, the motivation for accelerated development of hydro power is two-fold: first, it is required for meeting India's peak power demand; and second, it is vital for large-scale integration of solar and wind capacity into the grid. Storage hydro power has a multiplier effect in facilitating renewable energy as it provides the flexibility necessary to respond to fluctuations caused by intermittent sources of renewable power, particularly wind and solar. Prioritised development of this resource, along with close monitoring of a few carefully selected hydro-projects is important during the Twelfth and the Thirteenth Five Year Plans.

## Industry

**4.56.** Indian industry is among the largest in the world and has some of the most advanced plants and technologies available globally. This sector is also one of the largest consumers of energy, and improving the efficiency of energy use is critical for energy security, improving industry profitability and competitiveness, and reducing the sector's overall impact on climate change. Since this sector is growing rapidly, the opportunities to introduce more efficient technologies are quite large as the capital stock will more than double in the next 10 years.

### *Industrial Energy Consumption Overview*

**4.57.** In 2007, the industrial use of energy in India stood at 150 million tonnes of oil equivalent (Mtoe), accounting for 38 per cent of the country's total energy use. Though India is the fourth largest consumer of global industrial energy, surpassed only by China, the United States and Russia, its share is only 5 per cent of the total. In 2007, total final energy use in industry across the globe amounted to 3,019 Mtoe leading to direct emissions<sup>2</sup> of 7.6 gigatonnes of CO<sub>2</sub> (Gt CO<sub>2</sub>) and indirect emissions<sup>3</sup> of 3.9 GtCO<sub>2</sub>. Analysis by International Energy Agency (IEA) suggests that the industry worldwide needs to reduce

its direct emissions by about 24 per cent of the 2007 levels to halve global emissions, from the 2005 levels, by 2050.

**4.58. Industrial Energy and Emissions Intensity:** Iron and Steel, Cement, Chemicals and Petrochemicals, Pulp and Paper and Aluminium are the five most energy-intensive industrial sectors in India. These accounted for 56 per cent of India's industrial energy consumption in 2007. The Compound Annual Growth Rate (CAGR) of the energy consumption of manufacturing industries in India from 1990 to 2008 was 9.8 per cent. The energy intensity of Indian industries has shown a decreasing trend; however, this trend needs to be accelerated and policy interventions may be required to overcome challenges the industry faces as a result of global energy and emission linked constraints. Iron and steel, and cement sectors accounted for nearly 60 per cent of the total industrial GHG emissions in India in 2007. We deal with these in greater detail below.

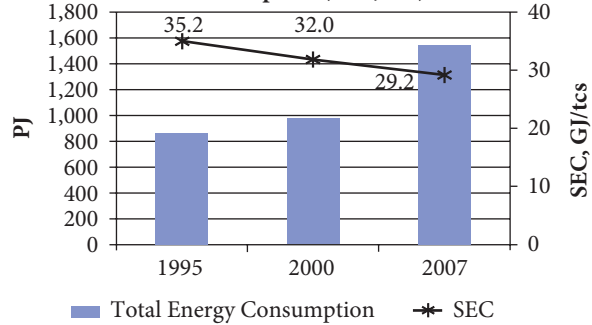
#### *Iron and Steel Sector*

**4.59.** India's iron and steel sector is the largest user of industrial energy in India, consuming 38 million tonnes of oil equivalent (Mtoe) in 2007. India produced 53 million tonnes (Mt) of steel in 2007, an increase of over 10 per cent per year since 2000. India is now the fifth largest producer of steel in the world. Considering a steel consumption of 200 kg per capita per year (up from 48 kg per capita in 2008) to achieve a level of economic development comparable to global standards, India will need approximately 280 Mt of steel per year.<sup>4</sup> Most of this will be produced domestically, as India has comparative advantage in steel production.

#### **Energy and Emissions**

**4.60.** The Iron and Steel industry was estimated to have a Specific Energy Consumption<sup>5</sup> (SEC) of about 29.2 GJ/tonne of crude steel (tcs) and emission intensity of 2.78 tCO<sub>2</sub>/tcs in 2007.<sup>6</sup> We find that although steel production in India has expanded rapidly, the energy intensity and specific emission ratios have declined considerably. Figure 4.2 depicts this trend over the last two decades.

**Historical energy consumption (in PJ) and specific energy consumption (in GJ/tcs)**



Source: Ray and Reddy, 2008; Singhal, 2009.

**FIGURE 4.2: Iron and Steel Industry**

#### **Steel Production Processes**

**4.61.** Energy intensity reduction comes from change in technology as well as from increase in efficiency of a particular process. In India there are four main process routes for manufacturing of steel.

1. BF-BOF: The blast furnace and basic oxygen furnace route.
2. DRI-EAF: Coal or gas based direct reduced iron (sponge iron) and electric arc furnace route.
3. COREX-BOF : The Corex process followed by basic oxygen furnace for conversion of iron into steel,
4. Induction Furnace : The induction furnace route for melting and production of steel.

#### **Future Projections**

**4.62.** In 2007, 47 per cent of the steel was manufactured using BF-BOF process; 27 per cent using IF; 20 per cent from COREX/FINEX-BOF and the remaining 6 per cent from DRI-EAF. DRI-EAF is the most energy efficient process, but it depends on the availability of scrap (India is the largest producer of DRI steel in the world). It is expected that BF-BOF will continue to dominate Indian steel production till 2020, while the share of COREX-BOF is expected to increase.

**4.63.** By 2020, the total steel production could reach 200 MT assuming an average economic growth rate of 8 per cent. The Expert Group has estimated that emission intensity of the iron and steel industry

could further reduce by 14 to 17 per cent, over 2007 levels, by 2020.

#### Policy Measures

4.64. From a policy planning perspective, there are a number of measures that could provide the pathway for reduction of emissions intensity in the iron and steel sector:

1. A shift in the process mix of the iron and steel sector towards more efficient processes
2. Diffusion of energy efficient technologies into the sub-processes of various process routes mentioned above
3. Waste heat recovery systems for moisture reduction and power generation
4. Utilization of renewable energy in specific process/plant/colony applications
5. Increased use of waste as alternate fuels
6. Increased scrap utilisation
7. Improving quality of coke and coal before its use in the industry
8. Low carbon captive power generation

Ministry of Steel and Department of Industrial Policy and Promotion need to work together and evolve a suitable policy framework so that progress along the above dimensions is incentivised to improve the efficiency of iron and steel industry in our country.

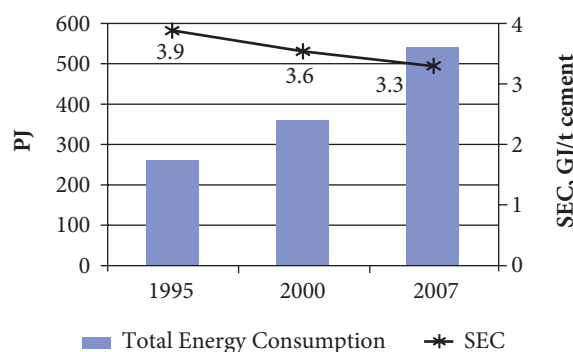
#### Cement Sector

4.65. India is the second largest cement producer in the world, second only to China.<sup>7</sup> Its per capita consumption in 2008 was approximately 150 kg, which is almost a third of the world average. As of March 2009, Indian cement industry comprised of 148 large cement plants and 365 mini-cement plants, with installed capacities of 219 Mt and 11 Mt respectively. India's cement industry is the largest consumer of power among all industries, but it has managed to attain efficiencies comparable to the best in the world.

#### Energy and Emissions

4.66. The production of cement has increased by 146 per cent from 67 Mt in 1995 to 165 Mt in 2007, while over the same period, Specific Energy

Consumption (SEC) has reduced from 3.89 GJ/t in 1995 to 3.3 GJ/t in 2007, which implies energy intensity reduction by about 1.5 per cent every year.<sup>8</sup> Figure 4.3 depicts this historical trend for the cement sector.



Source: PCRA, 2009; CMA, 2006.

FIGURE 4.3: Cement Industry: Historical Trends of Total Energy (in PJ) and Specific Energy Consumption (GJ/tonne)

#### Cement Production Processes

4.67. The cement industry comprises mostly of dry suspension preheater and dry precalciner plants, and a few old wet process and semi-dry process plants. The average installed capacity per plant in India is about 1.2 million tonnes per annum (MTPA) as against more than 2.1 MTPA in advanced countries like Japan. Production from large plants (with capacity above 1 MTPA) accounts for 88 per cent of the total production.

4.68. Three types of cements are produced in India: the Portland Pozzolana Cement (PPC), which has the maximum share of the total production (67 per cent), followed by Ordinary Portland Cement (25 per cent) and Portland Slag Cement (8 per cent). Blended cement<sup>9</sup> is another form of cement which is popular in India.

4.69. The production mix in the Indian cement industry is characterized by a large proportion of blended cement (which consumes less energy and is less emissions-intensive than ordinary Portland cement). Although the market share of blended cement in India (75 per cent) is much higher than the US (4 per cent), China (40 per cent) and Japan



(25 per cent) (2005 data), the percentage of blending material could improve further. Most PPC cement plants use fly ash to the extent of 20–30 per cent even though the Bureau of Indian Standards permits usage of up to 35 per cent.<sup>10</sup>

### Future Projections

4.70. By 2020, the total cement production could reach 500 mT assuming an average economic growth rate of 8 per cent. In this sector, reduction in energy consumption is primarily attributed to reduction in the energy intensity of production processes. The Expert Group has estimated that emission intensity of cement industry could further reduce by 13 to 16 per cent, over 2007 levels, by 2020.

### Policy Measures

4.71. From a policy planning perspective, there are a number of measures that could provide the pathways for further reduction in emissions intensity in the cement sector:

1. Diffusion of energy-efficient technologies in various sub processes of cement manufacture.
2. Waste heat recovery systems for moisture reduction in coal and raw materials and for power generation.
3. Utilisation of renewable energy in specific process/plant/colony applications.
4. Increased use of waste as alternate fuels, rationalizing the various policies that regulate this activity.
5. Increased blending using fly ash from thermal power plants and granulated blast furnace slag from steel plants, and the increased use of composite cements.
6. Improving quality of coal before its use in the industry.
7. Low carbon captive power generation.
8. Increase of blended cements in the public procurement process.

Department of Industrial Policy and Promotion needs to evolve a suitable policy framework to incentivise full realisation of the potential offered by the above measures in the cement industry.

### Energy Efficiency Interventions in the Industry

#### PAT Mechanism Overview

4.72. Perform-Achieve-Trade (PAT) is a market-based mechanism under the National Mission for Enhanced Energy Efficiency (NMEEE), under the Prime Minister's National Action Plan for Climate Change (NAPCC). The aim of PAT, as mandated by NMEEE, is to improve cost-effectiveness and enhance energy efficiency in energy-intensive large industries through certification of energy savings, which could be traded. The Ministry of Power (MoP) has in March 2007 notified industrial units and other establishments consuming energy more than the prescribed threshold in nine industrial sectors, namely Thermal Power Plants, Iron & Steel, Cement, Pulp and Paper, Textiles, Fertiliser, Chlor-alkali, Aluminium and Railways. The industries notified are referred to as Designated Consumers (DCs). Table 4.1 gives the details.

#### PAT Framework

4.73. The PAT framework has been developed as per the legal requirement under the Energy Conservation Act 2001 and situation analysis of the designated

**TABLE 4.1**  
Sector-wise Annual Energy Consumption of Designated Consumers

| Sector   | Minimum Annual Energy Consumption for the DC (Tonnes of Oil Equivalent) | Number of Probable DCs |
|--|---|------------------------|
| Aluminium                                      | 7,500   | 11                     |
| Cement   | 30,000  | 83                     |
| Chlor-alkali                                   | 12,000  | 20                     |
| Fertiliser                                     | 30,000  | 23                     |
| Iron and Steel                                 | 30,000  | 101                    |
| Pulp and Paper                                 | 30,000  | 51                     |
| Railways <sup>11</sup> (diesel loco workshops) | –   | 8                      |
| Textiles                                       | 3,000   | 128                    |
| Thermal power plants                           | 30,000  | 146                    |

Source: BEE, 2011.

consumers. The PAT framework includes the following elements:

1. Methodology for setting specific energy consumption (SEC<sup>12</sup>) for each DC in the baseline year.
2. Methodology for setting the target to reduce the Specific Energy Consumption (SEC) by the target year from the baseline year.
3. The process to verify the SEC of each DC in the baseline year and in the target year by an accredited verification agency.
4. The process to issue energy savings certificates (ESCerts) to those DCs who achieve SEC lower than the specified value.
5. Trading of ESCerts.
6. Compliance and reconciliation of ESCerts.
7. Cross-sectoral use of ESCerts and their possible synergy with renewable energy certificates.

4.74. The first PAT cycle will be covered in 3 years (2012–15). In the first phase, the energy-intensive DCs (as depicted in Table 4.1) are assigned individual SEC targets and are allotted a 3-year time period to accomplish it. The Monitoring and Verification (M&V) is carried out from the second year onwards. After the completion of M&V, energy saving certificates will be issued and trading will be permitted.<sup>13</sup>

4.75. In the next cycle(s) of PAT scheme (post 2015–16), the number of DCs may get revised as

more plants and sectors could be added. Petroleum refineries, petrochemicals, gas crackers/naphtha crackers, sugar, chemicals, port trusts, transport (industries and services), electricity transmission and distribution companies, and commercial buildings and establishments are some of the probable DCs that could be added in the second PAT cycle.

#### Rationale and Target Setting

4.76. The DCs of the 8 sectors account for about 231 mMtoe (million metric tonnes of oil equivalent) of energy consumption annually (as per the 2007–08 data), which is about 54 per cent of the total commercial energy consumed in the country. The target under the scheme will be defined in terms of the percentage reduction of Specific Energy Consumption (SEC) from the baseline value.

4.77. The methodology of establishing SEC reduction for each Designated Consumer is on a gate-to-gate basis. The targeted energy saving in the first commitment period of 3 years (2012–2015) is estimated at 10 million metric tonnes of oil equivalent (mMtoe), which will amount to 4.2 per cent energy intensity reduction over three years. Further, the overall target reduction of 10 mMtoe would be apportioned amongst identified sectors in proportion to their relative energy use. The break-up of energy consumption and the apportioned energy reduction of each sector is depicted in Table 4.2.

**TABLE 4.2**  
**Initial Estimate of Energy Consumption and Energy Reduction Targets**

| Sector               | Energy Consumption in 2007 (mMtoe) | Share of Consumption in 2007 (%) | Apportioned energy reduction by 2015 (mMtoe) over 2007 levels | Number of probable DCs |
|----------------------|------------------------------------|----------------------------------|---|------------------------|
| Aluminium            | 2.42                               | 1.05                             | 0.11  | 11                     |
| Cement               | 14.47                              | 6.25                             | 0.6   | 83                     |
| Chlor-alkali         | 0.43                               | 0.19                             | 0.02  | 20                     |
| Fertiliser           | 11.95                              | 5.16                             | 0.51  | 23                     |
| Iron and Steel       | 36.08                              | 15.58                            | 1.56  | 101                    |
| Pulp and Paper       | 1.38                               | 0.60                             | 0.06  | 51                     |
| Textiles             | 4.5                                | 1.94                             | 0.2   | 128                    |
| Thermal power plants | 160.3                              | 69.24                            | 6.92  | 146                    |
| <b>Total</b>         | <b>231.53</b>                      | <b>100</b>                       | <b>10.00</b>  | <b>563</b>             |

Source: BEE, 2011.

4.78. The PAT scheme is an energy intensity type of cap-and-trade scheme as it does not place an absolute cap on the total energy consumption in the industry. Some people argue that a simpler alternative for achieving energy efficiency and for mobilizing finances with greater certainty, would be to implement a carbon tax scheme. Both approaches have their own advantages and disadvantages. These are compared in the section below.

#### *Cap-and-Trade vs Carbon Tax*

4.79. Cap-and-trade programmes are often designed to achieve greater reductions over time, so the cap may be lowered in subsequent years to enable market participants achieve emission reductions gradually. To achieve compliance with the capped emission level, market participants are allocated allowances to emit (1 tonne per allowance) with the total number of allowances summing to the level of the cap. Market participants can purchase allowances from other participants to cover excess emissions, or sell allowances, if they reduce emissions below their allocation. Such trading increases economic efficiency.

4.80. A carbon tax is an alternative to a cap-and-trade (see Table 4.3). It can be given other names like cess, surcharge and levy among others. Although both policies generate a carbon price signal, there is a fundamental difference in the way in which the level of carbon price signal is determined under the two regimes. A carbon tax fixes the price of carbon and allows the quantity of emissions to adjust in response to the level of tax. In contrast, a cap-and-trade system fixes the quantity of aggregate emissions, and allows the price of CO<sub>2</sub> emissions to adjust to ensure the emissions cap is met.<sup>14</sup> UK's Climate Change Levy (CCL) and Australia's Clean Energy Package are examples of carbon tax.

#### *Foundations of a New Policy Initiative for the Indian Industry*

4.81. Global trends in energy and environment are likely to have a major impact on the profitability of Indian industry, as also on the larger goal of energy and strategic security. The existing National Mission on Enhanced Energy Efficiency (NMEEE) has been designed to deal with energy efficiency and emission

reduction issues of a relatively small number of large industries, which contribute significantly to emissions. Many of the provisions of NMEEE such as strong baseline, monitoring & verification, penalty and trading mechanisms are not easily extendable to a large number of small and medium units. Some recent studies<sup>15</sup> have emphasised the need for developing a strong framework for increasing awareness and facilitating upgradation of technology in small and medium enterprises.

4.82. India is experimenting with both cap-and-trade in the form of the PAT scheme and a carbon tax in the form of a cess on coal (₹50 per tonne). Both are in early stages of implementation. While the cap-and-trade mechanisms have a greater certainty in emissions reduction, as a tool for financing they face greater uncertainty. Carbon tax mechanisms, on the other hand, can provide greater certainty as a source of financing, while uncertainty on emissions reduction can be brought down by using energy or emission intensity benchmarks.

4.83. Studies on the demand side of energy consumption have shown that pay-back periods for energy efficiency measures are in the range of two to eight years. Yet firms do not take up such measures on their own. The major barriers are perceived risk, uncertainty about technology, costs of disruption and initial financing. What is needed is a mechanism to insure risk and assure finance on reasonable terms. The need of the hour is to set up a special fund with seed capital that will be managed at an arm's length from the Government, with the participation of the private industry.

4.84. While the PAT should continue to evolve, it would be useful to envisage a combined Energy Efficiency Package—consisting of the PAT scheme and an Energy Conservation Fund, to be implemented by a unified Central Government agency, namely the Bureau of Energy Efficiency (BEE). The legal provision for this already exists in the Energy Conservation Act 2001, wherein under Section 13, the BEE is empowered to levy fees for services provided for promoting efficient use of energy and it conservation. These services, like capacity building,

**TABLE 4.3**  
**Cap-and-Trade vs Carbon Tax**

| Cap-and-Trade  | Carbon Tax  |
|--|---|
| It sets a steadily declining ceiling on carbon emissions, and by creating a market that rewards companies for slashing CO <sub>2</sub> (corporations that reduce emissions below their allotment can sell them on the open market), it uses the free enterprise system to achieve emissions reduction. | Uncertainty about how much will it reduce carbon emissions. However, tax linked to benchmarks of energy or emissions intensity can help improve certainty with respect to mitigation. |
| It does not provide cost certainty as price of permits fluctuates and could be highly volatile in the spot market.   | Carbon tax provides cost certainty by setting a clear price on carbon emissions for many years ahead.   |
| It needs a market monitoring agency to examine issues such as rent seeking, cornering the market and so on.  | It is simple to understand and implement.   |
| The design leaves out many small and medium organizations (who together may release significant portion of the emissions).   | Carbon tax covers the entire economy, including automobiles, households and other units impossible to reach in a cap-and-trade.   |
| The revenues are likely to be bargained away well before the first trade ever takes place.   | Carbon tax raises a clear amount of revenue, which can be used for targeted purposes or rebated to the public.  |
| It can be more easily manipulated to allow additional emissions; if the permits become too pricey, regulators would likely sell or distribute more permits to keep the price 'reasonable'.   | The chances of manipulation are remote. The structure of the tax does not allow periodic regulator intervention.  |
| The long-term signals from cap-and-trade are less powerful, and the behavioural changes (for example, choice of the type of power plant) could turn out to be far fewer.   | Clear signals and impetus for behavioural changes.  |
| Political pressures could lead to different allocations of allowances, which affect distribution, but not environmental effectiveness and cost-effectiveness   | Political pressures could lead to exemptions of sectors and firms, which reduces environmental effectiveness and drives up costs.   |
| It will be a difficult process to adopt different international allowances and make it at par with the domestic allowance.   | Carbon-taxing nations can easily offset import price differences with a 'border tax adjustment'.  |
| The setting of the price (in an open market) could be very opaque.   | The process is more transparent and trustworthy.  |
| One of the immediate consequences is the design of financial and legal instruments   | This directly rewards innovation in engineering.  |

*Source:* Yale Environment 360. (2009). Putting a price on carbon: An emissions cap or a tax? Opinion.

preparation of detailed project reports and finance for adoption of energy-efficient technologies, are particularly important for non-PAT industrial units, which are smaller in size and cannot arrange such help on their own.

**4.85.** Unlike the coal cess which is deposited in the Government account, the energy efficiency fee will be deposited in the Central Energy Conservation Fund managed by the BEE (Section 20 of the Energy Conservation Act). The collections from the fee could be supplemented by international funding, as well as block grants from the Central Government through the NCEF.

**4.86.** Energy Conservation Fund could be used to leverage and/or finance energy-efficient technology upgradation of the domestic industry, particularly non-PAT industry, on terms softer than commercial borrowing. While participation under the scheme would be compulsory for non-PAT industry, industrial units participating in the PAT scheme could be permitted after one or two PAT cycles are over, but in a manner that does not crowd out the smaller non-PAT industry.

**4.87.** The UK Carbon Trust Fund could be a workable model for such an effort. An integrated Energy Efficiency Package of the kind suggested above,

which covers both PAT and non-PAT industry, needs to be carefully evolved over the Twelfth Plan period. The Expert Group on Low Carbon Strategies should also delve into greater detail on this.

## Transport

### *Vehicle Fuel Efficiency Programme*

4.88. The number of motor vehicles in India has been growing at about 10 per cent per annum, while-passenger and freight activity by road increased 15 and 6 per cent per annum respectively between 2001–02 and 2005–06, the last year for which data is available.<sup>16</sup> In turn, the fuel consumption has also increased, with petrol and diesel consumption increasing 10 and 8 percent respectively over the Eleventh Plan period. GHG emissions from the transport sector have also grown at 4.5 per cent per annum between 1994 and 2007.<sup>17</sup> Therefore, in addition to ensuring that automobiles pay for their full externalities such as congestion, pollution and reduced safety, India needs to urgently introduce fuel efficiency norms for the automobile industry to address both energy and environment challenges. Countries such as the US, Canada, Japan and the EU have already enacted such fuel economy legislations.

### **Framework of Fuel Efficiency Norms**

4.89. Fuel efficiency norms can be defined within a 'standards and labelling' framework. Vehicle labelling is a demand side measure to enable consumers to take an informed decision while purchasing a vehicle, whereas fuel efficiency standards are supply side measures for manufacturers to adhere to.

### **Vehicle Labelling**

4.90. Vehicles should carry prominent labels similar to those made popular by the appliance labelling scheme introduced by the BEE. These labels should give the consumer sufficient information about the relative efficiency of the vehicle to enable him to make an informed choice. It must contain the following:

- The fuel efficiency of the vehicle (in litres/100 km) as determined by an approved test mechanism.

- Its star rating, on a 1 to 5 scale, as compared to other vehicles of the same type and in the same (weight) category.
- A pointer on a band indicating the fuel efficiency position of this vehicle among all vehicles of the same category.

### **Fuel Efficiency Standards**

4.91. Given the relatively smaller size of the average Indian vehicle, the Indian vehicle fleet is among the most fuel-efficient in the world. The fuel efficiency standards should ensure that this characteristic of Indian vehicles is encouraged and preserved. Some measures are suggested below:

- The standards should be applicable to all vehicles sold in India—whether manufactured domestically or imported.
- Ambitious efficiency improvement programmes, such as Japan's 'top runner' programme define efficiency standards based on the best performers in the industry<sup>18</sup>. However, given the efficiency levels of the Indian fleet; Indian standards may be derived considering the average efficiency of the global vehicle fleet of a given type, the best performer and the average efficiency of Indian fleet.
- The standards must ensure that Indian vehicles retain their global fuel efficiency advantage and remain among the most fuel-efficient in their class. It should be noted that the average efficiency of passenger cars in India improved by 3 per cent per annum between 2006–07 and 2009–10, in spite of an increase of 2 per cent per annum in average kerb weight of cars sold in that period.<sup>19</sup> This is comparable to the rate of efficiency improvement proposed in the European Union and South Korea.<sup>20</sup>
- There has been a tendency for vehicles to get heavier without a corresponding increase in capacity, as seen in the 2 per cent per annum increase in average kerb weight of cars sold in India. This is not a desirable trend as it leads to increased fuel consumption without additional benefits. Therefore, standards must contain an explicit disincentive against up-weighting of vehicles. This can be achieved by making the standards not linear, but a sub-linear function of the vehicle weight. In the

sub-linear case, the permitted fuel efficiency loss for a given increase in vehicle weight is lower at a higher weight as compared to the permitted loss at lower weight levels.

- The BEE has already proposed a fuel efficiency scheme for passenger cars, and sought feedback on the scheme at a public consultation held on 1 November 2011. Given the rapid rate of growth of vehicles in the country, this process needs to be expedited. Some suggestions on further course of action are as follows:
  - BEE is in the process of publishing an alternative proposal based on the inputs received. This should be followed by another round of public consultations to ensure that significant concerns are addressed. It should then notify the norms, say, by September 2012.
  - Consumption of diesel by heavy commercial vehicles (buses and trucks) is considerably more than the fuel consumption of cars and two wheelers. Therefore, norms must be defined for these vehicles also at the earliest—say, by the end of 2012.
  - Two wheelers account for about 70 per cent of the vehicle sales as well as vehicle fleet in the country. Therefore, norms must soon be defined for them also.
  - The definition of fuel efficiency norms must not only be expedited, but also be based on public consultations with all stakeholders including the citizens groups and the automobile industry.
  - A clear-cut policy should be put into place for encouraging electric vehicles, including facilities for recharging.

#### *Improving the Efficiency of Freight Transport*

4.92. India's growing economy has resulted in increased demand for movement of freight in the country, with freight movement increasing roughly in proportion to the GDP. This has resulted in a corresponding increase in energy consumption and GHG emissions from freight transport. In order to improve the efficiency of freight movement, it is necessary to devise policy instruments to incentivize modal shift to the more efficient modes of freight transport, namely the railways. Rail freight is

significantly more energy-efficient than road freight, with the energy intensity of rail freight being 0.18 MJ/tonne-km, while the intensity for road freight being 1.6 MJ / tonne-km , that is a nine-fold difference.

4.93. However, the share of rail in total freight carried has steadily deteriorated from about 88 per cent at Independence to about 40 per cent at present, and the share of road freight has increased correspondingly. Figure 4.4 shows the historical trends in modal shares of freight transport. Such a change in freight modal share has not only increased the emissions, but has had other adverse effects listed below:

1. It has hurt the country's energy security as road freight is powered by diesel, and India imports over 80 per cent of its petroleum requirements.
2. It has worsened the balance of payments situation due to increased oil imports.
3. It has worsened the fiscal deficit given that diesel is a subsidized fuel in India.
4. It has worsened local air pollution in the form of tail-pipe emissions from diesel-powered commercial vehicles, which have been shown to have serious health effects in the form of respiratory problems, cancers and so on.

#### **Increasing the Share of Rail Freight in India**

4.94. As a principle, railways (which are more capital-intensive) should be the major freight mode along the major corridors, while road (with its greater reach and flexibility) should be the preferred mode from the 'spine' to the interior parts of the country. India's Integrated Energy Policy of 2006 also recognizes that there should be an increased role for railways in carrying freight in the country. GoI initiated the DFC project by setting up a special purpose vehicle called Dedicated Freight Corridor Corporation of India (DFCCIL) in 2006. The DFC project is expected to result in over 10,000 km of dedicated rail routes over six key corridors connecting India's four largest cities. The first phase of two corridors is expected to be complete by 2016–17. These corridors would be built with modern technology supporting higher axle loads, greater train lengths and speeds, thus further improving efficiency and reducing GHG emissions. However, work on these corridors is behind

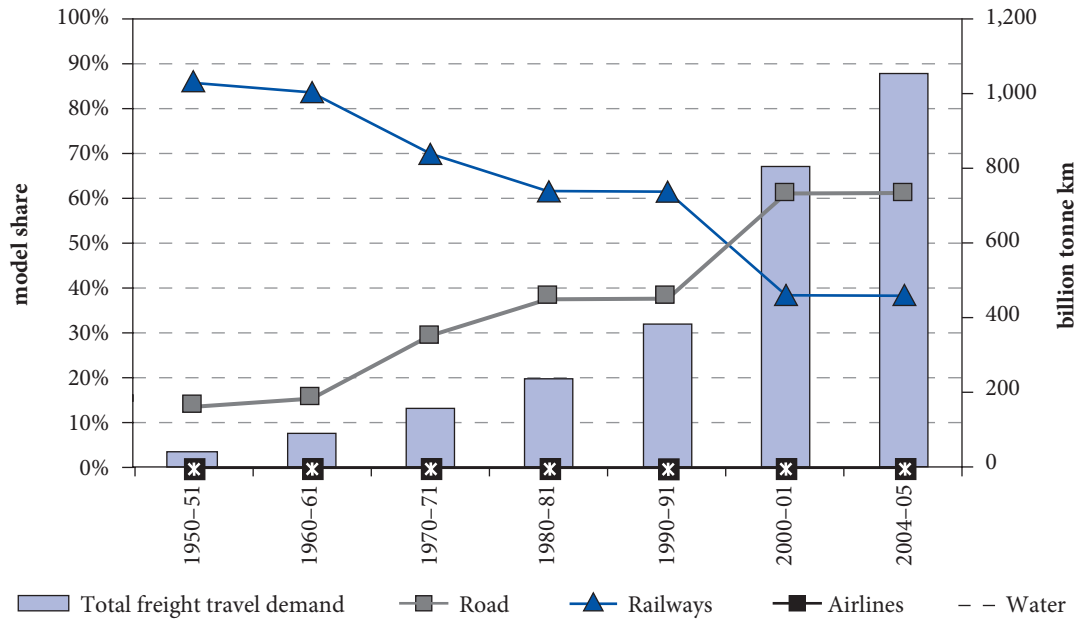


FIGURE 4.4: Modal share of freight transport in India<sup>27</sup>

schedule. The Government needs to use all its energies to ensure this is completed as soon as possible. For details of the dedicated freight corridor project see Chapter 13.

#### Improving the Efficiency of Road Freight

4.95. Road is expected to play an important part in freight movement even after a modal shift to railways. Therefore, there is a need to ensure that road freight performs as efficiently as possible. There is a perception that current road freight is inefficient because of reasons such as sub-optimal utilization of trucks, inefficient border crossing, toll regimes, insufficient use of multi-axle and tractor-trailer trucks, and lack of hub-and-spoke like arrangements for efficient dispersal of heavy loads onto smaller trucks for last mile connectivity. The Transport Policy Committee needs to further investigate these bottlenecks and suggest solutions to overcome them.

#### Water-Borne Freight

4.96. Freight carriage by waterways—both inland and coastal—is the most efficient form of freight transport. Though India has a long coastline and about 15,000 km of inland waterways, the share of water in freight transport is negligible at about

0.3 per cent. In contrast, water transport occupies about 6 per cent of the freight modal share in Europe. There is considerable room for improvement in this regard, and the GoI must initiate a serious study of how this potential can be maximized without affecting other uses of the water or waterways.

#### Improving Urban Public and Non-Motorized Transport

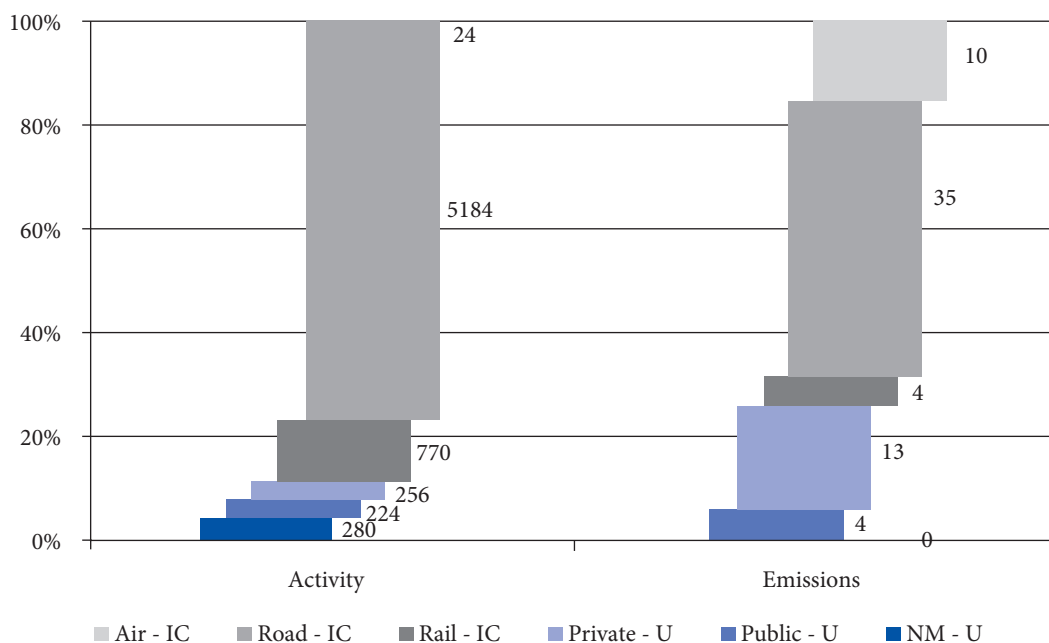
4.97. Our need for mobility has been growing rapidly. Official data indicates that passenger-km travelled by Indians is increasing at a rate of about 15 per cent per annum.<sup>22</sup> Consistent with this, automobile sales in the country are increasing around 10 per cent per annum. From an emissions perspective, this indicates rapid growth of emissions from the passenger transport sector, since most of the transport is powered by petroleum products. Further, such an increase of transport activity has also results in increased imports, since India's net import dependence for petroleum products is about 80 per cent. Given India's energy insecurity and balance of payment problems, there is a need to move transport in a more efficient direction so that mobility needs of our citizens are met with a lower consumption of fossil fuels.

4.98. Figure 4.5 depicts passenger transport activity and emissions in 2007. The important points to note are:

1. Only 4 per cent of the total passenger transport activity is by private automobiles in cities, but they contribute about 20 per cent of passenger transport emissions.
2. Air transport supports only 0.4 per cent of total passenger transport, but contributes 15 per cent to emissions from it.
3. Rail supports 11 per cent of passenger activity, and contributes just 5 per cent of the passenger transport emissions.
4. Non-motorized transport supports 4 per cent of passenger transport activity in the country without causing any emissions at all.

4.99. The way forward therefore is to promote public and non-motorized transport in cities, and rail for intercity passenger travel, while discouraging the use of private vehicles in cities, as well as intercity transport by air. This will have important co-benefits, such as:

1. Making mobility more inclusive as the promoted modes are typically more affordable.
2. Improving the country's energy security.
3. Reduce air pollution in the country's cities, towns and villages.
4. Reducing congestion on our city roads.
5. Improving road safety since studies show that public transport modes have lower per passenger-km fatality rates than private transport modes.



Sources: Ministry of Road Transport and Highways, Year book 2006-07, Directorate General of Civil Aviation, Indian Railways, Ministry of Petroleum and Natural Gas and Study on traffic and transportation policies and strategies in urban areas in India, Ministry of Urban Development, May 2008.

Note: NM-U: Non-motorised transport (Urban), Public-U: Public transport (urban), Private-U: Private transport (Urban), Road-IC: Road transport (inter-city), Rail-IC: Rail transport (inter-city), Air-IC: Air transport.

FIGURE 4.5: Passenger Transport Activity and Emissions in 2007



We should focus on policy instruments to encourage greater use of public and non-motorized transport in India's cities and towns, while discouraging the use of private motor vehicles. Official projections show that the current trend is exactly the opposite, as public and non-motorized transport is losing its share to private motorized vehicles. However, since urban transport is a State subject, the levers available with the Union Government are limited; and it is the State Governments and Urban Local Bodies which have an important role to play in realizing the transformation objective described above. The GoI can, however, leverage the funding under the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) to further these objectives.

#### Supporting Public Transport

4.100. Most urban bus utilities in the country are financially unviable, and a significant part of their financial burden is due to capital expenditure (to buy buses) and taxes. Some studies<sup>23</sup> suggest that these expenses—including various taxes on fuel form about 20 per cent of the total expenditure of a bus utility, and that these are comparable to or higher than taxes on private vehicles. Such taxation policy is clearly contrary to the objective of promoting public transport and discouraging private transport. Government needs to revisit its taxation policy of vehicles and ensure that tax burden on bus utilities is considerably lowered. It could also consider refunding fuel taxes collected from the bus utilities.

#### Urban Planning and Governance

4.101. Urban Local Bodies (ULBs) in India currently do not have the capacity to deal with the challenges posed by rapid urbanization. As a result, presently, the urban planning in the country does not go beyond provision of basic services to a chaotic urban sprawl, and simply does not take an integrated view of the modern urban requirements, including transport. This needs to be addressed urgently and capacities of ULBs need to be strengthened to enable mixed land use planning and preparation of an integrated transport plan for each city in the country.<sup>24</sup>

#### Lighting, Labelling and Super-efficient Equipment Programme

4.102. Lighting and appliances (such as refrigerators, air conditioners, water heaters, fans and so on) account for about 10 per cent of the total electricity consumption in India, which was estimated to be 68 billion kWh in 2010–11. With rising incomes and increasing penetration of appliances in households, the demand for electricity for lighting and appliances is expected to rise to 155 billion units by 2016–17. Over the Eleventh Plan period, the standards and labelling programme of the Bureau of Energy Efficiency BEE has enabled consumers to identify and purchase more energy-efficient appliances. Labels have already been introduced for 13 appliances<sup>25</sup>. They have been made mandatory for four appliances, namely, frost-free refrigerators, room air conditioners, tube lights and distribution transformers. As a result of this programme, the average energy efficiency ratio (EER) of air conditioners sold in India increased from 2.2 in 2006–07 to 2.8 in 2011–12; and the average consumption of a 300 litre frost free refrigerator declined from 547 kWh per day in 2006–07 to 368 kWh per day in 2011–12. Overall, savings due to the standards and labelling programme avoided an installed capacity of over 7,500 MW during the Eleventh Plan period.

4.103. The BEE has tightened the labelling norms for refrigerators and air conditioners w.e.f. 1 January 2012, and has notified a second tightening of norms to come into effect from 1 January 2014. As a result of these interventions, a further 30 per cent reduction in the average energy consumption of refrigerators and air conditioners is expected by 2016–17, as compared to those sold in 2011–12.

4.104. Annexure 4.1 provides an estimation of the electricity savings from various appliances in the market. While the actual savings may be different due to changes in assumptions underlying sales projections, the list of the top five appliances that contribute about 85 per cent of the total savings will not change. Of the five appliances, while refrigerators and air conditioners have already effectively adopted

the BEE's standards and labelling programme; a greater emphasis is needed for enhancing the efficiency of lighting appliances, motors and fans.

**4.105.** In the area of lighting, a major shift has taken place during the last 10 years due to large scale replacement of incandescent bulbs by Compact Fluorescent Lamps (CFLs), which consume only 20 per cent as much electricity as incandescent bulbs to produce the same amount of light. During 2011–12, the sales of CFLs in India exceeded 300 million; a 15 times increase as compared to the sales in 2002. However, incandescent bulbs continue to be used primarily in households where the higher first-cost of CFLs continues to be a barrier. The Bachat Lamp Yojana (BLY) provided an innovative business model to sell CFLs to households at the same price as incandescent bulbs, the balance being recovered as carbon credits. However, a sharp decline in the price of carbon credits has effectively made this business model non-viable.

**4.106.** At the same time, the emergence of solid state lighting, based on Light Emitting Diode (LED), presents an opportunity for another quantum jump in lighting energy efficiency. LED-based lighting appliances (bulbs and tube-lights) are 'super-efficient lights' in as much as they use only half as much electricity as fluorescent devices (CFLs and tube lights) to produce the same amount of light. However, their price is still much higher than those of CFLs; even though the price of a 5 W LED bulb (equivalent to a 10W CFL or a 50W incandescent bulb) declined from about ₹.1,200 in June 2010 to ₹.550 in December 2011. Further price decreases are possible with increased sales volume. During the Twelfth Plan period, enhanced procurement of LED bulbs and LED tube lights could create the sales volume necessary to bring down prices to levels where large scale penetration of LED lights in India would become a reality.

**4.107.** In a similar manner, 'super-efficient fans', which use half as much electricity as conventional fans, could be of great help in reducing electricity demand from this widely used appliance in the country. The current sales of ceiling fans in India is about 30 million per year and most of them are rated

at 70W. The penetration of five-star fans (which are rated at 50W) has been only 2 per cent, reflecting the price-sensitive nature of this market. During the Twelfth Plan period, development, introduction and market penetration of super-efficient fans, which are rated at 35 or less, will be promoted in a manner that boosts their sales volume, while also making them affordable.

**4.108.** Motors are the fifth application where market transformation towards more energy-efficient motors could lead to large scale savings. Most of the motors are, however, sold to businesses (rather to end-consumers), who incorporate them into other products, such as pumps, fans, air conditioners and so on. Consequently, direct sales incentives for efficient motors may not be the most appropriate or efficient way of promoting their uptake. A more aggressive labelling programme that will help in selection of energy-efficient motors may be more effective. Branding of products containing efficient motors (for example, 'energy efficient motor inside') could help inform the end-consumers about the energy efficiency of products they are buying.

**4.109.** During the Twelfth Plan period, the Super-Efficient Equipment Programme (SEEP) for super-efficient fans, LED bulbs and tube lights, seeks to incentivize the sale of these products to increase their volumes and bring down their prices for large-scale adoption. This 'virtuous cycle' could be jump-started though provision of a financial incentive for each super-efficient fan or light that is sold, that would help lower the price for end-consumers and enhance sales volume. This will provide confidence to manufacturers to invest in the development, manufacture and marketing of these products, which would otherwise find limited markets because of their higher price. The incentive should decrease with increasing volumes and reducing prices, till it is no longer needed. In terms of the transaction costs, it would be cost-effective to provide the incentive directly to the manufacturers, once third-party verification of sales volume has been carried out. However, performance standards for each of the super-efficient devices need to be put into place before the start of the programme, and periodic check-testing of the

super-efficient products that are being sold needs to be carried out to the check conformance to these standards. The SEEP for lights and fans could result in savings of 6.06 billion units per year by 2016–17, and help avoid an installed capacity of 1,500 MW during the Twelfth Plan period.

## Green Building Codes

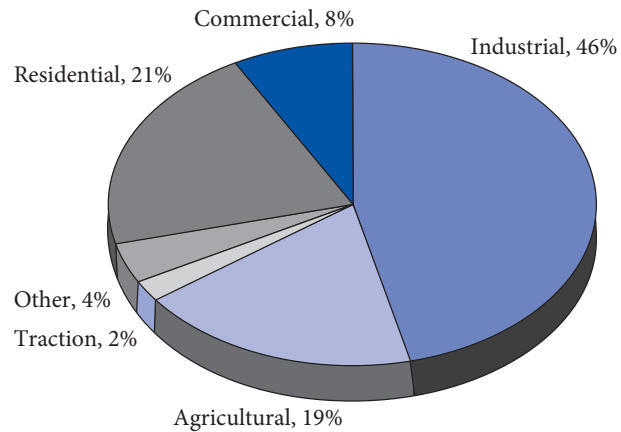
### Introduction

4.110. We define the building sector to include residential and non-industrial buildings. The latter are called commercial buildings, which include offices, hospitals, hotels, retail outlets, educational buildings, government offices and so on. Here we only deal with energy consumed in using these buildings. The energy embodied in construction of these buildings and structures is not considered.

4.111. Energy consumption in buildings offers a large scope for improving efficiency. The potential to reduce energy consumption through improvement in efficiency of appliances and equipment is already accounted for above. However, apart from this, buildings can be made more energy efficient by designs that reduce the need for lighting, heating, ventilation and air conditioning. We concentrate on savings in energy intensity that can be realized over and above what is possible through improvement in appliances and equipment.

4.112. The sector-wise electricity consumption in India is shown in Figure 4.6. The residential and commercial buildings account for 29 per cent of the total electricity consumption and this is rising at a rate of 8 per cent per annum (CWF, 2010). Significant part of this goes into heating, cooling and lighting. In order to work out the likely opportunities to reduce emission intensity, we need to first project the likely growth in buildings of different categories. The energy demand by buildings will continue to grow with the growth of IT enabled services (ITES) and the hospitality sectors.

4.113. The major growth in constructed area up to 2030 will be seen by residential and commercial sectors, as much as 4 to 5 times the constructed area in



Source: IEA, 2008.

FIGURE 4.6: Sector-wise Electricity Consumption in India

2005 (CWF, 2010). The growth rates in hospitality and retail sectors may be even higher, though their shares are relatively small. While the residential area is projected to increase from 16,300 m sq.ft. in 2005 to 70,000 m sq.ft. by 2030, the commercial build up area is projected to increase from 2,900 m sq.ft. in 2005 to 20,000 m sq.ft. by 2030.

### Residential Sector

4.114. Indian residential sector has witnessed phenomenal growth over the last fifteen years, primarily due to population increase, rise in income levels, growing urbanization, change in lifestyles and favourable public policies.

4.115. In 1961, the urban population of India was 78.9 million, that is, 18 per cent of the total population. By 2011 it has reached 377.1 million, which is 31.2 per cent of the total population. The urban populations are predicted to rise to over 600 million by 2031 (High Powered Expert Committee on Urban Infrastructure, 2011). This urban growth, combined with rapid growth in the economy, has put enormous pressure on housing requirements, urban infrastructure and other services. The residential sector accounts for 21 per cent of the total energy consumption<sup>26</sup> in India.

4.116. Ceiling fans and lighting constitute major energy use (62 per cent) in residential buildings.

Refrigeration and air-conditioning constitute another 20 per cent. The efficiency gains from the launch of the BEE energy labelling programme for domestic appliances to enhance energy efficiency of these appliances has already been accounted for above. The gains from redesigning buildings, to reduce the load for heating and air conditioning, have not been accounted for. However, these would be small for residential buildings, and we do not estimate them here at this stage.

#### *Commercial Sector*

4.117. The major energy-consuming equipments in the commercial sector are lighting (59 per cent); heating, ventilation and air conditioning (HVAC) (32 per cent), and other office related equipment (9 per cent). Commercial buildings also use window air conditioners and the gains in efficiency of these have been accounted for in the appliance efficiency programme. However, many of the commercial buildings have central air conditioning and chillers, whose efficiencies can be greatly improved. Architectural designs that increase daylight and reduce need for daytime lighting have not been accounted for above; nor have been the gains from better insulation, plugging of leaks and use of natural ventilation for geothermal energy. The gains from Energy Conservation Building Codes (ECBC) are mainly of these types and we estimate the potential for efficiency gains on this basis.

#### *Present Codes and Standards*

4.118. Codes and standards as determined by policy can significantly enable the reduction of CO<sub>2</sub> emissions in the building sector. The country has done well in developing various standards like National Building Code (NBC), Energy Conservation Building Codes ECBC and BEE rating programmes for appliances, and the more recent energy rating programme for the existing buildings. The market-driven voluntary Green Building Rating Programmes have significantly transformed the way buildings are designed. Green buildings have the potential to save 40 to 50 per cent energy vis-à-vis the conventional practices. Some of the widely used building codes in India are discussed below.

#### **Energy Conservation Building Code**

4.119. Energy Conservation Building Codes, formally launched in May 2007, specifies the energy performance requirements of commercial buildings in India. ECBC has been developed by the BEE under the provisions of the Energy Conservation Act, 2001. The code is applicable to all commercial buildings having a connected electrical load of 100 kW or more (or a contract demand of 120kVA or more).

4.120. The purpose of this code is to provide minimum requirements for the energy-efficient design and construction of buildings. The code is presently in the voluntary phase of implementation and is expected to become mandatory during the Twelfth Plan. However, some States have already moved ahead and notified it within their jurisdiction. The BEE is the primary body responsible for implementing the ECBC; and it works towards policy formulation as well as technical support for the development of these codes and standards, as well as in supporting compliance tools and procedures. States where ECBC has been made mandatory include Rajasthan, Orissa, Karnataka, Uttar Pradesh and Uttarakhand. Other States where ECBC is ready for implementation include Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Kerala, Maharashtra and Punjab.

#### **Green Building Rating Systems**

4.121. One of the major green building rating systems currently operating in India is the Indian Green Building Council (IGBC) programme. The ratings depend on a number of factors including energy consumption. The number of green buildings indicating their aggregate area by rating categories is given in Table 4.4:

4.122. Building sector provides tremendous opportunities for maximizing energy efficiency, and thereby reducing the GHG emissions. The large percentage of buildings (95 percent) that do not comply with the ECBC codes and the large savings that some of the rated buildings have achieved, indicate a large potential for energy savings in the building sector. These opportunities are available in both existing (for example, retrofitting of Bombay House) and new stock,

covering both commercial and residential buildings. The projected area of commercial buildings is likely to increase from 4,580 million sq. ft. in 2005 to 15,200 Million sq. ft. by 2020. The existing consumption pattern in conventional buildings (data from BEE), and the consumption trends in some of the recently constructed energy efficient buildings which would be ECBC compliant, have been analyzed. The ECBC compliant buildings are estimated to be 20 to 30 per cent more efficient than conventional buildings. These buildings have many energy conservation measures such as the use of flash blocks, wall and roof insulation, high performance glass, high SRI paints, vegetated roofs, LPD's (<1w/sq.ft.), high performance chillers, economizers, variable frequency drives, cooling towers and so on. The current baseline for CO<sub>2</sub> emissions for conventional buildings is estimated at 40,000 tonnes of CO<sub>2</sub> per million sq. ft. or 430,570 tonnes of CO<sub>2</sub> per million sq. m of building area. The estimated abatement potential will be worked out by the Expert Group in its final report.

#### Policy Measures

4.123. Since approval plans for buildings lie within the domain of ULBs and/or Urban Development Authorities created by the State Government, the scope for Central intervention is limited, the only real legal backing being the Energy Conservation Act, 2001. However, JnNURM and Finance Commissions are now a major source of finance for the ULBs. *To hasten the adoption of Green Building Codes across the country, implementation of these codes should be made one of the important conditionalities under the revamped JnNURM in the 12th Five Year Plan. The next Finance Commission should also be given the task of linking financial devolution to urban local*

*bodies to the implementation of Green Building Codes within their jurisdiction.*

#### Forest and Tree Cover

4.124. Enhancing forest and tree cover mitigates climate change by absorbing CO<sub>2</sub> from the atmosphere and turning it into biomass. This section attempts to bring out the present and the future potential that forestry sector of India can offer in mitigating the climate change, by directly increasing the forest and tree carbon sink on one hand, and by promoting efficiency of fuel-wood use, replacement of energy intensive building and household products with wood substitutes on the other. Needless to say, actions aimed at sustainable supply of domestic wood products would also aid mitigation and adaptation efforts, as sustained supplies would not be possible unless forests and tree vegetation themselves are first secured at reasonable levels.

4.125. With regard to the contribution to mitigation and adaptation actions, the forestry sector helps in mitigation by sequestering carbon, and helps in adaptation by increasing resilience of the system through ecological services of water retention, reduction in soil erosion, enhanced provision of renewable resources and so on. The forestry sector can make a positive contribution both in the numerator and the denominator—one, by increasing the forest carbon sink, and two, by increasing the GDP. Local livelihoods depending on forests are most likely to be impacted adversely not only because of climate change, but also due to continued pressure of land use change for development and other purposes. The national strategy aims at enhancing and improving the quality of forest and tree cover, which in turn will

**TABLE 4.4**  
**Coverage of Green Building Rating System up to October 2012**

| Green Building Rating Level | Energy Saving vis-à-vis Conventional Buildings (%) | Number of Buildings rated | Built-up area (in sq.m) |
|-----------------------------|--|---------------------------|-------------------------|
| Platinum                    | 40–50  | 85                        | 19,76,800               |
| Gold                        | 30–40  | 163                       | 72,06,544               |
| Silver                      | 20–30  | 48                        | 10,52,107               |
| Certified                   | 15–20  | 8                         | 82,190                  |

enhance the quantum of forest ecosystem services that flow to the local communities.

4.126. Strategy proposed to realize enhanced potential of forestry sector in mitigation and adaptation should therefore be two pronged—first, focus on actions that promote carbon sequestration; and second, focus on actions that improve and enhance ecosystem goods and services. Some options in the forestry sector for saving, maintaining and increasing forest carbon stocks are enumerated below:

- Conservation and Sustainable Management of Forests:
  - Conservation and sustainable management of protected areas.
  - Sustainable management of native forests.
  - Natural forests and
  - Dissemination of improved and efficient wood-burning cook-stoves.
- Afforestation:
  - National Mission for a Green India.
  - Agro-forestry practices including pulpwood plantations.
  - Energy plantations, that is use of forestry products as bioenergy to replace fossil fuel.
- Wood Products Use Management:
  - Initiate part replacement of energy intensive building materials like cement, iron and steel with lumber.
  - Initiate part replacement of office and domestic furniture made with metals by commercial wood based furniture.

4.127. Our present initiatives like National Afforestation Programme (NAP), together with programmes in sectors like agriculture and rural development, are adding or improving about 1 mha of forest and tree cover annually in our country. This combined with the accretion of biomass in our managed forests, protected areas and in tree cover outside the government forests, the total carbon service at present has been estimated at 138 mt CO<sub>2</sub>eq every year.<sup>27</sup> The cost of this business-as-usual reforestation and afforestation activities is estimated at about ₹5,000 crore annually.

4.128. **National Mission for a Green India:** The business-as-usual scenario will however, not suffice. In the Twelfth Plan, the national afforestation programme needs to be re-organized into a more comprehensive ‘National Mission for a Green India’ (for details see Chapter 7). The Mission is still being finalized, but the realistic aim would to double the present reforestation and afforestation efforts to about 2 mha of forest and tree cover annually. Over a ten-year period, this could increase or improve the quality of forest and tree cover over 20 mha of land area; which includes regeneration of 4.0 mha of degraded forests, improving canopy cover over 2.0 mha of moderately dense forests, restoration of 2.0 mha of degraded scrub/grasslands, and agro-forestry over another 2.0 mha of degraded/fallow agriculture lands, in addition to eco-restoration of mangroves and wetlands. The Green India Mission also proposes to improve the fuel-wood use efficiency (through the improved cook-stoves initiative) in 10 million rural households. It must also lay emphasis on liberalization of felling and transit rules for identified commercial species so that, on one hand, farmers get the right incentives to undertake agro-forestry in a big way, on the other, harvested wood products can replace building materials in house construction, while metal and plastic based furniture can be replaced with wood based substitutes.

4.129. According to preliminary estimates, the cost of this mitigation service would be double the amount currently being spent on afforestation activities—about ₹10,000 crore annually in the Twelfth Plan. It was estimated by the Expert Group that if implemented properly, the Green India Mission would help neutralize an additional 1.5 per cent of India’s GHG emissions annually, bringing the total GHG removal by India’s forests to 6 per cent by 2020. It will, however, not be possible to mobilize resources of this magnitude from gross budgetary support alone. CAMPA (Compensatory Afforestation Fund Management and Planning Authority) funds, already accumulated, could be used to supplement this resource. The REDD-plus funds (United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries), as and when

received, could also be channelized to supplement the available financial resources.

4.130. More resources could be mobilized using the 'Emitter Pays Principle'. Possible mechanism for implementing this could be a system of compulsory carbon credits purchased by emitting entities, equal to their emissions over and above the permissible limit, or a carbon tax regime with proceeds going to the carbon service providers, including the State Forest Departments, in proportion to the quantum of carbon service provided.

### AN OVERVIEW

4.131. Human activities result in significant environmental changes that cause damage to species, ecosystems and ecological processes. Preservation of the integrity of these ecological components is critical, considering they provide the bio-physical base necessary for human life, such as water, land, air, forests, biodiversity and so on. Issues related to these will be discussed in detail in the succeeding chapters.

4.132. India needs to adopt low carbon strategies in order to improve the sustainability of its growth process, while carbon mitigation will be an important co-benefit. The focus areas outlined in this chapter deserve special attention, and physical achievement targets need to be fixed for and monitored at

the highest level. We need to sustain over 7 per cent growth for the next twenty years, if we are to meet the rising aspirations of our people and become a genuine middle income country that provides a decent standard of living to all its citizens. To achieve this dream, pursuit of low carbon strategies is essential, as otherwise, sustainability and energy insecurity would itself become a constraint on our growth process.

4.133. Globally, India's policy goal of achieving sustainable development is guided by the principle of 'common but differentiated responsibility' (CBDR). India is one of the countries that prefer an 'aspirational' rather than a mandatory or 'prescriptive' approach. India feels the issue of sustainable development should be approached with a sense of equity; and the development aspirations of the developing countries should be built into the green economy principles being evolved at the international level.

4.134. If development has to be sustainable, we need to innovate, invest and improve our planning processes at the national, state and local levels. India's opportunity has come in 2012, as we formulate the Twelfth Five Year Plan. To remind what Peter Drucker said, 'Management is doing things right; leadership is doing the right things'. Let us be good leaders first and then managers!

**ANNEXURE 4.1**  
**Estimated Energy Savings due to Electrical Appliances Programme in the Twelfth Plan**

|                                   | Current Market Size (2007) | Expected Annual Growth Rate (2007–2020, in % terms) | Units Sold Cumulatively (between 2014–2020, both included) | Post 2014 Stock Surviving in 2020 | Average power consumption (W) | Total Annual Electricity Consumption (in MWh) | Energy Saving Potential (in % terms) | Total Energy Savings Potential (in GWh) |
|-----------------------------------|----------------------------|---|--|-----------------------------------|-------------------------------|---|--------------------------------------|---|
| Refrigerators                     | 51,50,000                  | 10.0  | 9,52,12,234  | 9,24,44,456                       | 300                           | 12,42,08,520                                  | 30                                   | 37,263                                  |
| Motors                            | 20,00,000                  | 10.0  | 3,69,75,625  | 3,59,00,760                       | 7,500                         | 67,31,39,244                                  | 5                                    | 33,657                                  |
| Air Conditioners                  | 22,53,000                  | 15.0  | 6,63,23,602  | 6,45,79,520                       | 1,641                         | 15,26,03,989                                  | 15                                   | 22,891                                  |
| Colour Televisions (CTVs)         | 1,35,00,000                | 15.0  | 39,74,11,730   | 32,84,31,475                      | 120                           | 8,63,11,792                                   | 25                                   | 21,578                                  |
| Lighting* (LEDs)                  | 13,04,00,000               | 12.0  | 2,90,83,88,221   | 71,39,96,050                      | 29                            | 3,62,35,300                                   | 40                                   | 14,494                                  |
| Lighting* (CFLs+TFLs)             | 19,56,00,000               | 12.0  | 4,36,25,82,331   | 1,07,09,94,074                    | 29                            | 5,43,52,949                                   | 15                                   | 8,153                                   |
| Chillers                          | 7,182                      | 15.0  | 2,11,423   | 2,05,863                          | 98,000                        | 4,03,49,215                                   | 30                                   | 12,105                                  |
| Ceiling Fans# (super-efficient)   | 40,00,000                  | 11.0  | 8,12,46,576  | 8,03,87,618                       | 65                            | 1,56,75,586                                   | 50                                   | 7,838                                   |
| Ceiling Fans# (higher-efficiency) | 60,00,000                  | 11.0  | 12,18,69,863   | 12,05,81,427                      | 65                            | 2,35,13,378                                   | 20                                   | 4,703                                   |
| Central AC and Heat Pump          | 86,953                     | 10.0  | 16,07,571  | 15,60,839                         | 8,400                         | 2,62,22,102                                   | 20                                   | 5,244                                   |
| UPS                               | 19,37,817                  | 13.0  | 4,74,33,986  | 4,38,65,644                       | 140                           | 4,29,88,331                                   | 10                                   | 4,299                                   |
| Computer Servers                  | 2,93,233                   | 20.0  | 1,35,70,829  | 1,14,50,034                       | 350                           | 3,36,63,100                                   | 10                                   | 3,366                                   |

\* It is assumed that of super-efficient lighting appliance sales, 40 per cent would be LED's and 60 per cent higher efficiency CFLs plus TFLs.  
# It is assumed that of the total ceiling fan sales, 40 per cent would be super-efficient fans and 60 per cent would be higher efficiency fans.



## ANNEXURE 4.2

### Co-Benefits Framework for Low Carbon Strategies

| S. No.          | Thrust Area                                       | Co-Benefit Sought | Brief Qualitative Assessment of Co-Benefit Potential   |
|-----------------|---|-------------------|--|
| <b>Power</b>    |   |                   |  |
| 1.              | Advanced Coal Technologies                        | Growth            | Positive—although costs are marginally higher, coal is used more efficiently. Energy security and reduced import dependence.   |
|                 |   | Inclusion         | Neutral or mildly negative if power costs increase and are passed on to low income consumers.  |
|                 |   | Local Environment | Positive—reduced emission of SO <sub>x</sub> , NO <sub>x</sub> and particulate matter.   |
|                 |   | Carbon Mitigation | Positive—10 GW of Ultra Supercritical coal plants can reduce emissions by ~ 15 per cent compared to current plants.  |
| 2.              | National Wind Energy Mission                      | Growth            | Positive—can substitute for fossil fuel imports and provide energy security. Indigenous manufacturing for large capacities can lead to job creation and growth.  |
|                 |   | Inclusion         | Neutral—Can be mildly negative if average electricity costs increase. Could also be mildly positive through creation of a decentralized energy industry.   |
|                 |   | Local Environment | Positive—although land is required for wind installations, policy can enable mixed land use. Noise pollution could be a concern.   |
|                 |   | Carbon Mitigation | Positive—zero emissions power.   |
| 3.              | National Solar Mission                            | Growth            | Mildly positive—can substitute for fossil fuel imports, decrease import bill and providing energy security.  |
|                 |   | Inclusion         | Neutral—Can be negative at present costs, which are higher than other sources. Could also be mildly positive through creation of a decentralized energy industry.  |
|                 |   | Local Environment | Positive—decentralized rural applications substitute diesel, kerosene and firewood. For large projects, dedicated land and water requirement may be a concern due to competing uses. However, solar power does not emit local air pollutants.            |
|                 |   | Carbon Mitigation | Positive—zero emissions power.   |
| <b>Industry</b> |   |                   |  |
| 4.              | Technology improvement in Iron and Steel Industry | Growth            | Positive—Less fossil fuel consumption, reduction in import of fossil fuels; Improved domestic and global competitiveness.  |
|                 |   | Inclusion         | Neutral—Mildly positive, if MSME also benefits esp. the sponge iron industry; mildly negative, if cost of output increases.  |
|                 |   | Local Environment | Positive—Usually, improved technologies provide increased environmental performance such as reduction in noise, particulate matter, SO <sub>x</sub> , NO <sub>x</sub> ; reduction in slag and other waste.   |
|                 |   | Carbon Mitigation | Positive—Reduced emissions per unit of iron and steel produced.  |
| 5.              | Technology improvement in Cement Industry         | Growth            | Positive—Less fossil fuel consumption; Reduction in consumption of raw material per unit of cement produced;   |
|                 |   | Inclusion         | Neutral—Mildly positive if price of cement reduces with higher clinker substitution; mildly negative, if cost of output increases due to technology costs.   |
|                 |   | Local Environment | Positive—Usually, improved technologies provide increased environmental performance such as reduction in noise, particulate matter, SO <sub>x</sub> , NO <sub>x</sub> , and so on; reduction in fly ash, slag and other waste and reduction in landfill; |
|                 |   | Carbon Mitigation | Positive—Reduced emissions per unit of cement produced.  |
| 6.              | Energy Efficiency Programmes in the Industry      | Growth            | Positive—Less fossil fuel consumption, reduction in import of fossil fuels; Improved domestic and global competitiveness.  |
|                 |   | Inclusion         | Positive—Potential price reduction over a longer term due to increased efficiency; Lower consumption could reduce peak power or energy deficit.  |

| S. No. | Thrust Area   | Co-Benefit Sought | Brief Qualitative Assessment of Co-Benefit Potential   |
|--------|---|-------------------|--|
|        |   | Local Environment | Positive—improved technologies provide increased environmental performance such as reduction in noise, particulate matter, SO <sub>x</sub> , NO <sub>x</sub> , and so on; reduced waste as by-products of energy feedstock are utilized. |
|        |   | Carbon Mitigation | Positive—reduced production intensity of fossil fuels.   |
|        |   |                   | <b>Transport</b>   |
| 7.     | Vehicle Fuel Efficiency Programme                           | Growth            | Mildly positive— reduced fuel imports, enhanced energy security. Savings on fuel expenditure could be invested domestically.   |
|        |   | Inclusion         | Neutral, unless it results in significant improvement in bus efficiencies which could lower fares.   |
|        |   | Local Environment | Reduced Air Pollution—as tail-pipe emissions decrease.   |
|        |   | Carbon mitigation | Moderately positive—fuel consumption would reduce, unless undermined by increased driving patterns.  |
| 8.     | Improving the Efficiency of Freight Transport               | Growth            | Positive—savings on fuel expenditure, reduced fuel imports. May facilitate enhanced trade.   |
|        |   | Inclusion         | Mildly positive—transport cost of goods would reduce, thus impacting overall prices.   |
|        |   | Local Environment | Positive—decreased emissions either through modal shift or improvements in efficiency of road transport.   |
|        |   | Carbon Mitigation | Improving freight transport efficiency will have a positive impact on carbon mitigation.   |
| 9.     | Better Urban Public and non-motorized Transport             | Growth            | Mildly positive—reduced fuel imports and savings on fuel expenditure could get invested domestically.  |
|        |   | Inclusion         | Positive—mobility for the poor would improve significantly.  |
|        |   | Local Environment | Positive—reduced local emissions   |
|        |   | Carbon Mitigation | Positive—reduced consumption of fossil fuels.  |
|        |   |                   | <b>Others</b>  |
| 10.    | Lighting, Labelling and Super-Efficient Equipment Programme | Growth            | Mildly positive—energy efficiency is typically cheaper than new power generation, bringing down average cost of electricity.   |
|        |   | Inclusion         | Neutral—positive, if appliances supported are used by relatively poor populations; negative, if predominantly used by the rich.  |
|        |   | Local Environment | Positive—energy efficiency substitutes for thermal power generation and brings down local air pollution.   |
|        |   | Carbon Mitigation | Positive—carbon mitigation as energy efficient appliances substitute for thermal power generation.   |
| 11.    | Faster Adoption of Green Building Codes                     | Growth            | Neutral or mildly positive—decreased energy costs lead to lower investments in higher cost power infrastructure.   |
|        |   | Inclusion         | Neutral—negative if green building codes raise costs.  |
|        |   | Local Environment | Positive—energy efficiency substitutes for thermal power generation and brings down local air pollution.   |
|        |   | Carbon Mitigation | Positive—carbon mitigation occurs as energy efficient appliances substitute for thermal power generation.  |
| 12.    | Improving the Stock of Forest and Tree Cover                | Growth            | Neutral or mildly positive—forest enhancement can increase ecosystem services.   |
|        |   | Inclusion         | Neutral or negative—depends on the existing use of land; and whether afforestation causes displacement and loss of livelihood.   |
|        |   | Local Environment | Positive or negative—depending on the type of forest cover.  |
|        |   | Carbon Mitigation | Positive—forests sequester carbon.   |

## NOTES

1. Lowe, 2001: ADB Publication.
2. Direct emissions include fuel combustion and process-related CO<sub>2</sub> emissions from within the industry.
3. Indirect emissions are emissions from the power generation sector due to electricity use in industry.
4. CCI, 2011; CSE, 2010.
5. Specific Energy Consumption is defined as the ratio of energy consumed to the total quantity of output produced.
6. Centre Study of Science Technology and Policy (CSTEP) estimates.
7. Assocham and Ernst & Young, 2011.
8. IEA, 2011; CSTEP estimates.
9. Clinker mixed with fly ash or slag is termed as blended cement.
10. Assocham and E&Y, 2011.
11. Railways have 8 DCs as per the notification of MoP. As the sectoral energy scenario and energy usage pattern is under study by BEE, these DCs have been excluded from the first cycle of the PAT scheme.
12. Specific Energy Consumption is defined as the ratio of energy consumed to the total quantity of output produced.
13. Bureau of Energy Efficiency (BEE), 2011.
14. Stavins, R.N., 2008. A meaningful U.S cap-and-trade system to address climate change. *Harvard Environmental Law Review* 32, pp. 293–371.
15. CSTEP 2012. Discussion on low carbon growth for SMEs.
16. Road Transport Year Book 2006–07 and 2007–09, Ministry of Road Transport and Highways.
17. India Greenhouse Gas Emissions 2007, Ministry of Environment and Forests.
18. Top runner program: Developing the world's best energy efficient appliances, Ministry of Economy, Trade and Industry, Government of Japan.
19. Consultation paper on proposed fuel efficiency norms published by Bureau of Energy Efficiency, Ministry of Power.
20. The International Council for Clean Transportation.
21. S. Sundar and C. Dhingra, *Transport and Energy: The Challenge of Climate Change*, International Transport Forum workshop on transport CO<sub>2</sub> in emerging economies, Leipzig, May 2008.
22. Ministry of Road Transport and Highways, *Year Book 2006–07*.
23. P. S. Kharola and Geetam Tiwari 'Urban public transport systems: Are the taxation policies congenial for their survival and growth', *Economic and Political Weekly* (11 October 2008).
24. For example, High Powered Expert Committee set up by the Government of India, *Report on Urban Infrastructure and Services*.
25. Labels have been introduced for TFLs, Room Air Conditioner, Frost Free Refrigerators, Distribution Transformers, Direct Cool Refrigerators, CTV, Storage Water Heaters, Agriculture Pumps, Induction Motors, Washing Machines, LPG Stoves, Laptops and Ceiling Fans.
26. Cooking is not included. This includes only electricity consumption in households.
27. Jagdish Kishwan, Rajiv Pandey and VK Dadhwal. (2011) Emission Removal Capability of India's Forest and Tree Cover. *Small Scale Forestry*. DOI: 10.1007/s11842-011-9168-9.

# 5

## Water

5.1. The Indian economy and society face daunting challenges in the water sector. The demands of a rapidly industrialising economy and urbanising society come at a time when the potential for augmenting supply is limited, water tables are falling and water quality issues have increasingly come to the fore. As we drill deeper for water, our groundwater gets contaminated with fluoride and arsenic. Both our rivers and our groundwater are polluted by untreated effluents and sewage continuing to be dumped into them. Climate change poses fresh challenges with its impacts on the hydrologic cycle. More extreme rates of precipitation and evapo-transpiration will exacerbate impacts of floods and droughts. It is no wonder then that conflicts across competing uses and users of water are growing by the day. Meanwhile, water use efficiency in agriculture, which consumes around 80 per cent of our water resources is only around 38 per cent, which compares poorly with 45 per cent in Malaysia and Morocco and 50–60 per cent in Israel, Japan, China and Taiwan.

### DEMAND AND SUPPLY OF WATER IN INDIA

5.2. Estimates of the annual flow of water available for human use after allowing for evapo-transpiration and minimum required ecological flow vary considerably. The water budget based on Ministry of Water Resources estimates shows utilisable water of 1,123 billion cubic metres (BCM) against current water demand of 710 BCM, suggesting more than adequate availability at the aggregate level given current requirements.<sup>1</sup> The Standing Subcommittee of the Ministry of Water Resources estimates total water demand rising to 1,093 BCM in 2025, which reaffirms

a comfortable scenario at the aggregate level even in 2025.

5.3. However, more recent calculations, based on more realistic estimates of the amount of water lost to the atmosphere by evapo-transpiration, are less reassuring. Since the amount of water available is more or less constant, rising demands due to increasing population and economic growth will strain the demand–supply balance. The 2030 Water Resources Group (2009)<sup>2</sup> estimates that if the current pattern of demand continues, about half of the demand for water will be unmet by 2030.

5.4. We must also recognise that water balances for the country as a whole are of limited value since they hide the existence of areas of acute water shortage, to say nothing of problems of quality. What is required is a much more disaggregated picture, accurately reflecting the challenge faced by each region. The exact level at which regions need to be defined would depend on the purposes of the exercise, as also unifying features of the region, such as basin and aquifer boundaries.

### NEED FOR A PARADIGM SHIFT

5.5. These challenges can only be met through a paradigm shift in the management of water resources in India. This shift comprises the following elements:

- A move away from a narrowly engineering-construction-centric approach to a more multi-disciplinary, participatory management approach to our major and medium irrigation projects,

with central emphasis on command area development and a sustained effort at *improving water use efficiency*.

- Since groundwater accounts for nearly two-thirds of India's irrigation and 80 per cent of domestic water needs, we need a *participatory approach to sustainable management of groundwater* based on a new programme of *aquifer mapping*.
- A massive programme for *watershed restoration and groundwater recharge* must be launched by transforming Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) into our largest watershed programme,<sup>3</sup> giving renewed energy to the reformed Integrated Watershed Management Programme launched in the Eleventh Five Year Plan and launching a completely revamped programme on Repair, Renovation and Restoration (RRR) of Water Bodies.
- A *new approach to rural drinking water and sanitation*.<sup>4</sup>
- All *urban water supply projects to necessarily integrate sewage systems* within them.
- Definite targets for *recycling and reuse of water by Indian industry* to move in conformity with international standards.
- Renewed focus on *non-structural mechanisms for flood management*.
- *Vastly improved systems of water-related data collection and management* as also transparency in availability of data.
- Adaptation strategies to mitigate the likely impact of climate change to be pursued under the National Water Mission (NWM).
- Perennial rivers with sufficient draft through the year could be the focal point of a renewed thrust to inland waterways transport as an environment-friendly economical mode of transport compared to road and rail.<sup>5</sup>
- A *new legal and institutional framework for water* based on broader consensus among the States.

5.6. This chapter provides full details of each of these initiatives in the backdrop of a review of the experience so far and lays out the approach to be followed in the Twelfth Plan period, spelling out the programmes and allocations within which this is to be embodied.

### Limits to Large Irrigation Projects

5.7. Traditionally, large dam projects have been the mainstay of the irrigation effort in the country. However, it is now recognised that there are definite limits to the role they can play in providing economically viable additional large water storage.<sup>6</sup> A World Bank study has pointed out that 'there is little value to additional storage in most of the peninsular river basins (the Kaveri, Krishna and Godavari) and in the Narmada and Tapi'.<sup>7</sup> Similarly, a study by the International Water Management Institute (IWMI).<sup>8</sup> shows that Krishna and Kaveri have reached full or partial closure. Another IWMI study shows that in the Krishna river basin, the storage capacity of major and medium reservoirs has reached total water yield,<sup>9</sup> with virtually no water reaching the sea in low rainfall years. Concern has also been expressed that the capture of so much water within the basin and the evaporation of an additional 36 BCM of water has changed the regional climate, increasing humidity and changing temperature regimes, aggravating saline ground water intrusion, and putting at risk the delicate wetland and estuarine ecology which is important not only for aquatic habitats and fisheries, but also for preventing shore erosion. The lack of adequate environmental flows in the Krishna River has significantly aggravated water pollution problems from cities, since domestic and industrial effluents can no longer be sufficiently diluted by flowing water.<sup>10</sup>

5.8. Given these constraints, the trend increasingly is to locate new projects in relatively flat topography that multiplies disproportionately the areas to be flooded and the people to be evicted. It also tends to aggravate already contentious relations between States, as witnessed in the Polavaram dam in Andhra Pradesh, strongly opposed by both Orissa and Chhattisgarh.

5.9. Water flow in the Himalayan Rivers, particularly the Ganga, is of course, far greater than in Peninsular Rivers but here there are other constraints. In the Ganga Plains, the topography is completely flat and storages cannot be located here. In a study for the Asian Development Bank, Blackmore<sup>11</sup> has argued that surface irrigation through dams in the Ganga

river basin is of low value since water tables are already high. Similarly for the Indus, Blackmore shows that 'the next major dam (at a cost of US\$ 12 billion) will yield less than 1.5 per cent increase in regulated flow'.<sup>12</sup>

5.10. There is also the problem that further up in the Himalayas we confront one of the most fragile ecosystems in the world. The Himalayas are comparatively young mountains with high rates of erosion. Their upper catchments have little vegetation to bind soil. Deforestation has aggravated the problem. Rivers descending from the Himalayas tend, therefore, to have high sediment loads. A 1986 study found that 40 per cent of hydro-dams built in Tibet in the 1940s had become unusable due to siltation of reservoirs.<sup>13</sup> Studies by engineering geologists with the Geological Survey of India record many cases of power turbines becoming dysfunctional following massive siltation in run-of-the-river schemes. Climate change is making predictability of river flows extremely uncertain. This will rise exponentially as more and more dams are built in the region. Diverting rivers will also create large dry regions with adverse impact on local livelihoods (fisheries and agriculture). Rapid rise of the Himalayas (from 500 to 8,000 metres) gives rise to an unmatched range of ecosystems, a biodiversity that is both enormous and fragile.

5.11. The north-east of India is one of just 25 biodiversity hotspots in the world.<sup>14</sup> According to Valdiya<sup>15</sup> as also Goswami and Das,<sup>16</sup> the neo-tectonism of the Brahmaputra valley and its surrounding highlands in the eastern Himalayas means that modifying topography by excavation or creating water and sediment loads in river impoundments can be dangerous. Quake-induced changes in the river system can adversely impact the viability of dams as several basic parameters of the regime of rivers and the morphology and behaviour of channels may change.

The last two major earthquakes in the region (1897 and 1950) caused landslides on the hill slopes and led to the blockage of river courses, flash floods due to sudden bursting of landslide induced temporary dams, raising of riverbeds due to heavy siltation, fissuring and sand venting, subsidence or elevation of existing river and lake bottoms and margins and the

creation of new water bodies and waterfalls due to faulting.<sup>17</sup>

5.12. Even more recent research published in *Science*<sup>18</sup> on Zipingpu reservoir-induced seismicity as a trigger for the massive Sichuan earthquake in 2008 raises doubts about the wisdom of extensive dam-building in a seismically active region.

5.13. The ambitious scheme for interlinking of rivers also presents major problems. While detailed project reports (DPRs) have been prepared for a few of the links, many concerns have already been expressed about how far the initiative can be taken. The comprehensive proposal to link Himalayan with the Peninsular rivers for inter-basin transfer of water is estimated to cost around ₹5,60,000 crores. Land submergence and R&R packages would be additional to this cost. There are no firm estimates available for running costs of the scheme, such as the cost of power required to lift water. There is also the problem that because of our dependence on the monsoons, the periods when rivers have 'surplus' water are generally synchronous across the subcontinent.

5.14. A major problem in planning inter-basin transfers is how to take into account the reasonable needs of the basin states, which will grow over time. Further, given the topography of India and the way links are envisaged, it might totally bypass the core dryland areas of Central and Western India, which are located on elevations of more than 300 metres above mean sea level. It is also feared that linking rivers could affect the natural supply of nutrients through curtailing flooding of the downstream areas. Along the east coast of India, all major peninsular rivers have extensive deltas. Damming the rivers for linking will cut down the sediment supply and cause coastal and delta erosion, destroying the fragile coastal ecosystems.

5.15. It has also been pointed out that the scheme could affect the monsoon system significantly.<sup>19</sup> The presence of a low salinity layer of water with low density is a reason for maintenance of high sea-surface temperatures (greater than 28 degrees C) in the Bay of Bengal, creating low-pressure areas and intensification of monsoon activity. Rainfall over much of the subcontinent is controlled by this layer

of low saline water. A disruption in this layer could have serious long-term consequences for climate and rainfall in the subcontinent, endangering the livelihoods of a vast population. It is, therefore, imperative that great caution is exercised in moving forward on this proposal.

5.16. The problems listed above provide a clear indication that further large-scale irrigation development in India will not be an easy option. This does not mean that the Twelfth Plan should reduce allocations to this vitally important sector of the Indian economy on which livelihoods of millions of our people depend. The only implication is that we need to seriously reconsider our priorities here. Over the last six decades since independence we have built up huge irrigation capacities. Improved utilisation of these capacities can dramatically add to irrigated area and also lead to a major improvement in water-use efficiency in our large irrigation sector. We also have many large projects underway that need to be expeditiously completed.

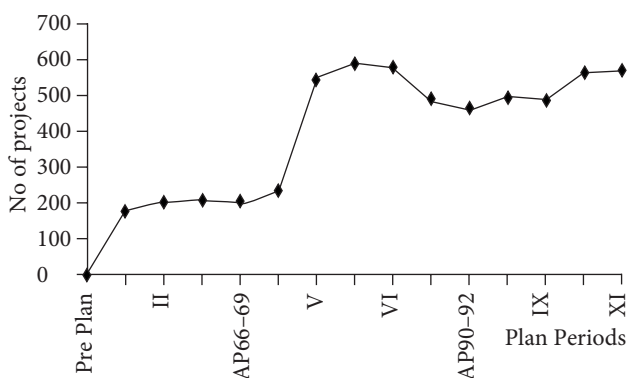
5.17. In order to fully understand the scale of the potential that exists in this direction, it would be useful to undertake an overview of the performance of this sector thus far.

### Review of Major and Medium Irrigation (MMI) Projects in India

5.18. There has been a massive increase in plan expenditure on irrigation and flood control over the last 60 years. As can be seen from Annexure 5.1, MMI outlays rose from ₹376 crore in the First Plan to a projected outlay of more than ₹1,65,000 crore in the Eleventh Plan, amounting to a total expenditure of around ₹3,51,000 crore over this period.

5.19. At the same time, it is clear that these projects have suffered from massive time and cost overruns. A study carried out by the Twelfth Plan MMI Working Group on cost overruns reveals that the worst offenders are the major irrigation projects where the average cost overrun is as high as 1,382 per cent. 28 out of the 151 major projects analysed witnessed cost overruns of over 1,000 per cent. Of these, nine had cost overruns of over 5,000 per cent. The cost overruns were relatively lower for medium projects

but still unacceptably high, the average being 325 per cent. 23 out of 132 medium projects had cost overruns of over 500 per cent and 10 had cost overruns of over 1,000 per cent. The data on time overruns compiled by the Working Group is in Annexure 5.2. A graphic overview is presented in Figure 5.1.



Source: Report of the Twelfth Plan Working Group on Major and Medium Irrigation and Command Area Development.

FIGURE 5.1: Incomplete MMI Projects across Plan Periods

5.20. It can be seen that the number of projects awaiting completion peaked in 1980 to 600; then there was decline till 1992 (460), after which it has again risen to 571, almost touching the 1980 figure again. Major irrigation projects are expected to have a gestation period of 15–20 years while medium projects should take 5–10 years for completion. Against these norms, a large number of major as well as medium projects are continuing for 30–40 years or even more. This reflects poor project preparation and implementation as well as thin spreading of available resources. As can be seen from Annexure 5.3, there is a spillover of 337 projects—154 major, 148 medium and 35 Extension, Renovation, Modernisation (ERM) projects into the Twelfth Plan from previous Plan periods.<sup>20</sup>

5.21. The Twelfth Plan, therefore, proposes that completion of ongoing projects be given the highest priority and new projects be taken up only where there is a demonstrated need of an outstanding character. The reversal since 1992 is also indicative of the declining capacities of individual State Governments in this regard. While financial capacities are being taken care of through programmes such as the Accelerated Irrigation Benefits Programme (AIBP),

lack of capacities in terms of human resources and other 'soft' aspects have emerged as major new challenges, which are proposed to be addressed during the Twelfth Plan. The capability of a State to take up new projects in the light of the backlog of ongoing projects will be assessed before sanctioning a new project for the State.

5.22. To check these huge time-overruns, the Twelfth Plan proposes to put in place a systematic mechanism to monitor progress achieved and suggest measures needed to restore time schedules and link it to the annual allocation of plan resources to the States.

### The AIBP Experience

5.23. The AIBP was launched in 1996 to fast-track the implementation of ongoing major and medium irrigation projects which were in an advanced stage of completion. Central assistance worth ₹54,251 crores has been provided to the States between 1996 and 2012 under AIBP. The AIBP has been successful in accelerating the rate of creation of additional irrigation potential in the MMI sector, which increased

from 2.2 mha per Plan till the Eighth Plan to 4.10 mha during the Ninth Plan following the introduction of AIBP and further rose to 5.30 mha during the Tenth Plan and 4.28 mha during the Eleventh Plan. The real difficulty is that while we have done well in creating additional irrigation capacities, their utilisation has been less than satisfactory (Annexure 5.4). Please refer to Box 5.1.

5.24. The huge investments over the last 60 years have meant that the irrigation potential created through MMI projects has increased nearly fivefold from 9.72 mha in the pre-Plan period to around 46 mha by the Eleventh Plan. However, during the same period, the utilisation of this potential has failed to keep pace. From being almost equal to the potential created in the pre-Plan period (9.70 mha), it is now well short of it, reaching only about 35 mha during the Eleventh Plan. The plan-wise data for irrigation potential created (IPC) and irrigation potential utilised (IPU) is provided in Annexure 5.5. A graphic presentation of the increasing gap between the two is presented in Figure 5.2.

#### Box 5.1

#### IIM Lucknow Evaluates AIBP for Planning Commission

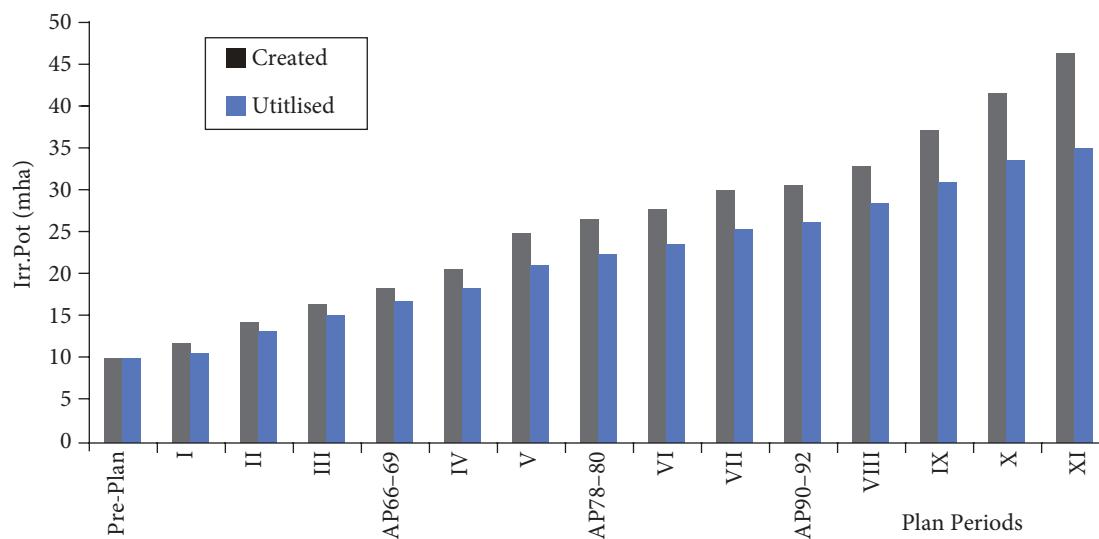
To assess the impact of the Accelerated Irrigation Benefits Programme (AIBP), the Programme Evaluation Organisation of the Planning Commission initiated an evaluation of the AIBP. This exercise, conducted by the Indian Institute of Management, Lucknow, carried out sample surveys in 10 different states covering 10 irrigation projects (4 Major, 4 Medium and 2 ERM). The study completed in late 2011 reveals that the gap between the irrigation potential created and utilised in these projects is substantial and growing. Major reasons are low water discharge, insufficient water distribution mechanism, unequal water distribution across farmers located at different points, loss of water during distribution, incorrect recording of irrigated area and diversion of cultivable land to other purposes within the command area.

State Governments are finding it difficult to finance recurring costs of irrigation and to collect economic water charges from the farmers. Majority of the farmers do not pay irrigation charges on time in major irrigation projects of UP, Karnataka, and Assam. These financial constraints not only affect the maintenance of assets under AIBP, that is, water outlets and distribution channels, which was found to be inadequate, but also the sustainability of these irrigation systems with adverse impact on water use efficiency and equity. Importantly, more than 50 per cent of the farmers in major irrigation projects are willing to pay extra charge for assured water supply indicating that access to water is more important than its cost.

If irrigation performance is to improve a wide range of mutually supporting interventions will be needed. Adequate funds should be allocated for timely repair and maintenance of the canals. High priority should be given to the task of lining of the whole canal system and lift irrigation system should be installed on the banks of canals. Farmers should be persuaded to adopt appropriate cropping pattern for optimum use of water. AIBP assistance should be extended even for construction of Field Irrigation Canal networks. Land acquisition needs to be completed before the project proposals are approved under AIBP. Institutional reforms such as restructuring of irrigation agencies including WUAs, irrigation management transfer to the farmers and promotion of self-financing of irrigation schemes is also required.

*Source:* Planning Commission, PEO, Report No. 214, November, 2010.





Source: Report of the Twelfth Plan Working Group on Major and Medium Irrigation and Command Area Development.

FIGURE 5.2: Increasing Gap between Irrigation Potential Created and Utilised

5.25. Studies by four Indian Institutes of Management (Ahmedabad, Bangalore, Kolkata and Lucknow) of 34 states and Union Territories (UTs) completed in 2009 show that the IPC-IPU gap reflects implementation issues such as faulty project designs, poor lining and desilting and shoddy maintenance of distribution channels. Another reason is that irrigation potential is defined on the basis of a certain volume of water expected in the reservoir which is divided by a presumed depth of irrigation required for a presumed cropping pattern. However, the actual values of these variables differ from their presumed values because of a switch to water-intensive crops at the upper end of the command. Institutional weaknesses are also important. There is lack of coordination between concerned department officials (resulting in delays in implementation and implementation without proper technical assessment) as also inadequate technical and managerial capacity of irrigation department staff. The absence or ineffectiveness of Water Users Associations (WUAs), is also mentioned as a significant contributor to the IPC-IPU gap.

5.26. The most important initiative for bridging the gap between IPC and IPU is the Command Area Development Programme (CADP) that has been

running since 1974-75. Annexure 5.6 summarises the performance of the programme over the last four decades.

5.27. The difficulty is that the CADP has been both divorced from the AIBP and not received the emphasis it deserves. The mode of implementation of the CADP has also left much to be desired in terms of the complement of human resources provided for the programme as also an inadequate understanding of participatory and devolutionary approaches. At times the supporting legal framework in the form of Participatory Irrigation Management (PIM) Acts has been lacking. Only 15 States have enacted PIM Acts and/or amended the existing Irrigation Acts. As many as 13 States are yet to do so. Although a large number of WUAs are reported to have been formed in various States, only a few have actually been handed over the system. Successful functioning of WUAs is reported only in a few projects in Maharashtra, Gujarat, Andhra Pradesh and Orissa. The Twelfth Plan proposes major changes to strengthen these initiatives.

5.28. Perhaps the most important of the five goals of the NWM is to increase water use efficiency by 20 per cent. Given that nearly 80 per cent of our

water resources are consumed by irrigation, an increase in water use efficiency of irrigation projects by 20 per cent will have a major impact on the overall availability of water not only for agriculture but also for other sectors of the economy. The Central Water Commission (CWC) has studied the water use efficiency in 30 completed major and medium irrigation projects. The results of these studies are summarised in Annexure 5.7. Nine projects have a water use efficiency of less than 30 per cent. The average across 30 projects is 38 per cent

5.29. Among the factors explaining the low water use efficiency levels identified by the CWC are poor maintenance of canal and distribution network resulting in growth of weeds and vegetation within them, siltation of canals, damage of lining in lined canals, distortion of canal sections due to siltation or collapse of slopes, leakages in gates and shutters. Non-provision of lining in canals, field channels and water courses passing through permeable soil strata has resulted in high seepage losses. No regulation gates on head regulators of minors has led to uneven distribution of water. Cases of over-irrigation due to non-availability of control structures in the distribution system have also been reported. Poor management practices and lack of awareness among farmers have contributed to an adverse performance overall.

#### MMI Reform: The Twelfth Plan Agenda

5.30. Learning from past experience, the Twelfth Plan proposes a major break from the past by focusing on four main thrust areas in the MMI sector:

1. Complete, as far as possible, the huge backlog of ongoing MMI projects by prioritising the allocation of investible funds to ongoing projects while taking up new only as a matter of exception; completing ongoing projects will help create new MMI irrigation potential of 7.9 million ha during the plan period;
2. Close the gap between IPC and IPU by at least 10 million ha by prioritising investments in Command Area Development and Management (CAD&M) projects and restore an additional 2.2 million ha of lost irrigated potential through ERM works in old MMI projects;

3. Catalyse, support and incentivise deep reform in irrigation departments by strengthening and broad-basing their human resources, by building capacities of civil engineers to move from a narrow construction-orientation to management roles (as being done by their counterparts throughout the world), capacitating Water and Land Management Institutes (WALMIs) and other irrigation training and research institutions and strengthening incentives in irrigation service provision and Irrigation Service Fee (ISF) collection;
4. Redesign the information architecture of the MMI sector to promote and support strong Management Information System at the MMI level and for improved water resources management at various levels.

5.31. Reflecting the above objectives, the proposed outlays for the MMI sector in the Twelfth Five Year Plan will be subdivided as follows:

- Sixty-five per cent of total outlays will be earmarked for completing the backlog of ongoing projects.
- Fifteen per cent will be earmarked for CAD&M and ERM projects that are likely to quickly add to the irrigation potential. To encourage and support States in taking up CAD&WM works on a priority basis, central assistance to such works will be enhanced from present 50 per cent to 75 per cent of the project costs.
- The remaining 20 per cent will be for new projects, especially in States where irrigation infrastructure is underdeveloped and where great potential remains to be created.

5.32. The Twelfth Five Year Plan proposes the setting up of a National Irrigation Management Fund (NIMF) to catalyse and support demand for irrigation management and institutional reform. This is a departure from the past practice. All along, institutional and management reforms have been pushed through supply-side mechanisms. Thus, many state governments have passed PIM Acts assuming that these per se will make PIM work. Earlier Plans have provided funds for training and research in irrigation management but without notable success.

5.33. The MMI sector has been stuck in a low-level equilibrium during recent decades. It must be recognised that in addition to plan outlays for expanding the system, it is necessary to put maintenance on a viable trajectory. Even as MMI investments are growing, capacities of irrigation departments in many States to deliver quality services are getting depleted. States compete for capital investments in new MMI projects but do little to manage them efficiently. Even farmers in MMI command areas have given up on demanding better services from MMI managers and have increasingly fallen back on private wells. With electricity offered free or at subsidised rates, tubewell irrigation has boomed even in command areas causing widespread groundwater depletion. In many States, ISF to be collected from irrigators has been abolished; where it is not, actual collection of ISF is 2–8 per cent of dues. Because ISF collected has no relation with area irrigated or irrigation service provided, there is total lack of information needed for effective management of the MMI systems. This implies that the accountability loop between farmers and Irrigation Departments is broken. PIM has failed to take off in many States because in the current scenario, WUAs have all obligations but no rights nor secure access to irrigation.

5.34. The starting point in breaking out of this low-level equilibrium has to be increasing resources available with MMI systems managers for proper operation and maintenance (O&M) of systems. In 2005, the World Bank estimated that to minimise deferred maintenance on Indian MMI systems, we need to spend ₹19,000 crore on annual maintenance, which is nearly 20 times more than what States actually spend. State Irrigation Departments are content to generate enough revenue to meet their establishment costs, which many do from the water charges they recover by selling a small proportion of MMI water to industries. But this just covers salaries and leaves little or nothing for regular maintenance and upkeep of systems—especially canals and distribution systems—which affect irrigation more than industrial or municipal customers.

5.35. A related issue has to do with the accountability mechanism built into the ISF. Wherever ISF

gets regularly collected, irrigation staff shows greater accountability and responsiveness to farmers. There is greater contact between the two; there is greater oversight of water distribution; and in general, farmers expect at least a minimal level of service if an ISF is demanded of them. When governments abolish ISF or fix it at a token rate or fail to undertake regular collection, farmers forfeit their right to demand service and irrigation staff can afford to neglect service provision.

5.36. Rationalising ISF and its full collection is, therefore, the key to management reform in the MMI sector. The Thirteenth Finance Commission took note of this aspect and recommended a grant of ₹5,000 crore over four years for providing central assistance to each State, linked to outcomes in terms of ISF collection, MMI performance and impacts. However, this incentive grant appears too small to nudge States to take up an aggressive irrigation reform agenda. Moreover, the formula of allocating incentive grants in proportion to Gross Receipts recovered and IPU of different States at the end of the Tenth Five Year Plan is not designed to reward improved irrigation outcomes in future. This is particularly so because many industrially developed States such as Maharashtra, Gujarat and Tamil Nadu can collect significant amounts of revenue by selling small portion of MMI water to industries. But this should not be the reason to ignore ISF collection which needs to be incentivised.

#### NATIONAL IRRIGATION MANAGEMENT FUND

5.37. Government of India should establish a non-lapsable NIMF, which will reimburse to each State Irrigation Department a matching contribution to its own ISF collection from irrigators on a 1:1 ratio. This will require that:

1. States desiring to avail of this matching grant maintain their own non-plan allocations to Irrigation Departments at the normal rate of growth of the aggregate non-plan budget of the State; that is, ensure that the Government of India (GoI)'s matching support is additional to the

- State's non-plan budget for MMI systems which will now have more resources for regular maintenance and upkeep;
2. States allocate central grant to various MMI systems in proportion to the ISF collection of each MMI system; this would incentivise ISF collection among MMI staff and generate competition in augmenting GoI incentive;
  3. At the end of the financial year, States desiring to avail of this matching grant will—through their regulator—present a certified, audited statement furnishing detailed data on the actual ISF collected from irrigators from different MMI systems preferably through Independent Water Regulator (or comparable independent agency). The Central Government will have an independent verification undertaken of the claims on ISF collection (including a scrutiny of a sample of vouchers), based on which central matching grant will be released each year.
  4. To give strong encouragement to PIM, the NIMF will provide a bonus on that portion of each State's ISF collection which has been collected through WUAs, as certified by the State's Water Regulator and verified by an independent agency designated by the Central Government. This bonus will be allowable only if WUAs are allowed to keep 50 per cent of the ISF collected by them and their federations at the distributary level are allowed to keep 20 per cent of the ISF paid by irrigators. This will expand resources with WUAs and their federations to undertake proper repair and maintenance of distribution systems; and increase their stakes in water management.
  5. Similarly, to encourage volumetric water deliveries and ISF collection, NIMF will provide an additional bonus on that portion of a State's ISF collection which accrues through volumetric water supply to WUAs at the outlet level under an irrigation service contract with each WUA.
  6. Overall, NIMF will act as a catalyst to undertake reforms in the water sector such as improving water use efficiency, participatory community based management of aquifers, regulation of groundwater, revamping irrigation/water resource departments and so on.

5.38. It is expected that such an Irrigation Management Fund which incentivises ISF collection, with proper implementation, will produce myriad beneficial impacts. In particular, it will: (i) enhance resources available with the MMI system managers to augment and broad-base their staff and their competencies; (ii) improve the ISF collection ratio; (iii) generate more accurate data on irrigation potential utilised; (iv) give strong fillip to PIM; (v) speed up CAD & WM; (vi) encourage rationalisation of ISF levels; (vii) encourage volumetric water supply and pricing; (viii) foster partnership between irrigation agencies and WUAs; and (ix) in general help reduce the gap between IPC and IPU.

5.39. The Union Ministry of Water Resources is instituting a study to evolve benchmarks for water sector reforms and gradation of States on their reform-friendliness. Based on this study, it should be possible to evolve a 'reform framework' laying down an objective system of benchmarks for assessing the reform-friendliness of the States based on which the incentive system can be operationalised.

5.40. To support institutional and management reform in the MMI sector, resources have also to be earmarked for redesigning the information architecture for the sector. The Ministry of Water Resources has initiated the process of development of a Water Resources Information System (WRIS). This will be completed at the earliest and made fully operational in public domain. Implementation of the NIMF will necessitate compilation of accurate statistics on area irrigated by MMI systems as well as ISF collected from farmers. This will create a reliable database on IPC and IPU, with third party verification. Such a data base will be the foundation of an information, planning and control system for improved management of MMI systems.

5.41. Institutional and management reform will also require major initiatives in training and research. The availability of real-time data on irrigated area, ISF collection and so on will facilitate benchmarking of MMI system performance and level of irrigation service received by users. To stimulate

practical problem-solving research on MMI management improvements, the GoI will provide a core grant of up to ₹20 crore to interested national institutes of eminence such as Indian Institutes of Technology, Indian Institutes of Management, National Institutes of Technology, Indian School of Business, and so on to establish centres of excellence in irrigation management to undertake research, education and training for senior MMI managers. Leading management institutes will be invited to develop and offer practical management training to senior MMI managers, with focus on performance management through planning, budgeting and monitoring systems. To support such activities, provision is being made to involve leading players of the Information Technology enabled services of the country to work with State Governments to develop management information systems for MMI schemes with the specific purpose of generating real-time information on the working and performance of these systems to enable their benchmarking.

5.42. To improve the quality as well as amount of training to ground-level functionaries of Irrigation Departments as well as farmers, the GoI will provide each of the 14 WALMIs a grant-in-aid of ₹5 crore over the five-year period to strengthen their training, research and extension work provided: (i) they induct trainers in social science, extension, agriculture, environment and other disciplines, (ii) undertake regular evaluation of their training programmes, (iii) offer a certain minimum number of training programmes for farmers and irrigation staff every year, and (iv) submit an independent, third party evaluation report of their work at the end of every year.

#### MODIFIED AIBP

5.43. To support the objectives and priorities outlined above, central assistance to States under the AIBP will be modified as follows:

1. Central assistance at the rate of 90 per cent will continue for the projects in special category States, projects in KBK (undivided Kalahandi, Bolangir and Koraput) districts of Orissa and projects benefiting tribal areas, drought prone and flood prone areas, as well as in areas included under Desert Development Programme.
  2. For general category States, the rate of central assistance under AIBP will be increased to 50 per cent in place of 25 per cent for all ongoing projects, provided the States initiate necessary actions and fully implement the reform agenda set out under the NIMF within the first two years of the Twelfth Plan, that is, during 2012–13 and 2013–14.
  3. New MMI projects of general category States will be included for support under AIBP only in exceptional cases and such projects would be eligible for central assistance at the rate of 25 per cent only.
  4. Lift irrigation schemes will be taken up for AIBP support only on the condition of implementing micro-irrigation (drip and sprinkler) in the command area of the project. Innovations may be tried in setting up micro irrigation systems (MIS) in clusters through Public–Private Partnership (PPP). Irrigation efficiencies are expected to increase to 90 per cent in case of Drip MIS and 80 per cent in case of Sprinkler MIS.
  5. Monitoring of all schemes under central assistance should include a specific mention of the progress made in respect of implementation of the reform agenda of the NIMF.
- 5.44. To emphasise the centrality of Command Area Development (CAD) to all irrigations projects, the following steps will be initiated:
- All irrigation project proposals (major, medium or minor) will include CAD works from the very beginning. Thus, each proposal will plan for irrigation water from the reservoir to the farm gate and not just the outlet as at present.
  - All DPRs will include CAD works and the estimated project cost and Benefit-Cost (BC) ratio will be worked out accordingly.
  - No investment clearance will be provided to any irrigation project devoid of CAD integration.
  - There will be parallel action in each irrigation command wherein works in the distributary network and software activities of CAD will be undertaken simultaneously with head works and

main canal work, leading to a seamless integration of work in the head-reaches and tail-end of the command.

- Recognition of potential creation at the outlet of distributary will be discontinued. Potential creation will be recognised only after complete hydraulic connectivity is achieved from reservoir to farm-gate.
- CAD will concentrate on field channels and drainage. The system correction and waterlogging components will be removed as they dilute the programme objective.
- Pipeline-based field channels will be allowed, if necessary, especially in desert and drought-prone areas.
- In order that progress on CAD can be clearly monitored, each investment clearance will distinctly list these works along with head works, canals and distributaries.
- Whenever projects come up for revised investment clearance, they will need to incorporate a CAD component. This will apply even to completed projects that come up with proposals for rehabilitation/modernisation.
- No projects with part components (for example, left bank canal or right bank canal) will be entertained. This has led to a proliferation of projects without corresponding outcomes because the holistic overview of the project has been missing.
- Currently, the CAD wing of the Ministry of Water Resources operates separately from the Water Planning and Projects Wing of the CWC. Beginning with the Twelfth Plan, a Chief Engineer CAD) will work under the Member (Water Planning and Projects) of the CWC so that a more integrated view can be taken of AIBP and CAD.
- The CWC itself will be strengthened to also include agronomists, hydrogeologists and social scientists such as sociologists/anthropologists and social workers who understand the dynamics of engagement with civil society organisations for mobilising farmers in the command areas.

#### **GROUNDWATER: AN EMERGING CRISIS**

5.45. While public investments since Independence have focused largely on surface water, over the last three decades, groundwater has emerged as the main

source of both drinking water and irrigation, based almost entirely on private investments by millions of atomistic decision-makers. The relative ease and convenience of its decentralised access has meant that groundwater is the backbone of India's agriculture and drinking water security. Groundwater is a common-pool resource (CPR), used by millions of farmers across the country. It remains the only drinking water source in most of India's rural households and many industries depend upon groundwater. Over the last four decades, around 84 per cent of the total addition to the net irrigated area has come from groundwater. India is by far the largest and fastest growing consumer of groundwater in the world. But groundwater is being exploited beyond sustainable levels and with an estimated 30 million groundwater structures in play, India may be hurtling towards a serious crisis of groundwater over-extraction and quality deterioration. Please refer to Table 5.1 and Figure 5.3.

5.46. The report of the Expert Group on Groundwater Management and Ownership of the Planning Commission (2007), had reported that in 2004, 28 per cent of India's blocks were showing alarmingly high levels of groundwater use. A recent assessment by NASA showed that during 2002 to 2008, India lost about 109 cu.km. of water leading to a decline in water table to the extent of 0.33 metres per annum.<sup>21</sup> According to the Central Ground Water Board's latest assessment,<sup>22</sup> at the all India level, the stage of groundwater development is now 61 per cent. In Punjab, Haryana, Rajasthan and Delhi, this level has crossed 100 per cent, closely followed by Tamil Nadu (80 per cent) and UP (71 per cent). In addition to depletion, many parts of India report severe water quality problems, causing drinking water vulnerability. Nearly 60 per cent of all districts in India have problems related to either the quantitative availability or quality of groundwater or both. This is a serious situation warranting immediate attention.

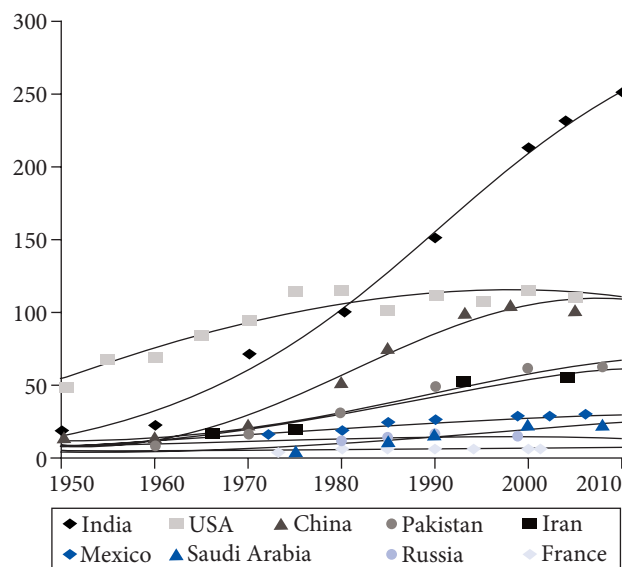
5.47. There is no dedicated national programme on groundwater management. While groundwater resources are perceived as a part of a specific cadastre—watersheds, landscapes, river basins, villages, blocks, districts, states—aquifers are seldom

**TABLE 5.1**  
**Top 10 Groundwater-Abstracting Countries as of 2010**

| Rank | Country                  | Abstraction (km <sup>3</sup> /year) |
|------|--------------------------|-------------------------------------|
| 1    | India                    | 251                                 |
| 2    | China                    | 112                                 |
| 3    | United States of America | 112                                 |
| 4    | Pakistan                 | 64                                  |
| 5    | Iran                     | 60                                  |
| 6    | Bangladesh               | 35                                  |
| 7    | Mexico                   | 29                                  |
| 8    | Saudi Arabia             | 23                                  |
| 9    | Indonesia                | 14                                  |
| 10   | Italy                    | 14                                  |

*Source:* 'Managing Water Under Risk and Uncertainty', The United Nations World Water Development Report 4, Volume 1 (2012).

*Note:* About 72 per cent of the global groundwater abstraction takes place in these 10 countries.



*Source:* 'Managing Water Under Risk and Uncertainty', The United Nations World Water Development Report 4, Volume 1 (2012).

**FIGURE 5.3: Groundwater Abstraction Trends in Selected Countries (in km<sup>3</sup>/year)**

considered. Aquifers are rock formations capable of storing and transmitting groundwater. A complete understanding of groundwater resources is possible only through a proper understanding of

such aquifers. The current approach also tends to ignore the common-pool nature of groundwater. As the work of Nobel Prize winning economist Elinor Ostrom shows, the first design principle in management of CPRs is the clear delineation and demarcation of its boundaries. And an understanding of its essential features, which in the case of groundwater includes its storage and transmission characteristics.

### Mapping India's Aquifers

5.48. The Twelfth Plan proposes to initiate a comprehensive programme for the mapping of India's aquifers as a prerequisite and a precursor to the National Groundwater Management Programme, which will also be started during the Twelfth Plan period. It is imperative that the design of the aquifer mapping programme has a clear-cut groundwater management purpose. This will ensure that aquifer mapping does not remain an academic exercise and that it will seamlessly flow into a participatory groundwater management programme.

5.49. Implementation of an integrated aquifer mapping and groundwater management programme is possible only through strong partnerships between Government Departments, research institutes, gram panchayats/urban local bodies, industrial units, civil society organisations and the local community. Such partnerships will break down the institutional silos that often constrain focused work on groundwater management. The Central Ground Water Board (CGWB) will lead this effort and State Agencies for groundwater will be constituted or reformed, to bring about organisational parity across the country. Most importantly, the interface of civil society and research institutes with government will be encouraged across all aspects of the programme, ranging from mapping India's aquifers, large-scale capacity building of professionals at different levels, action-research interface with implementation programme and development of social-regulation norms around groundwater, norms that can hold forward linkages to the overarching legislative and governance frameworks (elaborated later in this chapter).

5.50. Groundwater management responses would be most effective when a tractable aquifer typology

is developed for the country. Each 'type' within the aquifer typology is a function of the hydrogeological setting, which defines the socio-ecology of groundwater and the level of groundwater development of the specific area. This typology will become the starting point for planning aquifer mapping and designing interventions with regard to groundwater management, including work on recharging aquifers.

### National Groundwater Management Programme

5.51. The challenge of groundwater management arises from the fact that a fugitive, common-pool resource is currently being extracted by individuals, millions of farmers in particular, with no effective mechanism to ensure that the rate of extraction is sustainable. The good news is that over the last few years innovative approaches have been tried out across countries, which have blazed a trail in how this paradox might be resolved. Please refer to Box 5.2.

5.52. The Twelfth Plan will launch a National Groundwater Management Programme building upon these diverse experiences and carrying them to scale. The exercise of aquifer mapping will provide a foundation to this effort by enabling local planners to gain an understanding of the following aspects and make plans accordingly:

- Relationship between surface hydrologic units (watersheds and river basins) and hydrogeologic units, that is, aquifers;
- The broad lithological setup constituting the aquifer with some idea about the geometry of the aquifer—extent and thickness;
- Identification of groundwater recharge areas, resulting in protection and augmentation strategies;
- Groundwater balance and crop-water budgeting at the scale of a village or watershed.
- Groundwater assessment at the level of each individual aquifer in terms of groundwater storage and transmission characteristics, including the aquifer storage capacity.
- Regulatory options at community level, including the appropriate regulatory mechanisms at the panchayat level. These may include drilling depth (or whether to drill tube wells or bore wells at all), distances between wells (especially with regard to drinking water sources), cropping pattern that ensures sustainability of the resource (aquifer) and not just the source (well/tubewell), comprehensive plan for participatory groundwater management based on aquifer understanding—domestic water security, food and livelihood security and eco-system security, bearing in mind principles of equitable distribution of groundwater across all stakeholders and inputs to the use of

#### Box 5.2

##### Participatory Groundwater Management in India

- The FAO-supported APFAMGS programme in Andhra Pradesh aimed at involving farmers in hydrologic data generation, analysis and decision-making, particularly around crop-water budgeting.
- Social regulation in groundwater sharing under the AP Drought Adaptation Initiative (APDAI) involving Watershed Support Services and Activities Network (WASSAN), in parts of AP.
- Experiences from Barefoot College, Tilonia, with a water budgeting tool known as Jal Chitra.
- Foundation for Ecological Security (FES) taking a micro-watershed unit for water balance and planning groundwater use along with communities in Rajasthan, MP and AP.
- Experiences of Advanced Centre for Water Resources Development and Management (ACWADAM) with Samaj Pragati Sahayog in MP and with the Pani Panchayats in Maharashtra on knowledge-based, typology-driven aquifer-management strategies.
- Training programmes and drinking water initiatives by ACT in Kutch training local youth as para-professionals in their quest for improved groundwater management.
- Research on documenting local groundwater knowledge in Saurashtra and Bihar by INREM Foundation.
- The Hivre Bazar model of watershed development and social regulation to manage water resources in Maharashtra.



indirect instruments of regulation, mainly power rationing and/or metering based on aquifer characteristics and degree of exploitation.

### Central Ground Water Board (CGWB) Reforms

5.53. Effective management of groundwater requires changes in the nature of coordination among the government ministries related to groundwater (water resources/irrigation, drinking water, rural development, agriculture, environment and forests, urban development, pollution control and industrial effluent). These agencies must be required to assess the impact of their decisions on groundwater and report to CGWB, on issues concerning groundwater. For this to be effective, the institutional mandate of CGWB should be strengthened to enable it to perform its role as the manager of groundwater resource, including hiring from the fields of community institutions, participatory management of resource, political economy and economics, water markets, regulatory systems, alternative uses, opportunity cost of groundwater extraction, energy management and so on.

5.54. The Environmental Impact Appraisal conducted by the Ministry of Environment and Forests needs to include impact on groundwater based on inputs from CGWB. MoEF must be required to seek the opinion of CGWB in all groundwater stressed regions as well as in cases where a negative impact on water quality is anticipated. CGWB may develop protocols for conducting assessment of impact of major (industrial/urban/hydrological) interventions on groundwater and strengthen its own internal capacities to widen its scope of work.

### Breaking the Groundwater–Energy Nexus

5.55. The current regime of power subsidies for agriculture has had a major role to play in deteriorating water tables in most parts of India. These very same power subsidies fuelled the Green Revolution, which was driven by groundwater but given the emerging stresses on groundwater, an imaginative way needs to be found, which breaks the groundwater-energy nexus, without hurting farmer interests. Many States

have found solutions that are producing very positive results.

5.56. The single most effective solution has been the physical segregation of power feeders to provide  $24 \times 7$  electricity to rural habitations and non-farm users and separate feeders to give 3-phase predictable supply to agriculture, which is rationed in terms of total time, at a flat tariff. This provides requisite power to schools, hospitals and the non-farm economy, while allowing rationed supply of power to agriculture, which can be at off-peak hours. For example, the Government of Gujarat invested US\$1,250 million during 2003–06 to separate 8,00,000 tubewells from other rural connections and imposed an 8 hour/day power ration but of high quality and full voltage. This was combined with a massive watershed development programme for groundwater recharge. The net result has been: (i) halving of the power subsidy; (ii) stabilised groundwater draft and (iii) improved power supply in the rural economy.

5.57. Combined with other measures such as High Voltage Distribution System (HVDS), specially designed transformers and energy-efficient pump-sets, this could be a better way of delivering power subsidies that cuts energy losses and stabilises the water table at the same time. Major investments will be required in this direction in the Twelfth Plan.

### Promoting Groundwater Development in Eastern India

5.58. It is ironic that while much of India suffers from falling water tables due to overexploitation of groundwater, eastern India is broadly characterised by under-utilisation of this precious resource. During the Twelfth Plan sustainable groundwater irrigation development will be promoted in 11 Eastern States including the seven North-Eastern States,<sup>23</sup> in order to more fully realise the potential of this region to contribute to the needs of national food security, even while ensuring that this intensification of groundwater use does not lead to the same deterioration in water table and water quality that has been experienced in other parts of India.

5.59. To ensure sustainability, detailed aquifer mapping exercises at a scale 1:50000 will be conducted to delineate aquifers to be tapped, assess their storage and transmission potential, seasonal fluctuations in water levels, extent of natural monsoon recharge and the quantum of base-flow or rejected recharge. Such surveys would also address the question of water quality, to avoid problems of potential groundwater pollution. Proper hydrogeological survey is the primary requirement to be fulfilled before the scheme is implemented. The number of structures to be taken up will be based on norms for spacing of wells, based on an assessment of the groundwater potential of the aquifers. The subsidy will not be admissible for tubewell/borewell in over-exploited, critical and semi-critical areas in these States. Special care will be taken to ensure safe distance of these tubewells from drinking water sources, so as not to adversely impact the sustainability of these sources. Aquifers affected by arsenic or fluoride contamination will also be avoided. Given the relatively small size of holdings, Water User Groups (WUGs) will be formed around each new tubewell, which would federate into larger Aquifer Management Associations (AMA). The AMA would help facilitate sustainable and equitable ground water management.

5.60. A Steering Committee under the aegis of the Planning Commission and the Ministry of Water Resources, headed by an experienced and renowned professional in the field, will be responsible for preparing the detailed Operational Guidelines and sanctioning projects under the scheme.

#### **INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP)**

5.61. The Eleventh Plan saw several path-breaking initiatives in the watershed sector. The outlays of ₹15,359 crore for IWMP and ₹3,095 crore (at 2006–07 prices) for the Rainfed Areas Development Programme of the Ministry of Agriculture were unprecedented. But even more than the outlays a radically new approach was proposed for implementation of watershed programmes in the Eleventh Plan.

5.62. The Technical Committee on Watershed Programmes in India (Parthasarathy Committee) set

up by the Ministry of Rural Development submitted its report in January 2006. Drawing upon the lessons of the last two decades, the Parthasarathy Committee proposed key reforms in the watershed programme. These include a dedicated full-time implementation structure run by professionals, especially at the district level and below; a 3-phase programme, which includes an initial preparatory phase of two years focused on building local capacities and institutions; central emphasis on capacity building, involving the best available expertise from the voluntary sector; much greater emphasis on monitoring, evaluation, learning and social audit; building a livelihoods perspective into the programme; enhancing the per hectare norm to ₹12,000 from the prevailing ₹6,000; watershed works to be carried out on clusters of micro-watersheds from 4,000 to 10,000 ha rather than the earlier 500 ha micro-watershed.

5.63. The National Rainfed Areas Authority (NRAA) was set up in November 2006. The NRAA, in coordination with the Planning Commission, issued a new set of Common Guidelines for Watershed Development Projects in February 2008, which are applicable to all watershed development projects in all Departments/Ministries of the government. The Desert Development Programme (DDP), Drought Prone Areas Programme (DPAP) and Integrated Wastelands Development Programme (IWDP) were merged into a single Integrated Watershed Management Programme (IWMP).

5.64. However, a major part of the Eleventh Plan was occupied in completion of a large number of ongoing projects under DDP, DPAP and IWDP, although no new projects were sanctioned under these programmes. Out of 45,062, 41,812 projects were either closed or completed by the end of the Eleventh Plan. The remaining older projects are to be completed by the end of 2012–13 (refer Table 5.2).

5.65. Sanctioning of new IWMP projects commenced towards the latter half of 2009–10 and an area of 15.13 million hectare has been sanctioned across 23 States in the country as given in Table 5.2. Overall, however, against an approved outlay of

**TABLE 5.2**  
**Physical and Financial Progress in Watershed Projects of DOLR**

| Year    | Area to be Taken Up for Development (mha) |             | Finances (₹ in Crore) |             |
|---------|---|-------------|-----------------------|-------------|
|         | Target                                    | Achievement | Target                | Achievement |
| 2007-08 |   | –           | 11,14.50              | 1,164.54    |
| 2008-09 |   | –           | 15,45.00              | 1,594.40    |
| 2009-10 | 5.41                                      | 6.31        | 17,62.98              | 1,762.65    |
| 2010-11 | 8.5                                       | 8.82        | 24,58.00              | 2,456.73    |
| 2011-12 | 8.74                                      | –           | 25,49.20              | –           |
| Total   | 22.65                                     | 15.13       | 94,29.68              | 6,978.32    |
| In %    | 100                                       | 67          | 100                   | 74          |

₹15,359 crore in the Eleventh Plan, the actual expenditure was only ₹9,430 crore.

5.66. The Ministry of Rural Development constituted a Committee under the Chairmanship of Dr. Mihir Shah, Member Planning Commission to revisit the Common Guidelines for Watershed Development Projects to provide necessary flexibility within the Guidelines and to ensure momentum to IWMP, even while strengthening its innovative features. The key features of the new Guidelines proposed by the Mihir Shah Committee to be applied to watershed projects wef 1st of April 2013 may be summarised as follows:

- **Duration:** In order to provide greater momentum to the programme and avoid thin spreading of resources, it has been decided to make the IWMP a five-year programme. The division into three phases will continue.
- **Professionalisation:** One of the key deficiencies of the programme was found to be the shortage of funds to deploy high-quality professional human resources for both social and technical aspects. Hence a special allocation of 10 per cent of the total project cost has been proposed for deployment of professional human resources.
- **Capacity Building:** A new national strategy for capacity building has been unveiled, since this was a key requirement of the programme that needed much greater direction and momentum.
- **Institution Building:** This crucial element required to ensure sustainability of benefits under the programme continues to be neglected. Hence, a special provision has been made for this activity and guidelines issued to facilitate the same.
- **Role of Civil Society:** All reviews of the watershed programme show that the best work has been done by civil society organisations. The new Guidelines seek to provide further scope and facilitation for civil society participation in the programme.
- **Ridge to Valley Approach:** A watershed programme must follow the ridge-to-valley principle since the ridge is the catchment of streams and water bodies in the lower reaches. If we do not treat these catchments, the capacities of dams in the valley are likely to be impaired. However, it is also to be recognised that this is a participatory programme that needs buy-in from the community. Hence, some work may initially be done in the lower reaches nearer the village settlements so that the people can understand the benefits of the programme and feel a sense of ownership over it. However, it must be ensured that the ridges/catchments of each water body are fully treated soon thereafter.
- **Size of Watershed:** Experience has shown that both from the point of view of economies of scale and proper planning, the ideal size of a watershed project should be between 3,000 and 7,000 hectares. Wherever possible, additional watersheds in contiguous areas may be taken up so as to form larger clusters. However, smaller size projects may be sanctioned in the hilly/difficult terrain areas.
- **Smoother Fund Release Procedures:** To overcome avoidable delays in the progress of work, a new set of expeditious fund release procedures are outlined in these Guidelines.
- **Setting Up a Central Level Nodal Agency (CLNA):** Many States have expressed the need for more intensive support from the Centre. A strong professionally managed CLNA is now being set up with major facilitating responsibilities elaborated in these Guidelines. The role of the NRAA is also being suitably redefined in line with the recommendations of the Working Group for the Twelfth Five Year Plan so that the synergy and

complementarity between CLNA and NRAA can provide requisite support to the watershed programme.

- **Convergence:** Based on the experience of several States, a new framework is proposed for convergence of IWMP with allied programmes such as MGNREGA, NRLM, RKVY and so on.
- **Work on Forest Land:** A major concern emerging especially in tribal areas has been the procedural complexities of work in ridge areas that fall within forest lands. These Guidelines proffer a framework within which this work can be facilitated.
- **Focus on Physical Outcomes and Monitorable Indicators:** These Guidelines provide a clear list of monitorable indicators and green metrics that will be tracked on a regular basis to ensure that the massive outlays are converted into enduring outcomes on the ground.

#### REPAIR, RENOVATION AND RESTORATION (RRR) OF WATER BODIES

5.67. There is a rich historical tradition of local water harvesting in India from the ahar-pyne system in Bihar, the tankas of Rajasthan, the Himalayan dharas, the talabs in Bundelkhand to the eries of Tamil Nadu. According to the fourth Minor Irrigation Census (2006–07), there are 5.56 lakh water bodies in the country, out of which 3.02 lakh are publicly owned. Tragically, many of these water bodies have been languishing in a state of disrepair and disuse.

5.68. A scheme for the repair, renovation and restoration of these water bodies was launched in 2005. With the aim of covering water bodies that are larger than those covered under schemes such as IWMP and MGNREGA but smaller than those created under medium and major irrigation projects, the Twelfth Plan proposes a major overhaul of this scheme based on the lessons learnt so far as also drawing upon exemplary work done in some parts of the county by civil society organisations such as the DHAN Foundation in Tamil Nadu.

5.69. The major change is to place greater emphasis on not merely the physical repair and desilting of the water body itself but to address the two major challenges that limit their potential benefits to users:

- restoring the health of their catchment areas that would reduce the rate of siltation of the water bodies and prolong their life and
- developing the command areas that are served by these water bodies

5.70. To realise its full potential, the RRR scheme must combine work that is generally done in separate silos of watershed treatment and command area development. It needs also to absorb the central lesson of both these schemes, that it is not merely engineering but institution-building that must equally take centre-stage. This would enable stakeholders to fully participate in the planning and implementation of the scheme and feel a full sense of ownership over the work done and assets created/restored. Without such participation and ownership, the outcomes will be necessarily short-lived and unsustainable.

5.71. The objective must be to converge all RRR projects with the IWMP in such a way that the treatment of the catchment of the water bodies to be restored occurs *paripassu* with, if not prior to, the repair and renovation of the water body itself. This calls for a well-defined 3-tier structure of nested institutions:

1. Water Users' Association (WUA) at the Gram Panchayat Level, which would plan and participate in the implementation of renovation, pisciculture, tree planting and command area development works, as also maintenance and management, including water distribution and conflict-resolution across uses and users. The WUA would also earn revenues by charging for its services from its members and build up a corpus for maintaining and managing the water bodies over time.
2. Cascade Association (CA), wherever water bodies within a milli-watershed are interlinked in a cascade through a network of channels. The CAs will be responsible for renovation, cleaning and excavation of feeder channels and repairs to diversion weirs/regulators on feeder channels. They will also help resolve conflicts across WUAs within the cascade on water sharing and maintenance responsibilities.

3. WUA Federations at the Block level, which will help mobilise funds for rehabilitation of water bodies from various sources, organise training programmes for WUAs, monitor O&M of rehabilitated systems as also the performance of WUAs and CAs.

5.72. During the Twelfth Plan, RRR will cover all water bodies with ayacuts of 20 ha to 2000 ha. A total of ₹5,000 crores is being allocated for the scheme during the Twelfth Plan period. For districts with Gross Irrigated Area less than or equal to 40 per cent of the Gross Sown Area or blocks with SC + ST per cent  $\geq$  30 per cent, 90 per cent Central assistance will be provided. For all other areas, Central assistance will be 50 per cent. The remaining part is to be mobilised by States from their own resources or through other schemes of the GoI (such as IWMP, MGNREGA, National Lake Conservation Plan, National Wetland Conservation Plan, JNNURM) or through external assistance or through loans from other agencies. Each RRR project will mandatorily include a 10 per cent contribution from stakeholders. Each project will be eligible for assistance of ₹70,000–1,40,000 per ha.

5.73. The typical cost composition of an RRR project will be as follows:

- Physical Works: 80 per cent
- Social Mobilisation and Institution Building: 8 per cent
- Capacity Building: 7 per cent
- Sustainable Livelihoods: 3 per cent
- Monitoring and Evaluation: 1 per cent
- DPR Preparation: 1 per cent

5.74. A Steering Committee under the aegis of the Planning Commission and the Ministry of Water Resources, headed by an experienced and renowned professional in the field, will be responsible for preparing the detailed Operational Guidelines and sanctioning projects under the RRR scheme.

## URBAN WATER AND WASTE MANAGEMENT

5.75. Public health implications of unclean water are enormous and unacceptable. It is unacceptable that diarrhoea and other water borne diseases are one of

the most common causes of death among children under age five. The Twelfth Plan will focus on the need to invest in water and waste management in human settlements based on a strategy that is both affordable and sustainable.

5.76. The growth of cities and industries is inevitable and this growth will have massive implications on the use of water and discharge of waste. In the industrialised world, water use is primarily in the industrial and urban sectors and the demand from these sectors is also bound to grow in India. This necessitates a 're-allocation' of water from agriculture to industrial/urban use. Unless this is managed in an equitable manner, it is likely to lead to conflict with traditional users in rural areas, especially farmers. Such tensions are already in evidence in certain parts of the country. Indian cities and industries will have to reinvent their water trajectory to both secure the water they need and do so in a way that minimises the scope for conflict. Indian cities and industries need to find ways to grow with minimal water and minimal waste.

5.77. Effective policy intervention requires data on the usage of water. The present system of estimating demand and supply of water in cities is rudimentary and leads to poor accounting and poorer planning. Indian cities compute demand by simply multiplying the population (as known) by an estimate of water demand per capita (as understood). This leads to huge variations between cities in terms of how much water needs to be supplied. The guidelines provided by the Central Public Health and Environmental Engineering Organisation (CPHEEO) are used at times by city planners, but these often fail to provide clarity about how much water is needed.<sup>24</sup>

## Management and Equitable Supply of Water

5.78. As important as the quantum of water to be supplied, is the problem of its management and equitable supply to all. In most cities, water supply is sourced from long distances and the length of the pipeline determines the costs, including costs of pumping. In the current water supply system, there are enormous losses in the distribution system because of leakages and bad management.

But equally, there are huge challenges, for water is divided very unequally within cities. As per the NSS 65th round, only 47 per cent urban households have individual water connections.

5.79. Currently, it is estimated that as much as 40–50 per cent of the water is ‘lost’ in the distribution system. Even this is a guesstimate, as most cities do not have real accounts for the water that is actually supplied to consumers. Nagpur has prepared a water-loss balance sheet. According to this calculation, of the 765 mld the city sources from the Pench forest and tiger reserve—some 40 km away—it finally collects money for a mere 200 mld or 32 per cent of what is sourced. The revenue loss because of this leakage wipes out its entire budget. Please refer to Table 5.3.

5.80. The cost of delivering water is generally not computed or even understood when cities map out the current and future water scenario. City development plans submitted to JNNURM for funding typically emphasise the need to augment supply, without estimating what it will cost, in physical and financial terms. Data suggests that most cities spend anywhere between 30 and 50 per cent of their water supply accounts for electricity to pump water. As the distance increases, the cost of building and then maintaining the water pipeline and its distribution network increases. And if the network is not maintained then water losses also increase. The end result is that the government finds it impossible

**TABLE 5.3**  
**Nagpur’s Water Highway: Losing as It Travels**

| Nagpur  | Losses  | Balance |
|---|---------|---------|
| Journey begins: water is sourced                    | –       | 765 mld |
| Losses in canal                                     | 140 mld | 625 mld |
| Measurement losses in raw water purchase            | 125 mld | 500 mld |
| Treatment   | 20 mld  | 480 mld |
| Distribution/commercial losses in theft/metre error | 235 mld | 245 mld |
| Collection losses                                   | 45 mld  | 200 mld |

*Source:* S.S. Hastak, 24×7 Water supply project of Nagpur, NESL, presentation made to Ministry of Urban Development, New Delhi, April, mimeo.

to subsidise the supply of water to all and, therefore, does not deliver water as needed. The poor are typically the worst-affected as they have to spend a great deal of time and money to obtain water since they do not have house connections.

### Groundwater: Missing Link in City Water Accounts

5.81. City water agencies only provide estimates of the groundwater that they ‘officially’ source and ‘officially’ supply. They have no records of the amount of groundwater, which is privately extracted in the city, through private wells or supplied through tankers. The Central Ground Water Board’s network of observation wells is marginal in cities. The state groundwater board’s monitoring data, if available, is not factored into the city water agencies own assessment of water supply and usage in the city. It is clear that parts of the city that remain un-served by official water supply will depend increasingly on groundwater. Cities should, therefore, plan simultaneously for strategies that work to recharge aquifers. Without an assessment of groundwater usage, a city cannot estimate its wastewater discharge accurately, which then leads to flawed planning in terms of sewage and results in pollution.

5.82. The lack of recognition of the existing role of groundwater in city water supply leads cities to discount the need to provide for recharge and the role of local water bodies in this respect. These water bodies and their catchment are often encroached, reducing their supply potential. The essential role of water bodies as sources of local water supply and even potential spaces for sewage water treatment needs urgent consideration.

### The Water–Waste Connection

5.83. Even as cities worry about water, they need to focus on the waste this water will generate. Sewage invariably goes into streams, ponds, lakes and rivers of the town, polluting the waterworks so that health is compromised. Alternatively, it goes into the ground, contaminating the same water, which will be used by people for drinking. It is no surprise then that surveys of groundwater are finding higher and higher levels of microbiological contamination—a sign of

sewage contamination. This compounds the deadly and costly spiral. As surface water or groundwater gets contaminated, the city has no option but to hunt for newer sources of its supply. Its search becomes more extensive and as the distance increases, the cost of pumping and supply increases.

**5.84.** We have no official accounts for the excreta we generate or the excreta we treat or do not treat. The fact is that we have no way of really estimating the load of sewage in our cities, because of the different ways in which people source water and the different ways in which people dispose sewage. Currently, we measure sewage in the most rudimentary of ways: we assume that 80 per cent of the water officially supplied by municipalities is returned as sewage.

**5.85.** The imperative is to provide sanitation to all and to ensure that the facility is hygienic and does not add to pollution. Currently, people living in cities greatly vary as to their sanitation status. At the bottom are those with no access to sanitation facilities and at the top are those connected to a flush toilet, which in turn is connected to the official underground sewage network. The 2001 Census found 74 per cent of urban India had access to sanitation and 46 per cent urban Indians had water closets. But it did not specify whether these flush toilets were connected to septic tanks or underground networks or open drains. The 2011 Census has corrected this anomaly as its data sheet differentiates between toilets and disposal systems. Census 2011 shows that only 32.7 per cent urban Indians are connected to a piped sewer system and 12.6 per cent—roughly 50 million urban Indians—still defecate in the open. The challenge is enormous and needs urgent intervention, which provides both sanitation facility and disposal. Please refer to Table 5.4.

**5.86.** Large parts of the modern cities remain unconnected to the sewage system as they live in unauthorised or illegal areas or slums, where the state services do not reach. In this situation, it is critical, we invest in sewage systems, but it is equally and even more critical that we invest in building affordable and scalable sewage networks, which requires a fresh look at the current technology for sewage and its treatment. Please refer to Box 5.3.

**TABLE 5.4**  
**Sanitation Facilities in Urban India**

| No.      | Facility   | %            |
|----------|--|--------------|
| <b>1</b> | <b>Flush/pour toilet latrine of which connected to</b> | <b>72.6</b>  |
| A        | Piped sewer system                                     | 32.7         |
| B        | Septic system  | 38.2         |
| C        | Other system   | 1.7          |
| <b>2</b> | <b>Pit latrine of which</b>                            | <b>8.3</b>   |
| A        | With slab/ventilated improved pit                      | 6.4          |
| B        | Without slab/open pit                                  | 0.7          |
| C        | Night soil disposed into open drain                    | 1.2          |
| <b>3</b> | <b>Service latrine of which</b>                        | <b>0.5</b>   |
| A        | Night soil removed by human                            | 0.3          |
| B        | Night soil serviced by animals                         | 0.2          |
| <b>4</b> | <b>No latrine within premises of which</b>             | <b>18.6</b>  |
| A        | Public latrine   | 6.0          |
| B        | Open   | 12.6         |
|          | <b>Total</b>   | <b>100.0</b> |

*Source:* Census of India 2011, Houses, Household Amenities and Assets: Latrine Facility, Office of the Registrar General and Census Commissioner, India.

### Waste–Pollution Connection

**5.87.** If sewage systems are not comprehensively spread across the city to collect, convey and intercept waste of all, then pollution will not be under control. Currently, according to estimates of the Central Pollution Control Board, the country has installed capacity to treat only about 30 per cent of the excreta it generates. Please refer to Table 5.5 and Box 5.4.

**TABLE 5.5**  
**Waste Treatment Capacity in Indian Cities**

|                                | Class I<br>(0.1–1 million) | Class II city<br>(50,000–99,999) | Total     |
|--------------------------------|----------------------------|----------------------------------|-----------|
| Wastewater generated (mld)     | 35,558                     | 2,697                            | 38,255    |
| Waste treatment capacity (mld) | 11,554                     | 234                              | 11,788    |
| Missing capacity (mld)         | 24,004                     | 2,463                            | 26,467    |
| <b>Untreated Waste (%)</b>     | <b>68</b>                  | <b>92</b>                        | <b>70</b> |

*Source:* CPCB 2009, Status of Water Supply, Wastewater Generation and Treatment in Class-I cities and Class-II towns of India, Central Pollution Control Board, Delhi.

### **Box 5.3** **Bengaluru: The Best?**

No Indian city is in a position to boast of a complete sewerage system. Most Indian cities have a massive backlog of incomplete sewerage systems or systems in serious need for refurbishment and repair. The most advanced city is Bengaluru with 3,610 km of sewerage lines and 14 sewerage treatment plants. The rough estimation is that the city generates some 800–1,000 mld of sewage and the installed capacity to treat it is roughly equivalent—some 721 mld. It also has high tariff, 100 per cent metered supply, high recovery of its dues, 100 per cent water supply and substantial investment in sewerage infrastructure. However, there is a significant underutilisation of treatment capacity because Bengaluru's sewerage treatment plants only receive some 300 mld of sewage. In other words, less than half the sewage is trapped and half is treated. It is no wonder then that its waterways—rivers and lakes remain polluted and nitrate levels in groundwater are increasing, which is dangerous for health.

*Source:* Report of the Twelfth Plan Working Group on Urban and Industrial Water Supply and Sanitation.

### **Box 5.4** **A 'Wave' of Change in Tiruchirapally**

Tiruchirapally (Trichy) in Tamil Nadu has a population of just over a million—of which 25 per cent live in slums. Until the end of the 1990s the slums of Trichy, with their sanitation and toilet facilities in an appalling state, were no different from the rest of the country. But things began to change about 10 years ago, and Trichy has not looked back since. The city was ranked 6th in the sanitation ranking of Indian cities by the Ministry of Urban Development in 2009–10.

It all started with a major initiative launched by the NGO Gramalaya in 2000, mobilising women in the slums in self-help groups (SHGs) and launching an awareness campaign on sanitation through training and building/renovation of community toilets and child-friendly toilets in the slums, which would be managed by the women of the community on a pay-and-use basis. Sanitation health education teams were set up by the SHGs to propagate the message of sanitation, monitor the behaviour of residents, and supervise the maintenance of the toilets. Each toilet has a tap which supplies 24×7 water. Some have graduated to 'sanitary complexes' with room for bathing and washing. The Trichy City Corporation (TCC) waives the electricity charge for the pumping of water for the first few years of operating the toilets. Afterwards, the tariff for community toilets is levied at the lower domestic rate and not commercial rate. Most of these toilets are connected to the sewerage system or function through a septic tank.

At the community toilets run by SHGs, sanitary health education team members take turns to sit at a table placed outside the toilet complex with tokens to sell as people come to use the toilet. They engage cleaners who clean the complex two to three times a day. I found that the toilets were cleaner than what we may typically find in cinema halls in Delhi.

It is clear from the systems they have put in place to manage and maintain these toilets that these women understand the economics of it all. The collection from user charges is used to pay their electricity bills, the cleaner, the guard who keeps the watch, and expenses of minor repairs. The typical user charge varies from 50 paise to ₹1 per use, while children, the elderly and the physically challenged have free access. The accounts are meticulously-kept and are audited by the TCC.

All teams make a small subscription to come together under Women's Action for Village Empowerment (WAVE) which is a registered society. Monthly meetings of WAVE allow them to discuss their problems and learn from each other in finding solutions. A member of the TCC is also invited to these meetings. They are now extending their sphere to cover solid waste management and better delivery of other public services.

Together, the city corporation, the NGOs and the communities from the slums of Trichy have transformed the sanitation scenario.

*Source:* 'SHE creates a WAVE of change in Trichy', Isher Judge Ahluwalia, *Indian Express*, 27 April 2011.

5.88. Just two cities, Delhi and Mumbai, which generate around 17 per cent of the country's sewage, have nearly 40 per cent of the country's installed capacity. What is worse, some of these plants do not function because of high recurring costs—electricity and chemicals and others because they do not have the sewage to treat. In most cities, only a small (unestimated) proportion of sewage is transported



for treatment. And if the treated sewage transported in official drains is allowed to be mixed with the untreated sewage transported in unofficial and open drains, then the net result is pollution.

5.89. The added problem is that the location of the hardware—the sewage treatment plant—is not designed to dispose off the treated effluent so that it actually cleans the water body. Most cities don't seem to think of this factor when they build their infrastructure for sewage. They build a sewage treatment plant where there is land. The treated sewage is then disposed off, as conveniently as possible, invariably into a drain. But as this drain collects the untreated waste of large numbers of people, the end result is pollution.

### Investment in Water and Sanitation

5.90. The scale of investment needed in this sector is substantial. In the past five years, JNNURM has been an important game-changer in this sector, providing much needed public funding to build and refurbish assets. Under JNNURM the bulk of the projects are for water and sewerage—some 70 per cent of the sanctioned cost of ₹60,000 crore. Please refer to Table 5.6.

5.91. Between 2005 and 2011, roughly ₹42,000 crore worth of water, drainage and sewage projects were sanctioned under these schemes. This needs to be

**TABLE 5.6**  
**Sector-wise allocation of JNNURM Funds**  
**(as on 21.9.2011) 100th CSMC**

| Sector                       | ₹ Crore       | Per Cent of Total Cost Allocated |
|------------------------------|---------------|----------------------------------|
| Water supply projects        | 19,233        | 32.09                            |
| Sewerage projects            | 14,624        | 24.40                            |
| Drainage                     | 8,208         | 13.69                            |
| Preservation of water bodies | 116           | 0.19                             |
| Total water sector           | 42,181        | 70.39                            |
| Other urban sectors          | 17,748        | 29.61                            |
| <b>Total sanctioned</b>      | <b>59,929</b> | <b>100.00</b>                    |

Source: JNNURM 2011, Sector-wise release of funds under submission for urban infrastructure and government, Ministry of Urban Development, 2011.

compared to the ₹3,700 crore sanctioned for the same purpose in the 25 years before and the ₹5,000 crore sanctioned under the river conservation programmes. The High Powered Expert Committee Report on Indian Urban Infrastructure and Services pegs the total capital investment needed for infrastructure in the water, sewerage and storm-water sector at ₹7,54,627 crore over the next 20 years.

5.92. The average cost of a comprehensive water supply scheme under JNNURM is roughly ₹3 crore per mld. The average cost of a sewage project is ₹3.33 crore per mld. However, the cost of building sewage treatment systems and networks under the Union government's revamped Ganga programme averages over ₹5 crore per mld, with small cities like Munger in Bihar getting as much as ₹7 crore per mld. It is clear that the huge backlog of provisioning of water and waste services will require public investment. This investment must be carefully planned to provide affordable services that can then be sustained.

### Reform Agenda for the Twelfth Five Year Plan

5.93. Nothing less than a paradigm shift is required in the Twelfth Plan if we are to move towards sustainable solutions to urban water and waste management. First, we will have to reduce the length of the pipeline to bring water to homes, thus reducing costs, including electricity and pumping costs and 'leakage'. This means giving higher priority to reviving local water bodies and recharging groundwater, so that we can source water from as close as possible. Secondly, we must use less, not more water in our homes, so that we have less to treat and less to dispose off. Thirdly, we must also cut the costs and transportation of sewage—use decentralised networks and use a variety of technologies to treat sewage as locally as possible. Finally, we must begin to learn that we will have to reuse every drop of our sewage. It is even technically possible to turn it into drinking water but at the very least we should plan to recycle and reuse it in our gardens, in our industries or use it (after treatment) to rejuvenate natural water bodies. This would require change of standards so that groundwater pollution boards incentivise the reuse of wastewater for recharge. This water-waste

agenda needs to be incorporated deliberately into city plans.

5.94. Planning for urban water and sanitation must be made into essential pre-conditions for any support to urban projects under JNNURM. This should include:

1. Plan to supply water at affordable costs to all
2. Invest in protection and management of local water systems
3. Reduce water demand and intra-city inequity in water supply and sanitation
4. Invest on sewage first and water supply next
5. Reduce costs on sewage systems so that investment can reach all
6. Reinvent sewage management and treatment systems for sustainability
7. Plan to recycle and reuse every drop of water and waste

5.95. The reform agenda for the Twelfth Plan will have five major thrust areas:

*Agenda 1: Investments in Water Supply Will Focus on Demand Management, Reducing Intra-City Inequity and on Quality of Water Supplied*

5.96. The single biggest charge on municipal water supply today is the distance water needs to travel. The water supply programme of each city must provide for demand management and reduction in costs of supply. This will require cities to plan for local water bodies as well as plan to cut distribution losses through bulk water meters and efficiency drives.

5.97. User charges should plan to cover increasing proportions of O&M costs, while building in equity by providing 'lifeline' amount of water free of charge, with higher tariffs for increasing levels of use.

*Agenda 2: Protection of Water Bodies*

5.98. Each city must consider, as first source of supply its local water bodies. Therefore, cities must only get funds for water projects, when they have accounted for the water supply from local water

bodies and have protected local water bodies and their catchments. This pre-condition will force protection and will build the infrastructure, which will supply locally and then take back sewage—the water's waste connection—also locally. It will cut the length of the pipeline twice over, once to supply and the other to take back the waste.

*Agenda 3: No Water Scheme Will be Sanctioned without a Sewage Component, Which Joins the Dots with Pollution of Rivers and Waterways*

5.99. Investment in sewage must match the investment in water supply. It is also important to note that pollution control is not possible without investment in an extensive sewage system to reach all people and intercept the waste of all for treatment. Cities must plan carefully keeping in mind the backlog of sewage facilities and the need for sewage infrastructure in new growth areas. This planning for 'full coverage and costs' will lead cities to look for unconventional methods of treating waste.

5.100. For instance, cities would then consider treatment of sewage in open drains and treatment using alternative biological methods of wastewater treatment. Biological methods of wastewater treatment introduce contact with bacteria (cells), which feed on the organic materials in the wastewater, thereby reducing its BOD content. Through their metabolism, the organic material is transformed into cellular mass, which is no longer in solution but can be precipitated at the bottom of a settling tank or retained as slime on solid surfaces or vegetation in the system. The water exiting the system is much clearer than the one that entered it. The principle has to be to cut the cost of building the sewage system, cut the length of the sewage network and then to treat the waste as a resource—turn sewage into water for irrigation or use in industry.

5.101. Indian cities have the opportunity to leapfrog into new ways of dealing with excreta, which are affordable and sustainable, simply because they have not yet built the infrastructure.

#### *Agenda 4: Plan Deliberately for Recycling and Reuse of Treated Wastewater*

5.102. Cities must plan for reuse and recycling of waste at the very beginning of their water and waste plan and not as an after-thought. It is also clear that cities must think through the plan for reuse for affordability and sustainability. The diverse options for reuse must be factored in—use in agriculture, for recharge of water bodies, for gardening and for industrial and domestic use. In each case, treatment plan will be different. But in all cases, the treated effluent will improve the hydrological cycle. It will return water and not waste to the environment. While a larger sewage treatment plant affords economies of scale in operation, a plant fitted to size—collecting the waste of a group of houses, an institution or even colonies—may have higher costs of operations but there are substantial savings in the piping and pumping cost.

#### *Agenda 5: Plan on a Regional Scale*

5.103. Drinking Water and Sanitation issues are inter-linked in urban, peri-urban and rural areas and increasingly impact each other as development upscales. Thus, a regional planning approach for provision of drinking water supply and wastewater treatment and disposal is necessary to meet needs of both rural and urban areas and avoid duplication of schemes.

#### **Industrial Water and Waste Management<sup>25</sup>**

5.104. As the economy industrialises, it is extremely important that industry adopts the best international practices to improve water use efficiency. This can be broadly done in two ways:

- reducing the consumption of fresh water through alternative water-efficient technologies or processes in various manufacturing activities; and
- reusing and recycling the waste water from such water intensive activities and making the reclaimed water available for use in the secondary activities within or outside the industry.

5.105. Such an approach is extremely important to reduce the water footprint of Indian industry, both in terms of fresh water used, as also polluted wastewater released untreated into the environment. The urgency of this issue is because water conflicts are

increasingly arising across the length and breadth of India between competing users and uses. And industry, as a relatively new user of water, needs to recognise that economising on the use of water is now an essential ingredient in ensuring sustainability of its operations and may be in its own enlightened self-interest.

5.106. The first step in this direction during the Twelfth Plan period will be to make comprehensive water audits a recurring feature of industrial activity so that we know what is being used by the industrial sector at present and so that changes can be monitored and the most cost-effective basket of water efficiency technologies and processes designed and implemented to reduce water demand and increase industrial value added per unit of water consumed. The water audit will consider both quantity and quality aspects as the need to reduce polluting discharges to the aquatic environment or to sewage systems is often the key driver to water saving. The starting point will be large units in water-intensive industries such as paper and pulp, textiles, food, leather (tanning), metal (surface treatment), chemical/ pharmaceutical, oil/gas and mining.

5.107. The Planning Commission is working with leading representatives of Indian industry, as also the Ministry of Corporate Affairs, to make it mandatory for companies to include every year in their annual report, details of their water footprint for the year. This would include:

- the volume of fresh water (source-wise) used by them in their various production activities (activity-wise)
- the volume of water used by them that was reused or recycled (again activity-wise)
- a commitment with a time-line that the company would reduce its water footprint by a definite amount (to be specified) within a definite period of time (to be specified).

5.108. Simultaneously, the Planning Commission, working with concerned government institutions, would develop benchmarks for specific water use in different industries and would ensure their application in the grant of clearances for industrial projects.

As part of National Water Mission, Ministry of Water Resources has constituted a Committee with Industry Associations to carry out base line studies and to increase water use efficiency through water auditing, water footprints, and so on, including amendment in the Companies Act.

5.109. The second step would be to examine the measures to levy charges for water use and incentives for water conservation. Currently, the Water (Prevention and Control of Pollution) Cess Act 1977 is the only instrument to impose cess on discharge of effluent water from industrial units. This charge is based on the quantum of discharge from the industry and is used to augment the resources of the Central and State Pollution Boards. The charges imposed through the Water Cess are not enough of a disincentive for industries to reduce their water footprint. It is important to examine this Act and other provisions and options to increase the charges imposed on water use and effluents substantially. This is particularly important where industries use groundwater and do not pay municipalities, water utilities or even irrigation departments for water use. The importance of water pricing as an instrument for change is critical and must be actively used to incentivise industry.

5.110. The third step would be to publicly validate the water audit of industries so that this builds experience and confidence on the best practices. This water reduction commitment of each industry will be tracked for compliance and enforcement through environmental regulatory institutions.

5.111. The water audit would also help identify training requirements and the best way of achieving behavioural change within the business. The maximum water saving will be delivered when both behavioural change and hard measures are successfully adopted by the end user.

5.112. In order to more credibly move industry along this path, central and state governments need to set an example by undertaking their own audits of water use in their premises and setting targets for ensuring less water use and changes in technology and behaviour that will reduce waste.

5.113. It is also be very important to develop a forum which would:

- provide information on industry-specific good practices in wise water use;
- undertake to develop expertise in water audits and water use advisory services;
- provide details of 'exemplar' case studies that are relevant to the different industrial sectors operating in India;
- provide a 'gateway' for accessing information about water saving and water efficiency technologies in rain-water harvesting, recycling and reuse, water conserving devices and support to helping behaviour change. Please refer to Box 5.5.

5.114. Once such systems are in place, there is enough experience from across the world to show that significant economies can be effected in water use. Reported water savings range from 15 per cent to 90 per cent of current water use, depending on the industrial sub-sector considered, the individual process investigated or the combination of water saving measures analysed with the most commonly found figures being within the 30–70 per cent range. A study carried out by ICAEN for the Catalonia region in Spain between 1992 and 1997 shows potential water savings for different industrial sectors of 25–50 per cent (see Figure 5.4). The same study stressed that around 35 per cent of cost-saving measures were implemented in areas of management and control, 32 per cent in the process and 18 per cent in the reuse of effluents.

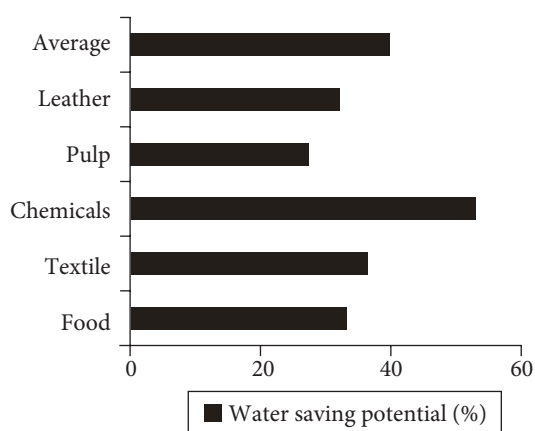


FIGURE 5.4: Water Saving Potential in Industry

### Box 5.5 Water Use Efficiency in UK Industry

In the UK, water companies have a statutory duty to promote the efficient use of water and as a result, water companies (in England and Wales) carry out a range of water efficiency activities with the purpose of promoting water efficiency to their customers. This water efficiency activity has been a duty under the Water Industry Act (WIA91 Section 93a) since 1996. To date targets for water savings have been set by water companies themselves. However, as of 1 April 2010 water companies will be working within a regime of mandatory water efficiency targets set by Ofwat (Office of Water, Regulator) for all water companies to achieve. These targets can be achieved by either targeting domestic or industrial customers, but the targets must be met year on year. The water efficiency targets comprise three key elements:

- An annual target to save an estimated one litre of water per property per day through water efficiency activity, during the period 2010–11 to 2014–15.
- A requirement to provide a minimum level of information to consumers on how to use water more wisely.
- A requirement that each company actively helps to improve the evidence base for water efficiency.

In addition to target setting, the water industry set up and funded an organisation called Waterwise to make the case for large-scale water conservation. Waterwise is a UK NGO focused on decreasing water consumption in the UK and is central authority on water efficiency information and guidance in the UK (<http://www.waterwise.org.uk/>).

Another NGO operating in the UK is Envirowise which offers free and independent support to businesses to help them become more resource efficient and for them to save money. Since 1994, Envirowise has helped UK industry save more than £1 billion by reducing waste early on in their organisation processes. A part of this waste minimisation strategy includes water (<http://envirowise.wrap.org.uk/uk/Topics-and-Issues/Water.html>).

The National Symbiosis Programme is a UK-based organisation which promotes the efficient use of resources in industry and has previously worked in water. The UK Government publish a Water Technology list covering water using devices which contribute to water efficiency. Envirowise publish a range of information on industrial water use, water using devices and water conservation. The Watermark project published water use and water efficiency benchmarks in 2003 for 17 categories of building. Industry Trade Associations such as the Food and Drink industries group provide information and guidance on best practice in water use.

5.115. Possible water savings (average values) for different types of actions are presented in Table 5.7.

5.116. The regulatory system for water usage in industries also needs to be strengthened. Currently, the environmental regulations require industries seeking clearances to provide information about water sources, which in turn is provided by the state government irrigation departments or groundwater boards. This permission for water does not take into account availability, especially in water-stressed regions. The Planning Commission will work with the regulatory institutions to ensure that the system of water assessment is strengthened for enforcement.

### Flood Management

5.117. The Twelfth Plan Working Group on Flood Management estimates that in the period 1953–2010, on an average, an area of 7.208 mha and a population

**TABLE 5.7**  
**Potential Water Saving from Various Measures in Industry**

| Efficiency Measure                   | Percentage of Water Saved (%) |
|--------------------------------------|-------------------------------|
| Closed loop recycling                | 90                            |
| Closed loop recycling with treatment | 60                            |
| Automatic shut-off                   | 15                            |
| Counter current rinsing              | 40                            |
| Spray/jet upgrades                   | 20                            |
| Reuse of wash water                  | 50                            |
| Scrapers                             | 30                            |
| Cleaning in place (CiP)              | 60                            |
| Pressure Reduction                   | Variable                      |
| Cooling tower heat load reduction    | Variable                      |

*Source:* Envirowise (2005): Cost-effective Water Saving Devices and Practices for Industrial Uses, United Kingdom.

of 3.19 million were affected by floods every year. The average annual flood damage to crops, houses and public utilities at constant (2010–11) prices works out to about ₹6,976 crores. This is excluding damage to private investments for which no estimate is available. Expenditure incurred by both the Central and State Governments in various Plans (at 2010–11 prices) is estimated to be about ₹1,26,000 crore. On an average this is an investment of ₹2,100 crores per annum, although allocation has increased in later Plan periods compared to earlier years. The States falling within Brahmaputra-Meghna, Ganga and Indus river basins are the most affected by floods. The current estimate of the flood-prone area in the country is 49.815 mha, which is higher than the assessment made by the Rashtriya Barh Aayog (RBA) in 1980 (40 mha). Overall, 39 districts in India have been identified as chronically flood-prone. Indiscriminate development and encroachment of flood plain areas, improper planning in construction of roads and railways, inadequate and ineffective drainage in urban areas, and so on, have contributed to increase in flood damage.

5.118. Broadly, three kinds of flood management strategies have been adopted:

1. Engineering/structural measures, including construction of reservoirs for impounding monsoon flow and its release after peak flows have passed (attenuation) and providing river embankments/flood walls;
2. Non-structural measures, including flood plain zoning, flood forecasting, flood warning and flood proofing;
3. Catchment area treatment, including watershed management and restoring the health of natural drainages.

5.119. The central focus has been on engineering/structural solutions. Apart from the massive investments in large dams, India has already constructed over 35,000 km of embankments. But these are rapidly reaching their limits. Recent studies show, for example, that the existing storage infrastructure in Peninsular rivers is mostly designed to smooth out the southwest monsoon flows in, say, 9 out of

10 years. There may still be the 1 in 10 year flood, for which, however, there is no economic justification to invest in substantial additional infrastructure. Instead, better weather and flood forecasting is required, along with flood insurance and possibly the designation of flood diversion areas, whereby farmers are asked to temporarily (and against compensation) set aside embanked land to accommodate flood overflow for the Ganges system, out of 250 BCM of potentially utilisable water, about 37 BCM are presently captured, and a total of at most 50 BCM would be captured if all possible dams under consideration were to be built. These would add little in the way of irrigation or flood prevention benefits. Tributaries at risk are already fully embanked, and floods have occurred not because water has flown over the embankments, but because embankments have been repeatedly breached as a result of poor maintenance (e.g., Kosi in Bihar) or inappropriate dam management (for example, Hirakud in Orissa).<sup>26</sup>

5.120. Evidence from floods in the Ghaggar river basin, both in 1993 and 2010, clearly shows the damage caused in Punjab and Haryana by breaches in embankments and unused, poorly designed and maintained canals, as also because settlements have been encouraged on flood plains and drainage lines. In 2008, a breach in an upstream embankment of the Kosi led to the nearly thousand deaths and the displacement of around 3.35 million people.<sup>27</sup> In North Bihar, despite the continued construction of embankments, the flood-prone area has increased 200 per cent since independence, at times because embankments end up obstructing natural drainages and impede the natural building up of river deltas and flood plains.<sup>28</sup>

5.121. In acknowledgement of the limits to further possibilities of building large storages and embankments, some State governments (such as Bihar) have decided to broaden their strategy of tackling floods by placing greater emphasis on rehabilitation of traditional, natural drainage systems, leveraging the funds available under MGNREGA. Since this involves a process of complex social mobilisation and social engineering, civil society organisations will work in close partnership with the State government in this

endeavour. The Twelfth Plan strongly endorses such a paradigm shift in flood management.

5.122. Indeed, an attempt will be made to, as far as practicable, convert adversity into opportunity. Part of the waterlogged area could be used for construction of small multi-purpose farm ponds. The mud of the ponds would be raised on the side as embankments on which crops like banana, papaya, mango, pigeon pea and cashew nut can be grown. The pond water will be used to irrigate the non-waterlogged, upland area. Experiments have shown that in waterlogged areas, cultivation of water chestnut (*Trapa bispinosa*) can be quite profitable. Research and field level trials have identified extra-tall varieties of paddy that can grow fast and can tolerate waterlogging. Waterlogging is often aggravated by the mismanagement of rainwater in the upper catchment. In situ rainwater conservation in the upper catchment and intensification of the use of groundwater through shallow tubewells are possible interventions to mitigate the problem. Through integrated management of land, water and nutrients, agricultural productivity of these uplands could be stabilised and enhanced, which would, in turn, have a positive impact on the waterlogged lowlands.

5.123. In addition, far greater priority will be given to non-structural measures such as the efficient management of flood plains, flood plain zoning, disaster preparedness and response planning, flood forecasting and warning, along with disaster relief, flood fighting including public health measures and flood insurance.

5.124. Many reservoirs were initially constructed without any flood cushion but with development and population growth, habitations have come up very close to the downstream of these reservoirs and operation of such reservoirs needs to be done carefully. The existing flood forecasting network of Central Water Commission (CWC) is not sufficient to cover the entire country adequately. The Twelfth Plan will draw up a concrete plan for extension of CWC's flood forecasting network in consultation with the State Governments and IMD to cover A, B-1, B-2 and C-class Cities located near rivers under the

network of automatic data collection, transmission and flood information dissemination. At present, the CWC provides inflow forecast to 28 reservoirs in the country. In the Twelfth Plan this will be extended to an additional 160 reservoirs, which will cover 80–90 per cent of the total live storage capacity.

5.125. Moreover, a majority of the flood warning systems in India are not timely, primarily due to poor transmission. Delays cause enormous damage to property and lives every year. Models used for flood forecasting and its influence zones are not rigorous enough due to lack of integration of hydrology and the weather forecasting systems. The lead time for flood forecasting can be improved through the use of hydraulic and hydrologic models which are linked to the weather forecasting system, the real time data acquisition system, and the reservoir operation system. It is possible to improve the current forecasting methods by using satellite based information for better estimates of rainfall and snowmelt.

5.126. Adequate flood cushion needs to be provided in all water storage projects, wherever feasible, to facilitate better flood management. In highly flood prone areas, flood moderation will be given overriding consideration in reservoir regulation policy, even at the cost of sacrificing some irrigation or power benefits. As a policy minimum, flood cushion of 10 per cent of live storage will be provided in all new dams and if affordable with respect to other purposes, the flood cushion could be considered up to 20 per cent. A portion of the capital cost of the reservoir allocated to flood control could be shared by all beneficiary States.

5.127. Given the large network embankments that already exist, great emphasis will be placed on their proper upkeep and surveillance during the monsoon season, centrally involving primary stakeholders in this process.

5.128. The Ministry of Water Resources has prepared a Model Bill on Flood Plain Zoning. State Governments have reported difficulties in enactment of necessary legislation and enforcement of laws in this regard due to constraints of evacuation of people

who are already occupying the flood plains and their settlement elsewhere due to constraints of land. However, demarcation of the flood plain zones by the concerned States in accordance with criteria suggested by CWC in the Model Flood Plain Zoning Bill and zone-specific strategies about the use of flood plains (including schemes of incentives and disincentives) need to be implemented. The States should also bring out standard norms for types of buildings which can be constructed in different zones of flood plains so that required water way is available for passage of the flood discharge.

**5.129.** A system of scientifically designed raised platforms, community housing with livestock units, health units where people can be accommodated during the four months of floods will be adopted. The National Disaster Management Agency (NDMA) will make adequate provision for development of model multipurpose flood shelters under the National Flood Risk Mitigation Project or other related programmes.

**5.130.** The Working Group has suggested a number of steps for strengthening the institutions dealing with flood management. Integrated water resources management, including integrated flood management, demands setting up of River Basin Authorities with requisite managerial skills and appropriate delegation of powers. The CWC, GFCC and Brahmaputra Board under the Ministry of Water Resources are required to play vital roles in the preparation of master plans for specific river basins. The strengthening of CWC is required in view of the proposed expansion of its hydrological and flood data collection network, flood data transmission and management of floods. The National Water Academy (NWA) located at Pune is presently involved in providing training to the engineers/officers of the Central/State Governments. During the Twelfth Plan, the NWA will be developed as a Centre of Excellence for international training programmes on matters pertaining to flood mitigation so that up-to-date globally available know-how could be shared under such training programmes. The NWA, Pune will also be suitably strengthened to meet the requirement of the NDMA for conducting

trainings on disaster risk reduction programmes. Project-specific planning and implementation is to be ensured by the State Governments. The present structure of the State flood control departments needs to be revamped so that they can discharge their role as prime flood managers in the State. The specific needs of human resources and their skill development need to be addressed.

**5.131.** Digital Elevation Models (DEM) along major river systems including area falling in the flood affected zone in the range of 0.5–1 m will be prepared for all river basins. Use of NRSC's flood hazard zonation maps, close contour information, river configuration & bank erosion studies, geo-spatial tools and flood mapping and flood damage assessment will be encouraged. The Disaster Management Support Programme will be expanded to include more river basins and the NDMA will provide necessary support to NRSC in this regard. Basin-wise flood management models including ALTM technology based Digital Elevation Models, Inundation Forecast Models, Bathymetric Surveys and Cubature Study Models will be undertaken jointly by NRSC, CWC and concerned States. Development of integrated mathematical models will be undertaken jointly by IMD and CWC for flood/runoff forecasting using weather parameters, rainfall observed and rainfall forecast.

### **Water Database Development and Management**

**5.132.** Keeping these challenges in mind, as part of the preparation for the Twelfth Plan, the Planning Commission decided to constitute, for the first time, a Working Group headed by Prof. A. Vaidyanathan (former Member, Planning Commission) to carry out a comprehensive and critical review of the present system for collection and dissemination of water related data, identify deficiencies in the data being generated and used for planning and policy, and to suggest a programme of action to overcome them. The Working Group highlights serious gaps and inadequacies in the scope, coverage and quality of data currently used for assessing India's potential and utilisable water resources from different sources,



their actual utilisation for, and impact on, various end uses:

- Collection of data is fragmented between different agencies. The agencies responsible for collection of the ‘physical data’ (to use precipitation and stream gauging as examples) are administered by differing Ministries, while the user data come under such diverse classifications as public health and sanitation, irrigation and urban planning. There is a consequential absence of a coherent and internally consistent conceptual framework and protocols for data collection and validation.
- The fact that ‘water’ is a ‘State’ subject leaves the Central Government agencies that are responsible for the national data with little choice but to rely on the State agencies for such data. Agencies of the Central Government—India Meteorological Department (IMD), Central Water Commission (CWC), (CGWB), Central Pollution Control Board (CPCB)—do collect a considerable amount of data, but most of the information at the regional and project levels is collected by the State agencies. As a result, much of the data are not readily accessible even within and between Government agencies concerned with water resources development, leave aside in the public domain.
- The Hydrology Project that has now completed its first phase has expanded the physical infrastructure and equipped it with improved measuring and recording devices. The idea was to collate them into a national data network (called HIS) to facilitate easier access to users. But accomplishments have fallen far short of expectations because of the reluctance of the States to send all the information they collect fully and promptly to the national data pool.

5.133. The Working Group spells out a concrete programme for phased action to improve physical facilities, methodologies and mechanisms to generate more comprehensive, detailed and reliable data in each of these respects and outlines changes needed in institutional arrangements for collection validation and dissemination of data and for facilitating intensive analysis through research. These recommendations are summarised in Annexure 5.8. The

Working Group’s recommendations will begin to get implemented during the Twelfth Plan period.

5.134. Data improvement is a national effort of the Central and the State government agencies that requires active involvement of specialised government agencies and scholars in universities, research institutions and non-governmental organisations in a way that fragmentation of focus and effort is minimised. This calls for a common agreed framework of concepts. It is, therefore, suggested by the Working Group that the Central Government take the lead in creating appropriate institutional arrangements to ensure independent and professional conduct of the surveys, providing financial and technical support to the States and ensuring that all agencies follow prescribed protocols and transmit the data to the central pool. For this purpose the Working Group suggests the constitution of a Steering Committee chaired by Member (Water Resources), Planning Commission, with knowledgeable and reputed experts on water related issues from relevant disciplines within and outside government to work out

- the strategy, modalities and funding for building a comprehensive, technical and scientific data base on potential and utilisable water from different sources;
- details of the scope, content, methodology and mechanisms of the surveys to assess performance and impact of programmes through sample surveys of users and specific projects; and
- the design of an integrated and digitised National Water Resources Information System by suitably expanding, reorganising and equipping the existing WRIS in the CWC.

5.135. The bulk of the expenditure on the programmes for data improvement in the Twelfth Plan will be for expanding and upgrading facilities for assessment of resource potential and utilisation. Sample surveys to assess actual performance and impact of schemes at the ground level will be a small but critical component. Altogether this investment in improving information on knowledge will be a small fraction of total outlays on water resource

development but the returns in terms of improving efficiency and sustainability of water use will be huge.

## NEW INSTITUTIONAL FRAMEWORK FOR WATER

### National Water Commission

5.136. During the Twelfth Plan, there is also a proposal to set up a National Water Commission (NWC) to monitor compliance with conditionalities of investment and environment clearances given to irrigation projects. At present, there is no appropriate body that can provide rigorous, credible and timely feedback to sanctioning authorities about compliance with the conditionalities they impose at the time of sanction. A multi-disciplinary, professionally capable and independent NWC to oversee water reform would have credibility with both Centre and States and would function on the lines of what has been attempted, for example, in Australia and become a guide for further water resource development in India. A decision on the NWC will be taken after thoroughgoing consultations with the States by the Union Ministry of Water Resources.

### Water Regulatory Authorities in Each State

5.137. We need to evolve an institutional framework backed by a legal regime that facilitates setting up of regulatory bodies that would enable resolution of water conflicts. To protect the right to drinking water for all, there is no alternative to entitlements and appropriate pricing of water. This demands a transparent and participatory process of determination of entitlements and prices. Again to ensure sustainability and meet environmental needs, a regulatory authority is a must in each State.

5.138. Since the water sector is a natural monopoly, international experience clearly indicates that it is regulators who provide the cutting-edge that is otherwise missing in a non-competitive environment. Regulators have contributed to major improvements in water-use efficiency, water quality and provision of environmental services. Thus, for example, while Scottish Water is a state monopoly, the legal and regulatory framework within which it functions, ensures that efficiencies are achieved, quality

standards adhered to and expectations of consumers satisfied. And given the impact that their operations can have on public health and the environment, the water and wastewater industry have to be highly regulated. Being undertakers of a natural monopoly, there is a need to protect the customer's interests.

5.139. The water quality, environment and health standards set by the regulator have a bearing on tariffs. The final call on tariffs would, of course, be a political one but the regulators have a crucial role in advising governments on the objective basis for tariff determination (somewhat akin to what the CACP does for agriculture pricing).

5.140. The basic requirements of drinking water and of the environment need to be determined and ensured in a transparent manner and kept as a 'Reserve' (as it is called, for example, in South Africa). In South Africa, the Reserve constitutes an attempt to quantify an amount of minimum flow in the country's rivers and impoundments reserved for the maintenance of basic ecological functions (such as habitat for fish and plants) and to ensure that the South African population is guaranteed a minimum of 25 litres per capita per day for domestic purposes. Thus categories of use that are perhaps not sufficiently defended vocally are nevertheless declared to be non-negotiable in the public interest. The Reserve is an attempt to decide what level of loss is acceptable rather than an attempt to determine what 'the environment' needs. The determination of this level requires an independent regulator who can transparently, accountably, and in a participatory manner conduct the processes and procedures required for this determination.

5.141. As part of the work leading up to the Twelfth Plan, a Sub-Group under Prof. Subodh Wagle of the Tata Institute of Social Sciences (as part of the Working Group on Water Governance) has drafted a Model Bill for State Water Regulatory System.<sup>29</sup> This draft is based on a thorough study of latest international thinking on regulation as also the experience of the Maharashtra Water Resources Regulatory Authority (MWRRA). The draft bill tries to resolve the conflicting demands of autonomy

and accountability brought into sharp relief by the Maharashtra experience. It does so by proposing a regulatory system with interrelated but separate institutions that handle distinct governance functions. The bill proposes a separation of the authority to make 'political' or 'normative' decisions and the authority to make 'technical' or 'predominantly non-normative' decisions. Thus, the State Water Regulatory and Development Council (SC) is expected to ensure accountability by providing the 'normative' or 'political' framework for the techno-economic regulatory decisions of the State Independent Water Expert Authority (SIWEA). The SIWEA will, in turn, be accountable to technical experts through the mechanism of regular peer reviews.

5.142. The SIWEA will be a multi-disciplinary body of independent professionals from civil engineering, ecology/environmental science, economics, accounts and auditing, sociology/political science and geology/hydrogeology. The SIWEA will prepare the Action Plan for Preparation of Regulations, CBRs and Criteria (APPRC), discharge specific regulatory functions, issue orders to the corresponding agencies, to enforce compliance with the guidelines, principles, rules, regulations, and criteria in a transparent, accountable, and participatory manner. The SIWEA will also be empowered to penalise defaulting agencies and issue orders on petitions, applications or proposals from governing agencies, stakeholders and citizens.

5.143. Chaired by the State Minister for Water Resources, the SC will comprise elected representatives from the State Legislature, PRI representatives from districts, blocks, GPs and ULBs as also stakeholder groups, including farmers, industry and civil society organisations. The SC will deliberate on the drafts of the APPRC prepared by SIWEA and provide considered comments and suggestions, which will be incorporated by SIWEA and re-presented to SC for final approval. The SC will undertake periodic review of orders and decisions of the SIWEA through deliberations in the general body of the SC in order to assess the compliance of the decisions

and orders of SIWEA to the normative framework provided by the SC.

5.144. The areas of regulation to be covered include:

- *Water Access, Extraction and Use*, including criteria for allotment of entitlements, priority of water use, norms for maximum water use for various activities, norms for effluent treatment, criteria for limits of extraction from unregulated, local water sources;
- *Execution of Projects and Programmes*, including techno-economic, socio-cultural, environmental and ecological aspects of project and programme design, including adherence to the integrated state water plan;
- *Water Service Provisioning*, including quantity and quality of water, also with special reference to the disadvantaged and ensuring good financial health of the water provisioning system;
- *Allocation of Financial and other Resources*, including norms and standards for reducing losses and theft, increasing tariff for non-poor, criteria for equitable distribution of resources including priority for drought-prone and backward regions, criteria for prioritising competing demands and so on;
- *Environmental Sustainability*;
- *Disaster Management*;
- *Private Sector Participation*, including criteria determining the details of tariff recovery in case of private water provisioning, norms for project-level purchases related to equipment, establishment, and other aspects of project management, specification of sectoral responsibilities to be handed over to private parties and so on;
- *Preparation of Integrated State Water Plan (ISWP)*;
- *Addressing Climate Change Issues*.

5.145. The Model Bill incorporates the principle of subsidiarity by laying out water governance at four levels: (i) State (ii) River Basin (iii) Sub-Basin and (iv) Local. At all these four levels of governance, institutions with different structure, compositions, functions, authorities, and roles are provided for in the bill. The apprehension that such decentralisation might prove dysfunctional or sub-optimal, especially

because of the lack of capabilities and understanding at lower levels of the institutional ladder is sought to be taken care of through the concept of phased institutional transition by providing step-wise, gate-protected processes for gradual introduction of the decentralised institutional structure.

5.146. The Bill also builds in enough flexibility in its design to take care of differences across States through a modular structure, from which modules based on the state-specific situation, requirements, priorities of water sector governance, and other factors could be selected by the state government while preparing and enacting their final draft of the Bill.

### NEW GROUNDWATER LAW<sup>30</sup>

5.147. Since sustainable and equitable management of groundwater based on aquifer management is going to occupy centre-stage, this requires a new legal framework to support efforts in this direction.

### Limitations of the Present Legal Framework for Groundwater

5.148. As early as the 1970s, the GoI put forward a model bill to regulate groundwater use for adoption by the States. This model bill has been revised several times (1992, 1996 and 2005) but the basic scheme adopted in the 1970s has been retained to date. The Model Bill to Regulate and Control the Development and Management of Ground Water, 2005 only introduces a limited regulatory framework to address groundwater depletion and pollution and amounts to little more than 'grandfathering' existing uses.

5.149. Rules concerning access to and use of groundwater in India have been progressively developed through judicial decisions. What is remarkable is that some of the most important legal principles governing groundwater even today were laid down in British common law as early as the middle of the nineteenth century and have not been updated since. These legal principles are:

- *Landowners given full control of groundwater:* Existing rules of access to and control over groundwater are still based on the common law doctrine of absolute dominion. This gives the

landowner the right to take substantially as much groundwater as she or he desires from wells dug on own land. Landowners do not own groundwater but enjoy access as part and parcel of their ownership rights to the land above:

The person who owns the surface may dig therein, and apply all that is there found to his own purposes at his free will and pleasure; and that if, in the exercise of such right, he intercepts or drains off the water collected from underground springs in his neighbour's well, this inconvenience to his neighbour falls within the description of *damnum absque injuria* [damage without injury], which cannot become the ground of an action.<sup>31</sup>

- *Defined vs Undefined channels:* 'Groundwater that percolates through underground strata, which has no certain course, no defined limits, but which oozes through the soil in every direction in which the rain penetrates is not subject to the same rules as flowing water in streams or rivers.'<sup>32</sup> On the other hand, where groundwater was found to flow in defined channels, case law says that rules applicable to surface water would also apply. This has been interpreted<sup>33</sup> to mean that the right of the landowner would then be limited to use and consumption for household and drinking purpose, for watering their cattle and even for irrigating their land or for purposes of manufacture provided that
  - the use is reasonable;
  - it is required for their purposes as owners of the land and
  - it does not destroy or render useless or materially diminish or affect the application of the water by riparian owners below the stream in the exercise either of their natural right or right of easement, if any.

5.150. A lot of legal hermeneutics was devoted over the years to clearly spelling out the distinction between defined and undefined channels of groundwater.<sup>34</sup> The difficulty, of course, is that this differentiation is completely meaningless in scientific

hydrogeological terms since groundwater occurs in aquifers, which are not necessarily in the form of 'channels' like streams and rivers are. Aquifers are rocks or rock material possessing the capacity to store water in different openings and transmit water from one point in the aquifer to another, due to the interconnectedness between these openings. Hence, the question of water flowing through streams generally does not arise (except in case of carbonate rocks which have large openings on account of the phenomenon called *karst*).

5.151. Natural groundwater flow (under static or non-pumping condition), follows certain directions defined by groundwater contours (flow lines representing direction or movement of groundwater but not necessarily in the form of channels, defined or undefined). This also means that water flowing underneath any parcel of land may or may not be generated as recharge on that specific parcel. As a matter of fact, recharge areas for most aquifers are only a part of the land that overlies the entire aquifer. Hence, in many cases, water flowing underneath any parcel of land will have infiltrated the land and recharged the aquifer from another parcel, often lying at a distance. When many users simultaneously pump groundwater, complex interference results between different foci of pumping, which is a common feature in many parts of India, where wells are located quite close to one another. In such situations, natural groundwater flow is changed and groundwater moves depending upon the distribution of pumped water levels in different parts of the aquifer, again making it difficult to create rules based on defined streams of water akin to surface water movement.

- *Indian Easements Act*: It must also be noted that while the Indian Easements Act, 1882 does directly address groundwater, it cannot be invoked in trying to determine the rights of landowners over the groundwater found below their own land. This is due to the fact that an easement right involves by definition a (dominant) owner claiming the easementary right and a (servient) owner on whose land the easementary right is exercised. Consequently, 'ownership and

easement are inconsistent and cannot coexist in the same person'.<sup>35</sup>

5.152. Apart from the absence of an understanding of aquifers in the present legal framework and the inability to separate the ownership of land from access to groundwater, there is the further problem that it only considers the interests of landowners, completely overlooking the hugely important fact that groundwater serves the basic needs of life of so many people who do not own land.

### The Way Forward: A New Legal Framework for Groundwater

5.153. New developments in jurisprudence have created both the basis and the necessity to redefine the legal framework for groundwater. These include:

- new water law principles (for instance, the Public Trust Doctrine enunciated by the Supreme Court)<sup>36</sup>
- environmental law principles (for instance, the precautionary principle)
- decentralisation principles embodied in the 73rd and 74th amendments to the Constitution
- changes in irrigation law focusing on participatory irrigation management over for the past fifteen years and implemented in a number of States<sup>37</sup>
- the fundamental right to water that has been a part of Indian law for the past two decades<sup>38</sup>

5.154. The Twelfth Plan Sub-Group on Legal Issues related to Groundwater Management and Regulation (as part of the Working Group on Water Governance), has drafted a new *Model Bill for the Protection, Conservation, Management and Regulation of Groundwater*.<sup>39</sup> This model bill has been drafted keeping in mind all the considerations spelt out above. It is based on the idea that while protection of groundwater is key to the long-term sustainability of the resource, this must be considered in a framework in which livelihoods and basic drinking water needs are of central importance. The overall objectives of the Model Bill are to:

- Regulate and control iniquitous groundwater use and distribution, based on priority of allocation

to ensure in particular that the safe and secure drinking water/domestic needs of every person and irrigation needs of small and marginal farmers can be met;

- Regulate the over-extraction of groundwater in order to ensure the sustainability of groundwater resources, equity of their use and distribution, and to ensure fulfilment of ecosystem needs;
- Promote and protect community-based, participatory mechanisms of groundwater management that are adapted to specific locations;
- Prevent and mitigate contamination of groundwater resources;
- Promote and protect good conservation, augmentation (recharge) and management practices; and
- Protect areas of land that are crucial for the sustainable management of groundwater resources and ensure that high groundwater consuming activities are not located in areas unable to support them.

5.155. The Model Bill draws on the various developments that have taken place in the legal framework since the GoI proposed the first model bill in the 1970s. In particular, it reflects the following:

- The principle that water, and groundwater specifically, is a public trust as put forward by the Supreme Court. This implies that the state at all levels (from the panchayat to the state government) is the custodian of the resource. This applies to groundwater as a resource (aquifer) and not to mechanisms (wells/tubewells) for abstracting it;<sup>40</sup>
- The recognition of the fundamental right to water by the Supreme Court;
- The principle of subsidiarity, as explicated in the 73rd and 74th amendments to the Constitution (Articles 243G and 243W);
- Protection principles, such as the prevention and precautionary principles, most recently statutorily recognised in the National Green Tribunal Act, 2010 (Section 20);
- *Proposed Andhra Pradesh Community Management of Groundwater Systems in Rural Areas Act, 2011;*

- *Proposed Maharashtra Groundwater (Development and Management) Act, 2009.*

5.156. The Model Bill also builds on existing laws and schemes and contextualises them to groundwater, including

- The Right to Information Act, 2005;
- *The Environmental Impact Assessment Notification, 2006 under the Environment (Protection) Act, 1986;*
- *Social audits called for under various schemes and policies of the Government.*

## NATIONAL WATER FRAMEWORK LAW (NWFL)

### Need for a National Water Framework Law

5.157. In formulating the Twelfth Plan, a Sub-Group (as part of the Working Group on Water Governance) was set up under the former Secretary, Water Resources, Prof. Ramaswamy R. Iyer to draft a National Water Framework Law.<sup>41</sup> The Sub-Group has articulated the case for drafting such a law in the following terms:

5.158. Under the Indian Constitution water is primarily a State subject, but it is an increasingly important national concern in the context of:

- the right to water being a part of the fundamental right to life;
- the emergence of a water crisis because of the mounting pressure on a finite resource;
- the inter-use and inter-State conflicts that this leads to, and the need for a national consensus on water-sharing principles, and on the arrangements for minimising conflicts and settling them quickly without resort to adjudication to the extent possible;
- the threat to this vital resource by the massive generation of waste by various uses of water and the severe pollution and contamination caused by it;
- the long-term environmental, ecological and social implications of efforts to augment the availability of water for human use;

- the equity implications of the distribution, use and control of water: equity as between uses, users, areas, sectors, States, countries and generations;
- the international dimensions of some of India's rivers; and
- the emerging concerns about the impact of climate change on water and the need for appropriate responses at local, national, regional, and global levels.

5.159. The above considerations cast several responsibilities on the Central Government. Some of these can be dealt with only partially under existing laws such as the Environment (Protection) Act 1986, the Water (Prevention and Control of Pollution) Act 1974, and others. On inter-State rivers there are (i) Entry 56 in the Union List which enables the Central Government to act if Parliament legislates for the purpose, (ii) the River Boards Act 1956 enacted under it (which has remained inoperative), and (iii) the Inter-State Water Disputes Act 1956 (ISWD) enacted under article 262 of the Constitution and amended in 2002. However, inter-State rivers and river valleys are not the same thing as 'water' per se, and adjudication is not the only thing that needs to be provided for.

5.160. Given the concerns set forth above, the need for a national water law becomes imperative. Such a law will not preclude the further use of Entry 56, or the re-activation of the River Boards Act, or amendments and improvements to the ISWD Act. Several States are enacting laws on water and related issues. These can be quite divergent in their perceptions of water. Again, under a number of projects and programmes different States are undertaking 'water sector reforms', and as a part of this they have formulated or are formulating State Water Policies. Here again, significant divergences are possible. Some divergences of policy and law may be inevitable and acceptable, but they have to be within reasonable limits set by a broad national consensus on certain basics.

5.161. Different State Governments tend to adopt different positions on the rights of different States over the waters of a river basin that straddles more

than one State. Such legal divergences tend to render the resolution of inter-State river-water conflicts even more difficult than they already are. A national statement of the general legal position and principles that should govern such cases seems desirable.

5.162. Water, like air, is one of the most basic requirements for life. If a national law is considered necessary on subjects such as the environment, forests, wildlife, biological diversity, and so on, a national law on water is even more necessary. Water is as basic as (if not more) than those subjects.

5.163. Finally, the idea of a national water law is not something unusual or unprecedented. Many countries in the world have national water laws or codes, and some of them (for instance, the South African National Water Act of 1998) are widely regarded as very enlightened. There is also the well-known European Water Framework Directive of 2000. The considerations behind those national or supra-national documents are relevant to India as well, although the form of a water law for India will clearly have to be guided by the nature of the Indian Constitution and our own specific needs and circumstances.

5.164. It is this recognition of the need for a minimal national consensus on certain basic perceptions, concepts and principles that led to the adoption of the National Water Policy (NWP) of 1987 and 2002. However, a national water policy has no legal status. A national water law is, therefore, necessary to make the tenets of such a consensual statement justiciable. The NWP 2012 recognises the need for a NWFL.

#### Nature and Scope of the NWFL

5.165. Having thus stated the case for drafting a national water framework law, it is important to clarify the nature and scope of this law:

- The proposed national water law is not intended to either centralise water management, or to change Centre-State relations or to alter the Constitutional position on water in any way. What is proposed is not a Central water management law or a command-and-control law, but a

*framework* law, that is, an umbrella statement of general principles governing the exercise of legislative and/or executive (or devolved) powers by the Centre, the States and the local governance institutions.

- No administrative machinery or institutional structure (except for a national water information system) is envisaged at the Centre under this framework law, and consequently no penal provisions are envisaged. This, of course, does not exclude the necessary administrative machinery, institutional structure and penal provisions in State laws within this framework.
- But the law is intended to be justiciable in the sense that the laws passed and the executive actions taken by the Central and State Governments and the devolved functions exercised by PRIs will have to conform to the general principles and priorities laid down in the framework law, and that deviations can be challenged in a court of law.
- The law will incorporate all major legal pronouncements by the Supreme Court with reference to water such as the Public Trust Doctrine and the recognition of the fundamental right to water as also the principle of subsidiarity, as explicated in the 73rd and 74th Constitutional amendments, the prevention and precautionary principles, most recently statutorily recognised in the National Green Tribunal Act, 2010 and the transparency principles of The Right to Information Act, 2005.

#### How the Law Is Proposed to be Enacted

5.166. According to the Twelfth Plan Working Group on Water Governance, given the present constitutional division of legislative powers between the

Union and the States, the only way a national water framework law can be legislated is to follow the procedure laid out in Article 252(1) of the Constitution. Thus, if two or more State assemblies pass resolutions in support of Parliament enacting such a law, Parliament can also accordingly enact it. This was the procedure adopted in the case of the Water (Control and Prevention of Pollution) Act 1974 and more recently for the Dam Safety Act 2010. An Act so passed will be applicable to the States that had passed the resolution and to other States that adopt the Act.

5.167. In July 2012, the Ministry of Water Resources constituted a Committee under the Chairmanship of Dr. Y.K. Alagh, former Member, Planning Commission to draft a National Water Framework Law. Once drafted, this Framework Law would be finalised after evolving a consensus involving intensive deliberations with States, to be initiated by the Union Minister of Water Resources through meetings with the States.

#### OUTLAYS FOR THE TWELFTH PLAN

5.168. The Central Sector Outlay for Twelfth Five Year Plan for Ministry of Water Resources (MoWR) is ₹18,118 crore, which envisages schemes like Irrigation Management Programme, Development of Water Resources Information System, Ground Water Management and Regulation (including aquifer mapping) and so on. The indicative outlays for the Twelfth Five Year Plan under the Water Resources sector (irrigation, flood management and command area development) would be about ₹4,22,012 crore. The realisation of this outlay is dependent upon the resource position of the States and their priority to the sector.



### ANNEXURE 5.1 Plan-wise Expenditure on Irrigation and Flood Control

(₹ Crores)

| Plan Period                       | Major & Medium Irrigation |                 | MI & CAD        | Total Irrigation | Flood Control     | Total Plan Outlay for all Sectors |
|-----------------------------------|---------------------------|-----------------|-----------------|------------------|-------------------|-----------------------------------|
|                                   | Taken Up                  | Completed       |                 |                  |                   |                                   |
| I Plan (1951-56)                  | 376                       | 66              | 442             | 13               | 1,960             |                                   |
| II Plan (1956-61)                 | 380                       | 162             | 542             | 48               | 4,672             |                                   |
| III Plan (1961-66)                | 576                       | 443             | 1,019           | 82               | 8,577             |                                   |
| Annual Plans (1966-69)            | 430                       | 561             | 991             | 42               | 6,625             |                                   |
| IV Plan (1969-74)                 | 1,242                     | 1,173           | 2,416           | 162              | 15,779            |                                   |
| V Plan (1974-78)                  | 2,516                     | 1,410           | 3,926           | 299              | 28,653            |                                   |
| Annual Plans (1978-80)            | 2,079                     | 1,345           | 3,424           | 330              | 22,950            |                                   |
| VI Plan (1980-85)                 | 7,369                     | 4,160           | 11,529          | 787              | 1,09,292          |                                   |
| VII Plan (1985-90)                | 11,107                    | 7,627           | 18,734          | 942              | 2,18,730          |                                   |
| Annual Plans (1990-92)            | 5,459                     | 3,650           | 9,109           | 461              | 1,23,120          |                                   |
| VIII Plan (1992-97)               | 21,072                    | 13,885          | 34,957          | 1,692            | 4,83,060          |                                   |
| IX Plan (1997-02)                 | 49,289                    | 13,760          | 83,049          | 3,038            | 9,41,041          |                                   |
| X Plan (2002-07)                  | 83,647                    | 16,459          | 1,00,106        | 4,344            | 16,18,460         |                                   |
| XI Plan (2007-12)<br>(Projection) | 1,65,350                  | 46,350          | 2,11,700        | 20,100           | 36,44,718         |                                   |
| <b>Total</b>                      | <b>3,50,892</b>           | <b>1,11,051</b> | <b>4,81,944</b> | <b>32,340</b>    | <b>72, 27,637</b> |                                   |

### ANNEXURE 5.2 Plan-wise Proliferation of Schemes in MMI Sector

|                        | Major Projects |           | Medium Projects |           | ERM Projects |           | Total Projects |           |
|------------------------|----------------|-----------|-----------------|-----------|--------------|-----------|----------------|-----------|
|                        | Taken Up       | Completed | Taken Up        | Completed | Taken Up     | Completed | Taken Up       | Completed |
| Pre Plan               | 74             | 74        | 143             | 143       | 0            | 0         | 217            | 217       |
| I Plan                 | 44             | 5         | 165             | 34        | 12           | 3         | 221            | 42        |
| II Plan                | 33             | 20        | 102             | 85        | 5            | 5         | 140            | 110       |
| III Plan               | 32             | 11        | 44              | 61        | 7            | 7         | 83             | 79        |
| Annual Plans (1966-69) | 11             | 5         | 27              | 43        | 1            | 3         | 39             | 51        |
| IV Plan                | 33             | 15        | 74              | 62        | 7            | 4         | 114            | 81        |
| V Plan                 | 68             | 6         | 303             | 70        | 20           | 1         | 391            | 77        |
| Annual Plans (1978-80) | 11             | 2         | 55              | 18        | 3            | 2         | 69             | 22        |
| VI Plan                | 31             | 30        | 89              | 138       | 37           | 4         | 157            | 172       |
| VII Plan               | 11             | 14        | 36              | 137       | 24           | 15        | 71             | 166       |
| Annual Plans (1990-92) | 2              | 7         | 0               | 12        | 0            | 8         | 2              | 27        |
| VIII Plan              | 19             | 9         | 72              | 48        | 30           | 22        | 121            | 79        |
| IX Plan                | 32             | 30        | 38              | 66        | 27           | 13        | 97             | 109       |
| X Plan                 | 49             | 32        | 84              | 40        | 46           | 30        | 179            | 102       |
| XI Plan                | 38             | 45        | 50              | 66        | 42           | 5         | 130            | 116       |

**ANNEXURE 5.3**  
**Spillover of Major, Medium and ERM Projects into the Twelfth Plan**

| Plan of Start of Project | Major      | Medium     | ERM       | Total      |
|--------------------------|------------|------------|-----------|------------|
| I Plan                   | 0          | 0          | 0         | 0          |
| II Plan                  | 0          | 0          | 0         | 0          |
| III Plan                 | 0          | 0          | 0         | 0          |
| Annual Plans (1966–69)   | 2          | 0          | 0         | 2          |
| IV Plan                  | 7          | 2          | 0         | 9          |
| V Plan                   | 11         | 1          | 1         | 13         |
| Annual Plans (1978–80)   | 10         | 2          | 0         | 12         |
| VI Plan                  | 14         | 13         | 0         | 27         |
| VII Plan                 | 6          | 9          | 0         | 15         |
| Annual Plans (1990–92)   | 1          | 2          | 0         | 3          |
| VIII Plan                | 13         | 17         | 0         | 30         |
| IX Plan                  | 28         | 28         | 3         | 59         |
| X Plan                   | 30         | 22         | 1         | 53         |
| XI Plan                  | 32         | 52         | 30        | 114        |
| <b>Total</b>             | <b>154</b> | <b>148</b> | <b>35</b> | <b>337</b> |

**ANNEXURE 5.4**  
**CLA/Grant and Irrigation Potential Created through AIBP, 1996–2012**

| Year         | Amount of CLA/ Grant Released (₹ Crore)* | Irrigation Potential Created (in '000 ha) |
|--------------|--|---|
| 1996–97      | 500                                      | 72  |
| 1997–98      | 952                                      | 200                                       |
| 1998–99      | 1,119                                    | 257                                       |
| 1999–00      | 1,440                                    | 220                                       |
| 2000–01      | 1,821                                    | 531                                       |
| 2001–02      | 2,595                                    | 443                                       |
| 2002–03      | 3,062                                    | 272                                       |
| 2003–04      | 3,129                                    | 357                                       |
| 2004–05      | 2,867                                    | 409                                       |
| 2005–06      | 1,900                                    | 703                                       |
| 2006–07      | 2,302                                    | 938                                       |
| 2007–08      | 5,399                                    | 544                                       |
| 2008–09      | 7,598                                    | 538                                       |
| 2009–10      | 6,946                                    | Target 1,050.00 Actuals Under Assessment  |
| 2010–11      | 6,837                                    | Target 950.00 Actuals Under Assessment    |
| 2011–12      | 5,784                                    | Target 1,050.00 Actuals Under Assessment  |
| <b>Total</b> | <b>54,251</b>                            | <b>5,485</b>                              |

\*Only for Accelerated Irrigation Benefits Programme Major and Medium Irrigation and Minor Irrigation. Others like CAD, FMP, RRR are not included.

### ANNEXURE 5.5 Plan-Wise Irrigation Potential Created and Utilised

(in million hectares)

| Plan                      |            | Potential Created |       |       |       |                | Potential Utilised |       |       |       |       |
|---------------------------|------------|-------------------|-------|-------|-------|----------------|--------------------|-------|-------|-------|-------|
|                           |            | Major & Medium    | Minor |       | Total | Major & Medium | Minor              |       | Total |       |       |
|                           |            |                   | S.W.  | G.W.  |       |                | S.W.               | G.W.  |       |       |       |
| Upto 1951<br>(Pre-Plan)   | Cumulative | 9.70              | 6.40  | 6.50  | 12.90 | 22.6           | 9.70               | 6.40  | 6.50  | 12.90 | 22.60 |
| I Plan<br>(1951-56)       | During     | 2.50              | 0.03  | 1.13  | 1.16  | 3.66           | 1.28               | 0.03  | 1.13  | 1.16  | 2.44  |
|                           | Cumulative | 12.20             | 6.43  | 7.63  | 14.06 | 26.26          | 10.98              | 6.43  | 7.63  | 14.06 | 25.04 |
| II Plan<br>(1956-61)      | During     | 2.13              | 0.02  | 0.67  | 0.69  | 2.82           | 2.07               | 0.02  | 0.67  | 0.69  | 2.76  |
|                           | Cumulative | 14.33             | 6.45  | 8.30  | 14.75 | 29.08          | 13.05              | 6.45  | 8.30  | 14.75 | 27.80 |
| III Plan<br>(1961-66)     | During     | 2.24              | 0.03  | 2.22  | 2.25  | 4.49           | 2.12               | 3.03  | 2.22  | 2.25  | 4.37  |
|                           | Cumulative | 16.57             | 6.48  | 10.52 | 17.00 | 33.57          | 15.17              | 6.48  | 10.52 | 17.00 | 32.17 |
| Annual Plans<br>(1966-69) | During     | 1.53              | 0.02  | 1.98  | 2.00  | 3.53           | 1.58               | 0.02  | 1.98  | 2.00  | 3.58  |
|                           | Cumulative | 18.10             | 6.50  | 12.50 | 19.00 | 37.10          | 16.75              | 6.50  | 12.50 | 19.00 | 35.75 |
| IV Plan<br>(1969-74)      | During     | 2.60              | 0.50  | 4.00  | 4.50  | 7.10           | 1.64               | 0.50  | 4.00  | 4.50  | 6.14  |
|                           | Cumulative | 20.70             | 7.00  | 16.50 | 23.50 | 44.20          | 18.39              | 7.00  | 16.50 | 23.50 | 41.89 |
| V Plan<br>(1974-78)       | During     | 4.02              | 0.50  | 3.30  | 3.80  | 7.82           | 2.70               | 0.50  | 3.30  | 3.80  | 6.50  |
|                           | Cumulative | 24.72             | 7.50  | 19.80 | 27.30 | 52.02          | 21.16              | 7.50  | 19.80 | 27.30 | 48.46 |
| Annual Plans<br>(1978-80) | During     | 1.89              | 0.50  | 2.20  | 2.70  | 1.59           | 1.48               | 0.50  | 2.20  | 2.70  | 4.18  |
|                           | Cumulative | 26.61             | 8.00  | 22.00 | 30.00 | 56.61          | 22.64              | 8.00  | 22.00 | 30.00 | 52.64 |
| VI Plan<br>(1980-85)      | During     | 1.09              | 1.70  | 5.82  | 7.52  | 8.61           | 0.93               | 1.01  | 4.24  | 5.25  | 6.18  |
|                           | Cumulative | 27.70             | 9.70  | 27.82 | 37.52 | 65.22          | 23.57              | 9.01  | 26.24 | 35.25 | 58.82 |
| VII Plan<br>(1985-90)     | During     | 2.22              | 1.29  | 7.80  | 9.09  | 11.31          | 1.90               | 0.96  | 6.91  | 7.87  | 9.77  |
|                           | Cumulative | 29.92             | 10.90 | 35.62 | 46.52 | 76.44          | 25.47              | 9.97  | 33.15 | 43.12 | 68.59 |
| Annual Plans<br>(1990-92) | During     | 0.82              | 0.47  | 3.27  | 3.74  | 4.56           | 0.85               | 0.32  | 3.10  | 3.42  | 4.27  |
|                           | Cumulative | 30.74             | 11.46 | 38.89 | 50.35 | 81.09          | 26.31              | 10.29 | 36.25 | 46.54 | 72.85 |
| VIII Plan<br>(1992-97)    | During     | 2.21              | 1.05  | 1.91  | 2.96  | 5.17           | 2.13               | 0.78  | 1.45  | 2.23  | 4.36  |
|                           | Cumulative | 32.95             | 12.51 | 40.80 | 53.31 | 86.26          | 28.44              | 11.07 | 37.7  | 48.77 | 77.21 |
| IX Plan<br>(1997-2002)    | During     | 4.10              | 1.09  | 2.50  | 3.59  | 7.69           | 2.57               | 0.37  | 0.85  | 1.22  | 3.79  |
|                           | Cumulative | 37.05             | 13.60 | 43.30 | 56.90 | 93.95          | 31.01              | 11.44 | 38.55 | 49.99 | 81.00 |
| X Plan<br>(2002-07)       | During     | 4.59              | 0.71  | 2.81  | 3.52  | 8.82           | 2.73               | 0.56  | 2.26  | 2.82  | 6.23  |
|                           | Cumulative | 41.64             | 14.31 | 46.11 | 60.42 | 102.77         | 33.74              | 12.00 | 40.81 | 52.81 | 87.23 |
| XI Plan*<br>(2007-12)     | During     | 5.77              | 1.41  | 3.29  | 4.70  | 10.47          | 1.27               | 0.43  | 1.01  | 1.44  | 2.71  |
|                           | Cumulative | 47.41             | 15.72 | 49.40 | 65.12 | 113.24         | 35.01              | 12.43 | 41.82 | 54.25 | 89.94 |

\*Anticipated.

**ANNEXURE 5.6**  
**Physical and Financial Achievements of CAD Programme**

| Period             | Central Assistance<br>Released (in ₹ Crores) | Achievement (in million hectares) |              |
|--------------------|--|-----------------------------------|--------------|
|                    |  | Field Channels                    | Field Drains |
| 1974-75 to 1996-97 | 1,688.11                                     | 13.95                             | 0.77         |
| IX Plan            | 751.66                                       | 1.80                              | 0.35         |
| X Plan             | 818.57                                       | 2.31                              | 0.64         |
| XI Plan            |  |                                   |              |
| 2007-08            | 277.14                                       | 0.39                              | 0.07         |
| 2008-09            | 324.29                                       | 0.43                              | 0.13         |
| 2009-10            | 413.70                                       | 0.38*                             | 0.09*        |
| 2010-11            | 456.40                                       | 0.41*                             | 0.06*        |
| 2011-12            | 205.00**                                     | 0.35 \$                           | 0.14 \$      |
| <b>Total</b>       | <b>4,934.87</b>                              | <b>20.02</b>                      | <b>2.25</b>  |

\*Provisional; \*\*Released till 15 January 2012 \$ Target for the year 2011-12.

**ANNEXURE 5.7**  
**Water Use Efficiency of Completed Major/Medium Irrigation Projects Based on Field Measurements of Losses**

| Sl. No.        | Name of Project                                   | Culturable Command Area (Hectares) | Conveyance Efficiency (per cent) | On Farm Application Efficiency (per cent) | Overall Project Water Use Efficiency (per cent) |
|----------------|---|------------------------------------|----------------------------------|---|---|
| (1)            | (2)   | (3)                                | (4)                              | (5)                                       | (6)   |
| 1.             | Bhairavanithippa Project                          | 4,856                              | 86                               | 67  | 58  |
| 2.             | Gajuladinne (Sanjeevaiah Sagar Project)           | 10,300                             | 57                               | 45  | 26  |
| 3.             | Gandipalem Project                                | 6,478                              | 73                               | 38  | 28  |
| 4.             | Godavari Delta System (Sir Arthur Cotton Barrage) | 4,10,108                           | 83                               | 54  | 45  |
| 5.             | Kurnool – Cuddapah Canal System                   | 65,465                             | 62                               | 45  | 28  |
| 6.             | Kaddam Project                                    | 27,519                             | 51                               | 36  | 18  |
| 7.             | KoilSagar Project                                 | 11,700                             | 83                               | 75  | 62  |
| 8.             | Krishna Delta System (Prakasam Barrage)           | 5,29,000                           | 87                               | 46  | 40  |
| 9.             | Nagarjuna Sagar Project                           | 8,89,000                           | 56                               | 39  | 22  |
| 10.            | Narayanapuram Project                             | 15,855                             | 47                               | 32  | 15  |
| 11.            | Nizamsagar Project                                | 93,659                             | 87                               | 45  | 39  |
| 12.            | Srisailam Project                                 | 59,900                             | 50                               | 34  | 17  |
| 13.            | Rajolibanda Diversion Scheme                      | 35,410                             | 82                               | 51  | 42  |
| 14.            | Somasila Project                                  | 54,650                             | 56                               | 32  | 18  |
| 15.            | Sri Ram Sagar Project                             | 3,71,054                           | 78                               | 57  | 45  |
| 16.            | Tungabhadra High Level Canal                      | 45,800                             | 81                               | 58  | 47  |
| 17.            | Tungabhadra Low Level Canal                       | 61,163                             | 72                               | 45  | 32  |
| 18.            | Vamsadhara Project                                | 82,087                             | 91                               | 58  | 53  |
| 19.            | Yeleru Project                                    | 27,240                             | 50                               | 28  | 14  |
| 20.            | Augmentation Canal Project                        | 85,443                             | 79                               | 72  | 57  |
| 21.            | Dholabaha Dam Project                             | 2,600                              | 74                               | 71  | 53  |
| 22.            | Ranjit Sagar Dam Project                          | 3,00,000                           | 51                               | 65  | 33  |
| 23.            | Ahraura Dam Irrigation Project                    | 14,964                             | 70                               | 70  | 49  |
| 24.            | Matatila Dam Project                              | 1,79,880                           | 68                               | 80  | 54  |
| 25.            | Naugarh Dam Irrigation Project                    | 64,221                             | 71                               | 70  | 50  |
| 26.            | Pili Dam Project                                  | 4,044                              | 58                               | 65  | 38  |
| 27.            | Walmiki Sarovar Project                           | 6,271                              | 62                               | 62  | 38  |
| 28.            | East Baigul Reservoir Project                     | 16,605                             | 64                               | 65  | 42  |
| <b>Average</b> |   |                                    | <b>69</b>                        | <b>52</b>                                 | <b>38</b>                                       |

## ANNEXURE 5.8

### Water Data Base Development and Management in the Twelfth Plan

The major recommendations of the Twelfth Plan Working Group on Water Data Base Development and Management are summarised below:

#### 1. Agro-Meteorological Data

In order to improve the coverage and quality of agro-meteorological data, the following steps will be initiated during the Twelfth Plan period:

- Setting up of a real-time, standardised rainfall data monitoring network geared to an automated data archiving and retrieval system, which will be relatively free from human errors. Modern technology makes it possible to achieve this goal through a hybrid system of Doppler Weather Radars (DWRs) which have a perception radius of about 200 km, supplemented with an adequate number of Tele-metred Automatic Rain Gauges (TRGs) required for calibration, ideally one per 50 sq km.
- A reliable set of real-time precipitation data covering the entire country can be generated in a standardised manner through an optimal network of ~60 DWRs with a radius of perception equal to ~200 km, provided they are meticulously supported and calibrated by ~40,000 automatic tele-metring rain gauges. Their standardised formats and calibrations would also enable countrywide consistent rainfall data and their user friendly retrieval and dissemination to bonafide users.
- The proposed network of 40,000 ARGs can be accomplished by setting up an additional 30,000 of them during the Twelfth Plan through a cooperative effort between IMD and the States. An example of such a network is already envisaged in Karnataka.
- To incentivise the process, the Centre will finance the capital and operating cost of upgrading State networks and arrange for the training of personnel with professional skills to operate them, subject to the condition that the States should observe the protocols prescribed by IMD, be open to inspection by its officials and undertake to transmit all the data to the national database.
- The current evapotranspiration and soil moisture measurement network is highly inadequate. Estimates based on direct observation derived in the past are most likely invalid now because of the considerable change in land-use patterns and meteorological conditions. As extant lysimeters have become very old, an adequate set of lysimeters equipped with digital/load cells, and data logger and GPRS transmission facility needs to be installed, and data collected and analysed to enhance the reliability of agro-met advisories on irrigation scheduling. The density required to get sufficiently disaggregated estimates for different agro-climatic regions, and to provide information for management of water in major projects and phased programmes covering design and costs, to achieve optimum density over the next 10 years needs to be worked out. Here again, a conscious effort will be made to build a national network in collaboration with the States, with financial support conditional on their being supervised by IMD.
- Direct measurements of PET in the 219 centres will be compared with empirical estimates in contiguous centres to establish the degree of confidence with which the latter can be used for operational purposes. If this exercise establishes the empirical formulae to be reasonably accurate, empirical methods can be used to get PET estimates for a much larger number of centres which are equipped to provide data on the relevant climatic variables.
- There are protocols by which estimates of daily PET estimates taken together with precipitation data can be converted to assess the soil moisture conditions in different seasons. Soil moisture status can also be estimated through remote sensing techniques, which needs to be corroborated/validated through actual measured ground data. In a similar pattern of gridded rainfall data, PET data will also be made available on  $1^\circ \times 1^\circ$  grid. This would greatly enhance the value of these datasets for assessing crop prospects in each season.
- These estimates will be validated by actual measurements on the ground in agricultural research stations that have experimental plots which are monitored by scientists, who have the necessary equipment with which to make the needed measurements.
- The efforts undertaken by various agricultural universities and the agro-met divisions of the State remote sensing applications centres (including the NRSC Agro-met Division) in terms of soil moisture monitoring need to be made inclusive and not limited to the 'research' domain.
- To assess agricultural needs of soil moisture a monthly average is suitable and the corresponding linear density is of the order of around 100 km. On the other hand when estimating run off, every event counts and the linear density should be 5–10 km. At the same time evaporation and Evapotranspiration are less variable than the rainfall itself thereby necessitating a linear density of around 50 km.

- Weather forecast models aided by cloud diagnostic support from satellites and radars are the tools for Quantitative Precipitation Forecast. But conventional methods, as were deployed till recently, essentially depend on climatological analogues of past events and weather pattern matching. Three major studies have been recently done for the river basins of Yamuna, Mahanadi and Narmada using the conventional methods. The Twelfth Plan augmentation in observational and predictive capabilities will make the ensuing studies for other river basins more accurate and reliable.

## 2. Water Resources Potential

The current estimate of utilisable surface flows for the country (690 bcm) as well as those for major basins is substantially the same as earlier ones (made in 1976, 1988 and 2001). The Working Group was unable to locate any document explaining the basis for these estimates. Given the present state of knowledge on these aspects, the data and assumptions underlying the estimates are impossible to verify or validate. The following proposals have been made by the CWC for the Twelfth Plan to improve estimates of overall and utilisable surface water resources potential:

- Expansion and up-gradation of the existing 878 hydrological observation (HO) stations and supporting infrastructure in site offices for repair and maintenance.
- 1917 additional HO stations will be opened in order to meet the minimum requirement of HO stations for achieving various goals such as assessment of basin wise water availability, study of climate change, better flood forecasting, flood mitigation, reservoir inflow forecasting, water quality and sediment assessment, morphological studies, planning and design of water resources projects, assessment of navigational potential for inland waterways, and so on.
- Eight hundred and ten of such sites shall be equipped with measuring systems to monitor silt load and water quality.
- Facilities for monitoring glacial lakes/water bodies and snow-melt forecasting in the Himalayan region.
- Expansion in the number of reservoirs equipped for telemetric monitoring of reservoir water level and live storage.
- Creating a Coastal Management Information System (CMIS) for collecting data on various natural phenomena occurring in coastal regions, and for appraisal and monitoring of projects for their protection.
- Setting up a new organisation, namely National Water Resources Information Centre (NWR-IC), comprising professionals with specialised expertise in water resources, GIS, remote sensing, computer science and other related disciplines to manage the large volume of data on water resources and allied fields generated under India-WRIS project and also to update periodically for proper decision-making.
- Strengthening in-house facilities for upgrading capacity for digitised management and dissemination of data.

## 3. Water Utilisation by Source and Use

Planning of water resource development policy and programmes requires reliable data on all potentially usable resources and also on how much each of these are being used from which source, where, for what purposes and with what effect; and how these are changing over time. The current state of data and knowledge on these aspects is extremely unsatisfactory for several reasons:

- Published estimates focus only on surface flows and groundwater. Very little attention is given to the contribution of rainfall, which is the sole source of water for all uses in un-irrigated areas and a significant source even in irrigated areas. More effective use of rainfall for increasing productivity of rainfed agriculture and supply of water supply for domestic use in rain fed areas is in fact the rationale for the integrated watershed management programme. Even with irrigation, the extent of improvement in soil moisture regime varies across agro climatic regions depending on the ability to adjust irrigation supplies according to rainfall across seasons;
- Estimates of utilisation of surface and ground water are available only for a few years and for major basins. They are not based on measurements of actual utilisation in particular years but are estimates of utilisation in an unspecified 'normal' or 'average' year, based on inadequate, unverified data and assumptions;
- Even for major and medium irrigation systems, which are supposed to maintain continuous records of water delivered into their canal networks the coverage and quality of recorded data are not known; nor are they compiled and collated by any agency;
- Estimates of groundwater extraction are also not based on any systematic measurements of actual draft per well of different types and in different regions;
- There are no data on overall utilisation of water from minor surface works;
- Estimates do not cover water extracted from private wells and tube wells used for non agricultural uses, and un-authorized diversion/pumping of water from rivers and streams;

- Available utilisation data do not cover canal water used outside the command area, water lifted from flowing water in rivers and streams, and underground water from river beds. Much of this is unauthorised and likely to go unrecorded by official statistics.

Concerted and sustained action to address these deficiencies is therefore of critical importance. For this purpose the Working Group suggests:

- Commission properly planned and scientifically rigorous studies of current utilisation of local rainfall and potential for its fuller, more effective use in selected watershed in different agro-climatic regimes.
- More effective use existing data sources including especially the records of water delivery being maintained by managers of major and medium surface systems and the detailed data on minor irrigation works of all kinds and the area/crops reported to be irrigated by them. It is essential to persuade/incentivise state agencies to collate both current and past series data from their records and make them available to the national data pool for scientific analysis and policy oriented research.
- Upgrade physical infrastructure for measuring water deliveries in all major public water supply systems.
- Rationalise the system for recording and validation of these data and reporting them to a central pool.
- Systematic field studies in selected systems of different types to assess technical efficiency of water use.
- Selectively assess the extent to which seasonal pattern of water deliveries relative to evapo-transpiration of crops being actually grown in the command may be a source of inefficiency.
- Monitored measurement of actual water pumped in a sample of wells/tubewells from different regions.

#### **4. End Uses of Water**

The basis of available estimates of both current levels of actual water consumption and projected future requirements are quite unsatisfactory in the absence of surveys of actual total and source-wise consumption by households and commercial establishments. Projections are based on norms regarding desirable levels of use per capita in rural and urban areas, assuming that this should be provided from public systems. Estimates for industries and power are again based on patchy data on requirements per unit of current and projected output in their different segments. In the case of agriculture, the system for compiling data on area of different crops irrigated by different sources based on village level records and estimating yields of major irrigated crops at the state level through sample crop cutting surveys has become unmanageable for a variety of reasons and the reliability of estimates based on them is in serious question.

The following steps are needed to redress these deficiencies:

- The recommendations of a recent Expert Group of the Ministry of Agriculture will vastly improve the quality of data needed to assess the impact of irrigation.
- This needs to be supplemented by more detailed and in-depth surveys of both rainfed lands and irrigated areas to collect comprehensive data on all important technical and operational aspects of water utilisation and socio-economic and environmental impact from different types of projects in different regions and river basins.
- The only way to get reliable estimates of actual groundwater extraction and use, is through sample surveys of all types of wells in rural and urban areas, distinguishing between wells which are primarily for irrigation as a sole source and used conjunctively with surface water, and those which are used primarily as a sources of domestic, commercial and different non-agricultural uses.
- Since the physical condition, water availability and use from all man made systems are prone to significant and rapid change over time, it is essential to repeat such surveys periodically.

These surveys will be entrusted to a consortium of government and non-governmental research institutions with experience in such studies who will use well-defined common concepts and methodologies to ensure comparability across regions and over time.



## NOTES

1. This is based on the Central Water Commission's estimate of India's water resource potential as 1869 BCM.
2. The 2030 Water Resources Group (2009): *Charting Our Water Future*.
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4. See full details of this initiative in Chapter 17 on Rural Development.
5. See full details of this initiative in Chapter 15 on 'Transport'.
6. R. Ackerman (2011): *New Directions for Water Management in Indian Agriculture*.
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16. D.C. Goswami and P.J. Das (2002): 'Hydrological Impact of Earthquakes on the Brahmaputra River Regime', Proceedings of the 18th National Convention of Civil Engineers, Guwahati.
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20. Around 56 per cent of these 337 projects have not been approved by the Planning Commission and are not eligible for central assistance.
21. V.M. Tiwari et al. (2009): 'Dwindling groundwater resources in northern Indian region, from satellite gravity observations', *Geoph. Res. Lett.*, 36, L18401, doi:10.1029/2009GL039401.
22. Central Ground Water Board (2009): *Dynamic Ground Water Resources of India*.
23. The States are Assam, Tripura, Manipur, Meghalaya, Mizoram, Nagaland, Arunachal Pradesh, Chhattisgarh, Jharkhand, Orissa and West Bengal.
24. For instance, the guidelines differentiate between cities with and without sewerage (70 lpcd to without and 135 lpcd to cities with sewerage system). But these do not indicate how much area must be under a sewerage system before a city qualifies for higher water norms. The guidelines are also imprecise—they provide that cities could provide additional water if hospitals, schools, airports and institutions require 'considerable quantities'.
25. This section partly draws upon a working paper *Developing a Water Conservation Strategy for Industry* prepared by the Centre for Energy, Environment and Water for the Planning Commission.
26. R. Ackerman (2011): *New Directions for Water Management in Indian Agriculture*.
27. Government of Bihar (2008): *Kosi Flood: Assessment Report*, World Bank, Global Facility for Disaster Reduction and Recovery.
28. Samaj Pragati Sahayog and Megh-Pyne Abhiyan (2012): *Leveraging MGNREGA for Flood Control—A Case for Policy Reform in Bihar*, National Consortium of Civil Society Organizations on MGNREGA.
29. The draft model bill is available on the website of the Planning Commission.
30. This section is based on the work done by the Twelfth Plan Sub-Group on Legal Issues related to Groundwater Management and Regulation as part of the Working Group on Water Governance.
31. *Acton v Blundell* (1843) 12 Meeson and Welsby 324 (Court of Exchequer Chamber, 1 January 1843). This was confirmed in *Chasemore v Richards* (footnote 21), which found that the right of the owner of a mill using spring water had no action against other landowners abstracting groundwater to the extent of affecting his own use of the water. This was because the judges determined that such a right would 'interfere with, if not prevent, the draining of land by the owner'.
32. *George Chasemore v Henry Richards* (1859) VII House of Lords Cases 349 (House of Lords, 27 July 1859).
33. B.B. Katiyar, *Law of Easements and Licences* (New Delhi: Universal Law Publishing, 13th ed 2010).
34. Thus, for example, in the words of Justice Seshagiri Aiyar 'It must have a fairly defined course. It must move. Its water must be capable of identification. It need not always be confined within banks. It need not have a continuous flow. Its width need not be of particular dimensions' *Unde Rajah Raja Sri Raja Velugoti Sri Rajagopala Krishna Yachendrala Varu Bahadur, K.C.I.E. Maharajah of Venkatagiri v Secretary of State for India in Council* (1915) 28 MLJ 98 (High Court of Madras, 19 October 1914).
35. M.S. Vani, 'Groundwater Law in India: A New Approach', in Ramaswamy Iyer ed., *Water and the Laws in India* 435, 444 (New Delhi: Sage, 2009).

36. *MC Mehta v Kamal Nath* (1997) 1 SCC 388 (Supreme Court, 1996); *State of West Bengal v Kesoram Industries* (2004) 10 SCC 201 (Supreme Court, 2004).
37. For example, the Andhra Pradesh Farmers' Management of Irrigation Systems Act, 1997; Gujarat Water Users' Participatory Irrigation Management Act, 2007; Maharashtra Management of Irrigation Systems by the Farmers Act, 2005 and Tamil Nadu Farmers Management of Irrigation Systems Act, 2000.
38. For example, *Subhash Kumar v State of Bihar* AIR 1991 SC 420 (Supreme Court, 1991).
39. The draft is available on the website of the Planning Commission.
40. The Model Bill is built around the need to regulate unreasonable use of sources of groundwater that threaten the aquifer to ensure that the resource (aquifer) itself is protected and can provide a sustainable basis for meeting the basic needs of every person for decades to come.
41. This draft is available on the website of the Planning Commission.

# 6

## Land Issues

6.1. India has had a long history of social discrimination, closely linked with denial of access to land. Specific land tenure systems prevailing at the time of independence also created their own set of problems. The deteriorating quality of land records administration over the last four decades has compounded the hardships of the poor. And in the recent past, the drive to acquire land for development has posed fresh challenges, most especially for the scheduled tribes. The last few years have witnessed a number of new government initiatives, including the Hindu Succession (Amendment) Act, 2005 and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, which are a response to both historical injustices and recent challenges. In January 2008, the Prime Minister approved the constitution of two High Level bodies—the National Council for Land Reforms under the Chairmanship of the Prime Minister and a Committee on State Agrarian Relations and the Unfinished Tasks in Land Reforms under the Chairmanship of the Union Minister for Rural Development. The Union Government has drafted *The Right to Fair Compensation, Resettlement, Rehabilitation and Transparency in Land Acquisition Bill*.

6.2. The constraint posed by land is emerging as a key challenge in ensuring both inclusiveness and sustainability of the growth process. There is a constraint faced by the landless, small and marginal farmers within agriculture, as also the constraint faced by the growing need for land for the processes of urbanisation and industrialisation.

### LAND FOR AGRICULTURE

#### Land Reforms: The Unfinished Agenda

6.3. Ever since independence, land reforms have been a major instrument of state policy to promote both equity and agricultural investment. Unfortunately, progress on land reforms has been slow, reflecting the resilience of structures of power that gave rise to the problem in the first place.

6.4. The main instrument for realising more equitable distribution of land are the land ceiling laws. These laws were enacted by several states during the late 1950s and 1960s, and the early 1970s saw more stringent amendments in the laws to plug loopholes in the earlier laws. But the record of implementation has not been satisfactory. Around 3 million hectares of land has been declared surplus so far, which is hardly 2 per cent of net sown area in India. About 30 per cent of this land has not yet been distributed as it is caught up in litigations. Besides, a number of benami and clandestine transactions have resulted in illegal possession of significant amounts of land above ceiling limits. There are widespread reports of allotment of inferior unproductive, barren and wasteland to landless households, many of whom have been forced to sell it off, in the absence of resources to make it productive. In many instances lands allotted to the rural poor under the ceiling laws are not in their possession. In some cases, pattas were issued to the beneficiaries, but possession of land shown in the pattas was not given, or corresponding changes were not made in the records of rights.

6.5. The balance of power in rural India is so heavily weighed against the landless and the poor that implementing land ceiling laws is difficult. It is clear that without massive mobilisation of the rural poor and a deepening of democratic governance in rural India, very little can be achieved in this direction. West Bengal, with more than half of India's ceiling surplus land beneficiaries, provides an example of what could be achieved.

6.6. Although half of India's population continues to depend on agriculture as its primary source of livelihood, 83 per cent of farmers operate holdings of less than 2 ha in size, and the average holding size is only 1.33 ha. This is often in fragments and unirrigated. There are also those who are entirely landless, although agriculture is their main source of livelihood. They have inadequate financial resources to purchase and often depend on leasing in small plots, on insecure terms, for short periods, sometimes only for one season. Hence many face insecurity of tenure and the growing threat of land alienation and pressures from urbanisation, industrialisation and powerful interests.

6.7. They are unable to take advantage of the economies of scale, or invest in lumpy inputs such as irrigation, technology or machinery. They have limited access to formal credit. Hence they have few resources for land improvement or crop insurance or adequate inputs (seeds, fertilisers, and so on). They are often ignored by extension agencies and seldom receive information on new technologies or training in skill-intensive agricultural practices.

6.8. Legally, land leasing laws in most states either prevent marginal and small farmers from increasing the area they cultivate by leasing in land, or create tenurial insecurity for informal tenants/sharecroppers. Unrecorded tenancies are mostly held by small and marginal farmers. At the same time, absentee landlordism is high in some regions (especially the hill states and rainfed areas), causing huge tracts of cultivable fallows to lie idle. Unfortunately, most tenancy laws have driven tenancy underground or made it even more informal. Micro-studies from different states show that the proportion of leased-in land is

significantly higher than reported by both the NSS and Census. In some cases, it is as high as 20–25 per cent of the gross cultivated area. Tenancy contracts are oral and for a short period. The proportion of leased-in land is higher in agriculturally developed regions compared to backward regions. All classes of households participate in the lease market both as lessors and lessees. However, while in backward agricultural regions, the traditional pattern is more common wherein the small and marginal farmers dominate the lease market as lessees and large and medium farmers as lessors, in agriculturally advanced regions, the lease market is in a state of transition where all classes of households participate. The trend towards reverse tenancy is more pronounced in these regions.

6.9. There is, therefore, a strong case for legalising tenancy and allowing leasing-in and leasing-out land with adequate safeguards to protect the interests of small and marginal farmers. Liberalisation of the lease market does not mean abrogation of existing tenancy legislations. These must be suitably amended to permit leasing-in and leasing-out of land, while making ownership rights non-alienable and secure, fixing tenure, recording of lease and allowing landowners to resume land for cultivation after expiry of lease.

6.10. Reforming tenancy laws would allow all sections to appropriately participate in the lease market depending upon their resource endowment. Studies have shown that in states like Punjab and Haryana, large and medium farmers who lease in land from small and marginal farmers invest in modern inputs, reap economies of scale and raise farm productivity. The small and marginal farmers who lease out their land also gain in terms of occupational mobility and higher incomes. In other states like Bihar and Orissa, with low wages and fewer employment opportunities, small and marginal farmers lease in land, enlarge their holding size and thus afford a reasonable level of living with all attendant benefits of tenancy like borrowing from financial institutions. The medium and large farmers in these states migrate to urban areas to take non-farm employment opportunities without any risk of losing their land. When their livelihoods become secure in the non-farm sector,

they could sell their land. Liberalising tenancy also helps in consolidation of holdings as farmers prefer to lease out rather than sell the piece of land that is inconveniently located. Long-term tenancy contracts would also help raise agricultural productivity.

6.11. These constraints are further compounded for tribal and women farmers. Increasingly, as more men than women move out of agriculture, there is a shift toward the feminisation of agriculture. Many women also serve as de-facto household heads. However, women farmers typically have little direct access to land and highly unequal access to inputs and other services.

6.12. Environmental factors further disadvantage poor farmers. Water tables have been falling and soils depleting. All this is happening against the backdrop of climate change. The key question is: *how can these constraints be transformed into opportunities?* Can the disadvantaged farmers attain sustainable livelihoods and become India's advantage for both higher growth and more inclusive development?

### The Way Forward

6.13. The Twelfth Plan Working Group on Disadvantaged Farmers, including Women has proposed several mechanisms for easing the land constraint faced by the landless and land-poor:

#### *Land Transfers by Government to Disadvantaged and Women (D&W) Farmers*

6.14. There should be a comprehensive assessment of all land available with the government, including ceiling surplus land, uncultivated wasteland, and so on. Unofficial estimates by organisations such as Ekta Parishad suggest much more land is available for distribution than reflected in official estimates.

6.15. All such available land should be distributed to groups of D&W farmers rather than to individual families. The land so distributed could either be registered in the group's name, or it could be given to them under a very long-term lease arrangement.

6.16. The recommendation of the Eleventh Plan that all rural families without homesteads be allotted

land in the woman's name, needs to be implemented in all States, to be used for shelter and supplementary livelihoods, although the amount allotted could be subject to availability. Some States have taken important initiatives in this direction. Kerala has had a longstanding programme of giving ownership rights on land on which a homestead stands, in its land reform programme. Some 4.46 lakh agricultural labour households benefited from this: the percentage of landless families declined from 15.7 per cent in 1971–72 to 4.8 per cent in 2002–03. These schemes provided land for shelter and also for supplementary livelihoods (for example kitchen gardens, goat and poultry rearing). The West Bengal and Orissa governments have also allotted homestead plots to landless families. Orissa has been allotting 4 to 10 cents and West Bengal has allotted up to 16 cents.

#### *Facilitating Land Purchase*

6.17. Apart from distributing all surplus land available with the government to D&W farmers, schemes could be instituted to enable the landless and land-poor to themselves purchase land. The Twelfth Plan Working Group on Disadvantaged Farmers, including Women recommends a loan-cum-grant scheme with 50 per cent being given as a low interest loan and 50 per cent being given as a grant, to help groups of landless or near landless women and men purchase land collectively. The land purchased can be registered in equal parts in each group member's name, but support is needed to help the group improve the land, and even cultivate it as a group.

6.18. A case in point is a scheme started in the 1980s by the Government of Andhra Pradesh, under which poor dalit women formed small groups to buy land collectively for joint farming, with support from the NGO Deccan Development Society. Many women's groups in Medak District took advantage of the scheme. The land was equally divided and registered in the names of individual women. But they are cultivating jointly by pooling it. However, experience has shown that government should not purchase land for leasing to D&W farmers, as attempted in Andhra Pradesh. Government entry in the land market tends to hike up prices, making the scheme unsustainable. It also adversely affects poor farmers who are outside

the scheme when they seek to buy or lease in land on their own.

#### *Facilitating Land Leasing*

6.19. Land leasing is a significant mechanism for bringing in fallow or little used land under cultivation, and providing land access to the land-poor. This will need both legal changes and institutional innovation.

6.20. *Legal changes:* Tenancy should be legalised and regulated to provide security to the tenant while also protecting the landowner's rights. The contractual period should be long enough to encourage investment in land. Legalisation should also protect the landowner's rights so that s/he has an incentive to lease out the land which might otherwise remain underutilised. A group approach to leasing in and use of the land should be built into the system, as also financial and institutional support for such cultivation. In other words, leasing by women's Self Help Groups (SHGs), or groups constituted of male or female headed disadvantaged farmer families, or production cooperatives, or other forms of group farms should be permitted. Sub-leasing within the group to individual members should be banned. Financial and institutional support should also be provided for group cultivation.

6.21. In 2009 Andhra Pradesh introduced a bill in the Assembly (Self-Help Group Tenancy Bill 2009), which would legally permit leasing by women's Self-help Groups. Landowners are assured that their titles will not be in jeopardy. However, a flaw in AP 2009 Bill is that the land will be leased collectively by the group, but can be sub-leased to group members, with the group bearing liability for the lease. This is retrogressive since default by one member would make the entire group indebted. Also subleasing will fragment the holdings and undermine potential economies of scale. Also reports indicate that even the news of this potential legalisation has frozen the land lease market.

6.22. *Public Land Banks:* Even legal guarantee may be insufficient to mitigate the landowner's fear of

losing his/her title, especially since many of the lessors are themselves small and marginal farmers. Enacting a law to recognise tenancies could freeze the informal land lease market in the short run. To guard against this, the Twelfth Plan Working Group on Disadvantaged Farmers, including Women proposes the creation of a *Public Land Bank* (PLB) at the panchayat level. This would regulate and rationalise land demand and supply. The PLB would take 'deposits' of land from landowners wanting to lease out their land, with the surety that they could withdraw their deposit when they wanted. The deposit could be for one season, one year, or three years and more. On deposit the farmers would get a small payment as incentive, the amount varying by the period of deposit (analogous to a current account, savings account, and fixed account in a financial bank). The incentive amount could be calibrated to a percentage of the prevailing average land rent in the panchayat. The landowner would receive an additional fee when the land is leased out.

6.23. The PLB would lease out the land under its command to specially designated categories of disadvantaged farmers, such as marginal farmers, women, dalits, and tribals, whether leasing as individuals or in groups. These lessees would get a guaranteed lease, fixed after assessing land quality, and in a consolidated plot where possible. Institutional finance and other support could also be provided.

6.24. There can be several incentives for farmers to deposit their land in the PLB: (i) a minimum rent from the PLB even for fallow land; (ii) an additional 'topping up' rent for land that gets leased out; (iii) development of the land in terms of soil conservation and so on, via MGNREGA or other means. (iv) government guarantee to protect the owner, with owners being free to withdraw their land from the Bank with due notice. For the lessees, it would provide D&W farmers access to land for which they cannot always compete in the open market. The PLB should provide a guaranteed lease and, where possible, a consolidated plot of reasonable size. This would, in itself, improve their ability to move up the value chain and taking advantage of new opportunities.

6.25. The PLB should be provided initial seed capital from the central and the state governments in a ratio of say, 80:20, or even 100 per cent by the Centre in the pilot stage for three years. The PLB would be registered as a Society.

#### *Group Farming: An Integrated Approach to Ease Multiple Constraints*

6.26. To ease the constraints D&W farmers face in access to land and other inputs, and to enable them to take advantage of new market opportunities, we need an integrated approach to problem resolution. The most comprehensive solution would be group farming with individual land ownership. There are several successful examples of group cultivation in India from which lessons can be learnt and the programme expanded to other states. The best known example is of the Kudumbashree project launched in 2007 by the Kerala Government; but initiatives in Andhra Pradesh are also of note.

6.27. The Kudumbashree project initially facilitated land leasing by small groups of women, typically women's SHGs. In March 2010, an additional step was taken under which SHGs undertaking group farming can be registered as Joint Liability Groups (JLGs)—a National Bank for Agriculture and Rural Development (NABARD) scheme—and given financial and technical support. The state government also provides support for land preparation and reclamation (linking it with MGNREGS in some districts). There are some 38,000 JLGs in Kerala today, covering 2.5 lakh women. Such collective/group farming is carried out in all 14 districts of Kerala, covering around 24,000 ha in 2010–11. Of this, 30 per cent is fallow land which is about 9 per cent of the total current fallow land in the state. Each JLG has 4–10 women members from poor families, who lease in land, and also pool small plots owned by members. Leases range between 1 and 3 years. Rent on fallow land is low. The main crops cultivated are paddy (almost one-third the acreage), tapioca, vegetables, banana and pineapple. Group farming through joint leasing has brought substantial uncultivated land under farming, revived agriculture and created employment.

6.28. The *Andhra Pradesh Mahila Samatha Society (APMSS)* is another significant case of successful group farming by women. In 2001, APMSS began implementing a five-year GoI–UNDP supported Dry Land Agriculture Project by mahila sanghams in five districts. The project covered 500 villages, with women farming in groups on jointly leased in or pooled personal land. In 2005, **United Nations Development Programme (UNDP) involvement ended but the programme continued** under APMSS. Many of these groups survive today. There are about 175 women's groups in five districts, involving 4,376 women farmers, belonging to small and marginal farmers and landless labourers. The groups mainly cultivate paddy with little irrigation and use non-chemical farming practices. All farm operations are shared and the output is distributed among the women.

6.29. Group farming has greatly increased food security among the participating households, which would not have been possible on an individual basis. However, the groups need sustained technical support at the field level which had been provided during the project period with UNDP funding.

6.30. The Kudumbashree and APMSS models could be tried on a pilot basis in other States, adapted to local contexts. The group enterprise model should also be replicated for other agricultural sectors, such as fisheries (for example, group pisciculture), poultry or livestock management. Group farming could also be integrated with MGNREGS for improving agricultural land. For instance, MGNREGS has been used productively for land preparation or reclamation to support group farming in Kerala (under the Kudumbashree project). Such efforts to integrate group farming with MGNREGS need to be encouraged to leverage such schemes better for improving land resources for agriculture.

6.31. Setting up of group enterprises takes time and resources. Funding for five years could be provided to all organisations willing to help form and mentor groups until they become self-sustaining. NGOs or other agencies could play this role.

## LAND ACQUISITION FOR NON-AGRICULTURAL USE

6.32. Faster industrialisation is both desirable and inevitable; so is faster urbanisation. Land is an essential requirement for these structural changes to proceed unimpeded. Government also needs to acquire land for a variety of public purposes, including human development and infrastructure projects. Recognising that all the land needed for development cannot be obtained in a purely voluntary manner, there is need for a fair land acquisition law which resorts to compulsory acquisition only where it is unavoidable and in a manner that seeks assessment of social impact as participatory as possible, while also ensuring that both fair compensation and Resettlement and Rehabilitation of the dislocated persons.

6.33. Independent estimates place the number of people displaced following development projects in India over the last sixty years at 60 million, and only a third of these are estimated to have been resettled in a planned manner. Most of these people are the asset-less rural poor, marginal farmers, poor fisherfolk and quarry workers. Around 40 per cent of those displaced belonged to Adivasis and 20 per cent to Dalits. Given that 90 per cent of our coal, more than 50 per cent of most minerals and most prospective dam sites are in Adivasi regions, there is likely to be continuing tension over issues of land acquisition in these areas.

6.34. These problems have arisen in large part because the legal framework under which land has been acquired is outdated. It is based on the principle of 'eminent domain'<sup>1</sup> under which the State can forcibly acquire land for a public purpose at prices which do not reflect the market price nor provide any premium to reflect the fact that the acquisition is forcible.

6.35. The way forward is to move away from the colonial perspective of treating people as 'subjects', which is inherent in the doctrine of eminent domain, towards a vision of citizens, whose rights are guaranteed under the Constitution. Ultimately, we have to go beyond narrow legality to seek broader legitimacy.

6.36. Resettlement & Rehabilitation (R&R) provisions must be made mandatory and not reduced to what they have generally tended to become—conditionalities without consequences. We also require an unequivocal commitment to imaginatively explore ways of rebuilding the livelihoods of those adversely affected by development projects.

6.37. Not addressing these issues has meant that even when the purposes for which land is to be acquired are in the legitimate national interest and/or subserve a vital public purpose, there have been fractious and irresolvable conflicts over land acquisition.

6.38. On the other hand, given the huge asymmetries of information and power in the land market, there are innumerable instances of distress sales by farmers to more powerful entities at throwaway prices. In many instances, these sales have been followed by use of the land in ways that run completely contrary to the original stated purpose and have yielded windfall profits to land and real estate mafias. That is why there has to be a role for the government—to put in place, a transparent and flexible set of rules and regulations, and to ensure its enforcement.

6.39. Government is in the final stages of formulating *The Right to Fair Compensation, Resettlement, Rehabilitation and Transparency in Land Acquisition Bill*. The Bill seeks to balance the need for facilitating land acquisition for various public purposes, including infrastructure development, industrialisation and urbanisation, while at the same time meaningfully addressing the concerns of farmers, and those whose livelihoods depend on the land being acquired.

6.40. The reason for combining the two into a single legislation is that land acquisition and R&R are two sides of the same coin. R&R must always, in each instance, necessarily follow upon significant acquisition of land. Not combining the two within one law, risks neglect of R&R which has been the experience so far.

6.41. Even as it protects the interests of the land and livelihood losers by ensuring them fair compensation and adequate R&R, the Bill also seeks to ensure



that land acquisition for vital public purposes happens in a manner that is judicious, transparent and time-bound, so that public purposes can be served in an expeditious and efficient manner.

6.42. The Bill is a milestone in legislation that should lead to a reduction in instances of perceived injustices that have played a major role in fuelling Maoism. On the other hand, by improving the functioning of the land market, it should lead to an upgrading of the overall investment climate in the country.

6.43. The Bill lists eight categories of public purpose for which government can acquire land:

1. Land for strategic purposes relating to armed forces of the Union, national security or defence, police, safety of the people;
2. Land for railways, highways, ports, power and irrigation purposes for use by Government and public sector companies or corporations;
3. Land for the project affected people;
4. Land for Planned development or improvement of village or urban sites or for residential purpose to weaker sections in rural or urban areas;
5. Land for Government administered educational, agricultural, health and research schemes or institutions;
6. Land for persons residing in areas affected by natural calamities;
7. Land acquired by the Government for
  - (a) use by government itself for purposes other than those above
  - (b) public sector companies; or
  - (c) PPP projects for the production of public goods or the provision of public services for physical infrastructure, social infrastructure and human development projects including those involving the production of intermediate goods and services for these purposes.
8. Land for private companies for the production of public goods or provision of public services for physical infrastructure, social infrastructure and human development projects including those involving the production of intermediate goods and services for these purposes.

6.44. Under categories (7) and (8), consent of at least 80 per cent of the landowning Project Affected Families (PAFs) is sought to be obtained through an informed process as outlined in the Bill. Under PPP projects, ownership of land will continue to vest with Government so that the PPP framework can apply.

6.45. In each case of land acquisition, fair compensation and R&R provisions as laid out in the Bill will apply. The compensation will be two times the market rate (including solatium) in urban areas and 2–4 times the market rate (including solatium) in rural areas (based on a sliding scale reflecting the distance of project from urban area). The sliding scale will be determined by State government or State Land Pricing Commission/Authority.<sup>2</sup> The land compensation calculated will not be taken as the base to determine the circle rate for subsequent acquisitions, in order to ensure there is no speculative price spiral.

6.46. In the interests of food security, reasonable restrictions have been placed on acquisition of multi cropped agricultural land, with the limits of these being in each case left to the States to decide. These restrictions shall not apply in the case of linear projects (such as railways, highways, major district roads, power and telegraph lines and irrigation canals)

6.47. The comprehensive R&R package for landowners and livelihood losers<sup>3</sup> includes:

1. Subsistence allowance at ₹3,000 per month per family for 12 months
2. The affected families shall be entitled to:
  - (i) Where jobs are created through the project, mandatory employment for one member per affected family or
  - (ii) ₹5 lakhs per family or
  - (iii) ₹2,000 per month per family as annuity for 20 years, with appropriate index for inflation. The option of availing (i) or (ii) or (iii) shall be that of the affected family
3. If a house is lost in rural areas, a constructed house shall be provided as per the Indira Awas Yojana specifications. If a house is lost in urban areas, a constructed house shall be provided, which will be not less than 50 sq mts in plinth

area. In either case the equivalent cost of the house may also be provided in lieu of the house as per the preference of the project affected family

4. *One acre of land* to each family in the command area, if land is acquired for an irrigation project
5. ₹50,000 for transportation
6. A one-time 'Resettlement Allowance' of ₹50,000

6.48. Additional benefits have been provided for SC/ST families. The Bill also seeks to provide the same R&R package to affected families on sale/purchase of land where sale/purchase exceeds a certain threshold. This threshold shall be fixed by respective States keeping in view the availability of the land and density of the population.

6.49. 25 infrastructural amenities are to be provided in the resettlement area, including schools and playgrounds, health centres, roads and electric connections, assured sources of safe drinking water for each family, panchayat ghars, Anganwadis, places of worship and burial and/or cremation ground, village level post offices, as appropriate, with facilities for opening saving accounts, Fair Price shops and seed-cum-fertiliser storage facilities and so on.

6.50. In order to avoid delays, stringent time-lines have been set. Compensation will be given within a period of three months from the date of the award. Monetary R&R entitlements will be provided within a period of six months from the date of the award. Infrastructure R&R entitlements will be provided within a period of eighteen months from the date of the award. No involuntary displacement will take place without completion of R&R. In irrigation or hydel projects, R&R shall be completed six months prior to submergence.

#### INNOVATIONS IN LAND FOR URBANISATION

6.51. Work on issues related to urbanisation during the preparation of the Twelfth Plan has thrown up a number of innovative ideas to ease the land constraint in this sector:

6.52. Land Readjustment (LR) is gaining acceptance as an alternative to land acquisition as it has many

advantages for land assembly. Under this process, a compact area is selected in consultation with the land owners for urban expansion/renewal. The municipal authorities provide infrastructure which is funded by exploiting a part of land. The remaining land, whose value has increased due to provision of infrastructure, is reallocated back to participating private land-owners. In essence a participatory tool, LR avoids public discontent and protests to a great extent. It also reduces the need for raising large amounts of money for acquiring land.

6.53. India has already been experimenting with a variant of LR in Gujarat's Town Planning Schemes (TPSs). Another ongoing experiment is the improvement of the C ward in Mumbai that showcases the promises of participatory processes in urban renewal. There is need for scaling such experiments. However, successful LR is grounded in three main enablers:

- Fairly well-defined property rights
- Streamlined, independent, and transparent evaluation processes
- Strong judicial system to address public concerns

6.54. Adopting mixed land-use and subsequently modifying regulations governing land-use, and removing deficiencies in the urban land market need to be given high priority. In many parts of the country, urban land planning limits redevelopment, modernisation and repurposing of older inefficient areas. Weak institutional and information foundations still govern land markets. In many cases, urban plans seek to preserve status quo by limiting land assembly and freezing the density of developments by using very low Floor Space Indexes (FSI), and limited coordination with infrastructure development. Under the Eleventh Plan, JNNURM sought to address these issues by incentivising several urban reforms. Completion of reforms mandated by JNNURM must be given priority.

6.55. Simplification of procedures for conversion of land-use and change in building bye laws have been mandated under JNNURM. These reforms should be completed urgently.

6.56. Rights of Slum Dwellers: Phase-II of the Rajiv Awas Yojana (RAY) is to be launched during the Twelfth Plan. RAY mandates giving 'property rights' to slum dwellers by suitable enactment within a year of the project being sanctioned. Besides, during this period it also mandates enactment of legislations to earmark 10–15 per cent of land or 20–25 per cent dwelling units for housing projects for economically weaker sections/LIG category and earmarking of at least 25 per cent of municipal budget for urban poor. It also requires the participating states to draw specific timelines for legislations like modification of the Rent Control Act.

### MODERNISATION OF LAND RECORDS

6.57. The deteriorating quality of land records administration over the last four decades has been a major cause for concern. Accurate and updated land records are a veritable lifeline for millions of small and marginal farmers in India. They secure them against a range of vulnerabilities and allow them to access credit and agricultural inputs, as also the benefits of various anti-poverty programmes. Unambiguously recorded land rights, firm in law, are the foundation for investments in higher farm productivity. On the other hand, chaotic land management results in sporadic encroachments and fratricidal litigation, at great cost to the poor. It also creates a governance regime within which rent-seeking and exploitation of the weak flourish unchecked.

6.58. Once land revenue began to decline in significance as an element in state income, especially in the 1970s, land record administration underwent great neglect. The most important activity for updating land records—original survey for cadastral mapping—has been neglected by many States. In many areas, especially the tribal hinterlands, land records have not been updated for decades. Mutation of names in the records does not happen (invariably as it should) upon transfer of possession and ownership of land. Millions of cases of mutation and measurement remain pending across the country.

6.59. In most states a multitude of departments are involved in land record management. People need to approach several agencies to obtain complete

land records—Revenue Department for textual records and mutations; Survey and Settlement (or Consolidation) Department for maps; Registration Department for verification of encumbrances and registration of transfer, mortgage and so on. and panchayats for mutation. The harassment they potentially suffer can be imagined. Also because these departments work in relative isolation from each other, updation by any one of them makes the records of others outdated. Absence of integration of textual and spatial records makes it hard to get maps-to-scale with the records of rights (RoRs).

6.60. The current system of land registration in India is based on the Registration Act, 1908, which provides for registration of deeds and documents, and not titles. Only the transaction is recorded. The transfer of ownership title remains merely presumptive. The massive time-lag between registration and mutation gives space for fraudulent transactions in land, litigation and so on.

6.61. An alternative and more direct system used in many other countries (such as the US, UK, Australia, New Zealand, Canada, Switzerland, Singapore, Kenya and Malaysia) is that of 'conclusive titles' (Torrens System) which confers a legal indefeasible title to the holder of the land. The system of conclusive titles is based on four fundamental principles: (i) a single agency to handle land records to ensure consistency and reduce conflicts between different sources; (ii) the 'mirror' principle, whereby the cadastral records mirror the reality on the ground; (iii) the 'curtain' principle, which indicates that the record of the title is a true depiction of ownership status, so that mutation is automatic following registration, referring to past transactions is not necessary and the title is a conclusive, rather than a mere presumptive proof of ownership; (iv) title insurance, which guarantees the title for its correctness and indemnifies the title holder against loss arising on account of any inaccuracy in this regard. At present, land records in India do not reflect any of these principles.

6.62. In order to move decisively in the direction of a Torrens System of land records in India, the National

Land Records Modernization Programme (NLRMP) was launched in 2008. The NLRMP was formed by the merger of two pre-existing CSSs—Strengthening of Revenue Administration and Updating of Land Records (started in 1987–88) and Computerization of Land Records (launched in 1988–89). The main aims of NLRMP are:

- To usher in real-time land records
- Automated and automatic mutation
- Integration between textual and spatial records
- To ultimately replace the present deeds registration and presumptive title system with that of conclusive titling with title guarantee

6.63. Real-time records will be available, which will be tamper-proof. Automatic and automated mutations will significantly reduce scope for fraudulent deals. Since records will be placed on the website with proper security IDs, landowners will have free access to their records while maintaining confidentiality. Single window service or web-enabled any-time-anywhere access will save time and effort. Due to IT interlinkages, time for obtaining RoRs and maps will reduce drastically. Free access will decrease interface with officials, thereby reducing corruption and harassment.

6.64. Abolition of stamp papers and payment of stamp duty and registration fees through banks will also reduce interface with the registration bureaucracy.

6.65. Conclusive titling will reduce land disputes and litigation. E-linkages to credit facilities will become possible. Certificates based on land data (domicile, caste, income, and so on) will become available through the web. Issue of land passbooks will become easier.

6.66. A district will be taken as the unit of implementation, where all activities under the programme will converge. The NLRMP is to be implemented in a time-bound manner and all the districts in the country are expected to be covered by the end of the Twelfth Plan. The country could move into a Torrens System during the Thirteenth Five Year Plan.

6.67. The manual distribution of RoRs has stopped in 16 states. In 21 states legal sanctity to computerised copies of RoRs has been accorded. In 16 states, RoRs have been placed on websites. 26 states have taken up digitisation of cadastral maps, while 18 have begun effecting mutations using computers. Computer centres have been set up in 4,434 tehsils/taluks, 1,045 sub-divisions, 392 districts, and 17 state headquarter monitoring cells. Sixteen states have completed the construction of about 1,366 land record rooms, while 15 states have completed the construction of about 4,311 patwari/talathi office-cum-residences. In 20 states revenue/survey training institutes have been strengthened through construction, renovation, upgradation, and providing modern equipment.

6.68. There are several challenges that will need to be tackled in the coming years. As much as 2.16 million sq. km of cultivable area has to be surveyed. The survey and settlements have to be done for 140 million landowners with 430 million records. There are 92 million ownership holdings each with 4–6 parcels of land. Around 42 million field measurement blocks and around 1 million village maps have to be digitised.

6.69. Establishing Ground Control Points (GCPs) across India over 3.29 million sq. km will be a major challenge. So far, 300 GCPs (satellite) have been established at a spacing of 200–300 km; 2,220 points at a distance of 30 to 40 km (aerial) have to be undertaken in the second phase; the third phase will have GCPs at a spacing of 8 to 10 km (cadastral). Further, 42 million field measurement books and 1 million village maps will have to be digitised.

6.70. Of the 4,018 registration offices in the country, 1,896 are yet to be computerised. Nearly all of them have to be interlinked with the state revenue departments. As many as 1.5 lakh patwaris, the staff of 5,000 tehsils, 4,000 registration offices, and 50,000 survey staff need to be trained.

6.71. These challenges demand a greatly stepped up order of preparation on the part of the Department of Land Resources and the states. The most critical bottleneck that is likely to arise is in the capacity

building of human resources. There is need to both strengthen the profile of the personnel deployed, as also to train those currently in service, whose skill sets are currently completely out of sync with the demands posed by the radically new architecture visualised for NLRMP.

## NOTES

1. The Supreme Court traces the doctrine to Hugo Grotius (*De Jure Belli et Pacis*, 1625): 'The property of the subject is under

the eminent domain of the state, so that the state or he who acts for it may use and even alienate and destroy such property... for ends of public utility, to which ends, private ends should give way. . . the state is bound to make good the loss to those who lose their property.'

2. This multiplier factor is the multiple of the market value as determined based on the average registered sale transactions in the last 3 years.
3. Their precise numbers will in each project be determined through a rigorous, transparent and participatory Social Impact Assessment.

# 7

## Environment, Forestry and Wildlife

### INTRODUCTION

7.1. Globally, environment has emerged as a major area of governance—bringing the scientific, socio-economic and political dimensions in a single crucible. Sustainability of economic development itself crucially hinges on the protection of environment. For India, challenges of arresting the pace of degradation of environment are formidable due to the imperatives of maintaining high economic growth, increasing trends of urbanisation, population growth, industrialisation, unmet basic needs, life style changes and biotic pressures. While these challenges are formidable, there are also positive factors such as our strong base in science and technology, our institutional infrastructure that can drive the new paradigms and a holistic approach demanded by the environmental governance today. Impacts on environment are an amalgam of the roles of multiple stakeholders such as government, industries and citizens. To respond to a diverse range of dynamic challenges, environmental governance should now be founded on adaptive and agile systems that optimise and strengthen the roles of all stakeholders.

The Twelfth Plan aims to transition the environmental governance system towards such holistic approach (refer to Box 7.1).

7.2. Global interfaces are gaining increasing importance in the field of environment. Environment is characterised by interconnectedness that transcends national/international boundaries and hence international cooperation and national efforts are semi-ally important to achieve the objectives of equitable access to clean air and water, adaptation and mitigation of climate change, conservation of biodiversity, sustainable forest management, safety in the management of chemicals, wastes and other hazardous substances.

7.3. Resource constraints had also limited the effectiveness of managing our environmental and forest resources. Currently, the annual budget of Ministry of Environment and Forests (MoEF) is around ₹2,000 crore, which is merely 0.012 per cent of Gross Domestic Product (GDP) and less than 0.25 per cent of the annual national budget. The situation in the

### Box 7.1 Vision

Managing Environment, Forests, Wildlife and challenges due to Climate Change for faster and equitable growth, where ecological security for sustainability and inclusiveness is restored, equity in access to all environmental goods and ecosystem services is assured through institutionalisation of people's participation;

AND

A future in which the nation takes pride in the quality of its environment, forests, richness of its biodiversity, and efforts by the State and its people to protect, expand and enrich it, for intra and inter-generational equity and welfare of the local and global community.

States and at the city level is a real cause for concern. There is a need for significant increase in the investment towards environment protection and sustainable management of natural resources.

7.4. Constitutionally, Environment is a residual subject, with both the Central and the State Government responsible for regulation and enforcement. Thus, there is a need to include 'environment' as a concurrent subject in the constitution. This will help the State Governments and the local authorities enact and notify their own enforcement laws and rules to ensure compliance of relevant environmental norms. This issue, which was highlighted in the previous plan as well, not only remains relevant but needs to be pursued on priority. This initiative will also be important for integrating environmental concerns into planning and developmental activities across all the sectors. The MoEF is concerned with protection and management of the environment in the country. It is mandated with the responsibility of planning, promotion, cooperation and overseeing the implementation of various environmental and forestry schemes/programmes. The main objectives of the MoEF include protection of the environment; conservation and survey of flora, fauna, forests and wildlife; prevention and control of pollution; afforestation and regeneration of degraded areas; ensuring welfare of animals; and international cooperation in forestry and environment. The MoEF is also concerned with environmental management: to promote health considerations; to focus on poverty alleviation by enhancing access to poor of natural resources for livelihood; and to enhance the awareness regarding environmentally sound living process by focusing on nature-man synergy. MoEF is also designated as the nodal agency for the United Nations Environment Programme (UNEP) and the International Centre for Integrated Mountain Development and looks after the follow-up of the United Nations Conference on Environment and Development (UNCED).

7.5. Several Ministries, notably the Ministry of Urban Development (MoUD) run major programmes like Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and Urban Infrastructure Development Scheme for Small and

Medium Towns (UIDSSMT), which have a direct impact on the objectives of MoEF. Programmes such as the JNNURM and National River Conservation Programme (NRCP) need to be effectively combined to achieve the target of rivers cleaning. The MoUD should also ensure creation of required waste management system in all urban local bodies. Similarly, afforestation work including rehabilitation and livelihood improvement activities can be taken up under the schemes of Ministries of Rural Development (MoRD), Agriculture, Tribal Affairs, Panchayat Raj, Renewable Energy and so on. There is thus, considerable potential for dovetailing of resources with the schemes of several Ministries and an attempt could also be made for earmarking of resources under these Ministries for investment in environment and greening of the country.

7.6. Besides programmes, legislative initiatives of a number of Ministries also have a bearing and impact on the working of environment related laws. International commitments in various sectors and their compliance through new laws, institutions of enforcement and programmes of action also impact environmental governance. Further, the National Environmental Policy has the object of ensuring that all developmental decisions duly recognise and take into account the environmental imperatives of conservation and sustainable development.

## REVIEW OF THE ELEVENTH PLAN

7.7. The Eleventh Plan laid emphasis on environmental sustainability while pursuing development by incorporating environmental concerns in development planning at all levels. A number of schemes on pollution abatement, conservation of biodiversity and habitat management were implemented.

### Progress Achieved

7.8. The Eleventh Plan emphasised on four environment related targets and the progress achieved against these is summarised below:

#### *Increase Forest and Tree Cover by 5 Percentage Points*

7.9. The Forest and Tree Cover (FTC), as reported in the State of Forest Report 2009 is 23.84 per cent. To achieve the plan target of 5 per cent increase,

### **Box 7.2** **Waste Disposal in PPP Mode**

The state of solid waste management in Kanpur was no different from most other Indian cities until only a few years ago. Kanpur Nagar Nigam (KNN) had the responsibility for collecting, transporting and disposing of the solid waste generated in the city, estimated at about 1,500 tonnes per day.

In June 2008, KNN gave a BOOT (build, own, operate, transfer) contract for processing, disposing, collection and transportation of solid waste to A2Z Infrastructure, a private company, which was selected through a process of competitive bidding. Land (46 acres) was given free on a long lease of 30 years for the project. The plant to process 1,500 tonnes per day capacity of solid waste was set up with a tipping platform, a pre-segregation unit, a composting unit, an RDF (Refuse Derived Fuel) unit, a plastic segregating unit, a briquette manufacturing unit, and a secured landfill in place. Of the total project cost of ₹110 crore, ₹56.6 crore came from JNNURM and the rest from the private partner.

Door-to-door collection of garbage is being done in bins attached to rickshaws by safaimitras using hand gloves and protective masks. The garbage is compressed while being transported. Garbage transport vehicle is equipped with Global Positioning System (GPS) and every incidence of the compactor halt to collect garbage is monitored and recorded. Rag-pickers have been given the opportunity of starting a new life. Some of the former rag-pickers (130, to be precise) now earn a regular salary as safaimitras, sport a bank ATM card, enjoy social security and health benefits, and their young kids have started going to schools.

The garbage is taken to a central site where it is sorted, segregated, transformed into a number of products of value, for example, premium quality compost, refuse derived fuel (RDF), interlocking tiles from construction debris for use in footpath paving, and so on. Kanpur Waste Management Plant is the largest producer of compost from organic waste. The plant is not able to meet the growing demand for organic fertiliser.

In 2010, A2Z Infrastructure, the private company, set up a waste-to-energy plant, creating the largest integrated project in solid waste management in Asia, which produces 15 MW of electricity, using RDF produced in house. The plant has been registered with United Nations Framework Convention on Climate Change (UNFCCC) for carbon credits claiming certified carbon reductions achieved by Clean Development Mechanism (CDM) projects under the Kyoto protocol. The KNN received best city award (JNNURM) for improvement in solid waste management from Prime Minister in 2011. Dr. Isher Judge Ahluwalia—a leading columnist after her visit and discussion published this article in print and electronic media which is widely acclaimed. Ahmedabad and Surat Municipal Corporations have also set up integrated Municipal Solid Waste collection and disposal mechanism. In the Twelfth Five Year Plan, every attempt will be made to replicate the similar model in maximum number of cities in the country.

an additional 16 million ha FTC was required by 2012. The tree planting during the Plan period has been around 1.5 million ha per year, but the actual increase in green cover is not likely to be more than 5.0 million ha during the entire Plan period.

#### ***Treat All Urban Waste Water by 2011–12 to Clean River Waters***

7.10. Deterioration in river waters is largely due to discharge of raw/partially treated sewage into the rivers. Cleaning of rivers is a mammoth task requiring the involvement of all the stakeholders. As per the Central Pollution Control Board (CPCB), the estimated wastewater generation in 498 Class I cities and 410 Class II towns is estimated to be about 38,000 million litres per day (MLD), against which treatment capacity of only 12,000 MLD exists at present.

Sewage treatment capacity of about 4,418 MLD has been created under NRCP and Ganga Action Plan-I (GAP-I). Given the large gap between sewage generation and treatment capacity available, substantial increase in allocations is required to be made in the Twelfth Plan period. (Also refer to Box 7.2 for waste disposal in PPP mode)

#### ***Attain World Health Organisation (WHO) Standards of Air Quality in All Major Cities by 2011–12***

7.11. The MoEF feels that the notified National Ambient Air Quality Standards (NAAQS), instead of the WHO guidelines, would serve as a more realistic and appropriate goal for achieving better air quality in India. The NAAQS were revised in the Eleventh Plan, and limits for 12 pollutants, including new



parameters such as Ozone, Arsenic, Nickel, Benzene and Benzo(a)Pyrene were notified.

### *Increase Energy Efficiency by 20 Percentage Points by 2016–17 in the Environment and Forests Sector*

7.12. A National Mission on Enhanced Energy Efficiency (NMEEE) has been launched under National Action Plan on Climate Change (NAPCC) by the Ministry of Power in order to achieve fuel savings of 23 MTOE (against 24 MTOE consumed in nine sectors); avoid capacity addition of over 19,000 MW; and reduce 98.55 MTs of Carbon Dioxide (CO<sub>2</sub>) equivalent annually over a five-year period. India has also announced its domestic mitigation goal of reducing emissions intensity of GDP by 20–25 per cent by 2020 compared with 2005. An Expert Group constituted by the Planning Commission is in the process of drafting a low carbon inclusive growth strategy for India for the Twelfth Five Year Plan.

### **Major Policy Developments**

7.13. Besides the progress achieved in four monitorable targets, a number of major policies were formulated during the Eleventh Plan.

- The National Environment Policy was unveiled in 2006 to help realise sustainable development goals by mainstreaming environmental concerns in all development activities.
- The Environmental Impact Assessment (EIA) process has been made more efficient, decentralised and transparent, based on a comprehensive review of the existing environmental process and its re-engineering through the EIA Notification, 2006, and its amendments thereafter. A system of mandatory accreditation of EIA/Environmental Management Plan (EMP) consultants has also been introduced to improve the quality of impact assessment reports submitted by project proponents.
- Re-engineering of Coastal Regulation ZONE (CRZ) Notification 2011 was done to ensure livelihood security to fishing and other local communities, to conserve and protect coastal stretches and to promote development based on scientific principles. Another Notification on Island

Protection Zone was issued for similar purposes for the islands of Andaman & Nicobar and the Lakshadweep.

- An NAPCC was released in June 2008 to outline India's strategy to meet the challenge of climate change. The Indian Network for Climate Change Assessment (INCCA), a network-based programme to make science the essence of our policymaking in the climate change space, was also launched.
- Towards conservation of biodiversity, a National Biodiversity Action Plan was released in November 2008. The Plan identifies major threats and constraints facing biodiversity and lists out action points for addressing/conserving the same.
- A National Ganga River Basin Authority (NGRBA) has been set up to ensure effective abatement of pollution and conservation of the river Ganga by adopting a holistic approach with the river basin as the unit of planning.
- The NAAQS have been revised and limits for 12 pollutants are notified. The revised standards are based on global best practices, local Indian conditions and in keeping with the advancement in technology and research.
- National Green Tribunal (NGT) was set up on 18 October 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources.
- Towards further environmental regulatory reforms and improving environmental governance, an exercise has been initiated to conceptualise and constitute a National Environment Assessment & Monitoring Authority (NEAMA).
- To resolve the deadlock of Compensatory Afforestation Fund Management and Planning Authority (CAMPA), State Level CAMPAs have been created, providing an integrated framework for utilisation of multiple sources of funding and activities relating to afforestation, regeneration, conservation and protection of forests.
- Interventions have been undertaken to increase forest cover. The Green India Mission under NAPCC is going to be operationalised in 2012–13.
- Wildlife (Protection) Act, 1972 was amended to enable Constitution of the National Tiger Conservation Authority and the Tiger and other Endangered Species Crime Control Bureau.

7.14. A number of externally aided projects also became operational in the Eleventh Plan including National Coastal Management Programme, Capacity Building for Industrial Pollution Management project (CBIPM) under Pollution Abatement scheme, and Biodiversity Conservation and Rural Livelihood Improvement Project. The aforementioned NGRBA for effective abatement of pollution and conservation of river Ganga, was funded under both budgetary support and external aid from the World Bank.

### Rationalisation of Schemes during Eleventh Plan

7.15. Plan schemes of the MoEF were rationalised by suitably merging/clubbing its 68 smaller schemes into 22 thematic schemes, for implementation in the Eleventh Five Year Plan. Of these 22 approved

thematic schemes, the scheme of Muli Bamboo was successfully completed in 2008–09. The new scheme of Afforestation through Panchayati Raj Institutions (PRIs), which proposes large scale intervention in non-forest areas, has been dropped following the formulation of National Mission for Green India with similar objective on a much higher scale. The scheme of Taj Protection had been put on hold pending an evaluation of the scheme by National Environmental Engineering Research Institute (NEERI), Nagpur. The Evaluation Report has since been accepted and it is proposed to revive the scheme in the Twelfth Five Year Plan. Thus, there are 20 thematic schemes under implementation at the end of the Eleventh Plan (refer to Table 7.1) with each scheme having further components/ programmes. Among the 20 thematic heads, there are 12 Central Sector (CS)

**TABLE 7.1**  
**Thematic Schemes under Implementation at the End of the Eleventh Plan**

| Environment and Ecology   | Scheme Type |
|---|-------------|
| Environment Monitoring and Governance                           | CS          |
| Pollution abatement   | CS          |
| Research and Development (R&D) for Conservation and Development | CS          |
| Environmental Info, Education and Awareness                     | CS          |
| International Cooperation Activities                            | CS          |
| National Coastal Management Programme                           | CS          |
| National River Conservation Plan                                | CSS         |
| Conservation of Natural Resources and Ecosystems                | CSS         |
| Environment Management in Heritage including Taj Protection     | CSS         |
| Forestry  | Scheme Type |
| Grants-in-aid to forestry and Wildlife institutions             | CS          |
| National Afforestation and Eco Development Board (NAEB)         | CS          |
| Capacity building in forestry sector                            | CS          |
| Strengthening of Forestry Division                              | CS          |
| Afforestation and Forest Management                             | CSS         |
| National Afforestation Programme                                | CSS         |
| Afforestation through PRIs (Panchayat Van Yojana)—being dropped | CSS         |
| Wildlife  | Scheme Type |
| Strengthening of Wildlife Divisions                             | CS          |
| Animal Welfare  | CS          |
| Integrated Development of Wildlife Habitats                     | CSS         |
| Project Tiger   | CSS         |
| Project Elephant  | CSS         |

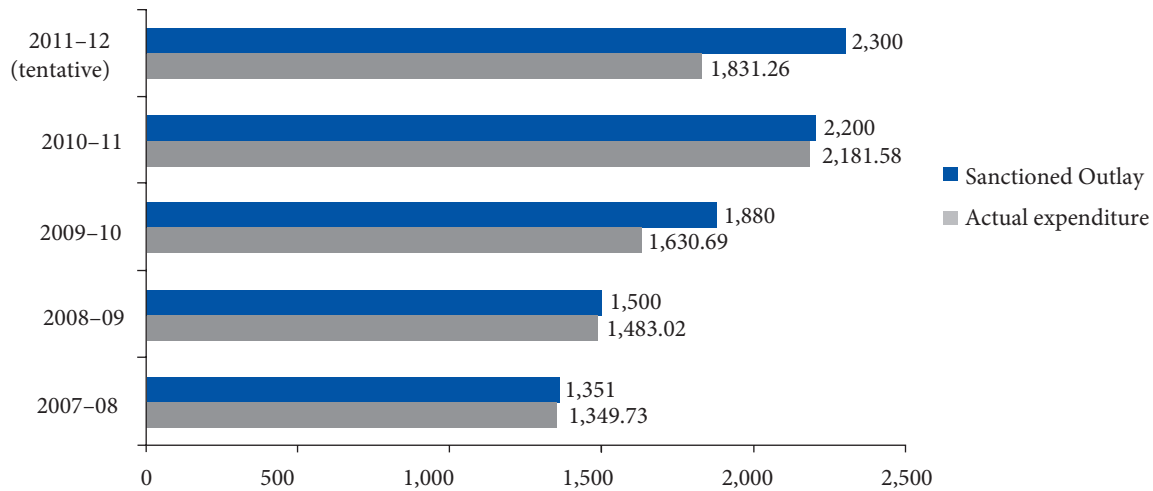


FIGURE 7.1: Sanctioned Outlay vs Actual Expenditure in the Eleventh Plan (₹ Crore)

schemes and the remaining are Centrally Sponsored Schemes (CSS).

7.16. Other developments during the Plan so far include transfer of the 'civil construction unit' component under International Cooperation Activities scheme to non-plan budget; merger of the 'state of environment' component with Environmental Information System (ENVIS) component under the Environmental Information, Education and Awareness scheme; and addition of a new externally aided component on Capacity Building for Forest Management and Training of Personnel under the scheme of Capacity Building for Forestry Sector.

#### Financial Performance of Eleventh Plan

7.17. MoEF had an approved outlay of ₹10,000 crore for the Eleventh Five Year Plan, 2007-12. Figure 7.1 provides the sanctioned outlay along with the actual expenditure for each year of the Eleventh Plan.

7.18. For the current financial year 2011-12, MoEF has been allocated an outlay of ₹2,300 crore, against which likely expenditure is tentatively placed at ₹1,831.26 crore.

7.19. Thus, a total outlay of ₹9,231.00 crore has been allocated to MoEF in the Eleventh Plan as budgeted expenditure (BE), against which its likely expenditure is ₹8,476.28 crore which implies a utilisation ratio of around 95 per cent during this period. Total

allocations made in the Eleventh Plan amounted to around 92 per cent of MoEF's sanctioned/approved outlay.

7.20. The sector-wise position of allocations/expenditure during the Eleventh Plan is summarised in Figure 7.2.

7.21. During the Eleventh Plan the country pursued its development agenda considering environmental protection at the core of all policy formulation. In the Twelfth Plan it has been felt that the country needs more focused efforts not only to preserve and maintain natural resources but also to provide equitable access to those who are denied this currently.

#### TARGETS AND ACTION FOR THE TWELFTH PLAN

7.22. After an in-depth analysis of the policies and programmes in the Environment, Forestry, Biodiversity, Wildlife and Animal Welfare sectors, 12 monitorable targets (Box 7.3) have been set for the Twelfth Plan. These include three targets in the areas of Environment and Climate Change, four targets in Forestry, three targets under Wildlife, Ecotourism and Animal Welfare, and two under Ecosystems and Biodiversity.

7.23. Further, 15 areas which should receive special attention have been identified for the Twelfth Plan (presented in Box 7.4).

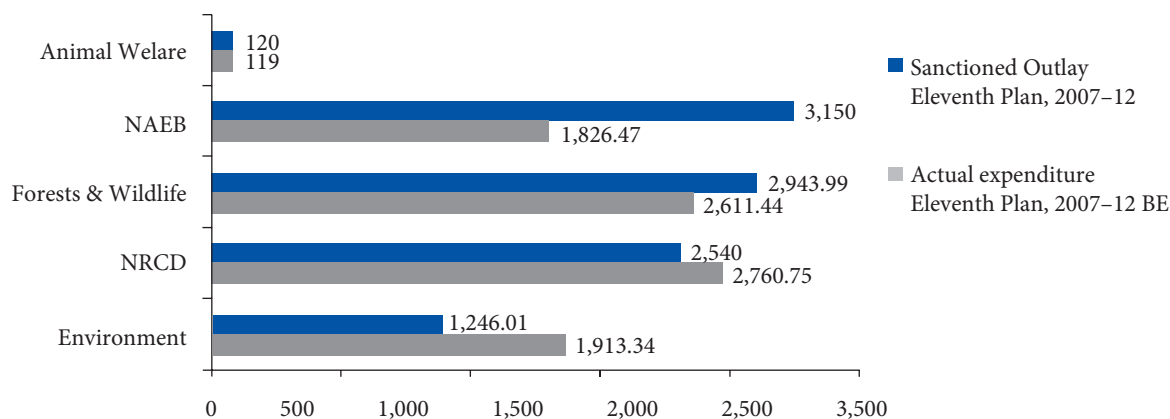


FIGURE 7.2: Sector-wise Allocations/Expenditure during the Eleventh Plan (₹ Crore)

### Strategy for the Twelfth Plan

7.24. Due to its cross-cutting nature, and wide local and global stakeholder base, environmental governance needs to be strategic. An ideal framework should be anticipative, technically oriented, cognizant of legal issues, geo-politically relevant and forward-looking, capable of maximising national interests and progressive enough to make a social impact. Most importantly, management of the environment should include progressively adapting/changing actions that rely on sound scientific, technological, human-cognitive and collaborative principles. Thus, environmental management should be based on:

- Data and facts (founded on a sound measurement regime of key environmental parameters).
- Analytics and modelling (founded on scientific and predictive data integration/modelling)
- Indexing and thresholding (founded on scientific assimilation of time-profile data to determine constantly changing indices of environment status).
- Collectively powering the management and conservation of environment and also formulation of national policy and legal foundations.

7.25. The Twelfth Plan is thus oriented towards such strategic directions for managing environment in India. The following sections provide details on

programmatic, institutional, regulatory, research and capacity building elements that weave into such an overall strategy, taking into account past experience as well as overall objectives of the plan.

### Programmatic Strategies

7.26. The Approach Paper for the Twelfth Plan for environment, forests, wildlife and climate change focused strategic attention on the following:

- Securing ecology of watersheds and catchments;
- Cumulative environmental impact assessments for vulnerable regions;
- Carrying capacity studies in selected river basins;
- Maintaining acceptable water quality and quantity through pollution control of water resources;
- Restoration of wetlands/lakes; and
- Management of waste water discharge from industrial and commercial establishments into major water bodies.

7.27. It also emphasised in situ conservation and sustainable use of biodiversity to enhance livelihood security, promotion and evaluation of ecosystem services in the national planning process. This includes the study of the economics of ecosystem and biodiversity; abatement of marine pollution and prevention of traffic in marine resources; the need for safe storage and disposal facilities for hazardous

**Box 7.3**  
**Monitorable Targets for the Twelfth Plan**

**ENVIRONMENT AND CLIMATE CHANGE**

1. Assess and remediate 12 identified contaminated sites (hazardous chemicals and wastes) with potential for ground water contamination by 2017.
2. Clean 80 per cent of critically polluted stretches in rivers by 2017 and 100 per cent by 2020.
3. States to meet NAAQS in urban areas by 2017.
4. To reduce emission intensity of our GDP in line with the target of 20 to 25 percent reduction over 2005 levels by 2020.

**FORESTS AND LIVELIHOOD**

5. Greening 5 million ha under Green India Mission including 1.5 million ha of degraded lands, afforestation and eco-restoration of 0.9 million ha of ecologically sensitive areas.
6. Technology-based monitoring of forest cover, biodiversity and growing stock including change-monitoring on periodical basis through dedicated satellite by 2017 and establishment of open web-based National Forestry and Environmental Information system for research and public accessibility by 2015.
7. Engagement of Village Green Guards/Community Foresters for every Joint Forest Management (JFM) village by 2016.
8. Establish forestry seed bank in forest circles and Model Nursery in every district with information on public portal by 2014.

**WILDLIFE, ECOTOURISM AND ANIMAL WELFARE**

9. Twenty per cent of veterinary professionals in the country will be trained in treating wildlife.
10. Integrated Ecotourism District Plans covering 10 per cent of all potential Protected Areas (PAs) by 2017.
11. Promoting participation of private sector, civil societies, NGOs and philanthropists in animal welfare.

**ECOSYSTEM AND BIODIVERSITY**

12. Restore 0.1 million ha of wetlands/inland lakes/water bodies by 2017.
13. Mapping and preparation of biodiversity management plans for deserts (both cold and arid), coastal areas, important coral zones, wetlands, mangroves and so on to be completed by 2017.

### Box 7.4 Goals

#### ENVIRONMENT

1. Epidemiological studies to assess improvement in health status due to better management of environment and ecology.
2. Promotion and adoption of cleaner technology, strengthening and initiation of reforms in regulations, policy making and enforcement institutions for environmental governance.
3. Move towards cumulative and strategic EIA.
4. Ensure ecological flows in all rivers by regulating abstractions so as to allow conservation of riverine ecosystems through developing a legal framework and management strategy for conservation of river basins.
5. Promotion of recycling and reuse of treated sewage in urban projects such as sanitation, landscaping, central air conditioning and so on.

#### FORESTS AND LIVELIHOOD

6. Improve forest productivity, production and sustainable management of biodiversity (equity in access to benefit sharing with local people).
7. Restoration and intensification of forest-rangelands/grazing-land management and establish community grazing land around forest fringe villages.
8. Build capacity of Village Forest Committees/Joint Forestry Management Committees for management of forest resources including ecotourism.
9. Revive seed orchards and silviculture plots for various forest types of the country, as well as, for enlisted species under Minor Forest Produce/Non Timber Forest Produce (MFP/NTFP) including genetic improvement of and establishment of clonal orchards.

#### WILDLIFE, ECOTOURISM AND ANIMAL WELFARE

10. Reducing and managing human-wildlife conflict.
11. Commercialisation of permissible marine products rich in poly unsaturated fatty acids (PUFAs), vitamins and so on.
12. Promotion of ecotourism and participatory eco-development support livelihood of local population.

#### ECOSYSTEM AND BIODIVERSITY

13. Develop national targets and indicators related to biodiversity and support actions to strengthen implementation of Biological Diversity Act, 2002 and ensure bio-safety for economic and social development of local communities.
14. Assess coastal biodiversity resources, ensure sustainable management, restoration of mangroves, coral reefs and wetlands and support livelihood.

waste and its possible use as source of energy and raw materials; improvement in forest cover; management of invasive weeds; urban solid waste management; restoration of mined areas; community rights and NTFPs; achieving air quality to the level of NAAQS for urban environments; and community participation in forest management and climate change issues.

7.28. Taking these aspects as well as the progress made in the Eleventh Plan into account, the vision, the goals, the targets, the strategy and the action for Twelfth Plan have been formulated.

7.29. The Twelfth Five Year Plan adopts specific strategies to meet emerging challenges concerning conservation and assessment of flora, fauna, forests and wildlife; prevention and control of pollution; afforestation and regeneration of degraded areas; protection of the environment; and issues related to the welfare of animals (refer to Figure 7.3).

#### *Organisational Strategies*

7.30. In the Twelfth Plan, institutional mechanisms like establishment of a Department of Environment in the States for environmental management to resolve inter-sectoral issues needs to be addressed on priority. Inter-ministerial Standing Committees and Working Groups in specific domains within broad areas like air quality management and waste management need to be established both at the Central and State Government levels

7.31. It is proposed to set up a high powered body called the National Environment and Forestry Council (NEFC) with the Prime Minister as Chairperson, the Minister of Environment and Forests as Vice Chairperson, aided and advised by a group of experts. This body would have the representation from the Ministries of External Affairs, Science & Technology, Agriculture, Commerce, Urban and Rural Development, Tribal Affairs and so on. Its primary function would be to bring in harmony in the functioning of different Ministries and to ensure that the evolution of all policies, laws and their implementation concerning development, of

every kind, are in conformity with the objectives outlined in the National Environmental Policy (NEP), 2006.

7.32. On similar lines as the NEFC, a high-powered body called State Environment and Forest Council (SEFC) needs to be constituted to align the working of the other Departments with that of the Department of Environment and Forests in each State. Additionally, Environment Cells have to be constituted in the related Ministries and Departments at the Central and State levels so as to mainstream environmental concerns in their activities and programmes.

#### *Regulatory Strategies*

7.33. A comprehensive review and reform of laws concerning Environment, Forests, Wildlife and Biodiversity will be undertaken in the Twelfth Plan in order to make them more effective, work in harmony with each other and address new challenges. This would particularly be carried out in the following areas:

1. Pollution control and waste management regime: Reforms would be carried out against the backdrop of the exponential expansion of the powers and functions of the existing authorities. Among other objectives, reforms would aim at dealing with non-point source pollution issues (like agricultural run offs and so on) and alarming increase in nutrient loading of soil and other natural resources. A National Environment Protection Authority (NEPA) is also proposed to be set up fully empowered to restructure the existing environmental management regime.
2. EPA and notifications under it such as EIA and CRZ: Reforms would be attempted to make the system more effective and to evolve better proactive legislative and administrative measures for:
  - Switching over from a carbon-intensive economy to a carbon neutral one;
  - Promoting alternative energy options;
  - Dealing with challenges arising out of creation of SEZs;

- Strengthening the Impact Assessment Law and coastal laws by making local authorities more responsible and accountable;
  - Plugging the loopholes that weaken and dilute the system’s effectiveness;
  - Giving effect to the new Liability Regime to which India has committed itself (2010 UNEP Guidelines on Liability, Response Action and Compensation for Environmentally Harmful Activities—a new legal regime that will have far-reaching implications on all perceivable development activities and the actors engaged in them, without exception); and
  - Foregrounding the idea of ‘Commons’ at the domestic level and securing it.
3. Forest, wildlife and biodiversity regime: Reforms would be undertaken, in the light of legislative developments in related areas initiated by other Ministries (like Protection of Plant Varieties and Farmers’ Rights Act, Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, Seeds Amendment Bill, Biotechnology Regulatory Authority Bill and so on) towards:
- Evolving effective and robust legal safeguards for addressing the issue of ‘bio-safety’;
  - Internalising the international commitment concerning the access and benefit sharing regime (Nagoya Protocol);
  - Providing sufficient and effective safeguards for the protection of traditional knowledge (TK) and folk art concerning biodiversity;
  - Ensuring that India receives international recognition as the president of the CoP of the Convention on Biological Diversity (CBD) starting from 2012 in compliance with its international commitments over biodiversity issues (primarily over bio-safety, conservation of TK, equity, benefit-sharing and so on); and
  - Developing harmony in the working of laws in the sector with the Panchayat Extension to Scheduled Areas Act, 1996.
- 7.34. A multi-pronged approach to environmental regulation in terms of capacity building of existing institutions, improved database management, professionalisation of environmental clearance system

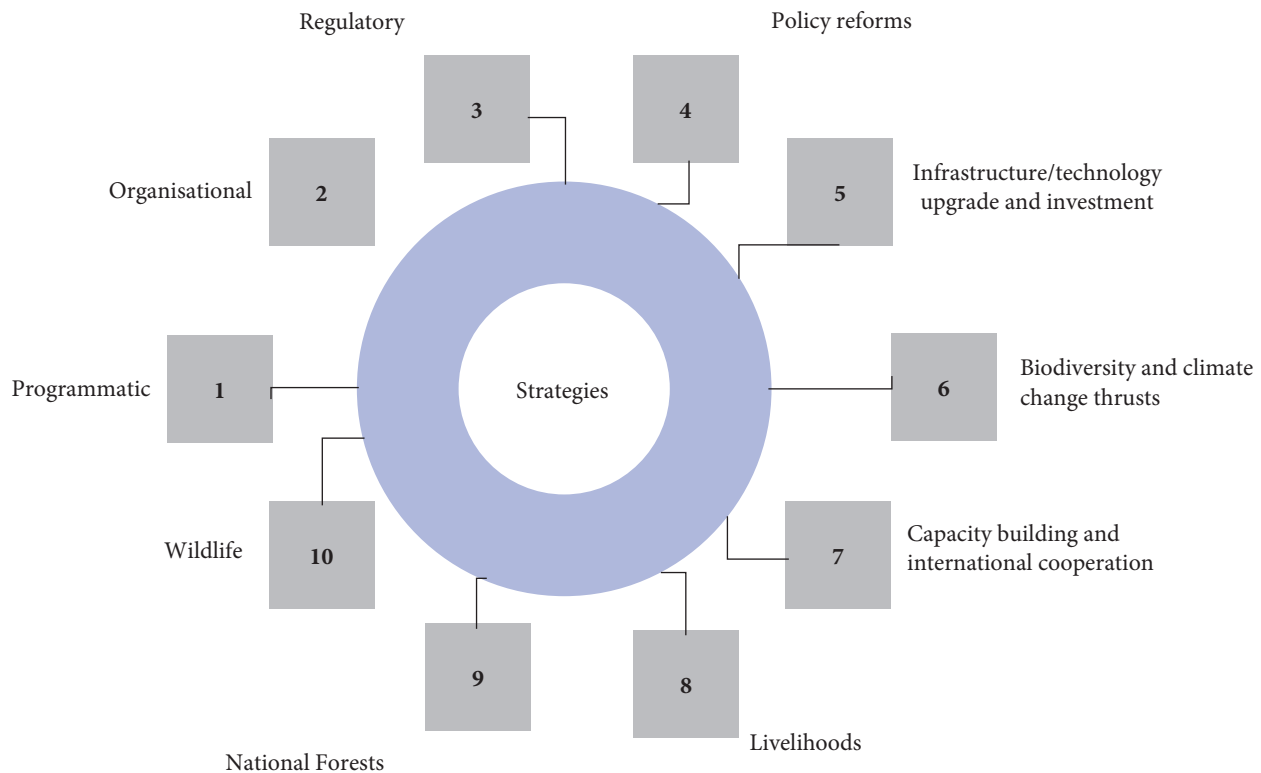


FIGURE 7.3: Strategies for the Twelfth Plan



and introduction of alternative system of regulation needs to be developed.

7.35. For effective regulation on environmental pollution it is suggested that the Environment (Protection) Act, 1986 may be amended for an upward revision in the quantum of penalties and also to include an enabling provision for civil administrative adjudication to fast-track levy of penalty.

#### *Policy Reforms and Metrics-based Management*

7.36. A number of initiatives need to be undertaken to promote:

- Implementation of load-based standards to facilitate carrying capacity based cumulative EIAs, particularly for areas having concentration of developmental activities such as mines and thermal power plants;
- Effective enforcement of the application of 'polluter pays' principle;
- Development and deployment of cleaner technologies in the Micro, Small and Medium Enterprises (MSMEs) sector, particularly for the 17 categories of highly polluting industries;
- Strengthening of the National Water Quality Monitoring Network;
- Collection and monitoring of basic data on coastal water quality, oxygen zone in the sea, transport of nitrogen and phosphorous in the rivers from agriculture;
- Review of existing policies to enable drafting of mitigation strategies and introduction of new effluent standards; and
- Implementation of continuous effluent monitoring systems at industries as well as CETPs.

7.37. It is proposed to setup a National Environmental Monitoring Programme (NEMP) for monitoring forests, air and water quality, river and ocean pollution, noise and so on with sharing of real-time data from local to national levels which will also help in monitoring change.

7.38. A multi-disciplinary autonomous body namely National Environment Assessment and Monitoring Authority (NEAMA) is proposed to be set up for

strengthening the processes for grant of environmental clearances and monitoring thereof. NEAMA is also envisaged to grant clearances under the Environment (Protection) Act, 1986 including the coastal zone regulations and marine fisheries regulations.

7.39. In the Twelfth Five Year Plan, the Central and State Governments also need to invest in strengthening the mechanisms for implementing rules notified under the Environment (Protection) Act, 1986 including the CRZ Notification and the Marine Fishing Regulation Act.

#### *Infrastructure/Technology Upgrade and Investment Strategies*

7.40. A number of initiatives can be undertaken towards achieving infrastructure/technology upgradation and directing investment in the environment, forest and wildlife sectors. These include:

- Promotion of continuous 24 × 7 online air quality monitoring which includes Continuous Ambient Air Quality Monitoring Stations (CAAQMS) and Continuous Emission Monitoring System (CEMS);
- Introduction of cost-effective technologies such as bioremediation to address the pollution of water bodies is proposed;
- Encouragement of use of hazardous waste of high calorific value in cement kilns, power or steel plants as a safe alternative to conventional incineration;
- Integration of environmental attributes into cost-benefit analysis while making public investment decisions, to encourage more efficient allocation of resources;
- Amendment to the environmental laws to introduce pollution charges and other economic instruments to enable creation of fund in order to augment allocation to the sector. This fund can be utilised for incentivising good environmental performance;
- Creation of a National Environment Restoration Fund (NERF) from voluntary contributions and the net proceeds of proposed economic instruments such as user fees for access to specified natural resources. The Fund may be used for

restoration of environmental resources and clean-up of sites contaminated with toxic and hazardous waste;

- Strengthening of Botanical Survey of India (BSI) and Zoological Survey of India (ZSI) in terms of manpower and infrastructure to scale up their mandated task of inventorisation of flora and fauna of the country needs to be achieved;
- Validation and updation of the Indian Biodiversity Information System (IBIS), the Indian Bio-resource Information System (IBIN), India Biodiversity Portal (IBP) and the Indian Ocean Census of Marine Life (IOCoML) needs to be undertaken, for which a consortium of research organisations needs to be created;
- An effort to digitise and make available existing collections of taxonomic collections should be piloted;
- The mandate of different institutes engaged in forestry, biodiversity and wildlife research requires to be broadened to accommodate emerging needs for collaborative multidisciplinary research.

### **Biodiversity**

7.41. Ecological processes that generate ecosystem goods and services are central for ecological sustainability. It is proposed to establish an Ecosystem Research Institute (ERI) under MoEF for undertaking research in ecosystems, biodiversity and sustainable development.

7.42. The Biological Diversity Act 2002 has to be implemented at all levels throughout the country. Immediate steps need to be taken to constitute Biodiversity Management Committees (BMCs) at *Gram Panchayats*, *Taluka Panchayats*, *Zilla Panchayats*, as well as *Nagarpalikas* and *Mahanagarpalikas*. Further, the BMCs need to be obligated to levy 'collection charges' as provided in the Biological Diversity Act.

7.43. It is proposed to develop a national information grid for biodiversity, ecology and environment data for monitoring and management of natural resources. This should be an open, transparent and comprehensive web-based information system that covers various landscapes such as forests, coastal

stretches and territorial waters of the country's Exclusive Economic Zones (EEZ), mountains and deserts regions.

### **Capacity Building and International Cooperation Strategies**

7.44. In the area of international cooperation in the Twelfth Plan, the MoEF would take the lead in setting up an institutional mechanism for a regional alliance of South Asian Association for Regional Cooperation (SAARC) for developing and implementing policies, laws and action plans. Further, the mechanism could also promote strengthening of capacity by linking scientific and research institutions and Centres of Excellence (CoE) concerning forestry, wildlife and biodiversity. This could include a variety of measures such as strengthening the South Asia Co-operative Environment Programme (SACEP), technical cooperation, management practices for conservation and sustainable use of bio-resources, strengthening legal capacity in administration, information sharing and its dissemination and building capacity in justice-delivery.

### **Livelihoods**

7.45. To develop the NTFP sector in a holistic way and coordinate the various activities for sustainable management and livelihood, an autonomous agency needs to be set up with branches in all states. For the overall management of NTFP resource including conservation and development of an estimated 6 lakh ha as well as value addition and marketing support, a new scheme for sustainable livelihoods through NTFP management including bamboo needs to be formulated.

7.46. There is an urgent need to focus on pasture management and formulation of grazing policy at the national level which will enhance the livelihood, nutrition and quality of life of all fringe forest dwellers. A new scheme on rangeland and silvi-pasture management for rehabilitation and productivity enhancement of rangelands, traditional grasslands on common/revenue lands around forest areas is required. Infrastructural and institutional mechanism for fodder storage, value addition facilities, maintenance of germ-plasm banks and nurseries is

required to be developed during the Twelfth Plan period.

#### *Forest Management Strategy*

7.47. A proposed scheme on Satellite-based Forest Resource Assessment will put in place a system for technology-based collection of baseline data and evaluation of forestry schemes with **Geographic information system** (GIS) mapping of areas under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

7.48. To evolve a national consensus on forestry matters and meet new challenges, it is proposed that the Central Board of Forestry (CBF) be revived with Prime Minister as Chairperson and Minister of Environment & Forests as Vice Chairperson, on the lines of National Board for Wildlife. This could be the apex body for policy development and consultation in the country.

7.49. Reorientation of the Indian Council of Forestry Research and Education (ICFRE) on the lines of Indian Council of Agricultural Research (ICAR) with augmentation of funding also needs to be taken up during the Twelfth Five Year Plan.

7.50. The Working Plan Code based on which forest working plans are prepared and adhered to needs to be amended to incorporate new dimensions along with assigning specific responsibility to the cutting-edge level workers and for transferring the rights in the field with proper documentation.

7.51. There is a need for creation of a 'Green fund' for forestry activities by imposing forest development tax on sale of forest produce and forest conservation tax/cess on sale of petroleum products and coal mining. Further, other similar taxes such as Eco-tax in Himachal Pradesh, Uttarakhand and other States may also be pooled in for this purpose.

#### *Wildlife and Animal Welfare*

7.52. Integrated Development of Wildlife Habitats (IDWH) will continue to be the umbrella scheme for conservation and management of wildlife with focus on all species other than the tiger.

Tiger conservation, as led by the National Tiger Conservation Authority, needs to be continued as a flagship programme of the MoEF. Based on past experience, several new thrust areas have been identified for implementation. This includes strengthening the protection and furthering the coexistence agenda in the buffer areas of tiger reserves and voluntary relocation along with regular monitoring of tiger population and their habitat.

7.53. Project Elephant needs a new focus under the plan through the creation of the National Elephant Conservation Authority (NECA) and notification of critical areas of Elephant Reserves as Ecologically Sensitive Areas under the Environment (Protection) Act 1986. Special focus is required for mitigation of human–elephant conflict through strengthening the existing Project Elephant Scheme.

7.54. The plan will specifically focus on following areas of concern:

- Scientific and socio-economic issues related to wildlife conservation including strengthening of veterinary care for wild animals;
- Scientific management of PAs and wildlife-rich areas outside PAs as well as mitigation of human–wildlife conflict;
- Operationalisation of ecotourism linked to livelihood enhancement of local communities and;
- Coordinated approach for rejuvenating the animal welfare structure in the country.

7.55. Strengthening of IDWH and Project Elephant schemes is necessary to achieve the above objectives. In addition, two new schemes, namely, Operationalisation and Strengthening of Ecotourism for Local Livelihoods and Promoting Participation of Private Sector and Philanthropists in Animal Welfare are also proposed to be taken up.

7.56. Animal Welfare Boards need to be setup in all the States, including Society for Prevention of Cruelty to Animals (SPCAs) under the Prevention of Cruelty (Establishment of Societies for the Prevention of Cruelty to Animals) Rules, in all districts within all States.

7.57. Significant increase in investment for better protection and conservation of wildlife, strengthening of institutional mechanism, improvement in livelihoods of forest fringe dwellers, capacity building of local level management committees needs to be the focus.

### Rationalisation of Schemes

7.58. Pursuant to the recommendations of the B.K. Chaturvedi Report (September 2011) on CSS, MoEF has rationalised the eight schemes existing in the Eleventh Five Year Plan to five in the Twelfth Five Year Plan by suitable merger/clubbing as shown in Figure 7.4.

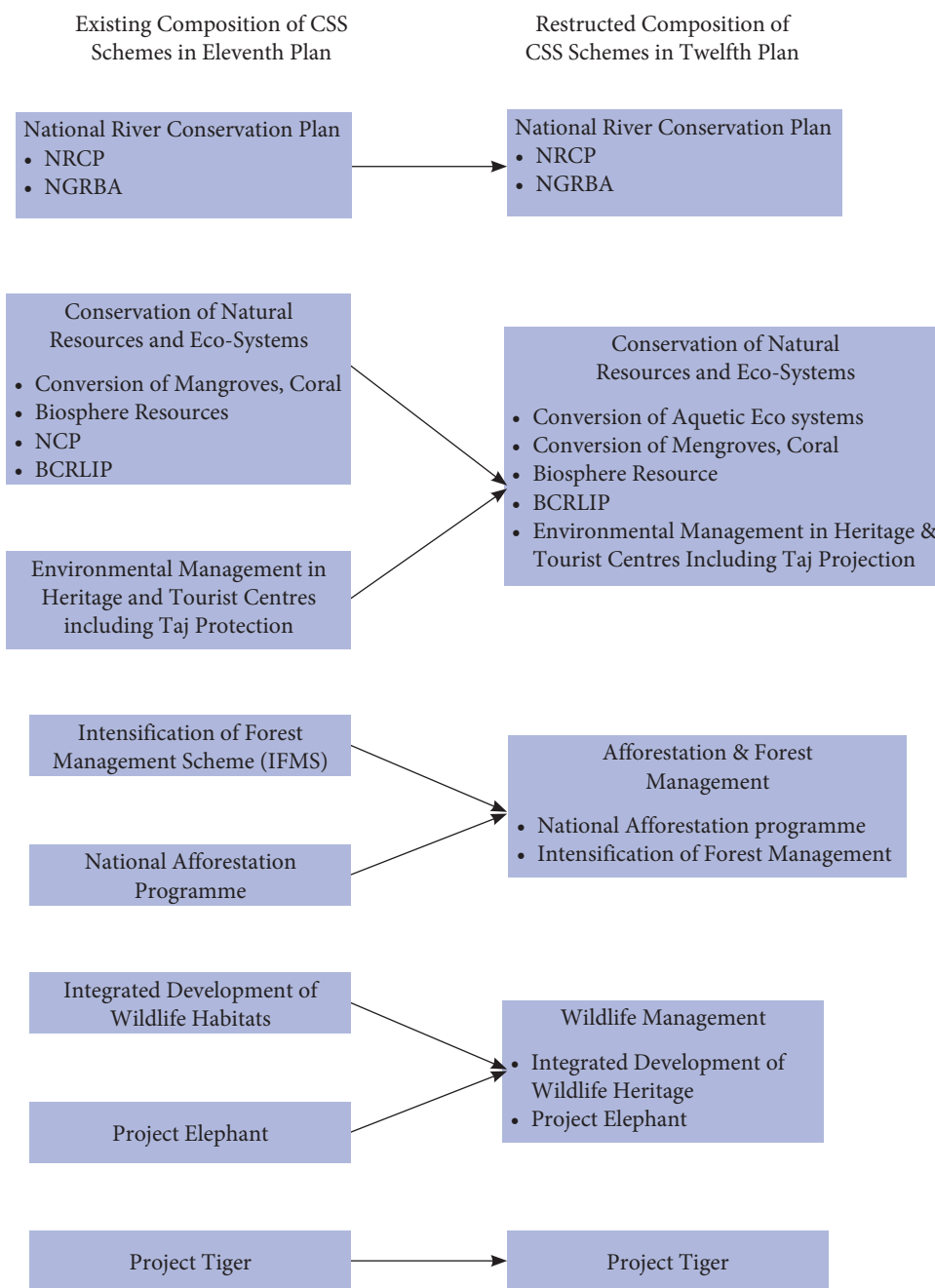


FIGURE 7.4: Rationalisation of Schemes from the Eleventh to the Twelfth Five Year Plan

7.59. The total number of thematic schemes in the Twelfth Plan has been reduced to 18 comprising of 5 CSS and 13 CS schemes, including one on Climate Change which has been approved by the Planning Commission. Amongst sub-schemes, the schemes of Industrial Pollution abatement through preventive strategies and Clean Technologies have been merged into a single scheme under the Pollution Abatement Scheme. Similarly, the schemes of National Lake Conservation Plan (NLCP) and Wetlands have been merged into a single scheme, namely, National Plan for Conservation of Aquatic Ecosystems under the thematic scheme of Conservation of Natural Resources and Ecosystems. The scheme of Taj Protection has also been clubbed under this scheme. Under the thematic scheme of International Cooperation Activities, a new sub-scheme on Desertification Cell has been proposed. The Civil Construction Unit scheme is a non-Plan scheme and has been shown to account for Plan expenditure on construction of new building of MoEF, which is likely to be completed in 2012–13.

### New Initiatives for the Twelfth Plan

#### *Recasting the Scheme of CETPS*

7.60. In light of the operational deficiencies in the existing scheme of CETPs, the extant guidelines of CETPs are proposed to be revised for enforcement during the Twelfth Plan period. CPCB has initiated a study for 'Inventorization of industrial clusters in the country and assessment of the unmet demand for CETPs'. Based on the recommendations of the study, a prioritised list of required CETPs will be prepared and a strategy will be formulated for recasting of the existing scheme. A sub-scheme for Environment Protection was introduced for upgradation of CETPs in leather complexes in the Eleventh Plan by Department of Industrial Policy and Promotion (DIPP) which is to be strengthened during the Twelfth Plan.

#### *Enhancement of Sewage Treatment Capacity*

7.61. Concerted efforts would be made to complete the ongoing work of the Eleventh Plan under National River Conservation Plan (NRCP)/National Ganga River Basin Authority (NGRBA)/National Lake Conservation Plan (NLCP). Requirement of

additional fund for enhancement of sewage treatment capacity need to be made available either under the JNNURM/UIDSSMT and/or under NRCP. Technical and financial capacity of ULBs will also have to be suitably augmented for meeting both the capital and Operations & Maintenance (O&M) requirements of Sewage Treatment Plants (STPs). States are also required to earmark allocations and mobilise necessary resources for funding sewerage infrastructure and their maintenance.

#### *National Plan for Conservation of Aquatic Ecosystems (NPCA)*

7.62. Merger of National Wetland Conservation Programme (NWCP) and NLCP schemes into one integrated scheme entitled NPCA recommended by Expenditure Finance Committee is proposed with effect from Twelfth Plan period. This merger has been recommended with the objective of conserving aquatic ecosystems, namely, lakes and wetlands through implementation of sustainable conservation plans. The merged scheme is proposed to be implemented by National River Conservation Directorate in the MoEF in a mission mode with target oriented implementation.

7.63. Ganga River which has been declared as the national river supports the economic activity of the large part of the country. The NGRBA has proposed a river basin treatment strategy which includes augmentation and sustenance of ecological flow of the river and its tributaries. This needs to include initiatives on zero discharge and control of non-point source of pollution with people participation and public-private partnerships.

7.64. In river basins, recycle and reuse of sewage is not feasible when STPs are centralised systems to which sewage is conveyed over long distances involving intermediate pumping stations and outfall sewers. A decentralised sewage system offers opportunities to efficiently use the treated sewage and hence is recommended.

#### *National Environmental Monitoring Programme*

7.65. There is a need to set up a unified National Environmental Monitoring Programme NEMP

focusing on tracking status and change in socially relevant biophysical parameters and their impact. This will enable real-time sharing of data on environmental parameters making the information widely accessible for monitoring and evaluation.

#### *National Forestry Information System*

7.66. The National Forestry Information System should enable networking with States for tracking changes in forest development, harvesting, trade and utilisation scenario with particular focus on issues of ownership and rights under Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act.

#### *Invasive Species Management*

7.67. A national programme specific to invasive species needs to be launched. One of its aims could be to compile a national inventory of invasive species. A standardised protocol needs to be developed for the identification of invasive species using GIS and remote sensing technology. Invasive species identification should not be limited to invasion in forests—it should also include invasion in aquatic and marine ecosystems, grasslands, wetlands and so on. A national invasive species monitoring system to track the introduction and spread of invasive is needed. Such a system should be linked to the state forest departments, and field staff should be trained to collect information on invasive species.

#### *Coastal and Marine Conservation*

7.68. Conservation of coastal and marine conservation in India requires to be scaled up and managed under CRZ guidelines. Effective management of these habitats needs integration of science with traditional knowledge systems and facilitation of greater involvement of communities/community based organisations in monitoring resource use, status, history and on-going changes. This will lead to better information flow within and between target groups to ensure that the communities/resource managers are empowered to play their roles effectively in conservation. Information on the following activities necessitates concerted efforts:

- Creation of vital information on spatio-temporal trends of responses of ecosystem/species to

human and climate induced variations by initiating long-term monitoring of ecosystems and to develop valuable baseline information that will be critical in taking informed management decisions.

- Understanding critical ecosystem processes, identifying and bolstering the inherent resilience of ecosystems to climate and manmade perturbations.
- Evaluating impacts of resource exploitation (especially fisheries) on the functionality of coastal and marine ecosystems and evaluate efficacy of different management practices.
- Continuous monitoring of coastal biodiversity and digitisation for sustainable utilisation of marine bio-resources which calls for identification of institutions for implementing a national coordinated project through concerned Ministry for assessing the coastal and marine biodiversity resources so as to plan sustainable use of the same.
- Quantify Eleventh Plan accomplishments on the success of mangrove plantations and the difficulties encountered including steps taken by states for both conservation and enhancement of corals and its biodiversity and fix targets for the same during Twelfth plan.
- The potential of marine bio-resources towards commercialisation of PUFAs, vitamins, essential amino acids needs to be popularised and commercialised. Drug development from marine bio-resources need to be intensified by studying potential marine organism like sea snakes. There is significant potential for offering additional and alternative livelihood options by promoting marine cage cultures, marine ornamental fish culture such as clown and damsel, culture of algae and seaweeds towards organic fertilisers and growth promoters, micro-algae towards biofuels and so on.

#### *Valuation of Ecosystem Services and Biodiversity*

7.69. Successful and efficient ecosystem evaluation depends on development of appropriate institutional mechanism preferably by the Finance Commission, Planning Commission, Centre of Excellence in Environmental Economics and the MoEF. This institutional mechanism should allow for effective implementation of compensation and green bonus schemes which aim to fix, monitor, negotiate and share payments. Payments made to any state or

organisation against green bonus should be based on negotiations between stakeholders. Institutional mechanism for research on ecosystems, bio-diversity and sustainable development is vital for ensuring sustainability of ecosystem services and biodiversity maintenance and hence an institution for achieving this is a necessity.

#### *Environmental Performance Index (EPI)*

7.70. The Planning Commission is in the process of developing an EPI to incentivise states for environmental performance through budgetary allocations. The Planning Commission's EPI may be a positive incentive for efforts by the States and UT's towards pollution abatement, conservation and sustainable management of natural resources and tackling climate change. The proposed EPI criteria and indicators are presented in Table 7.2.

#### *Rangeland and Silvi-Pasture Development Scheme*

7.71. A new scheme has been proposed for rangeland and silvi-pasture development. The scheme will take care of the grazing needs for cattle of local population. Major focus of the scheme will be rehabilitation

and productivity enhancement of existing rangelands and potential grasslands in common/revenue lands around forest areas, fodder bank and storage, value addition technologies and facilities, establishing linkages with existing institutes/Centre of Excellence on fodder and pasture management, conducting fodder research, developing rangeland and silvi-pasture models, germ-plasm banks, fodder nurseries and so on. (Refer to Box 7.6 for Bundelkhand model of farmland productivity enhancement.)

#### *Satellite Based Forest Resource Assessment*

7.72. Remote sensing-based forest cover monitoring in close collaboration with Forest Survey of India, National Remote Sensing Agency and Indian Institute of Remote Sensing has been proposed. This initiative will be taken for developing a countrywide mosaic of high resolution satellite images (LISS IV, Cartosat) and overlaying polygons/grids of areas to be taken up for interventions. This centralised spatial data base in the GIS domain can be used as a policy tool for mid-course correction. In order to achieve higher level of accuracy in the monitoring and evaluation system, a dedicated

**TABLE 7.2**  
**Categories along with indicators selected for Planning Commission's EPI**

| S. No.       | Criteria         | Indicators  | No. of Variables |
|--------------|------------------|---|------------------|
| 1            | Air Pollution    | <ul style="list-style-type: none"> <li>• Nitrogen Oxide (NO<sub>x</sub>)</li> <li>• Sulphur Oxide SO<sub>x</sub></li> <li>• Suspended Particulate Matter (SPM)/Respiratory Suspended Particulate Matter (RSPM)</li> <li>• TFC as a percentage of State GA and contribution to national average</li> </ul> | 3                |
| 2            | Forests          | <ul style="list-style-type: none"> <li>• Increase/decrease in forest cover</li> <li>• Growing stock</li> <li>• Afforestation efforts</li> <li>• Percentage of waste water (DOM)</li> </ul>  | 4                |
| 3            | Water-quality    | <ul style="list-style-type: none"> <li>• Surface water quality [Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), TFC]</li> <li>• Percentage ground water extraction</li> <li>• Municipal solid waste</li> </ul>  | 3                |
| 4            | Waste Management | <ul style="list-style-type: none"> <li>• Bio-medical waste</li> <li>• Industrial waste—hazardous</li> <li>• Preparation of State Action Plan on Climate Change (SAPCC)</li> </ul>   | 3                |
| 5            | Climate Change   | <ul style="list-style-type: none"> <li>• RE growth rate including mini hydro</li> <li>• Electricity intensity of SGDP</li> </ul>  | 3                |
| <b>Total</b> |                  |   | <b>16</b>        |

**Box 7.5****Tribal Families Jointly Manage 'Yepuru' Forests, Nellore District, Andhra Pradesh for One and Half Decade, for Sustainable Livelihood**

Yepuru *Van Samrakshana Samithi* (Forest Protection Committee) was formed on 12 March 1997 in Rapur Range of Nellore Forest Division. The *Van Samrakshana Samithi* (VSS) formed by 37 tribal families consisting 64 tribal members. An extent of 310 ha has been allotted to the VSS in compartment number 300 and 301 of Nallepalli Reserve Forests in Yepuru Section (Tumaya Beat) of the Nellore Division. Out of 310 ha allotted to VSS, an extent of 198 ha has been raised with plantation of eucalyptus and NTFP up to 2010-11. Out of 198 ha, Eucalyptus clonal plantations were raised over an extent of 110 ha and the balance 88 ha was treated with NTFP species.

In the year 2010-11, 80 ha Eucalyptus clonal plantations have been finally harvested as per the prescriptions of the Forestry Working Plan of the Division. A net revenue of ₹29,48,562 per has been realised up to the year 2010 from the intermittent and final harvests of the Eucalyptus plantations by the VSS.

Fifty per cent of the net revenue, that is, ₹14,74,281 has been distributed to VSS members among 37 families at the rate of ₹39,845 per family. The balance 50 per cent amount was used to constitute a Reinvestment Fund. Reinvestment Fund was also utilised for post-harvest operations and regeneration works up by the VSS members. Out of ₹14,74,281, an amount of ₹12,75,946 has been spent towards Raising of 35 ha. Eucalyptus plantation and post-harvest operations while the balance amount ₹1,98,335 has been earmarked for maintenance works of plantations to be carried out in future.

The uniqueness of *Yepuru's* experience is the demonstration of willingness of the community to reinvest revenues from forest management to continue sustainable forest management. This is an example of a 'potential natural resource management tool' for economic inclusion of tribal hamlets through joint forest management. Almost 60 per cent of forest cover in the country lies in tribal districts where mainstreaming of participatory afforestation with definite usufruct sharing, holds the key for achieving inclusive development in the Twelfth Plan.

forest satellite for monitoring forest cover, NTFP resource, bio-diversity on periodical basis along with change monitoring has been proposed. The improved real-time, web-based monitoring system under this scheme would be extended to other schemes by strengthening the Forest Survey of India (FSI) and Remote Sensing/Geomatics Units in the states.

**Green India Mission**

7.73. The Government of India has taken initiatives by formulating National Mission for a Green India (GIM) as one of the 8 missions under the National Action Plan on Climate Change (NAPCC). The mission has been approved by the Prime Minister's Council on Climate Change with a proposed cost of ₹46,000 crore over 10 years starting from 2012-13. The GIM has been conceived as a multi-stakeholder, multi-sectoral and multi-departmental mission, recognising that climate change phenomena will seriously affect and alter the distribution, type and quality of natural resources of the country and the

associated livelihoods of the people. GIM puts the 'greening' in the context of climate change adaptation and mitigation and is meant to enhance ecosystem services like carbon sequestration and storage (in forests and other ecosystems), hydrological services and biodiversity; along with provisioning services like fuel, fodder, small timber through agro and farm forestry, and NTFPs. During the Twelfth Five Year Plan, provisions have been kept for the GIM for increasing forest and tree cover on 2.5 mha area (non forest through agro/social/farm forestry), improving quality of forest cover on another 2.5 mha area, improving ecosystems services, and increasing forest based livelihood income and enhanced annual CO<sub>2</sub> sequestration. (Refer to Box 7.5 for the example of Andhra Pradesh.)

**Plan Outlay**

7.74. An indicative plan outlay of ₹17,899 crore at current prices for the Twelfth Five Year Plan has been made for the Ministry of Environment and Forests.



**Box 7.6**  
**Bundelkhand Model for Farmland Productivity Enhancement in Rain-fed Areas of the Country through Water Harvesting**

The project area under Bundelkhand Special Package for Madhya Pradesh was marked by acute shortage of water, forage and low agricultural productivity. Lack of irrigation facilities coupled with scanty rainfall has resulted in low productivity and uncertainty in food grain production. During 2009-10 and 2010-11, 150 check dams, 192 contour trenches, 177 percolation tanks, 53 pond were constructed and other Soil Moisture Conservation (SMC) activities were carried out in 49,678 ha forest land. The catchment areas have since been regenerated with vegetation by artificial seeding of *Mahua*, *Ber*, *Stylosantus hamata*, *Thimida quadrialivis*, *Cenchrus ciliaris*, *Guner* and *Deenanath* grass. Increased vegetative cover has enhanced the interception and percolation of rainwater facilitating groundwater recharge.

A study of the progress based on field observations indicate that people have started shifting from rain-fed maize to soyabean crop (high protein and nutrition crop) in the project area of Chatarpur and Tikamgrah districts. Similarly, SMC works such as staggered contour trenching, gully plugs, earthen check dams, banding, and plantation activities carried out in Banda, Chitrakoot, Jhansi and Mahoba districts of Uttar Pradesh has resulted in recharging of ground water in adjoining non-forestland, particularly agricultural land.

As a result of water retention in the higher reaches, mostly forest areas of the locality, and consequential increase in water table, there has been a marked increase in extent of Kharif and Rabi Crop coverage as well as in productivity. The coverage area under six districts of Bundelkhand region of MP has registered an increase from 23.39 lakh ha in 2007-08 to 27.61 ha in 2009-10. Similarly, the productivity has gone up from 15.51 lakh tonne to 26.7 lakh tonne and yield from 743.65 kg/ha to 996.52 kg/ha in 2009-10.

This project was implemented by the Forest Departments of the States and was funded under the Bundelkhand Special Package. This has not only improved the food security of the region but also the socio-economic condition of the farmers. Bundelkhand Model of MSC activities can be replicated in most of the rainfed areas as a strategy to combat desertification, practice resilient agriculture and climate change adaptation.

## CLIMATE CHANGE

**7.75.** The threat of climate change is a serious global concern. There is near consensus among scientists that climate change is unequivocal. Increase in anthropogenic activities, since the advent of industrialisation in the mid-eighteenth century, has built up concentration of Greenhouse Gases (such as Carbon Dioxide, Methane, Nitrous Oxides and so on) in the Earth's atmosphere. Greenhouse Gases (GHGs) trap infra-red radiations reflected by Earth, leading to global warming; which, in turn, could lead to changes in rainfall patterns, disruption in hydrological cycles, melting of ice caps and glaciers, rise in sea levels, and increase in frequency and intensity of extreme events such as heavy precipitation or cyclones. These developments can have a serious impact on sustainability of water resources, agriculture, forests and ecosystems, affecting the well-being of billions of people on Earth. Climate Change can slow down the pace of development either through its adverse impact on natural eco-systems, or through erosion of adaptive capacity of the people, particularly those who are socially and economically

vulnerable. Projections of temperature change as estimated by the IPCC are given in Table 7.3 and Figure 7.5.

**7.76.** India is highly vulnerable to climate change. As per recorded observations, India has seen an increase of 0.4 degree Centigrade, in the mean surface air temperature over the past century (1901-2000). Change in mean temperature and precipitation will require change in cropping patterns. It has been estimated that a 2.0 to 3.5 degree Centigrade increase in temperature, and the associated increase in precipitation, can lower agricultural GDP by 9 to 28 per cent. Yields of most crops will fall in the long run. The impact in the short run may be small, but the heat stress will affect the productivity of animals and milk production may even decrease over the present levels. Agriculture technology can adapt to these changes to partially offset the adverse impact by adoption of water conservation practices, by changing cropping patterns and practices, and by developing new varieties that can withstand short term variability in weather patterns.

**TABLE 7.3**  
**Different Levels of Global Mean Temperature Increase above Pre-industrial Levels**

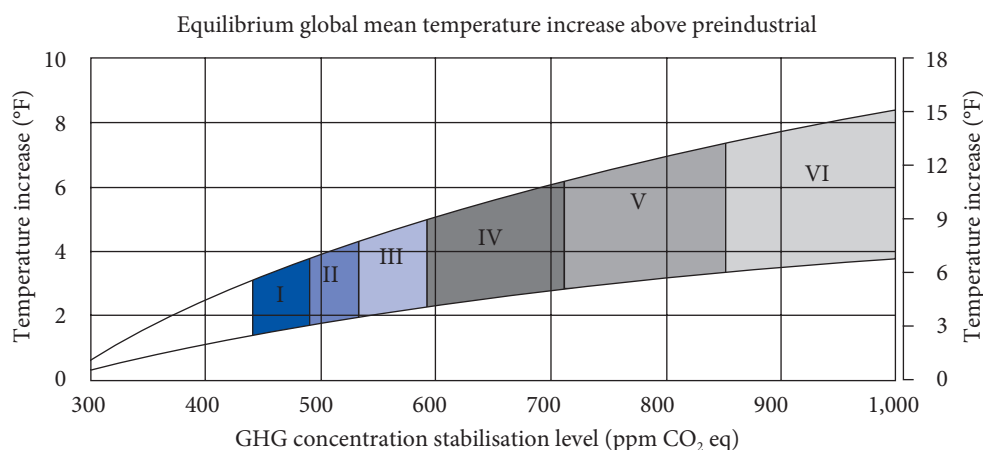
| Category | CO <sub>2</sub> Concentration (ppm) | CO <sub>2</sub> eq. Concentration (ppm) | Global Mean Temperature Increase Above Pre-industrial Levels (Deg C) | Peaking Year for CO <sub>2</sub> Emissions | Change in Global Emissions in 2050 (per cent of 2000 Emissions) |
|----------|-------------------------------------|---|--|--|---|
| I        | 350–400                             | 445–490                                 | 2.0–2.4  | 2000–2015                                  | –85 to –50  |
| II       | 400–440                             | 490–535                                 | 2.4–2.8  | 2000–2020                                  | –60 to –30  |
| III      | 440–485                             | 535–590                                 | 2.8–3.2  | 2010–2030                                  | –30 to +5   |
| IV       | 485–570                             | 590–710                                 | 3.2–4.0  | 2020–2060                                  | +10 to +60  |
| V        | 570–660                             | 710–855                                 | 4.0–4.9  | 2050–2080                                  | +25 to +85  |
| VI       | 660–790                             | 855–1,130                               | 4.9–6.1  | 2060–2090                                  | +90 to +140   |

7.77. Climate Change will also affect the water balance, particularly the amount of runoff and recharge, which determines the overall water resources available in the ecosystem. This will change vegetative cover, affect availability of fodder, fuel-wood and minor forest produce. Climate change is also expected to raise sea levels, which could submerge coastal lands in some areas, thereby threatening coastal cities and habitations. Apart from the loss of land and property, millions may be displaced. Increase in sea and river water temperatures is likely to affect fish breeding, migration and harvest. We need to understand these threats and take action well in advance.

7.78. India is, and has been, on per-capita basis, one of the lowest GHG emitters in the world. Its emission

of 1.18 tonnes of CO<sub>2</sub> equivalent per person in 2008, was nearly one-fourth of the global average of 4.38 tonnes (one-tenth that of Europe and one-eighteenth that of US). Since it is cumulative emissions that affect climate variability, it is the historical emissions of developed countries that have been the major contributor to climate change. However, India remains vulnerable to the adverse effects of both climate variability and change. Global action is urgently required to minimise the threat and damage that climate change can inflict on us.

7.79. As a responsible nation, India has already shown its commitment to help address the global climate challenge. It is determined to work, both at domestic and international levels, in accordance with the principle of common but differentiated



Source: IPCC AR4 (Working Group III: Mitigation of Climate Change)

**FIGURE 7.5: Global Temperature Rise—Effect of Increase in GHG Concentration**

responsibility under the United Nations Framework Convention on Climate Change. Prime Minister has already expressed on June 8, 2007, at the Heiligendamm meeting of G8+5, India's determination to see that her per capita emissions levels will never exceed the average per capita emissions levels of the developed countries in the world (Singh Convergence Principle). India is an active participant in the Clean Development Mechanism (CDM) under the Kyoto Protocol, with the second highest number of projects registered for any country; and these have the potential to offset almost 10 percent of India's total emissions per year. Furthermore, in December 2009, India announced that it would aim to reduce the emissions intensity of its GDP by 20–25 per cent over the 2005 levels by 2020. India's voluntary actions will hopefully lead other nations to reduce their emissions, and to arrive at an effective and just global agreement.

**7.80.** India has also formulated a NAPCC which has a mix of mitigation and adaptation actions. The plan formulated under the aegis of the Prime Minister's Council on Climate Change has outlined eight missions and several other initiatives. Four of these missions address adaptation to climate change, while three of them address mitigation and one relates to knowledge.

**7.81.** Since global warming depends upon the total concentration of GHGs, minimisation of the threat of climate change requires concerted action by all the countries. However, whatever the world community does, some effects of climate change seem unavoidable at this stage. It is, therefore, important for India to minimise the vulnerability of various sectors, and make its economy, society and environment adapt to climate change, even as it takes strong actions to enhance sustainability of its development path.

**7.82.** The Twelfth Plan adopts a three-pronged approach to realise this objective. First, it elaborates and articulates the objective of the NAPCC through various sectors of the Plan. It ensures that plans of all sectors contain an assessment of their vulnerability to climate change, and specific adaptation measures are identified and implemented over the longer term.

Second, a nationally agreed strategy will be implemented to achieve lower carbon inclusive growth and to realise the domestic goal of reduction in the emissions intensity of our GDP. The strategy will outline a potential for such reduction, as well as the required policy measures to achieve this objective in various sectors. The required financial outlays and the relevant delivery mechanisms will be part of this strategy. Lastly, the Twelfth Plan will take scientific and institutional initiatives for regular climate change assessments, GHG measurement, capacity building for technical analysis, monitoring and management of such complex systems at various levels.

### India's Emission Structure

**7.83.** In 2007, India's GHG emissions, by sources and removal by sinks, were 1,727.71 million tonnes of CO<sub>2</sub> equivalents (or 1,904.73 million tonnes of CO<sub>2</sub> equivalents without land use, land use change and forestry), with the largest shares coming from electricity generation (38 per cent), agriculture (18 per cent) and other energy industries (12 per cent). However, India's CO<sub>2</sub> emissions from fuel use in 2007 were less than 5 per cent of the world total (International Energy Agency, 2009). In recent years, India has taken substantial initiatives to reduce energy intensity of its GDP, through measure such as energy efficiency standards, labelling of equipment and appliances, building codes, and introduction of market mechanisms for energy intensive industries. However, economic growth, increasing urbanisation, rise in per capita consumption and spread of energy access, are likely to substantially increase India's energy demand in the long run.

### Vulnerability Assessment and Adaptation

#### Agriculture

**7.84.** Agriculture is the provider of livelihood for nearly half of our working population. Studies done at the Indian Agricultural Research Institute indicate the possibility of loss of 4–5 million tonnes in wheat production for every 1°C rise in temperature throughout the growing period. Losses for other crops are uncertain, but are expected to be smaller for the kharif crops. Agriculture sector contributes 18 per cent of the total GHG emissions from India. The

emissions are primarily due to methane from the rice paddies, enteric fermentation in ruminant animals, and nitrous oxides from the application of manures and fertilisers. Although relative proportion of emissions from agriculture in India is likely to show considerable reduction in future because of the larger emission growth in other sectors, adaptation for agricultural communities will remain a major concern.

**7.85.** Some policy and programmatic interventions can help farmers and other stakeholders adapt to climate change and reduce the losses. Change in cropping patterns, for example, can help adjustment to changes in mean temperature and precipitation. Amongst the key actions for adapting Indian agriculture to climate change are improved land management practices, development of resource conserving technologies, development of crop varieties that can withstand climate-stress, effective risk management through early warning, credit-insurance support to farmers and nutritional strategies for managing heat stress in dairy animals. Complementary actions in terms of identification of cost-effective opportunities for reducing methane generation, emissions in ruminants by modification of diet, and in rice paddies by water and nutrient management will help make adaptation measures sustainable. New policies should support the new land use arrangements, enhance investment in water harvesting, promote small-farm mechanisation and efficient water use technologies. A package of financial incentives for improved land management, including resource conservation (water, carbon, energy) and balanced fertiliser use may facilitate quicker adoption of these measures.

#### **Water**

**7.86.** Given the stress on glaciers and snow covers, and the threat of reduced summer and autumn flows in the Himalayan river systems, a comprehensive analysis of the possible impact of climate change on water resources is necessary. Such an assessment should include the assessment of the likely impacts of climate change on the constituents of the hydrological cycle at the basin/sub-basin level.

**7.87.** The National Water Mission launched in 2008 partly addresses this need by aiming at

(i) development of a comprehensive water database and assessment of the impact of climate change on water resources, (ii) promotion of citizen and state actions for water conservation, augmentation and preservation, (iii) focused attention on vulnerable areas including over-exploited areas, (iv) increasing water use efficiency by 20 per cent, and (v) promotion of basin level integrated water resources management.

**7.88.** During the Twelfth Plan, it should be our effort to create a framework which enables the mapping of hydrological units with the hierarchy of river basin at the highest level to catchment at the intermediate and watershed at the lowest level. Formulation of such framework including development of present and future scenarios can be undertaken by line Department(s) in consultation with the academic and research organisations working in this area. Assessment of water utilisation for various purposes linked to sources is a basic necessity for working out the adaptation measures. Such an exercise is also essential for addressing the issues of inter-sectoral competition for water. During the Twelfth Plan the National Water Mission would be revamped to ensure an integrated management of ground and surface water resources.

#### **Forests and Other Natural Ecosystems**

**7.89.** Climate is one of the most important determinants of forest vegetation patterns. However, climate change is expected to occur more rapidly than the rate at which ecosystems can adapt and re-establish themselves. Projected impacts for India indicate that 40 to 70 per cent of the forested grids in different states are likely to experience climate change, resulting in forest die back and loss of biodiversity.

**7.90.** Given the vulnerability of forests, the GIM launched during the Eleventh Plan period envisages a combination of adaptation and mitigation measures aimed at (i) enhancing carbon sinks in sustainably managed forests and other ecosystems, (ii) adaptation of vulnerable species/ecosystems to the changing climate patterns and (iii) adaptation of the forest-dependent communities. The specific target adopted by the Mission is to increase the forest

and tree cover by 10 mha of forest/non-forest lands through (i) qualitative improvement of forest cover/ecosystem in moderately dense forests (1.5 mha), open degraded forests (3 mha), degraded grassland (0.4 mha) and wetlands 0.1 mha; (ii) eco-restoration/afforestation of scrub, shifting cultivation areas, cold deserts, mangroves, ravines and abandoned mining areas (2 m ha); (iii) bringing urban/ peri-urban lands under forest and tree cover (0.20 mha); and d) agro-forestry/social forestry (3 mha).

7.91. The incremental annual mitigation potential of the Mission interventions is estimated to be about 55 MtCO<sub>2</sub> in the year 2020, using moderate to conservative carbon accumulation rates. The GIM should also aim at implementing a programme of Reduced Emissions from Deforestation and Forest Degradation (REDD+) that ensures sustainable management of forests.

7.92. Current central assistance for afforestation programmes is only around ₹350 crore per year. While budgetary support needs to be enhanced, one of the keys to success of this Mission will be its ability to establish convergence with other flagship programmes like MGNREGA, Compensatory Afforestation Fund Management and Planning Authority (CAMPA) and National Action Plan (NAP); and effecting regulatory improvements that help local communities access and benefit from local forest resources. Synchronised implementation of MGNREGA and GIM, and unlocking of CAMPA funds for this purpose will not only enhance the availability of resources, but also achieve stronger inter-sectoral linkages. MoEF and the MoRD have already developed guidelines for convergence between NREGS and NAP. These need to be operationalised at the state level without any further delay.

#### Coastal Areas

7.93. Indian coast line is prone to increased frequency of climatically induced extreme events like cyclones, storm surge, high tides and rise in sea levels. Large portion of the population along the coastline derives livelihood from climate dependent activities such as marine fisheries and agriculture. Sensitive ecosystems such as the mangroves

are also threatened by climate change. Identification of coastal vulnerability and assessment of the consequence of coastal inundation should, therefore, receive high priority during Twelfth Five Year Plan.

7.94. Protection and management of coastal areas is not specifically covered under any of existing programmes. During the Twelfth Plan, this gap needs to be filled by according priority to the Integrated Coastal Zone Management (ICZM). The ICZM policies should be designed to afford protection against coastal vulnerabilities. Coastal zone regulations concerning construction activities have recently been modified to take into account the likely prospect of long-term rise in sea-levels. Infrastructure development near the coast also needs to take these risks into account. Climate Change Impact Assessment needs to be integrated into the existing practice of cumulative impact assessment of the environment. Comprehensive modelling of the coastal processes incorporating all necessary parameters is essential for planning mitigation and adaptation strategies. To enable this, existing capabilities of MoES and Indian Space Research Organization (ISRO) (Remote Sensing) may also need to be strengthened during the Twelfth Five Year Plan.

#### Health

7.95. There is a growing concern in both medical and climatological communities that global climate change is likely to affect human health. Climate change may adversely affect mortality and morbidity rates through general warming. Diseases such as malaria, yellow fever, dengue and cholera are all sensitive to climate change. Many are spread by insects like mosquitoes, which prefer a wetter, warmer world. Deaths from heart diseases and respiratory illness during heat waves add to the toll. In a developing country like India, population growth, industrialisation, increased energy consumption, and degrading air and water quality may worsen the health impacts of climate change.

7.96. The Indian Council of Medical Research (ICMR) has identified four areas of risks arising from climate change such as (i) Climate Change and vector borne diseases, (ii) aerosols and respiratory

diseases, (iii) UV-A and UV-B corneal damage and cataract and (iv) environment and heart diseases. Following this assessment, the ICMR has constituted Task Force Groups such as (i) Vector Borne Diseases and Climate Change (ii) Respiratory Diseases and Air Pollutants and (iii) Eye Health and Environment.

7.97. During the Twelfth Plan period, additional priority areas of research need to be taken up in the areas of climate variability, and its effect on diarrhoeal and viral diseases, heat stress and certain types of cancer such as skin cancer. Other multi-disciplinary long term studies would also be initiated in partnership with Indian Meteorological Department, Central Pollution Control Board and ISRO.

#### **Infrastructure**

7.98. Infrastructure plays a pivotal role in development. Hence, the large investments planned for future have to be protected against climate-change induced risks. This includes the infrastructure related to energy resources. An integrated climate change risks management framework for infrastructures should include market and policy induced enforcements and adaptation strategies. The key to manage risks lies in identifying them and initiating appropriate risk management and adaptation initiatives.

7.99. Some early assessments for specific sectors and locations suggest that adaptation costs for new infrastructure could be in the range of 3–10 per cent of the total investment, although for certain sectors and locations this may be higher. This, however, does not cover the cost of likely future damages due to climate change. For existing assets, the adaptation costs could be as much as 25 per cent of present costs of creating similar assets.

7.100. During the Twelfth Plan, detailed sectoral, regional and integrated studies need to be commissioned for assessment of risks to Indian infrastructure due to climate change, especially to establish the damage functions and costs. Assessments by neutral third parties may be conducted for all such upcoming infrastructure projects. Environmental Impacts Assessment of new infrastructure projects should also include impacts of climate change on the project in near, medium and long-terms.

#### **Industry**

7.101. Industry has recently taken several voluntary initiatives to adapt itself to the emerging international challenges from climate change. These include both the manufacturing and service sectors. Some corporate units have adopted the practice of making voluntary public disclosure of information relating to sustainability performance. In such cases, the units prepare sustainability reports using the guidelines followed by private corporate or civil society bodies. Some of them have even adopted voluntary practices for carbon foot-printing, using ISO 14,064, WRI-WBCSD GHG Protocol or IPCC Guidelines and so on. However, the relevance of such private actions for the national policy goals is not fully evident.

7.102. Transition of industries to a more energy efficient and lower carbon energy based operation is a more fundamental issue that is key to sustainable growth. However, this needs to be supported by availability of technological and financial resources. The key issue in this regard is the adoption of appropriate technologies that may help the industrial units in saving energy, improving energy efficiency and conserving natural resources without affecting their competitiveness. This will need to be addressed through a well thought out lower carbon strategy for inclusive growth.

#### **National Action Plan on Climate Change**

7.103. Eight national missions were launched in the Eleventh Plan covering the areas of solar energy, energy efficiency, habitat, agriculture, water, Himalayan ecosystems, forestry and strategic knowledge. The mission documents have been finalised by the Prime Minister's Council on Climate Change and are at various stages of implementation. Although the nodal Ministries entrusted with implementation of the missions are yet to fully assess the likely costs, the preliminary estimates indicate a sum of ₹2,30,000 crore may be needed to fulfil the Mission objectives. Funds of this magnitude cannot be mobilised through budgetary resources alone.

7.104. The Solar Mission aims at making solar electricity cost competitive to coal power and increasing the share of solar energy in the total energy mix

through development of new solar technologies, both photovoltaic and solar thermal. The Mission recommends implementation in three stages leading up to an installed capacity of 20,000 MW by the end of the Thirteenth Five Year Plan in 2022. The total financial outlay during Phase 1 is estimated as ₹4,337 crore. Requirement for second phase will be assessed after review of phase 1.

**7.105.** The Energy Efficiency Mission seeks to upscale efforts to create a market for energy efficiency. It comprises of four initiatives, namely, Perform, Achieve and Trade (PAT), Market Transformation for Energy Efficiency (MTEE), Energy Efficiency Financing Platform (EEFP) and Framework for Energy Efficient Economic Development (FEEED). As a result of implementation of this mission over the next five years, it is estimated that by about 2015, about 23 million tonnes of oil-equivalent of fuel saving—in coal, gas, and petroleum products, will be achieved every year along with an avoided capacity addition of over 19,000 MW. While the initial cost of starting the Mission during the Eleventh Plan was about ₹425 crore (excluding the investment made by private investors) the costs for implementing the Mission during the Twelfth Plan period is estimated to be ₹3,400 crore (excluding the investment made by private sector). The cost for subsequent periods is yet to be estimated.

**7.106.** The Sustainable Habitat Mission attempts to promote energy efficiency in buildings, management of solid waste, and modal shift to public transport including transport options based on bio-diesel and hydrogen. Main components of the mission are (i) development of National Sustainable Habitat Standards (legal/regulatory) measures (ii) incorporation of principles of sustainable habitat in city development and planning and (iii) complementary action such as support for building green demonstration projects and outreach programme for creating consumer awareness. The total cost estimate projected in the Mission Document is ₹1,000 crore. During Eleventh Plan, expenditure of ₹50 crore is to be incurred and remaining ₹950 crore is to be incurred during the Twelfth Five Year Plan.

**7.107.** The Sustainable Agriculture Mission aims at making Indian agriculture more resilient to climate change through development of new varieties of climate-stress resistant crops, new credit and insurance mechanisms, and improving productivity of rain-fed agriculture. The main focus of the mission is ensuring food security and protecting land, water, biodiversity and genetic resources for sustainable production of food. An outlay of ₹12 to 15 thousand crore is likely to be available for this mission during the Twelfth Five Year Plan.

**7.108.** The Water Mission aims at conservation of water, minimising wastage and ensuring more equitable distribution both across and within states. The mission focuses on (i) intensive rain water harvesting and ground water charging to meet the demand of 1,120 critical blocks during the Eleventh Plan and remaining blocks in the Twelfth Plan (March 2017), and (ii) increasing water use efficiency at least by 20 per cent by 2012. Water has been identified as a major challenge of sustainable development for the Twelfth Five Year Plan. A new national program will be launched for sustainable management of water resources in the country. Since this issue is larger than climate change, it is better to subsume this into the larger mission to be launched for the Twelfth Five Year Plan.

**7.109.** The Mission on Sustainable Himalayan Ecosystems aims at evolving management measures for sustaining and safeguarding the Himalayan glacier and mountain eco-system. The four key issues to be addressed by the mission are (i) Himalayan glaciers and the associated hydrological consequences, (ii) biodiversity conservation and protection, (iii) wildlife conservation and protection, and (iv) traditional knowledge societies and their livelihood. For implementing its activities, a total provision of ₹900 crore needs to be made during the Twelfth Five Year Plan.

**7.110.** The Green India Mission focuses on enhancing eco-system services and carbon sinks through afforestation on degraded forest land, in line with the national policy of expanding the forest and tree cover in the country and improving the quality of forests. A total expenditure of ₹46,000 crore is projected under this mission for coverage of 10 mha over the

next ten years. An outlay of ₹12,500 crore is likely to be available for this mission during the Twelfth Five Year Plan.

7.111. The Strategic Knowledge Mission intends to identify the challenges of, and the responses to, climate change through research and technology development and ensure funding of high quality and focused research into various aspects of climate change.

7.112. *For a Mission to succeed it must have separable objectives, dedicated implementation machinery and adequate funding.* For objectives which lie within the domain of other flagship programmes, or are completely cross-sectoral, it is better to identify a few policy thrust areas, which would still be part of the NAPCC and be regularly monitored by the Prime Minister's Council.

7.113. To achieve effective results, the missions stated above need to be reorganised in accordance with the updated priorities. We should aim at a short list of reorganised missions and a few policy thrust are as under the NAPCC, that will be achieve more focused and tangible results over the Twelfth Plan period. Some suggestions for reorganising the NAPCC are as follows:

1. The Water Mission here needs to be merged with the new *National Water Mission* that is being formulated for the Twelfth Five Year Plan. This will ensure water related issues are dealt with in a more holistic manner, as climate change is also an important subject under the new National Water Policy being put up for approval. However, critical actions like treatment of all sewage being released into water bodies, which have a bearing on our adaptive capacity to climate change, should be monitored as a separate policy thrust area under the Prime Minister's Council on Climate Change.
2. Strategic Knowledge Mission is also likely to remain peripheral and is not likely to attract adequate funding through this window. It is better to mainstream development of green technology and research into various aspects of climate change into the main programmes of

ourscientific departments, like earth sciences, space, science & technology, agriculture, health, biotechnology and others, as these are likely to attract substantial funding during the Twelfth Five Year Plan. It can be monitored as a policy thrust area under the Prime Minister's Council on Climate Change.

3. Sustainable Habitat Mission presently has overarching objectives, some of which are out of proportion to the limited funding that is available. Solid Waste Management is an area that is funded through a separate central programme, namely the JNNURM. This subject, being of immense importance, should be monitored as a policy thrust area through the PM's Council; while the Habitat Mission under NAPCC should focus on critical areas like evolution, adoption and implementation of green building codes, urban habitat planning and development, so on.
4. Our efforts to develop wind energy meet the requirements of a separate mission like the solar mission. To accelerate progress in this area, and to meet the steep targets set for the Twelfth Plan, a new National Wind Power Mission needs to be launched under the NAPCC. India has already built up sufficient technological capability in this area, which needs to be harnessed to maximise utilisation of wind power potential in the country.
5. The Energy Efficiency in Industry is an important policy thrust area. PAT scheme is only suitable for certain large industries (called 'designated consumers' under the Energy Conservation Act). To facilitate efficiency improving technology interventions in the industry at large, an Energy Conservation Fund needs to set up under the aegis of the Bureau of Energy Efficiency. Similarly, Advanced Coal Technologies, Dedicated Freight Corridors and Improved Urban Public Transport are the critical policy thrust areas that can go a long way in saving the scarce fossil fuels for the country, and therefore, need a focused attention at the highest level.

7.114. Accordingly, a reorganised framework for the National Action Plan for Climate Change is suggested in Box 7.7. *These suggestions will be placed*



**Box 7.7****Suggested Re-organisation of the National Action Plan for Climate Change****A) NATIONAL MISSIONS**

1. National Solar Mission
2. National Wind Energy Mission
3. The Energy Efficiency Mission
4. Sustainable Habitat Mission
5. Sustainable Agriculture Mission
6. Mission on Sustainable Himalayan Eco-systems
7. National Mission for a Green India

**B) POLICY THRUST AREAS**

1. Advanced Coal Technologies
2. Energy Efficiency Improvements in Major Industries
3. Solid Waste Management Systems in Towns and Cities
4. Treatment of all Sewage before Release into the Water Bodies
5. Improved Urban Public Transport
6. Dedicated Freight Corridors along Major Routes
7. Climate Related Research through Scientific Departments

*before the Prime Minister's Council on Climate Change and discussed before a formal decision is taken.*

**State Action Plans on Climate Change**

7.115. Involvement of States is critical in building capacity at local levels to address climate change and to protect local communities that are vulnerable. During the Twelfth Plan period, attempt will be made to create capacity at the state level, and to provide some resources to incentivise state action in the area of adaptation and mitigation. MoEF has already initiated the process of preparing State Action Plans on Climate Change (SAPCC). The SAPCCs are to be finalised with assistance of experts and through a process of consultations. It will identify vulnerable areas and communities that need to be insulated against the adverse effects of climate change. Some of the effective adaptation strategies are listed below:

1. Agriculture: Change in land use management, development of resource conserving technologies, development of crop varieties that can

withstand climate stress, effective risk management through early warning, credit insurance support to farmers and better nutritional management of dairy animals.

2. Water: Framework for mapping hydrological units, assessment of water utilisation to address inter-sectoral competition, research to support policy improvements in water use management and to improve understanding of linkages within the ecosystem.
3. Forests: Forest planning and development of programmes that will minimise the adverse impact of climate vulnerability and change, implement REDD+ activities programme.
4. Coastal Zone: Scientific evaluation of potential changes in the coastal zone, estimation of inundation of vulnerable zones, planning for infrastructure and large scale displacement of people in coastal areas.
5. Health: R&D and clinical management of vector borne respiratory, heart and corneal diseases.

7.116. The State Action Plans will include a strategy and a list of possible sectoral actions that would help the States achieve their adaptation and mitigation objectives. Most of the States have already started working on a template provided by the Central Government. An expert committee in the MoEF has been set up to examine the draft action plans from a technical point of view. A National Steering Committee has also been formed to endorse the SAPCCs, as well as strategies and outlays presented by the State Governments.

7.117. Most of the resources required for sectoral actions under the State Action Plans will need to be provided by the State Governments through their respective plan outlays. However, some resources may be mobilised as Central Assistance to State Plans through the Gross Budgetary Support. Towards this end, an umbrella scheme on Climate Change Action Programme is proposed to be launched during the Twelfth Plan. Support to State Governments could be based on a set of transparent and objective criteria to be monitored by a Steering Committee in the MoEF. In addition, State Government may earmark provisions for implementing activities under the SAPCC.

Thirteenth Finance Commission has recommended grants to the State Governments for environment action, which also cover some of the activities under the NAPCC. Even then, resources are likely to fall far short of what is required, and international assistance will need to be mobilised through bilateral and multilateral channels.

#### *Climate Change Science and Assessment*

7.118. Existing institutions in different Ministries have studied the patterns and behaviour of climate from a scientific angle. However, the science of study and assessment of climate change has acquired added importance in the recent years. There has been a significant leap in the understanding of the 'science' of climate change and its impacts on socio-economic systems, which is evident from the work done by the IPCC in its Third Assessment Report.

7.119. The Ministry of Environment and Forests has been engaged in the last two decades in assessing climate change and presenting its findings. It prepared the first National Communication in 2004. The Second National Communication based on the data of 2007 has been prepared and presented to the international community in 2012. To provide a systematic basis to the research in the area of climate change, the Ministry has set up an Indian Network for Climate Change Assessment (INCCA) as a network-based scientific programme. The INCCA is visualised as a mechanism to create new institutions as well as engage existing knowledge institutions working with the Government.

7.120. Considering the importance of scientific assistance to policymaking, we need to create a more systematic and credible institutional arrangement that would enable us to continuously enhance the understanding of the 'science' of climate change. It should make a regular assessment of the impacts due to changes in the climate system, and also assess the extent and nature of key vulnerabilities. It should include systematic preparation and publication of GHG inventory, preparation of National Communications (NATCOMs) as per international obligations, and facilitate mainstreaming of climate change related studies. Towards this end, it

is proposed that new research programmes may be launched to strengthen scientific research, assessment, planning and management capability particularly in the following areas of Climate Change:

1. A specific programme aimed at Climate Change Assessment Studies (CCAS) and institutionalising the obligatory and scientific work of the Ministry is urgently called for. The programme is required to build capacity in modelling of climate change effects, which can be done with the help of technological, economic and scientific data collected in a systematic manner. This programme may initially be conceptualised within the MoEF with a Director and at least 10 scientists and experts from different fields and associated support staff. In the long run, a dedicated Centre for Studies and Research in Climate Change should be set up as an autonomous institution attached for budgetary purposes to the MoEF. The Centre should plan, collate and coordinate the assessment work for National Communication, which is a regular and mandatory international obligation performed by the Ministry. The Twelfth Plan should support provision of at least ₹25 crore over a period of five years to this Centre with an appropriate institutional arrangement.
2. GHG Inventory Management System (GHG-IMS) needs to be institutionalised as India is required to publish its Greenhouse Gases (GHG) inventory every two years. The programme can initially be planned in the same manner as the Climate Change Assessment Centre, to be housed under INCCA and operationalised at the MoEF. The programme should coordinate with network agencies for estimation and regular publication of GHG inventory. The nodal centre at MoEF would also act as a data repository for GHG inventory and conduct analysis to support policy making. The budgetary support required for this activity would be ₹20 crore per year for the initial five years, followed thereafter by regular budgetary support to ensure its continuity.

#### **Strategies for Financing**

7.121. Assessment of the costs of adaptation and mitigation is a difficult task, although it is clear that

these costs are significant, and will likely rise in future as initiatives are taken to achieve the mitigation and adaptation goals outlined in our national policies. Though no ready estimates are available, several studies<sup>1</sup> suggest that incremental economic or investment costs incurred for adaptation and mitigation of emissions will be sizeable and may divert resources from other critical sectors of our economy.

**7.122.** During the Twelfth Plan, financing of climate change related actions will be a major challenge. Low carbon strategies will particularly require enhanced deployment of renewable and clean energy technologies, and capital finance for improvements in technology. Some of these objectives may be met through regulatory interventions and use of market mechanisms, in which case the required budgetary support may be small, but indirect and unquantified costs for economy may be large. In other cases, adequate financial outlays will be needed to implement policies and measures that can achieve specific mitigation outcomes in the individual sectors. A framework for understanding finance strategies is outlined in Box 7.8.

**7.123.** Before deciding on the optimal strategy it is important to answer questions like whether the incentive will actually be passed on to the consumer, whether the income transfer to the consumer would result in increased demand, what will be the impact on risk-sharing, information asymmetry, moral

hazard and so on. Where markets exist, signals could be delivered through either price or quantities. Where they do not exist, and externalities are paramount; markets may need to be created as well as deepened. In this context, the relevance of regulatory measures as appropriate instruments to reflect externalities and trading as a possible way of minimising the economic costs will need to be examined.

**7.124.** Given that energy supply and end-use technologies are evolving rapidly, policy instruments should reflect the contemporary state of technology. Whether a technology will be viable and adopted widely depends on the private discount rate, the social discount rate and monetisation of net co-benefits. An example of what policy intervention will be optimal for what technology is explained with examples in Table 7.4.

#### *Domestic Resources*

**7.125.** The most obvious source of financing for climate change action is the government budgetary support. Most of it would come as sectoral finance since some of the resources for adaptation and mitigation are built into the on-going schemes and programmes of the respective Ministries. Although carbon mitigation is sometimes an important co-benefit, the deployment of resources for such purposes is largely guided by the overall availability of resources with the respective Ministries. Some prominent examples are budgetary support for super-critical thermal power plants, for dedicated freight corridor, for urban public transport, so on. This is supplemented by internal and extra-budgetary resources of public enterprises like NTPC, Ministry of Railways, Metro-Rail Corporations, so on. Additional allocations are available as grants from the Central Government on the recommendation of the 13th Finance Commission. Three grants of ₹5,000 crore each, namely for forest cover, renewable energy and water sector, have been recommended for the State Governments.

**7.126.** While the budgetary resources indicated above flow through the Consolidated Fund, Government of India has created another window for climate action through the Public Account. With a view to generate additional resources, a cess at the rate of ₹50 per

#### **Box 7.8** **Framework for Understanding Finance Strategies**

- A. Changing the Cost Curves (Producer Side Strategies)
  - Capital Costs: capital subsidy, interest subsidy, depreciation rules
  - Variable Costs: output based incentive (Feed-in-tariffs, rebate/drawback of commodity taxes)
- B. Changing the Demand Curves (Consumer Side Strategies)
  - Purchase Based Incentives (purchaser rebates)
  - Purchase Quotas (Renewable Purchase Obligations)
  - Guaranteed Procurement (public procurement policy)

**TABLE 7.4**  
**Policy Interventions Optimal for Various Technologies**

| Technology Examples                    | Viability Using Private Discount Rates | Viability Using Social Discount Rates | Social Discount Rates + Monetised Mitigation Benefits | Policy Approach  |
|--|--|---------------------------------------|---|--|
| ECBC, CFL, Supercritical Coal Tech.    | Viable                                 | Viable                                | Viable  | Mandatory Standards + Information labelling            |
| Super-efficient Appliances             | Unviable                               | Viable                                | Viable  | Incentive to Manufacturer and/or incentive to Consumer |
| LED's & Ultra-supercritical Coal Tech. | Unviable                               | Unviable                              | Viable  | Domestic or International Carbon Finance (grant/loan)  |
| Carbon Capture & Storage               | Unviable                               | Unviable                              | Unviable  | Pilot Project on 100 per cent grant basis              |

tonne of coal was levied in the budget of 2009. The cess has become operational and its revenue (of the order of about ₹3,000 crore every year) will go to a newly created National Clean Energy Fund (NECF), which will be used to finance innovative projects in clean energy technologies and to harness renewable energy sources to reduce dependence on fossil fuels. From the Fund, allocation of ₹200 crore has already been proposed for environment remediation programmes and another ₹200 crore for the Green India Mission.

7.127. Funds can also be established outside the Government. This is particularly important for private sector industry, even more so small and medium enterprises, who will find it difficult to access the National Clean Energy Fund in the Government Public Account. It would be simpler and more useful to set up a 'Carbon Trust' or a 'Low Carbon Fund' managed by an autonomous body like the Bureau of Energy Efficiency, into which collections from an 'Energy Efficiency Surcharge or Levy', as suggested in the industry section, could be deposited. The collections, even though small, could be supplemented by block grants from the National Clean Energy Fund under the Government, and indeed some international sources of finance. This could go a long way in meeting the demands of the private industry.

7.128. Given the importance of supporting the development of clean energy technologies, a separate

window could be opened in the Fund to support development of early stage technologies and/or supporting diffusion, deployment and adoption of commercially available but high cost climate friendly technologies. Such measures could be taken in the mode of public-private partnerships. We could also create a 'priority' credit facility through the scheduled commercial banks to help finance their low carbon efforts, while interest subvention could be dovetailed with the Trust fund suggested above. To summarise, a clearly planned strategy and mechanism for supporting diffusion, deployment and adoption of climate friendly technologies should be launched during the Twelfth Plan.

#### *International Sources*

7.129. The intensity of domestic mitigation response depends rather significantly on the multilateral response to climate change. According to the UNFCCC, international financial support is to be provided to developing countries to enable them to take voluntary actions for mitigation and adaptation. Even though resources are scarce, India has been making specific budgetary outlays to address the challenge of climate change. However, domestic resources fall far short of the actual requirements. Expert Group on Low Carbon Strategies has explicitly stated in its Interim Report that aggressive mitigation cannot be achieved unless substantial international help, both in terms of financial resources and transfer of technology, is forthcoming.

7.130. A major channel for mobilising funds to the developing countries is likely to be the Green Climate Fund that is still under construction. At the same time, the World Bank (Climate Investment Fund) and other multilateral agencies are offering their funds to be used for climate action on the basis of agreed terms and conditions. The expected funds flow through the Green Climate Fund, and other bilateral and multilateral channels, will enhance India's capacity to address the climate challenge. It is important to ensure funds flows through these sources are indeed 'new and additional resources', and their terms of finance are in accordance with the multilateral rules of climate change. Unfortunately, the promises made through the Conference of Parties and recommendations of the High Level Panel on Climate Change Finance are yet to be implemented.

7.131. One way of differentiating between domestic and international sources of finance is the co-benefits framework mentioned above. Policy measures that generate adequate development co-benefits should be funded domestically, while those which primarily provide climate benefits should be funded by international sources. Even measures with adequate co-benefits may require international financing, if the initial investment is very large. Thus, actions which generate climate benefits along with development co-benefits should be the ones that should be categorised as the Nationally Appropriate Mitigation Actions (NAMAs).

#### *Carbon Markets and Clean Development Mechanism*

7.132. CDM is an international mechanism for emissions trading that helps developing countries gain some financial resources through sale of emission reduction certificates to developed countries, while enabling them to meet their emission reduction targets. The market for such trading is either compliance-based such as the one created under Kyoto Protocol, or voluntary in nature. India has been an active player in the Clean Development Mechanism and the National CDM Authority (NCDMA) in the Ministry of Environment & Forest has so far accorded Host Country Approval to over 2000 projects. These projects have the potential of facilitating

an overall inflow of approximately US \$ 7.07 billion in the year 2012, provided all of them get registered. Interestingly, most of the projects in India are unilateral in nature, wherein the project entity itself undertakes the initial investment, and aims to sell the Certified Emission Reduction (CER) units in the spot market rather than selling them in the forward markets.

7.133. Efforts are being made to increase participation of financial institutions/banks in financing voluntary projects, including the bundling of small projects which may reduce transaction costs and increase the average project size. A programme for capacity building to help industry adopt new and more efficient methodologies, such as programmatic CDM projects, is also being considered. However, the ability of international carbon markets to act as a stable source of adequate finance for domestic mitigation actions in developing countries is limited, because of the uncertainties about the scale of emissions reduction in the 2nd commitment period under the Kyoto Protocol. Further, in some of the key markets such as that of the European Union, unilateral restrictions are being imposed on sale of CERs from major developing countries in terms of eligibility, additionality criteria, sectoral caps, so on. In brief, the contribution of CDM to real technology transfer is limited, and as market prices remain depressed and volatile, considerable uncertainty prevails over its future.

7.134. Innovative domestic markets mechanisms are being evolved under the Perform, Achieve & Trade (PAT) Scheme that is being implemented by the Bureau of Energy Efficiency for designated industries under the provision of Energy Conservation Act 2010. Efforts are being made to support this scheme by creating a Partial Risk Guarantee Fund with help from the Global Environmental Facility. However, this scheme is not suitable for the small and medium industry, for which new forms of financial support and capacity building are needed.

7.135. Renewable Energy Certificates is another attempt at creating domestic markets through regulatory interventions at the state level. It may, however, be easier to deepen the existing quasi-markets

in the power sector so that renewable power achieves grid parity faster.

7.136. The potential for these domestic measures to link with global carbon markets remains unclear, largely due to lack of clarity in the international negotiation process. Until such clarity emerges, the most that can be expected are loosely linked regional markets. We must be prepared to link with them, though we cannot expect substantial resource flow from this source in the short term. India's actions for climate change will, therefore, need to be financed from a pool of resources consisting of the domestic resources, international carbon finance and multilateral funds available to India in accordance with the agreed multilateral rules of the UNFCCC.

### Way Forward

7.137. India faces the twin challenges of adaptation and mitigation. As a country with many critical sectors and regions that are highly climate-sensitive, there are significant costs in addressing the impact of climate variability and change. At the same time, as a signatory to the UNFCCC, India is expected to undertake mitigation actions consistent with the multilateral framework.

7.138. India has already taken decisive steps in this regard. Over the Eleventh Plan Period, it initiated the National Action Plan on Climate Change, which is monitored by a body no less than the Prime Minister's Council for Climate Change. It has voluntarily announced a domestic goal for reducing the emission intensity of its GDP. It has set up an Indian Network for Climate Change Assessment for making periodic assessment of climate variability

and change. It has also set up an Expert Group to evolve Low Carbon Strategies for Inclusive Growth, which has made important recommendations for power, industry, transport, buildings and forestry sectors.

7.139. As adaptation is the urgent need of communities that are vulnerable to climate change, regular and periodical assessment of vulnerability in different sectors and preparation of adaptation strategies should be part of sectoral plans of the relevant Ministries. Climate change concern should permeate all processes of planning in the long term, and certain sectors where the needs are urgent, such assessments should be mounted urgently and integrated into the sectoral strategy.

7.140. As we embark on the Twelfth Plan, the NAPCC, like all major flagship programmes, needs to be reorganised in accordance with the updated priorities. As already mentioned, for any mission to succeed, it must have separable objectives, dedicated implementation machinery and adequate funding. For objectives which fail to meet this test, it is better to identify a short list of 'policy thrust areas', which could be separately listed under the NAPCC, and yet, be regularly monitored by the Prime Minister's Council. Accordingly, a reorganised framework for the NAPCC has been presented in Box 7.7.

### NOTE

1. 'Energy and Environmental Sustainability: An Approach for India', McKinsey & Co., New Delhi, 2009; 'National Energy Map for India, Technology Vision 2030', The Energy Resources Institute, New Delhi, 2006.

# 8

## Science and Technology

### INTRODUCTION

8.1. India's development plans have consistently emphasised the need for sustained investment in research and related activities leading to creation of substantial capacity and capabilities in science and technology (S&T). The fruits of this effort are evident in India's nuclear and space programmes, information and communication technology services, automotive and pharmaceuticals industries and other areas. As the Indian economy continues on the path of rapid, more inclusive and sustainable growth, it will be necessary to ensure that India's capabilities in S&T grow in strength. This is especially important if India is to become one of the major economies of the world over the next 20 years.

8.2. Many positive steps have been taken in recent years to give a boost to S&T efforts and these are having a steady, incremental effect. The Indian science sector has gained growth momentum during the last three years. Relative position of India with respect to scientific publications has improved from 15th in 2003 to 9th in 2010. Our science output has reached 3 per cent of the global output in 2010. While this is heartening, the current rate of improvement is slow and falls short of global standards in many areas. This is indicated by the fact that India's share of top 1 per cent publications is only 0.5 per cent, as of 2006, less than those of other Asian countries like China and South Korea.<sup>1</sup> Inventiveness in our basic science, as indicated by creation of intellectual property, is low and India's innovation system ranking varies between 50 and 60 among the

nations. The country has major challenges to address in health, food, energy and environment and these can be met by doing quality science, showing greater inventiveness and achieving quality in product innovation. The challenges of a robust economy can be met by investing adequately in knowledge systems and achieving global leadership positions in some areas in the next two decades.

8.3. For a country of the size of India, with a robust scientific infrastructure and a vast pool of trained scientific manpower, productivity gains from a hike in research and development (R&D) spending could be huge. The country needs to move up from investing 1 per cent of gross domestic product (GDP) in the R&D sector to 2 per cent of GDP and more, as has been the case with several developed and emerging economies for quite some time now. This must be achieved through an additional government effort, but also a much increased private sector effort.

### APPROACH TO THE TWELFTH PLAN

8.4. India made substantial investments in the R&D sector during the Eleventh Plan period laying a strong foundation for building a vibrant and dynamic S&T sector in the country. Average growth rate of publications from India in scientific journals is about 14 per cent during the last three years of the Eleventh Plan period. This is against the global average of 4.1 per cent during the same period. The share of scientific publications emanating from universities increased from 15 per cent in 2003 to 31 per cent in 2012. These are welcome changes as far as expanding

the R&D base of the country is concerned. However, these remain incremental changes. What the country really needs at this point of time is a quantum jump, to position itself at par with the developed economies in the next two decades.

8.5. To face up to the increasing challenges in the new world order, the Indian S&T landscape needs to undergo a paradigm shift. It needs to evolve new delivery mechanisms for innovative deployment of technologies and business models for financing deployment of innovations. This calls for a well-enunciated Science, Technology and Innovation policy. The Twelfth Plan should therefore work to develop an ecosystem that addresses the national priority for sustainable, inclusive and accelerated growth taking along the education, research and corporate sectors. The corporate sector, in particular, must play a much larger role in building research capability as happens in other countries.

8.6. A competitive knowledge economy must be built on the pillars of: (i) an educational system that produces human resources which are employable and globally benchmarked; (ii) S&T pursued on an enormous scale to generate knowledge for long-term use and (iii) strategic translational research inspired by national needs and global opportunities. In pursuit of these objectives the Twelfth Plan should be geared to achieve the following:

- Evolve a new Science, Technology and Innovation policy to bring in more resources from both public and private sector for R&D for socially and strategically relevant projects and mainstream innovation-related activities with a focus on affordable and sustainable innovations;
- Catalyse a radical but participative transformation of the Indian S&T system by refocusing the efforts of the designated Departments/Agencies at:
  - National Focus—build partnership with identified players of the National Innovation System to build the scientific, technological and human resource niches for the country;
  - Organisational Focus—address the needs of each Department/Agency for achieving the goals in national focus and rigorously review the ongoing projects/programmes to phase out those which have by and large fulfilled their goals; and
  - Leadership Focus—stimulate the Department/Agency’s leadership in identified domains of science, technology and human resource development.
- Ensure that S&T becomes an integral component of the national developmental processes by interconnecting competencies and research resources and strengthening interconnections with the weakly connected stakeholders to the R&D outputs;
- Increase the number of full-time researchers/scientists from the current level of 1.54 lakh to 2.50 lakh; the volume of publication outputs in basic research from a global share of 3 per cent to, say, 5 per cent; improve the global ranking from 9th to 6th by the end of the Twelfth Plan; focus on doubling the number of patents and increase the commercialisation of patent portfolio to 5–6 per cent from a level of less than 2 per cent;
- Increase R&D expenditure to 2 per cent of GDP and significantly enhance corporate sector R&D expenditure to at least 1 per cent of GDP by attracting investments and engaging the corporate sector in R&D through policy and reforms processes; earmark 10–15 per cent of public investment exclusively for public–private partnership (PPP) R&D to private sector through the competitive grant process with a stipulation that comparable provisions would be made by the private sector under PPP model;
- Provide more flexibility to the younger generation of scientists to pursue their ideas and greater mobility between industry, academia and R&D institutions; strengthen gender parity in R&D by way of mobility and women re-entry programmes; consolidate on the gains achieved during the Eleventh Plan in nurturing students to pursue science as a career;
- Build technology partnerships with States through new models of technological solutions, design, development and delivery;
- Initiate Grand Challenge Programmes and launch PAN-India missions to address national priorities



in various developmental sectors through bottom-up approach, particularly in the areas of Health, Water, Energy and Food through consortia of institutions and agencies cutting across public and private sectors; two major areas which require immediate focus during Twelfth Five Year Plan are Energy and Water;

- Encourage large Indian industries to establish globally benchmarked R&D centres on the lines of R&D centres set up by multinational companies (MNCs);
- Leverage the large-scale innovative component of strategic research spin-offs from defence, space and atomic energy for civilian benefits in a much larger segment.
- Create new Inter-University Centres (IUCs) and Inter-Institutional Centres (IICs) in chosen areas of Science and Engineering, which will provide access to state-of-the-art facilities and academic ambience for researchers in universities and academic institutions;
- Create new R&D institutions in trans-disciplinary science and engineering to achieve leadership positions;
- Create Peta-scale supercomputing facilities and provide high-performance computing for various applications such as climate modelling, weather prediction, aerospace engineering, computational biology, nuclear applications, earthquake simulations, animation in movies, national security and finance;
- Create an independent institutional arrangement for Technology Assessment capability.
- Bring in structural reforms in the S&T sector by creating new financial appraisal and audit mechanisms and a new personnel policy based on best global practices coupled with seamless mobility of S&T personnel;
- Partner with high-value global mega projects in the areas of contemporary scientific interest and technological relevance and enhance India's role in global mega projects such as India-based Neutrino Observatory, Thirty Meter Telescope, Square Kilometer Array, Next Generation Synchrotron and so on; and
- Enhance collaboration with reputed foreign universities/agencies towards addressing the scientific aspects of common interest and global in nature.

## SPECIFIC FOCUS AREAS FOR THE TWELFTH PLAN

### Enrichment of Knowledge Base

8.7. In 1985, the number of PhDs produced in India was in the range of 4,500 and the country figured among the top in the league of developing nations in the science sector. Since 1985, however, other emerging Asian economies invested heavily in R&D, blunting India's competitiveness in the S&T sector. None of the Indian institutions figure among the top 100 in the world. The full-time equivalent (FTE) R&D professionals in India have stagnated for long; India ranks 9th as far as FTE of R&D professionals are concerned. In scientific publications as well, India ranks 9th. The global share of Indian publications in most cited papers has also remained low.

8.8. The last few years show an improvement as far as some of these parameters are concerned, but if the country has to aim at positioning its R&D institutions among the top 50, or gaining the top three slots with respect to scientific publications or target a ranking of even 6th with respect to FTE, it will have to aim at quadrupling its R&D base, stimulate research where R&D productivity is relatively lower, provide challenges to institutions for global positioning including in intellectual property (IP) generation, establish new academies and institutions, build up large publicly funded and privately managed facilities to help researchers and adopt aggressive mechanisms to attract the Indian diaspora for R&D positions. Emphasis should also be given on strengthening linkages between universities, R&D institutions, science academies and industry.

8.9. India's established research centres from which R&D outputs are generated need to expand their personnel strength to give a boost to R&D outputs. Expanding the strength of R&D personnel in the established centres of R&D by about 10,000 within the Twelfth Plan period should be considered feasible. It is also imperative that the large latent potential in colleges, universities and some academic centres is tapped. Adequate measures for ensuring quality of research output should also be looked at.

8.10. Basic research in India should aim at cutting-edge science leading to impact-making discoveries. Investments in basic research may be sized to meet the aspirational goals of the research community during the Twelfth Plan period. Basic research supporting group and interdisciplinary efforts on grand challenges would require a new paradigm of R&D funding. Approaches for spotting, nurturing and encouraging sparks and talent in scientific research have to form one of the established strategies for promotion of basic research. In addition to support for emerging areas in various disciplines of science, there should also be a parallel effort to identify areas of national interest and gaps and promote basic research in such areas. Some orientation to basic research to combine relevance with excellence may be in order. Focus on the research areas of national relevance such as energy and food security, affordable health care and water-related areas needs to be accorded high priority.

### S&T Human Resource Development and University Interaction

8.11. There is a close relationship between human resources in S&T and economic growth. Although the country has a vast network of schools, colleges and universities apart from national institutes and Indian Institutes of Technology (IITs), which have produced one of the largest pools of scientific manpower in the world, the global competitiveness of the S&T sector can only be achieved through much better quality. For this, the science education system, as it stands today, needs radical transformation.

8.12. Science teaching as a profession needs to be incentivised, accorded the respect it deserves and once again placed on a high pedestal. Equally important would be exposing these teachers at all levels in the country to the best global practices and pedagogy innovations to enable them to practise and spread superior methods of teaching and research. A scheme needs to be designed and developed jointly by the Ministry of Human Resource Development and the Ministry of S&T.

8.13. The quality of S&T education and research at the college and university levels needs to be

improved to give an edge to the scientific task force coming out of these places of learning. There is now adequate evidence for significant gain in scientific outputs and citation frequencies when the university sector engages in S&T cooperation within the country and abroad. As one of the strategies, international cooperation for deployment needs to be scaled up manifold, for enriching quality of research in the university sector. IUCs have shown a positive impact on the university system. Several new IUCs in carefully chosen areas should be set up during the Twelfth Plan in newer areas such as Biodiversity and Genetic Epidemiology; Mathematical Modelling; Computer Science and Cyber Security; Cognitive Sciences; Advanced Materials, Manufacturing and Fabrication; Technology Management; and Interdisciplinary Approaches in Humanities, Social Science and Natural Sciences.

### Aligning S&T to Developmental Needs

8.14. In addition to R&D in high science and strategic technology areas that would enable the country to position itself at the world level, there are several areas that require significant S&T inputs to generate solutions for issues that are significant for the country's development goals, in the context of both industrial development and rural development. These include energy, water and sanitation, farm production, health care, waste disposal, computing and communications, e-infrastructure, cyber security and so on.

8.15. A strategy needs to be evolved for implementation of R&D programmes focused on social and public goods for: (i) connecting competencies and research resources for scaling and impact; (ii) mounting Grand Challenge programmes on topics of national interest; (iii) adopting different funding strategies for basic and translational research under Extra Mural Research models; (iv) strengthening Intra Mural Research mechanisms for public and social goods in agencies like Council of Scientific and Industrial Research (CSIR); (v) forging State-Centre technology partnerships and technology coalitions among R&D agencies and (vi) promoting PPPs for public and social good by developing new models.

8.16. The Twelfth Plan must find ways of connecting States and socio-economic Ministries with R&D outputs leading to public and social goods as a priority. For deployment of readily available technologies in States, the following need to be evolved: (i) a synergy among the S&T and socio-economic sector, (ii) a policy decision by socio-economic Ministries to allocate a certain minimum percentage (say 1–2 per cent) of their overall budget for supporting R&D, (iii) setting up of joint centres by the socio-economic Ministries in R&D institutions and universities, (iv) participation of socio-economic Ministries in PPP projects supported by the science sector and (v) involving enterprises for effective implementation of R&D solutions arising out of synergies among science sector and socio-economic Ministries. Focus should also be on creating start-ups and utilising the cutting-edge knowledge base.

8.17. The involvement of States in R&D in the country is at present relatively low. Most States have not established suitable mechanisms for full utilisation of technologies emanating from public-funded research in the country. State Councils for S&T in many States remain as weak links between the national science sector and the State Governments. Allocation of States in their own budgets for S&T remains relatively insignificant. Special mechanisms need to be developed to promote the technology relationships between the Centre and the States. Establishment of special competitive fund for States for absorption of indigenous technologies could form one of the strategies for creating demand pull for technologies in the States. Emphasis should be given for connecting the State Councils for S&T to R&D organisations like CSIR, Indian Council of Medical Research (ICMR) and Defence Research and Development Organisation (DRDO) and so on.

8.18. The Indian R&D system is predominantly government funded. It is important that the corporate sector (both public and the private) come forward to fund R&D programmes directed towards national developmental goals. The target of total expenditure in R&D increasing to 2 per cent of GDP by the end of the Twelfth Plan could be achieved

by about 1 per cent in the public sector and 1 per cent in the corporate sector, including public sector undertakings (PSUs). At present, the resources devoted to R&D by large public sector organisations are pitifully small. They need to be incentivised to make larger provisions for both in-house R&D as well as R&D in research institutions and universities, both public and private. The step taken during the Eleventh Plan by Bureau of Public Enterprises to include R&D in the memorandum of understanding (MoU) of a PSU with the government is a move in the right direction. These sectors should spend 2–3 per cent of their sales turnover on R&D contracting out research to institutions and universities. The current levels of coupling between the R&D and manufacturing sectors are weak. High priority to PPPs that would ensure flow of innovation into industrial manufacturing leading to wealth creation, thus, has to be accorded. Industry needs to identify critical technology areas where through the partnership with publicly funded R&D system they can become global leaders.

8.19. The corporate sector both from public and private sectors too needs to be encouraged and incentivised to set up R&D centres just as the R&D centres set up in India by some of the world's leading research institutions, as R&D activities by MNCs have created enclaves for world-class technological development and have helped the creation of a pool of highly skilled scientists and technologists through setting up of their R&D centres in India. Thus, it is crucial to evolve new strategies and mechanisms to propel investment by industry if 1 per cent of GDP investment on R&D is to be targeted by this sector.

8.20. The strategic research sector could play an effective role in meeting the national developmental goals in non-strategic areas, whether it is space technology, nuclear technology or defence research. Several technologies developed by the strategic sector could trigger successful spin-offs for social and industrial sectors. A suitable mechanism to provide thrust to utilising outputs of strategic research for the social and industrial sectors needs to be worked out and created.

### Implementation of National Missions

8.21. Realising that national challenges cannot be tackled without nationally coordinated mission mode programmes involving interdepartmental and inter-ministerial collaborations, PAN-India S&T missions in select areas such as (i) Agriculture, (ii) Water, (iii) Energy, (iv) Environment and (v) Health need to be given priority.

#### Agriculture Sector

8.22. The Department of Biotechnology (DBT) proposes to support 10 agricultural universities through long-term R&D grants for promoting R&D on agriculture for public and social good. Synergy and connecting competencies of institutions under Indian Council of Agricultural Research (ICAR) with the research programmes supported by the six science departments form the selected approach for R&D on agriculture. As an example, synthesising R&D outputs from agro-metrological services of Ministry of Earth Sciences (MoES), advisory services of State remote sensing centres and State-based Spatial Data Infrastructure initiatives of Department of Space (DOS), National Spatial Data Infrastructure and National Geographic Information Systems (NGIS), fertiliser and other agrochemical technology solutions from CSIR, food processing technologies from both CSIR and Department of Atomic Energy (DAE), translation research in molecular breeding emanating from the efforts of DBT and technology deployment support to States for implementation of technologies and services by Department of Science & Technology (DST) would form a strong impact. Secondary agriculture, climate-resilient agriculture, water-saving agriculture, technologies for reducing food wastages as well as indigenous manufacture of fertilisers, precision agriculture for water-starved agro-climatic zones and international S&T cooperation for enhancing water and land productivity would form the priority areas of the six departments. The regulatory aspects for genetically modified (GM)-related crops will also be given due emphasis. Biotechnology Regulatory Authority of India (BRAI) Bill is considered as essential for streamlining regulation of all modern biotechnology products.

#### Water Sector

8.23. R&D for development of technologies for managing water-related challenges is being undertaken by almost all the six science departments in association with the line departments of Central and State Governments. While the DoS is engaged in resource mapping of water, MoES has developed and demonstrated technologies for Low Temperature Thermal Desalination (LTTD) and DAE has been developing and demonstrating a range of technologies including reverse osmosis (RO) and multi-stage flash for sea water desalination. CSIR has developed significant knowledge base on water, ranging from source finding to mapping of water resources, from quality assessment to enhancing potability of water and from recycling to waste water treatment. The technologies on flocculation and chlorination currently in vogue do not remove trace organics, metals and pathogens in treated drinking water and, therefore, R&D in ion exchange technique and nano-filtration processes need to be taken up. The DST is implementing a technology mission on Winning, Augmentation and Renovation of water where solutions to water-related challenges are being implemented and demonstrated in several locations. Therefore, in the design, development and delivery of the Twelfth Plan programmes, end-to-end solutions of water-related challenges by integrating R&D efforts of the six science departments with the line departments of both centre and State are to be given thrust.

#### Energy Sector

8.24. For achieving the full objectives of the National Solar Energy Mission, technology breakthroughs are required to increase the conversion efficiencies and to lower the costs of delivered power, for which it would be necessary to engage mainstream scientists drawn from the entire S&T sector of the country with expertise in relevant areas. R&D for clean energy systems is of paramount importance. On energy R&D, almost all six science departments are engaged in either performing research or supporting R&D or both. Similarly, clean coal technology, fuel cells, hydrogen energy, materials for harvesting both light and heat, new inorganic chemistry for converting coal into liquid fuels, bio-inspired

inorganic materials for artificial photosynthesis and bio-refinery for agro-wastes as energy sources also need focus. Since energy sector works in regulated environments, it is necessary for the R&D sector to develop adequate synergies with Bureau of Energy Efficiency and the concerned departments. The MoES is engaged in the assessment of wind, wave and tidal energy potential as a part of tapping renewable energy, including gas hydrate exploration. Thus, collaboration and cooperation in areas of technology leads where synergies could benefit the R&D systems need to be promoted, including that from the defence research system during the Twelfth Plan period.

### Environment Sector

**8.25.** R&D for controlling pollution of the local environments and emission of green house gases for mitigating global climate change demands different approaches. Whereas the R&D for mitigating pollution is promoted best through intramural research in domain area organisations, national capacity on climate change science needs to be developed over wider cross section of scientists and R&D professionals. Accordingly, under the National Action Plan for Climate Change, DST shall coordinate two missions under which formation of knowledge networks and thematic centres has been proposed by DST. These actions are focused on stimulating the latent and inherent capacities of the universities and research institutions. PPP for R&D for adaptation and mitigation of climate change will be another tool to be used. R&D sector may need to develop technology plans for solving the environment-related challenges of such sectors in association with the relevant line Ministry, and accordingly efforts of all the players need to be significantly synergised in the area of R&D on environment during the Twelfth Plan period. The MoES has been monitoring the health of coastal waters of India which would be of immense importance to UN endeavour on global assessment of marine environment.

### Health Sector

**8.26.** Affordable human health care is an area of high priority to the country. There are several parallel efforts of high significance. Indian Council of

Medical Research is the important national agency for R&D on human health care. The focus of the agency is generally on delivery of human health-care tools and public health-related R&D at this time. The agency is also well poised for delivery of R&D outputs. DBT is aggressively promoting research in human health care sector through both intra- and extramural mechanisms, as well as PPP models. CSIR has launched a major initiative on Open Source Drug Discovery (OSDD) and large number of programmes relating to R&D on human health care. In view of the high relevance of the R&D efforts for the country, some of these initiatives of the six science departments might have to be fostered as strategy for the Twelfth Plan. Human health care is an area where regulatory processes require advanced scientific knowledge and technical expertise. Speed in regulatory processes without sacrifice to the correctness of decisions demands applications of many modern technologies and R&D outputs and tools. Current mechanisms of regulation require a revisit. Biomedical Regulatory Authority Bill is considered essential if the indigenous manufacture of biomedical devices were to gain momentum and access to affordable health care system were to be enlarged. There is a strong case for promotion of PPPs for R&D on Drug and pharmaceuticals. Particularly, investment requirements for drug discovery are large. Special schemes for promotion of drug discovery and support for phase III clinical trials may be required in diseases of national interest. India could engage in basic research on disease biology for gaining new insights for discovering drugs including from marine organisms.

**8.27.** For building programme synergies and implementation on the above socially relevant missions, a special task force needs to be created. A separate PAN-India Mission Fund needs to be built-in in every department so that this fund could be deployed for building synergies among the programmes proposed by various departments and address gap areas. The Twelfth Plan emphasises that PAN-India mission mode projects addressing national needs and priorities may be launched through extensive participation of stakeholders to achieve the goals and targets in a defined time frame.

### Mega Science Projects

8.28. While PAN-India missions could bring about synergies in R&D programmes at the national level, the efforts need to be made to position Indian researchers at the global level. This involves participation at the international level in exciting experiments like in European Organization for Nuclear Research (CERN) and International Thermonuclear Experimental Reactor (ITER). During the Twelfth Plan period, India needs to invest into developing following major Mega facilities: (i) Laser Interferometer Gravitational Wave Observatory (LIGO) Experiments; (ii) India-based Neutrino Observatory (INO); (iii) Thirty Meter Telescope (TMT); (iv) Square Kilometre Array (SKA); (v) National Large Solar Telescope and (vi) Next Generation Synchrotron.

8.29. These mega science projects would be coordinated by DAE and DST through appropriate funding sharing mechanism. Besides, the above mega science projects, each department will also have mega projects already built in their budget.

8.30. Besides providing a quantum leap for scientific research, many of the above international collaborations will open up possibilities of creating technological capabilities for India. It is also time to embark upon indigenous efforts to build Peta-scale super-computer capacities and capabilities for the country's requirements that will place India among the top five supercomputing power in the world.

8.31. While Box 8.1 gives a glimpse of collaborative research through which India's competency to deliver good on global research agenda has been demonstrated, Box 8.3 provides a novel path to launch National Biodesign alliance through collaborative technology innovation for leveraging international collaboration, thereby strengthening national programmes.

### Strategies for Transformational Changes

8.32. In order to promote transformational changes within the S&T sector and gain global competitiveness with respect to S&T output indicators, it is necessary

#### Box 8.1

#### Discovery of Higgs Boson—Indian Contribution

During the Tenth and Eleventh Five Year Plan, India has taken major initiatives relating to mega science programmes by collaborating with international partners. These include themes related to High Energy Physics, Astronomy, Thermonuclear Fusion and Synchrotron supported material science research. This model is turning out to be very beneficial in the context of India's involvement in frontier science research, development of capabilities in high technology and facilitating the creation of new generation of scientists working for PhD as well as postdoctoral scientific research. The most recent example of this strategy of science collaboration relates to the Indian participation in the Large Hadron Collider (LHC). Indian Institutions joined the large LHC experiments at a pretty early stage, starting from 1994.

India contributed high technology items for Compact Muon Solenoid (CMS) experiment, which was a key detector facilitating the discovery of possibly the most important particle in High Energy Physics, the Higgs Boson. Further, India also contributed to the design and development of A Large Ion Collider Experiment (ALICE) looking for quark-gluon plasma which is important to answer some key questions in fundamental Physics beyond standard model. Both these experiments produced large amounts of data which need to be processed quickly. This called for creating a distributed computer environment and opened up a new computing regime called Grid computing. Indians not only contributed in the development of this field by developing the software but also set up a CMS computing centre resulting in the overall computing infrastructure for the experiments. The scientific team that participated in the CMS experiment included 33 PhD physicists from India. Further, the ALICE experiment has participation from several Indian universities and other institutions with 36 faculty, 22 engineers and 30 students. Together, the two experiments, CMS and ALICE, involved a total expenditure of about ₹150 crore besides kind contribution of about ₹300 crore involving many high-technology items from India.

This example of a collaborative research has demonstrated India's competency to deliver on global research agenda and provides an opportunity to work on similar model in the Twelfth Five Year Plan. Some of the mega science projects being considered in the Twelfth Plan are Laser Interferometer Gravitational Wave Observatory, National Large Solar Telescope and India-based Neutrino Observatory, besides the ongoing International Thermonuclear Experimental Reactor (ITER). These envisage adopting similar models to keep India in the forefront of scientific research, development of high technology capability, innovative computing techniques and creation of specialised human resource base.

to make strategic interventions during the Twelfth Plan period. These include: (i) increasing density of scientists by about 60 per cent, (ii) interconnecting competencies, (iii) synergy development of research resources, (iv) establishment of performance–reward relationships, (v) engaging in rewarding and mutual international partnerships, (vi) investing larger resources into performing individuals through grant model of funding, (vii) deploying more effectively the tool of PPP for R&D and (viii) creating an enabling policy environment for sustainable innovation ecosystem.

8.33. To this end, SAC to PM under National Vision for Science has suggested the development of a new, expansive personnel policy for R&D sector, based on global best practices. The National Vision also recommends re-engineering and rationalisation of processes for the science sector to increase the speed of decision-making, without compromising rules and processes, for accelerated and transformational changes and enabling youthful leadership opportunities. The SAC-PM has also suggested that the audit discipline needs to be modified from procedure- or process-based to performance- and objective-based system. In the Twelfth Plan, the suggested structural reforms for S&T sector need to be pursued so as to derive the best out of it. More recently, SAC to PM has also prepared outlines of an agenda for action on the S&T inputs to pressing national problems which will be pursued for implementation.

### Performance Measurement Systems

8.34. For Indian science to gain global competitiveness in all its dimensions, it is essential to develop suitable measurement systems for the science, technology and innovation output indicators for India. Appropriate measurement systems and comparative analysis of India vis-à-vis other emerging economies needs to form a basis for outcome-based performance. It may accordingly be desirable to adopt strategic planning for positioning India in niche positions in areas of comparative strength rather than to invest through a broad spectrum approach.

### Review of the Eleventh Plan Programmes

8.35. High priority was accorded by the government during the Eleventh Plan period for investments into S&T for deriving maximum benefits for the society and knowledge generation for capacity building. Major priorities of the Eleventh Plan for S&T sector have been:

- Setting up national-level mechanism for evolving policies and providing direction to basic research
- Enlarging the pool of scientific manpower and strengthening the S&T infrastructure and attracting and retaining young people to careers in science
- Implementing selected national flagship programmes that have direct bearing on the technological competitiveness of the country in a mission mode
- Establishing globally competitive research facilities and centres of excellence
- Developing new models of PPPs in higher education, particularly for research in universities and high technology areas
- New ways and means of catalysing industry–academy collaborations
- Promoting strong collaborations with advanced countries including participation in mega international science.

8.36. Significant initiatives/contributions have been made for each of these priority areas. Detailed account of these is provided in the respective section of the S&T departments.

### STRATEGY FOR THE TWELFTH PLAN

8.37. In spite of some positive signs, India's performance in science is yet to match her potential. The emphasis during the Twelfth Plan by the six science departments and agencies is to consolidate the gains of the Eleventh Plan period and propose new initiatives with the objective of enhancing global competitiveness of the Indian R&D system. All departments and agencies have developed programmes based on their own niche and position in the mind-to-market chain.

8.38. All the six departments of science sector must make elaborate efforts to meet the aspirations of their stakeholders. This section below presents the summaries of the proposals of each department for Twelfth Plan programmes. The deliverables and targets from the S&T sector as a whole and those from the departments are provided in Annexure 8.1 given at the end of the chapter.

### Department of Science & Technology

#### *Twelfth Plan Objectives/Thrust*

8.39. The DST, engaged in the formulation of S&T related policies and promotion of R&D through Extra Mural Research Schemes has mounted a large number of proactive schemes and measures during the Eleventh Plan period. There are some incremental improvements in the S&T outputs of the Indian science sector. The department is committed to align its Twelfth Plan programmes and initiatives

to support the overall plan of the Indian Science, Technology and Innovation sector towards global leadership. One of the strategies evolved for implementation of Twelfth Plan proposals of the Indian science sector is connecting competencies and research resources. Several new initiatives of DST for the Twelfth Plan period have been prepared taking into account national needs and likely impact. However, such initiatives should be preceded by a careful and critical review of all ongoing programmes and consolidation of successful schemes as well as the new Eleventh Plan initiatives. While formulating the Twelfth Plan programmes, the department has adopted an output-directed development path and related inputs to expected and targeted goals as well as likely impacts.

8.40. The significant achievements of Department of Science & Technology during Eleventh Plan are given in Box 8.2.

#### **Box 8.2**

#### **Significant Achievements/Development of DST during Eleventh Plan Period**

##### **ORGANISATIONAL**

- National Science and Engineering Research Board (SERB) has been established as an autonomous funding body and has assumed the major role from the erstwhile Science and Engineering Research Council (SERC).
- DST has also established new institutions, namely, National Innovation Foundation (NIF), Ahmedabad; Institute for Advanced Studies in Science and Technology, Guwahati; National Center of Molecular Materials, Thiruvananthapuram; and Institute of Nano Science and Technology, Mohali.

##### **PROMOTIONAL**

- The SERC, one of the largest schemes for promoting basic research in the country supported about 1800–2000 new projects annually, which has resulted in more than 7500 scientific publications. Five hundred departments were supported under the fund for improvement of S&T infrastructure in the form of the state-of-the-art R&D facilities in universities and higher educational institutes.
- Promotion of University Research and Scientific Excellence (PURSE) and Consolidation of University Research, Innovation and Excellence (CURIE) have been launched to improve and support the R&D in the universities.
- Two hundred and seven JC Bose National Fellowships, 155 Ramanujan Fellowships and 323 Boyscast Fellowships were awarded to support excellence in research. A major scheme known as INSPIRE for attracting talent in science and for nurturing students right from the school level has been initiated and around 14000 students have been awarded SHE Scholarships; more than 6 lakh awards for students in classes ranging from Class VI to X and 1200 INSPIRE Fellowships for pursuing doctoral degrees have been granted, and INSPIRE faculty awards have been made to 74 postdoctoral scholars.



### S&T HIGHLIGHTS

- Several technologies aimed at specific end use have been developed, which include: atmospheric plasma processing system for angora wool, arsenic removal technology using microbial-cum-adsorbent route and ceramic membrane–reverse osmosis based iron removal plant for removal of iron and salinity in drinking water; development of large chemical vapour deposition (CVD)-coated silicon carbide substrates for space optics applications.
- Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram, has successfully commercialised indigenous technologies like Chitra Heart Valve, Bioceramic Bone Graft, Ophthalmic Sponge and so on. International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad, has developed and supplies IR transparent ZnS domes to DRDO for the missile programme, light-weighted SiC substrates for satellite mirrors for Indian Space Research Organisation (ISRO) and oxide dispersion strengthened (ODS) steel for Fast Breeder Reactor (FBR) clad tubes. Raman Research Institute (RRI), Bangalore, studied re-ionisation era of early universe and also published papers on generation of Nano Scale heat conductors which has practical application in minimising heat dissipation in computer connectors.
- Under Drugs and Pharmaceutical Research Programme, 25 collaborative R&D projects and 15 new facilities like the clinical research facility to develop stem cell technologies and regenerative medicine have been implemented with leading industries. The programme has resulted in filing of 10 product patents. Some of the important products that have been developed include: (i) BONISTA for osteoporosis; (ii) RECEPTOL for the management of HIV/AIDS and (iii) RHOCLONE for Hemolytic disease of the new born (HDN). Several industrial leads on psoriasis, migraine, malaria and anti-glaucoma are being taken up for different phases (Phase I, II and III) of clinical trial. A drug for fighting malaria developed through PPP.

### MAJOR FACILITIES

- Several high-end R&D facilities have been established. Some of the notable ones are Clean room facilities at IISc, Bangalore; Ultra High Resolution Aberration Corrected Transmission Electron Microscope (TEM) at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore; and Centre for Knowledge Management of Nano Science and Technology (CKMNT) at ARCI, Hyderabad. Three accelerator-based research facilities have also been established at IIT, Kharagpur, Kurukh University and University of Allahabad. In addition, an India–Japan beam line was established for nano materials research at the photon at KEK, Tsukuba, Japan. India has also leased 13 beam lines equivalent times at the PETRA-III synchrotron radiation facility at DESY-Nano sized X-ray source for access by Indian scientists.
- The following major atmospheric observatory facilities have been established/being created: (i) 1.3 m Optical Telescope; (ii) 3.6 m Devasthal Optical Telescope; (iii) high-energy pulse LIDA system; (iv) fabrication and development of an Ultraviolet Imaging Telescope (UVIT) as a payload for the dedicated Indian astronomy mission ASTROSTAT; (v) design, development and execution of experiments for studying the solar corona through total solar eclipses; (vi) High Altitude Gamma Ray (HAGAR) telescope system at the Indian Astronomical Observatory, Hanle.

### Twelfth Five Year Plan Programmes

8.41. Basic research in frontier areas of S&T will remain a priority of the R&D sector. Since basic research is expected to give rise to applications in the long-term horizon, investments into basic

research are generally made on the basis of competitive grant model employing concepts of Extra Mural Research funding. Among the various departments and arms of the government, the DST has emerged as the major source of Extra Mural

Research funding in the country. In recent times, the department has also established Science and Engineering Research Board as an autonomous agency and alternative mechanism for supporting basic research in India.

*Scenario in Basic Research—Strategies for Global Positioning of India*

8.42. The DST has adapted, to the extent possible, evidence-based approaches to make its proposals for investments during the Twelfth Plan for supporting basic research. DST has made an attempt to compare the per capita outputs of Indian scientists in basic research in terms of scientific publications and developed national strategies for improving the relative position of India in global ranking. The current rate of growth of scientific publications is more than 14 per cent during the last three years. If Indian rank were to improve from the current 9th to 6th during the Twelfth Plan period in basic research—based on volume, the total number of scientific publications should increase from the current levels to at least 62,500 per year.

8.43. The SERB scheme would be strengthened during the Twelfth Plan. In addition to current models of project funding, SERB proposes to invest into researchers of proven record and establish about 200–250 centres based on Grant Model with fixed budgets and reward–performance relationships. ‘Centres of Excellence’ around a group of individuals would also be established. Advanced centres in scientific research around performing scientists in the cutting-edge areas of science of relevance within the country are proposed.

8.44. *Rejuvenation of Research in the University Sector:* During the last three years, DST has been investing into university sector through PURSE based on volume of scientific publications and h-indices of these universities. The success of the PURSE scheme is evident from the growth of number of universities eligible for support increasing from 14 in 2008 to 44 in 2010. The collective share of publications of the universities receiving support through PURSE has improved from less than 15 per cent to 25 per cent as of 2010. Analysis of data has shown that among the

top 50 Indian institutions engaged in scientific publications, 23 are from the university sector. Further analysis of citations per paper for publications emanating from the university sector indicates that as many as seven universities register citations per paper for the data corresponding to the period 2004–09 above the national average of 3.47 per paper. All the 23 universities seem to gain in citations per paper when they collaborate with other international R&D centres. New schemes to promote the international S&T cooperation for the performing universities are proposed during the Twelfth Plan.

8.45. *Performance Observation in Science Sector:* Overall, the percentage share of scientific publications emanating from individuals and various institutions receiving support from DST (without discounting contributions from funding by other sources to the same researchers and institutions) could be assessed as high as 40–42 per cent of India’s publications in Science Citation Index (SCI)-indexed journals currently. However, the R&D outputs of the individuals and institutions could not be entirely attributed to the support extended by DST for basic research. DST proposes to establish Science Observatory as well as Technology Observatory for monitoring the S&T output indicators of the Indian R&D system without cause attributions. Such measures are considered necessary as planning tools and decision support systems.

8.46. *National SERB—New Vehicle of Funding Basic Research:* SERB is emerging as a new body and mechanism for promoting basic research in the country. SERB is a national flagship for Extra Mural Research support. Ongoing programmes of SERB for investigator-based research grant models and investments into individual scientists based on track records will be dealt by SERB. The new body is expected to offer the benefits of (i) re-engineering and rationalisation of governance processes to suit the nature and efficiency of funding agencies, (ii) enrolling other arms of the government and private sector into R&D funding and (iii) flexibility and speed in research funding. Some of the new initiatives proposed by DST for investing into individuals would be delivered through SERB. DST proposes to invest up to 35 per cent of

its budgetary resources through SERB during the Twelfth Plan period for supporting the ongoing and some new initiatives of DST.

**8.47. Strategic Interventions for India Emerging as One of the Top Six Global Powers in S&T Sector:** Indian aspiration to emerge as one of the top six scientific powers in basic research would call for twin strategies. For increasing the volume share of scientific publications from India to reach the top six nations in the world, the FTE of R&D personnel may need to be increased to about 2,50,000. This could be partially accomplished by (i) increasing the density of scientists in performing institutions and (ii) unleashing the latent potentials available in the academic sector in colleges and universities. DST has proposed schemes for increasing the volume and density of R&D professionals by enlisting researchers from the university sector.

#### **Approaches for Strengthening and Expanding R&D Base**

**8.48. Programmatic Approaches:** During the Twelfth Plan period, DST has proposed a number of new initiatives. They are: (i) 1,000 overseas doctoral scholarships, (ii) 250 overseas postdoctoral fellowships, (iii) women mobility scheme for employed scientists, (iv) Enlarging the PI base to include about 500 teachers from colleges and universities, (v) Start-up research grant for Indian diaspora undertaking faculty assignments in Indian academia, (vi) 'Disha' for women in science programme, (vii) building educators for science teaching, (viii) challenge awards for institutions for global positioning and (ix) National Centres for Advanced Research.

**8.49. Technology Development and Deployment:** The DST has responded to the changing stakeholder aspirations with respect to Technology Development and Deployment programmes. Whereas the programmes of the DST under Technology Development and Deployment in the previous plans were generally focused on demonstrating the viabilities of technologies developed by public-funded institutions, proposals for the Twelfth Plan under this objective have been developed under a different paradigm. User needs for

technologies have been accorded high priority in selection of technology goals. Technology platform for solving real-life challenges is a novel approach proposed. Technology platforms are expected to enlarge the scope of work of DST in the technology arena. The department has proposed a total of eight platforms. Climate change programmes, modernisation of Survey of India (SoI) and National Atlas and Thematic Organization (NATMO), and district-level technology interventions for increases in per capita incomes are new objectives of the Twelfth Plan programmes. Promoting technology deployment will receive as much focus as technology development. Technology solutions for agricultural, chemicals, water, energy requirement, environmental sustainability and affordable human health care would form areas of thrust. Technology Mission for biomedical devices engineering and technology is proposed for implementation during the Twelfth Plan period.

**8.50. Partnerships and Alliances Involving DST and Programmes for Serving the Social Contract of S&T:** Partnerships and alliances for technology development and deployment form essential linkage capitals. Objectives of the programmes under partnerships and alliances are generally based on reciprocity and parity principle for international cooperation and for value generation of R&D outputs from public-funded research under national linkages. New mechanisms have been proposed for PPPs and Centre-State Technology partnerships. Established mechanisms are proposed to be employed for bilateral and multi-lateral S&T cooperation. Contributions to PAN-India missions, like Joint (Virtual) centres and North East Centre for Technology Applications and Reach form new schemes. Social contract of S&T has remained an important programme of the department. DST has recently constituted a Council for Science and Technology for Rural India (CSTRI) providing new mechanisms for delivering technologies to the rural India. Special schemes for vulnerable sections of the society will be taken through CSTRI.

**8.51. Building Capability and Capacity in Supercomputing:** A national programme on creating

supercomputing capabilities and scaling capacities to Peta scale is being envisaged for which DST has been assigned the coordinating responsibility. Alliance and partnership programmes with Ministry of Human Resource Development for enhancement of quality to science teaching and with DAE for the creation of large R&D office structure for Mega Science would be further developed during the Twelfth Plan Period.

**8.52. Strengthening Existing Autonomous Grant-in-Aid Research Institutions:** DST extends Grant-in-Aid to a total of 13 research institutions across the country. These institutions have been established by eminent scientists and citizens. Some of these institutions, although small in size with respect to the number of scientific personnel employed there, have emerged as major sources of scientific outputs with contributions to the national share of high-impact-making publications. Some of these institutions lend themselves to playing important roles in increasing the share of India in high-impact-making publications. During the Twelfth Plan, a strategic funding support to these institutions based on their contributions to national share of high-impact-making scientific publications and citation frequencies is proposed to be implemented. It is proposed to commission performance review of these existing Grant-in-Aid institutions by international or national experts during the Twelfth Plan Period. The Terms of Reference to the proposed Review teams would include as suggestions for directional changes and recommendations for governance model, if required.

**8.53. Strengthening of R&D Support and Knowledge Service Organisations under DST:** DST would continue to support the governance of Technology Development Board (TDB), Technology Information, Forecasting and Assessment Council (TIFAC), Vigyan Prasar (VP), National Accreditation Board for Testing Laboratories (NABL), Good Laboratory Practice (GLP), SoI and NATMO and National Spatial Data Infrastructure. These organisations serve special and niche needs in their own domain.

The role of TDB in promoting PPP for R&D is proposed to be expanded significantly during the Twelfth Plan. TIFAC proposes to refocus its programmes and meet the mandated goals better and participate in developing a technology vision 2035 for India. Vigyan Prasar is working in unique space in science communication, particularly with respect to development of content and new communication tools and techniques. Alliances and partnerships for larger outreach of R&D outputs of VP are proposed. NABL has emerged as a major national accreditation body in the world platform. The body does not receive government grants and is engaged in a special space. This organisation proposed to expand its reach by establishing regional centres and expanding its scope of business. It is proposed to modernise SoI and new administrative governance systems for SoI and NATMO is proposed to be introduced.

**8.54. National Geographical Information System (NGIS):** To meet the rapid growth of the country and developmental activities, it is proposed to establish a robust information and decision support system as envisaged through setting up an Indian Geographical Organisation (INGO) under the programme NGIS. The endeavour will be implemented through a network of agencies such as ISRO, DIT, NIC, DST, SOI and MoES, so on. The process would give a boost to various developmental activities for government, industry, academia and citizens including sectors like education and research.

**8.55.** An indicative plan outlay of ₹21,596 crore at current prices for the Twelfth Five Year has been made for the DST.

## **Department of Biotechnology**

### *Twelfth Plan Objectives/Thrust*

**8.56.** The overall strategy for DBT for the sector during the Twelfth Plan is to 'accelerate the pace of research, innovation and development to advance biotechnology as strategic area by taking India's strengths in foundational sciences to globally competitive levels and expanding the application of

**Box 8.3****Leveraging International Collaboration for Strengthening National Programmes  
Journey From Stanford–India Biodesign Programme—A Novel Collaborative Technology Innovation  
to Launching National Biodesign Alliance**

Bioengineering and biodesign integrates physical, chemical or mathematical sciences and engineering principles for the study of biology, medicine, behaviour or health. It advances fundamental concepts, creates knowledge for the molecular to the organ systems levels and develops innovative biologics, materials, processes, implants, devices and informatics approaches for the prevention, diagnosis and treatment of disease, for patient rehabilitation and for improving health.

Recognizing the need for capacity building in terms of human resources as well as biodesign and medical technology development, Department of Biotechnology sponsored the program “Stanford India Biodesign Internship” in the year 2008–09 as a collaborative venture with Stanford University, USA, for a period of five years. In India, this programme is centred at All India Institute for Medical Sciences (AIIMS) and Indian Institute of Technology (IIT), Delhi, with a focus to develop implants, medical devices and bioinstrumentation matching national priorities.

Achievements so far include (i) training of a total 20 fellows and 28 interns; (ii) formation of a start-up company ‘Consure’ by the fellows of the first batch (2008) of this programme; (iii) development of several other technologies/prototypes such as: Intraosseous device—useful for intraosseous infusion in any emergency that overcomes the limitation of resource constrained environment; patient transfer device—to transfer patient from one surface to another surface; limb immobilisation device—to immobilise and support an injured body part; and (iv) technology transfer of a low-cost disposable device to manage fecal incontinence in non-ambulatory patients across all care facilities.

Phase II of this programme has been initiated for refinement, validation, testing developing business model for commercialisation of developed prototypes/technologies.

Scale up at national level: During the Twelfth Plan, a programme “National Biodesign Alliance” has been established with various partners such as Regional Centre for Biotechnology, Gurgaon; Translational Health Science and Technology Institute, Gurgaon; International Centre for Genetic Engineering & Biotechnology, Delhi; IIT, Delhi; AIIMS, Delhi; and Christian Medical College, Vellore. A Centre for Biodesign and In vitro Diagnostics has been established at Translational Health Science and Technology Institute, NCR region. Efforts are being made to expand the concept of biodesign at other IITs, medical schools and other related institutions.

biotechnologies for overall growth of bio-economy within the framework of inclusive development’.

8.57. The significant achievements of DBT during Eleventh Plan are given in Box 8.4.

**Twelfth Five Year Plan Programmes**

8.58. The strategy of the Twelfth Plan complementing the foundations laid during the Eleventh Plan shall be achieved through focused investments, policy support, reforms in governance and management of projects around the following strategic goals:

1. *Expand available pool of research scholars and scientists at all levels (PhD, PDFs, young faculty) in biological and interdisciplinary space by three to five folds:* A major programme-based support will be provided for expanding biological/

life science departments and clusters in universities, IITs, medical, veterinary and agriculture and pharmaceutical universities/departments, centres of excellence. This would involve important interdisciplinary bio-based science linking to quantitative sciences (chemistry, engineering, and physics) and expanding biological and interdisciplinary sciences in human, animal and plant science systems to achieve greater translatability of knowledge with feasible model system.

2. *Connecting and augmenting existing competences across institutions and universities for bio-economy and social impact:* Interdepartmental and institutional centres and extramural centres of DBT institutions supported with a novel contractual career path for faculty and scalability to connect existing competencies will improve interdisciplinary science, using inspired and

**Box 8.4****Significant Achievements/Development of DBT during the Eleventh Plan Period**

- Under Human Resource Development efforts, a total of 5,887 research personnel were supported in R&D projects which include 1,768 Junior Research Fellows, 1,844 Senior Research Fellows, 1,060 Research Associate and 70 professorships. In addition, about 2,142 postgraduate students in life sciences and biotechnology were given biotechnology industry training fellowships involving 200 industries. About 2,410 projects have been implemented under various R&D schemes costing about ₹1,600 crore, of which 26 per cent (535) of the projects in the area of medical biotechnology and allied areas, 22 per cent in agriculture and allied areas of biotechnology, 21 per cent in basic research and emerging areas, 19 per cent bio resources and bioprospecting and 12 per cent in capacity building.
- Through DBT support, a total 1,104 publications of impact factor 5 and above published; 312 patents (national/international) were filed and 110 patents have been granted; and 105 technologies developed, 21 transferred to industry and 5 commercialised. A large number of technology transfers are in process. Health care technologies dominated in technology development compared to agriculture.
- Under Centres of Excellence activities around innovative leaders and institutions, 35 programme supports and 11 individual projects resulted in 200 publications with impact factor >5 published; 33 national patents filed and 24 granted; 37 international patents filed and 26 granted; 10 research leads obtained and 1 technology transferred.
- Ten translational research centres and platforms established for clinical development service, GM crops translational research, energy biosciences, bio-design for implants and medical devices, stem cell research, drug discovery, Primate Research and veterinary biologicals. Major translational research initiatives through Grand Challenge schemes and network programmes in the areas of agriculture and health care resulted in several technological developments. Vaccines for malaria, dengue, cholera, and rotavirus are at various phases of clinical trials. Rota viral vaccine is in phase III trials and may be commercialised soon.
- Seven new autonomous R&D institutions, namely (i) Translational Health Science and Technology Institute, Faridabad; (ii) Regional Centre for Biotechnology, Faridabad; (iii) National Agrifood Biotechnology Institute, Mohali; (iv) National Institute of Biomedical Genomics, Kalyani; (v) Institute of Stem Cell Biology and Regenerative Medicine, Bangalore; and (vi) National Institute of Animal Biotechnology, Hyderabad were set up.
- Under Small Business Innovative Research Initiative (SBIRI) and Biotechnology Industry Partnership Programme (BIPP), 100 PPP projects have been launched so far which has resulted in 6 Indian patents and development of 16 technologies in agriculture, health care and instrumentation. Sixty projects supported under BIPP scheme benefitted 51 companies (27 small, 12 medium and 12 large companies).
- Public sector-developed GM crops such as insect-resistant chickpea, rice, brinjal; drought-tolerant groundnut, sunflower and mustard with hybrid vigour are in regulatory pipeline. Accelerated molecular breeding programmes in rice, wheat, corn and mustard have been launched, and protein-rich maize is already commercialised.

translational research. Some such connectivities proposed are: Biosciences with chemical sciences and synthetic biology for next-generation biofuels; Nano science; chemical sciences and pharmaceutical sciences with clinical research for novel drug delivery, novel diagnostic and

medical imaging; engineering–medicine–biology and medical science for implants and devices, chemical biology and physical biology.

3. *Expanding, diversifying career paths with a linkage to high-end interdisciplinary sciences, innovation, translation and entrepreneurship:* Involving

support to centres of excellence, incubators, programmes for expanding existing research and human resource capacity by threefolds through increase in current areas of relative strength such as molecular and cell biology, structural biology, immunology, neurobiology, bioengineering and promoting career paths in clinical and translational research, regulatory sciences, Intellectual Property (IP) technology transfer and knowledge management, entrepreneurship and education, and so on, are proposed. It is also proposed to expand, redesign and create extramural and inter-institutional centres as a cost-efficient process of scale up, utilising the existing best people with some additional younger people. The IIT system offers a unique opportunity over a substantially large interconnected and effective bioscience, interdisciplinary science, bio and other engineering science linked to technology innovation in almost all areas of biotechnology relevant to the country. This would receive high priority and use the instruments defined above for connectivity and for conversion of early leads to meaningful solutions and products.

4. *Strengthening regulatory science and infrastructure:* Involves establishment of BRAI; central agency for regulatory testing and certification laboratories with some core activities and network of testing facilities in public sector laboratories; promotion of regulatory science research units; and human resource development.
5. *Expanding existing autonomous R&D institutions:* The expansion aims at expanding current strengths of researchers and scientists by threefolds at all levels through on-site expansion or establishment of second research campus; setting up of Extra Mural Research centres on or off site to promote translational science, launch mission programmes or to advance interdisciplinary science area and expanding physical infrastructure including technology platforms. It is proposed to adopt a system of intramural institutes and extramural centres for each of the 13 autonomous institutes of DBT. These extramural centres would be located in medical schools, State agricultural universities, engineering schools with about 10–12 Principal Investigators at each extramural centre. About 500 scientists additionally can be supported with existing leadership and anchor role by the autonomous institutes.
6. *Expansion and commissioning of bio clusters at Faridabad, Mohali, Kalyani and Hyderabad:* This would involve adding new programme-based centres at each cluster: academic centres, medical centres, bioengineering centre, contract labs, Genetically Modified Products (GMP) units, animal model resources, novel platforms for therapeutics for sharing by SMEs, technology incubators and parks of entrepreneurship training centres and offices for technology transfer and management and to provide connectivity for innovation.
7. *Establish DBT Grant-in-Aid or partnership research and translational centres through long-term support* in 10 best universities/institutions in at least 10 areas of interest, for example: Agriculture sciences and innovation for pre-breeding, genetic modification (GM) technology and molecular breeding; veterinary S&T for animal productivity and health; biopharmaceutical sciences and health technology; chemical biology and synthetic biology.
8. *Reorient 'Grand Challenge Programme' scheme of the Eleventh Plan to address national priorities* in various developmental sectors through bottom-up approach and also encourage discovery-led innovative ideas: These are eight mission mode programmes with separate governance, management, milestones with inter-departmental participation and global partnerships and bottom-up idea-based competitive grants for R&D and innovation or network projects with several partners along the biotechnology value chain.
9. *Rejuvenate existing and establish new research resources, facilities and services:* A National Life Sciences Resource Centre (NLSRC) with specialised research staff, informatics support and databases to network all research resources, training for skill development activities and organise a systematic information access management facilitating biology research community proposed to set up. New facilities and resources proposed include: low-end virtual supplies for

small organisations such as micro array, knock-out mice; validation and prototyping, safety testing technology platforms/centre for implants, devices, cell therapies; large animal resource centre; viral testing facilities; genomic and proteomic facilities; new generation sequencing service units and so on.

10. *Leverage international collaboration for partnerships in cutting-edge areas of research, education and technology development, access and acquisition:* The experience with existing global partnerships with countries and international agencies will be leveraged to bring about directional change in partnership strategies. Towards this objective, focus shall be on establishing joint centres of excellence; graduate schools across universities; forging 2×2 international partnership involving industry and academia on either side, 1×1 partnership among SMEs; projects linking DBT autonomous institutions with international institutions and universities; joint development of industrial biotechnologies with global organisations. Global consortia of industries and public institutions will be promoted on the lines of the Indo-US Bioenergy initiative in other areas, such as molecular breeding, cell therapy and regenerative medicine and so on.
11. *Continued and sustained support to PPPs with new innovative funding schemes:* Besides continuing with some reforms in SBIRI and BIPP schemes operations innovative funding schemes such as: Ignition Grant Scheme available to individuals or a team of individuals—in partnership with private investment agencies; schemes for creating and nurturing start-up for early-stage technologies; provision of ‘bridge funding’ firms to function between successive private equity funding or planning for IPOs; funding for technology access and acquisition and licensing and special investment incentives to industry for building more biotechnology/pharma special economic zones (SEZs). Biotechnology Industry Research Assistance Council (BIRAC) would be made fully operational in Twelfth Plan to assess and facilitate bio industry as per its mandate and manage funding through PPP schemes. The affordable health technology initiative with Welcome Trust will be launched. It will have a pro-poor bias, focus on mass health impact and enhance our abilities to access technology from overseas in addition to from within the country.
12. *Promoting discovery-led innovation and strategic investments in priority sectors:* The department has been funding investigator-driven R&D projects across areas of basic agriculture, health care, environment, animal health and reproduction, bio resource utilisation and food S&T and so on. During the Twelfth Plan, it is proposed to redesign sectoral strategy in such a way that every sector utilises more than one mechanism or modality, linkages, partnerships and alliances and platforms that are required for successful development of both S&T.
13. *Promoting new-generation biotech industries:* Innovative funding schemes and incentives within the framework of existing mechanisms shall be extended to develop capacity for setting up of new bio industries such as bulk/specialty chemicals/biochemicals; food and nutrition technologies; biotech-led/biotech-enabled services engineering, components and equipment manufacture; nano-bio industries and so on. Efforts would also be made for reengineering the economic model for biotechnology product/industry development.
14. *Technology acquisition, transfer and licensing for product development:* Major initiatives will be taken in Twelfth Plan such as establishment of Intelligence Innovation and Idea units to serve as ‘think tanks’ in life sciences and biotechnology to imagine the future and prepare for the future to analyse needs and opportunities and create product profile for products that will be usable and marketable; technology acquisition fund with legal process and mechanism technology and IP management centres, particularly DBT partner universities and institutions.
15. *Communication platform/system for creating awareness and public understanding of biotechnology:* To address this issue, it is proposed to set up Centre for Biotechnology Communication for content creation and coordination; communication units in universities and institutions; commissioning regular programmes



and publications in electronic and print media and constitution of authorised communication expert groups for crisis management and response.

16. *Expedite legal framework and legislations:* BRAI Bill has been tabled in parliament for introduction. It is proposed to bring other bills dealing with public sector-funded IP management; DNA profiling and Regional Centre for Biotechnology.
17. *Strengthening and consolidation of the major Eleventh Plan initiatives:* Keeping in view zero-based budgeting (ZBB) exercise, certain projects and programmes that have outlived their relevance will be phased out. At the same time, successful schemes shall be strengthened through stringent project management and scale up. Schemes in this category belong to promotion of innovation and excellence; PPPs; research resources specialised centres, translation platforms and service facilities; innovative human resources development programmes and major R&D programmes and networks for technology development.
18. *Promote policy research and analysis in biotechnology:* Policy research and analysis has become an essential ingredient of biotechnology development due to IPR, regulations, public concerns and technology options/alternatives, affordability, access and trade issues. Besides general capacity building through workshops, training and research, centres/units for health and agriculture biotechnology policy research will be supported along regular policy dialogue among stakeholders through special meetings and seminars.
19. *Establishment of new autonomous national research centres/institutions in emerging areas:* It is proposed to establish few institutes/research centres in emerging areas of translational research such as Bioinformatics and Computational Biology; Marine and Microbial Biotechnology; Bidesign, Bioscience and Bioengineering; Chronic Disease Science and Biotechnology and Infectious Science and Biotechnology Institute in North East (linking to Translational Health Science and Technology Institute [THSTI] as partner for Training and Education).

8.59. An indicative plan outlay of ₹11,804 crore at current prices for the Twelfth Five Year has been made for the DBT.

## Ministry of Earth Sciences

### *Twelfth Plan Objectives/Thrust*

8.60. The MoES/Earth System Science Organisation (ESSO) was established by the Government of India in 2006 to address holistically various aspects relating to earth processes for understanding the variability of earth system and for improving forecast of the weather, climate and hazards. The programs of the Ministry has been reinforced and restructured with a view to provide best possible services relating to earth system science towards socio-economic benefit of the Indian sub-continent and in the Indian Ocean region. The various services being rendered by the Ministry caters to over 25 sectors and the estimated economic benefits appear to be contributing significantly to GDP of the country. The major focus of the Twelfth Plan proposals has been to carry out research on discovering new phenomena; exploring unchartered areas, especially sea-bed and Antarctica; understanding earth processes and developing new services as well as improving existing services for societal, environmental and economic benefits. The programmes of MoES/ESSO have been grouped into major schemes which are as follows: (i) Observation System, (ii) Atmospheric Processes, Modelling and Services, (iii) Climate Change Research, (iv) Airborne Platforms for Atmospheric Research, (v) Ocean Observations, (vi) Ocean Science and Services, (vii) Ocean Survey and Mineral Resources, (viii) Ocean Technology, (ix) Ocean Research Vessels, (x) Polar Science and Cryosphere, (xi) Marine Geoscientific studies, (xii) Seismological Research, (xiii) High Performance Computing (HPC) for Earth System Science Research, (xiv) Research, Education, Training & Outreach, and (xv) Earth Enterprises.

8.61. The significant achievements of ESSO during the Eleventh Plan are given in Box 8.5.

### *Twelfth Five Year Plan Programmes*

8.62. *Atmospheric Observation Systems Network:* The modernisation plan aims at commissioning of

**Box 8.5**  
**Significant Achievements/Development of MoES/ESSO during**  
**the Eleventh Plan Period**

- Under the first phase of modernisation of the India Meteorological Department (IMD), accomplishments include: (i) commissioning of 10 global positioning system (GPS) stations; (ii) installation of nine Doppler Weather Radars (DWRs) one each in Delhi, Nagpur, Patna, Patiala, Agartala, Lucknow, Hyderabad besides the existing five DWRs which have improved now casting services; (iii) installation of integrated Airport Meteorological Instruments (AMIs) at Mumbai, Hyderabad, Bangalore, Jaipur and Delhi airports; (iv) installation of 550 Automatic Weather Stations (AWSs) apart from the existing 125 AWSs, in addition to installation of 689 Automatic Rain Gauges (ARGs); (v) commissioning of a set of four HPCs with a total installed capacity of 124 Teraflops for global data processing and Numerical Weather Prediction (NWP) for weather forecasting services. A district-level agro-meteorological advisory service along with a five days in advance district-level weather forecast system, covering all the 555 districts, was launched for farmers in partnership with a number of Central Government ministries and organisations, state-level institutions, private agencies, non-governmental organizations (NGOs), progressive farmers and the media. Over 3 million farmers have subscribed for receiving this information through mobile phones.
- A programme on 'National Monsoon Mission' was launched which will be equipped with the state-of-the-art infrastructure, namely, high-end computers, radars and scientific manpower to generate more detailed and accurate forecasts.
- In atmospheric modelling, there has been remarkable improvement in capability by running a wide range of high-resolution global circulation models. By introduction of these models like T574, the spatial resolution of the models has been increased sustainably from 50 km to around 22 sq km.
- Under Ocean Science and Services, an integrated unique system of fisheries advisories based on identification of Potential Fishing Zones (PFZs), using remote sensing technology, has been made operational. A tuna fishery forecast specifically for deep sea fish industry has also been made operational.
- A high resolution Indian Ocean forecast for the Indian Ocean on various parameters, namely, currents, sea surface temperature and mixed layer depth was also launched using a suite of ocean models. Towards strengthening ocean observation systems, a ground station for Ocean Sat-2, Ocean Colour Monitor (OCM) data has been established. Over 160 Argo floats (10 floats with oxygen sensors), and 66 drifting buoys were deployed in the Indian Ocean. Besides, a 16-moored buoy network has been made operational for continuous acquisition of data from the seas around India for operational weather forecast. In addition, over 25 tide gauge stations and 10 Coastal Radars were also installed to improve ocean information services.
- The first Indian scientific expedition to the South Pole was conducted in December 2010 which significantly improved India's scientific capability in the Antarctic. A scientific expedition using the international research facility at Ny-Alesund in the Spitsbergen island of Norway has been undertaken for Arctic research. India has successfully commissioned 3rd Permanent Antarctic Station 'Bharati' in the Larsemann Hills with state-of-the-art facilities for conducting Antarctic Research.
- Two Low Temperature Thermal Desalination (LTTD) technology-based desalination Plants with 1 lakh litre capacity have been established, one each at Minicoy, Agatti islands of Lakshadweep . Using waste heat from power Plants, a 1 lakh litre per day LTTD Plant was demonstrated which has been operational at the North Chennai Power Plant.
- With climate change science getting special attention and focus, a dedicated Centre for Climate Change Research at Pune has been set up to address scientific issues relating to climate change, including impact on sectors like health, agriculture and water.

- For activities under ocean resources, an instrument, along with complete hardware and software has been developed in collaboration with Russia to measure seabed soil properties in situ, at a depth of 5,200 metres. A prototype for a remotely operated vehicle has also been developed and tested successfully at a depth of over 5,284 metres. India has become one among a handful of nations that have the capacity for deep sea mining. Further, survey and exploration of polymetallic nodules has been carried out at a closer grid of 6.25 km for selected blocks, along with developing and testing the artificial nodule laying system.
- Under disaster support activities, the state-of-the-art Tsunami Warning System with the world's best infrastructure and communication system was made fully operational on 24×7 basis at INCOIS, Hyderabad. A set of 17 broadband seismic observational networks in peninsular India and six bottom pressure recorders in the Arabian Sea and Bay of Bengal were also upgraded. Towards this, an Earthquake Risk Evaluation Centre was created in New Delhi to evaluate seismic hazards at a very high resolution. The Indian Tsunami warning centre, which has been recognised the best centres in the Indian Ocean, is capable of issuing bulletins within 10 minutes of occurrence of earthquakes in the Indian Ocean.

state-of-the-art observing systems throughout the country. It is proposed to undertake phase II of the modernisation, focusing on the augmentation of the existing infrastructure established during the phase I of the modernisation in terms of observing systems and integrating the same with the rest of the network, namely, ground-based radiometers providing temperature and humidity profiles and complementing the sonde observations to be developed with priority. A Centre for Atmospheric Technology (CAT) is also planned to coordinate development of instruments, calibrate instruments including satellite-based and provide overall technology support to atmospheric sciences, besides validation of satellite data. It is proposed to set up a dedicated forecasting system for the entire Himalayan region with a much focused objective of integrating and improving the weather related services.

**8.63. Atmospheric Processes and Modelling and Service:** The sole purpose of the programme is to develop a wide range of atmospheric models for providing weather and climate forecasting services to various sectors by integrating all the process studies and models. The major sectors would be agriculture, aviation, metro cities, mountain regions, defence, sports and disasters. The existing district-level Agromet Advisory Services (AAS) to deliver crop and location-specific AAS to farmers will be graduated to the block level with village-level advisory. The upgradation of facilities of

about 100 airports in the country will be taken up. Metropolitan air quality and weather service providing real-time weather, as well as now casting of weather and air quality in all metro cities as well, are proposed. It is essential to work out a modelling framework and put it in use to predict monsoon weather and climate in India on different time scales ranging from short and medium range to seasonal mean. National Monsoon Mission will be set up with the state-of-the-art weather infrastructures, namely, high-end computers, radars and scientific manpower to generate more detailed and accurate forecasts. Other deliverables are Cloud Physics and severe weather warning system.

**8.64. Climate Change Research:** It is proposed to develop long-term (multi-decadal) simulations of monsoon using coupled ocean-atmospheric models upon the commissioning of the HPC system upgrade for climate change research. The development of seasonal and intra-seasonal prediction of monsoon through coupled model is to be taken up. The utility of geo-engineering schemes to mitigate global warming has to be explored. There is need to develop expertise in India to evaluate the benefits and risks of these schemes. The research projects would be taken up to enhance our understanding of the changing water cycle. Besides, paleoclimatic studies will be conducted to understand the past variations of climate for possible projections of climate scenarios.

**8.65. Airborne Platforms:** A wealth of atmospheric, aerosol and cloud microphysics data will be generated using airborne platforms which will be useful to validate the convection and cloud schemes, and for improving the model physics. The proposed programme will be useful in air pollution assessment and associated impacts over India (health, visibility, climate), hydrological and water resources studies, and enhancement of research infrastructure.

**8.66. Ocean Observation System (OOS):** The objective is to acquire time-series data from the seas around India and to develop a wide range of ocean atmospheric models towards augmentation of services. The data acquired through Argo floats, Drifters, Current Meter Arrays are being used for various operational and research purposes including forecasting of cyclones and understanding the climate variability.

**8.67. Ocean Science and Services (OSS):** The OSS have been reoriented into a major programme during the Twelfth plan by integrating all the service-oriented ocean-related projects under one umbrella. These are providing a suite of Ocean Information services, assessment of marine Living Resources, periodical monitoring of health of the coastal waters of India, Management of Coastal Marine Area and operation of Tsunami Warning system on 24×7 basis for issue of bulletins for India and to the countries of the Indian Ocean region. In the Twelfth Plan, an International Centre for Operational Oceanography has been planned. The major deliverables under the scheme are high-resolution ocean modelling and microbial oceanography.

**8.68. Ocean Survey and Mineral Resources:** This programme is primarily aimed at conducting surveys for harnessing the marine nonliving resources in a sustainable way, available in exclusive economic zone (EEZ) and deep sea region of the Indian Ocean. These include gas hydrates, polymetallic nodules, hydrothermal sulphide minerals and cobalt crust. Apart from continuing some of the activities of ongoing schemes like gas hydrate and polymetallic manganese nodule (PMN), the major emphasis would be on research activities relating to Hydrothermal.

**8.69. Ocean Technology:** The Ocean Technology programme of India encompasses four core missions as Ocean Energy, Deep Sea Mining, Coastal and Environmental Engineering and Marine Instrumentation. National Institute of Ocean Technology plays a key role in undertaking ocean-related activities, Ocean Science & Technology and enhancement of marine living resources, development for breeding, rearing and fattening of lobsters, to begin with, for Andaman and Nicobar Islands. Consolidation of deep sea mining technology such as integrated deep sea mining system, soil tester, Remotely Operated Vehicle (ROV) and manned submersible would be carried out, besides developing Marine Sensors and underwater equipment. Under ocean technology, a set of eight in-house R&D programmes like Energy, Ocean Acoustics, Marine Sensor, offshore structures, Inter-institutional R&D of National Institute of Ocean Technology (NIOT) would be carried out. Desalination plants would be established in all major islands of Lakshadweep.

**8.70. Ocean Research Vessels:** Two new vessels are proposed which will be greater than 100m, Ice class, with speed of 20 knots and fitted with winches and systems for exploration of deep sea living resources. *Sagar Sampada* had the limitation of undertaking these studies only up to 1,000m to 1,500m depths. These vessels will give a considerable boost to mineral surveys and ocean research in the Indian Ocean Region.

**8.71. Polar Sciences and Cryosphere:** The Polar Science and Cryosphere programme entails the study of the Antarctic, Arctic and Glaciers of Himalayas that are important to understand the climate change and climate variability in the Indian region. The deliverable under the scheme would be replacement of Maitri station.

**8.72. Seismological Research:** It is proposed to provide thrust to the earthquake-related studies and to generate inputs for earthquake disaster mitigation. The primary activities would include: (i) Deep crustal studies across the Indian continental margin and the interior, (ii) Paleo seismological studies and kinematics of the Himalayan region,

(iii) Andaman subduction zone and (iv) Active faults of India. Besides, this programme also envisages reconciling the constraints from available geophysical and geological data along a series of transects across the Indian peninsula into a consistent model of the Indian lithosphere to conduct studies on deep bore holes investigations in Koyna, Warna region and Marine Geoscientific Studies. To address these issues relating to earthquake in a holistic manner, a National Centre for Seismology (NCS) is being set up.

**8.73. Geoscience:** Deep sea drilling in the Arabian Sea basin through the Integrated Ocean Drilling Programme is proposed to be undertaken. The scientific proposal of deep sea drilling in the Arabian Sea for discovering the tectonic climatic unknowns will be taken up. An institute for Geo Technologies, integrating all the scientific and operational bodies and taking new initiatives on merit like finding geo technology solutions to serious problems like global warming is proposed to be established. The deliverables under the scheme would be exploring the origin of the largest Geoid low on the earth and origin of monsoon and evolution of Himalayas. For advanced research in isotope geochemistry and geochronology pertaining to earth, atmospheric and oceanic sciences, high-resolution Secondary Ionization Mass Spectrometry studies would be carried out.

**8.74. High Performance Computing System:** Towards catering to the demand of computing facility for Centre for Climate Change Research (CCCR), Seasonal Prediction of Monsoon, Extended Range Prediction of Active Break Spells, National Monsoon Mission, Programme for Advanced Training in Earth System Science and Climate, and activities of CCCCR, it is proposed to augment computing power from existing 124 Terra-flops to 2.5 Peta-flop during the Twelfth Five Year Plan.

**8.75. Research Education, Training and Outreach:** Facilities will be created to provide necessary infrastructure. The other main activities would be setting up a Centre for Operational Meteorology and an International Training Centre for Operational

Oceanography as part of UNESCO's endeavour for training and capacity building and Indo-African Centre for Medium Range Weather Forecast for extending weather forecasting services in the African region. It is proposed to support Human Resource Development through establishment of MoES Chair Professorship in IITs and IISERs and initiation of academic programmes at IITs and IISERs.

**8.76. Earth Enterprise:** There has been a phenomenal increase in the sectoral applications of weather and climate products as well as ocean technologies and related products, resulting in an unprecedented demand for reliable and timely supply of products and information. A PSU, the Earth Systems Enterprise, would be set up under the Companies Act under the administrative control of the Ministry for providing data/technologies on commercial basis developed by the autonomous bodies/attached and subordinate offices.

**8.77.** An indicative plan outlay of ₹9,506 crore at current prices for the Twelfth Five Year has been made for the MoES.

## Department of Scientific & Industrial Research (Including CSIR)

### *Twelfth Plan Objectives/Thrust*

**8.78.** The thrust of the Department of Scientific & Industrial Research (DSIR) is to promote industrial research, technology development and transfer to enable India to emerge as a global industrial research and innovation hub. Emphasis is on attracting industrial research in the country through industry and institution-centric motivational measures and incentives, creating an enabling environment for development of new innovations to channelise benefits to the people.

**8.79.** CSIR has conceptualised and developed a document entitled 'CSIR@80: Vision and Strategy 2022', which is a road map for 2022. The document is based on the motivation that the year 2022 would bring us to India@75—the platinum jubilee of Indian independence. The India@75 will coincide with CSIR@80, a unique stage in the life of any R&D

organisation. By that time, as per the various projections, India would have changed its image as a third world country to the third most powerful country in the world. CSIR, as India's largest and most diverse S&T organisation is aspiring to help India in achieving this goal. In view of the building scenario by 2022, CSIR's vision would be to build a new CSIR for new India and CSIR's mission would be: 'Pursue science which strives for global impact, technology that enables innovation-driven industry and nurture trans-disciplinary leadership thereby catalysing inclusive economic development for the people of India.' The people and nation-centric thrust to science, technology and societal pursuits would remain the cornerstone of CSIR's mission.

**8.80.** The Twelfth Five Year Plan of CSIR focuses on achieving science and engineering leadership; developing innovative technological solutions; practising open innovation initiatives; developing and nurturing human resource in trans-disciplinary areas; facilitating science-based entrepreneurship; and enabling socio-economic transformation through appropriate S&T intervention. In view of attaining the above focus, CSIR proposes many new initiatives and envisages adopting strategies that are goal focused—attaining the identified goals; process focused—building and streamlining organisational processes; growth focused—achieving organisational growth; and competitive advantage focused—achieving competitive advantage over peers.

**8.81.** The significant achievements of DSIR including CSIR during the Eleventh Plan are given in Box 8.6.

#### *Twelfth Five Year Plan Programmes*

**8.82. Programmes of DSIR:** The major Plans and Programmes of DSIR for the Twelfth Five Year Plan include: (i) *Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM)*—wherein innovative proposals of MSMEs shall be supported; CSIR—Cluster Innovation Centres (CICs) promoted by National Innovation Council shall be supported for providing innovative solutions; existing network of TePP Outreach Centres shall be expanded; proposals from individual innovators/incubates shall be

supported and support shall be extended to approved Technopreneur Promotion Programme (TePP) projects, spilling over from the Eleventh Five Year Plan; (ii) *Scheme on Patent Acquisition and Collaborative Research and Technology Development (PACE)*—wherein support shall be provided to Indian industries to acquire Intellectual Property at early stage from overseas or within the country and add value to the acquired IP; and focus shall be on PPPs to create enabling environment for collaborative research between Industry and Universities/Public Funded Research Institutions; (iii) *Building Industrial R&D and Common Research Facilities (BIRD)*—wherein R&D in Industry shall be encouraged and supported; and support shall be provided for creation of Common Research Facilities for Small and Micro Industries; (iv) *Access to Knowledge for Technology Development and Dissemination (A2K+)*—wherein science-, technology- and innovation-related international journals from major publishers shall be made accessible to 1,500 in-house R&D units of industry and 600 Scientific & Industrial Research Organisations (SIROs) and techno-entrepreneurs, besides conducting studies/conferences on industrial status in the country; support shall be provided for Technological Empowerment of Women projects, including projects spilling over from the Eleventh Five Year Plan; and support shall be extended to Technology Development and Demonstration Programme (TDDP) projects, spilling over from the Eleventh Five Year Plan.

#### *Consultancy Development Centre*

**8.83.** The important activities envisaged during the Twelfth Five Year Plan period would include Consultancy Promotion, Services, Research and Analysis, National Programme for Competency Development in strategic focus areas, Technology Delivery Transfer and Commercialisation, National Knowledge Depository, Training and Development, Export promotion and International Collaborations.

#### *Central Electronics Ltd. (CEL)*

**8.84.** During the Twelfth Five Year Plan period, leveraging on its technology prowess, CEL plans to develop capabilities for the manufacture of Dye Sensitized Solar Cells (DSSCs or Grätzel cells), which

### Box 8.6

#### Significant Achievements of DSIR/CSIR during the Eleventh Plan Period

- CSIR has enabled India excel in high science and has been the pioneer of the country's intellectual property movement. It has been contributing on an average 12 per cent of the national SCI publications with an average impact factor per paper of more than two. It has published 16,664 research papers in SCI journals of national and international repute during 2007–10. It has also contributed towards the development of highly qualified S&T manpower in diverse areas and has supported over 8,396 research scholars; 4,000 students are pursuing PhD in various CSIR laboratories. It produces 500 PhDs and 2,000 postgraduate degree holders and research trainees every year. Being in the forefront of generating intellectual property, it was granted 1,282 foreign and 1,507 Indian patents, and it has 3,250 foreign and 2,350 Indian patents in force and 222 patents licensed as on date. The percentage utilisation of patents is 8.67 per cent, which is much above the world average of 3–5 per cent. CSIR's per patent cost is the lowest in the world amongst state-funded R&D organisations.
- CSIR designed and developed, through a PPP, the CNM5, a five-seater all-metal civil aircraft that had been successfully test flown. The carbon fibre technology was licensed to M/s Kemrock. The technology for recovery of Sulphate of Potash (SOP), developed by CSIR-Central Salt and Marine Chemicals Research Institute (CSIR-CSMCRI) from bittern has been transferred to M/s Arcana Chemical Industries. Technology for Head Up Display (HUD) for Light Combat Aircraft (LCA) was transferred to Bharat Electronics Limited (BEL), Panchkula. The ATBS process developed by CSIR-NCL has been commercialised by M/s Vinati Organics Limited (VOL) at MIDC, Lote Parsuram, Chiplun.
- CSIR has licensed to Nostrum Pharmaceuticals for worldwide commercialisation of new generation thrombolytic molecules and will receive over 150 million US\$. A new-generation clot-specific protein that displays plasminogen activation property was transferred to M/s Nostrum Pharmaceuticals, USA at ₹19.60 crore plus 5 per cent royalty. Technology for Caerulomycin A, and its proprietary derivatives and analogues for their novel indication of immuno-suppression—a discovery of immense importance in tissue transplantation like in kidney and heart—was licensed to M/s Nostrum Pharmaceuticals, USA at ₹14.70 crore plus 2 per cent royalty. Recombinant streptokinase produced from *Escherichia coli* was launched by M/s Shasun Drugs & Chemicals through M/s Lupin Pharmaceuticals and M/s Alembic Chemicals, at a cost of ₹1 crore plus 3.5 per cent royalty. This would bring down the prices of clot busters significantly. A new anti-ulcer drug—CSIR's patented know-how on a natural agent for treatment of symptoms associated with gastrointestinal toxicity and ulcer—was licensed to M/s IPCA Laboratories Ltd., Mumbai, at ₹2.5 crore plus royalty.
- CSIR developed a 10hp tractor named 'Krishi Shakti' which is low in cost (₹1 Lakh) and is suitable for small and marginal farmers. A facile process for Heptafluoropropane (FM 200), a halon substitute used in fire-fighting systems was transferred to M/s Mechvac Fabricators Ltd., Mumbai, for commercial production. A 3,000 TPA Plant from Aditya Birla Group for the manufacture of epichlorohydrin from allyl chloride, based on an improved and patented catalytic process, went on stream at Ryong, Thailand. Process technology for sugarcane bagasse for the recovery of cellulose, hemi-cellulose and lignin was licensed to M/s Godavari Sugars at ₹6.5 crore plus 3 per cent royalty.
- CSIR laboratories have developed significant knowledge base on water and water-related technologies. CSIR has developed a high-flux hollow-fibre membrane based technology for disinfection and purification of water. Refined and portable device called the Terafil water filter has been developed which provides drinking water without the use of chemicals. This coupled with a technology for RO desalination has been used extensively to provide fresh drinking water in disaster-affected areas. RO plants are further being exported to Afghanistan and Kenya.

- A novel variety of Ashwagandha with a high root yield developed and released to farmers. The plant has useful anti-inflammatory, anti-stroke and anti-arthritic applications.
- In the area of affordable health care, the first-ever large-scale comprehensive study of the genetic structure of the Indian population has been completed, thereby creating an Indian Genome Variation database (IGVdb). This has opened up new vistas for developing predictive medicine using repeats and single nucleotide polymorphisms. India's footprint in the genomic world, a CSIR initiative along with others, led to reconstructing Indian population history. CSIR with Cadila Pharmaceuticals has developed for the first time a novel therapy named as 'RISORINE' for the treatment of tuberculosis. Lead for this novel therapy is obtained from Ayurveda. Commercialisation of Risorine has reduced the cost of formulation containing Rifampicin-Isoniazide by 23 per cent. Prostalyn, an anti-cancer drug, a herbal molecule obtained from *Murraya koenigii* and *Tribulus terrestris* for treatment of prostate cancer was released in the market. CSIR has also developed bacosides-enriched standardised extract of *Bacopa*—Bacosides Enriched Standardized Extract of Bacopa (BESEB)—a single plant-based unique natural memory enhancer formulation, and patented the development. The BESEB is successfully commercialised.
- A high-yielding cultivar of Lavender developed by CSIR has proved to be an excellent alternate crop for cultivation by farmers in the state of Jammu & Kashmir. CSIR has set up post-harvest centres in Mizoram (Aizawl) and Arunachal Pradesh (Pashighat). More than 10,000 farmers of the North-East would be able to sell their produce at 20–25 per cent higher price to these processing centres.
- CSIR has launched an ambitious, socially relevant programme named CSIR 800. This programme aims at developing and providing innovative R&D-based products and processes which would be affordable by the common masses. These would come in handy not only for removing drudgery but also for adding to economic upliftment of the Indian populace by successfully launching small scale enterprises. CSIR has designed and developed an eco-friendly dual-powered rickshaw named 'Soleckshaw'. The soleckshaw is in commercial production.
- CSIR launched Open Source Drug Discovery (OSDD) programme has emerged as a new platform for innovation in the domain of health care. This CSIR-led 'Team India' consortium with global partnership has more than 4,500 researchers from over 100 countries as registered participants.
- CSIR's Traditional Knowledge Digital Library (TKDL) in collaboration with Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) has emerged as a unique resource for protecting Indian traditional knowledge from exploitation through IP filings. TKDL has signed access agreements with European Patent Office (EPO), United States Patent and Trademark Office (USPTO), German Patent Office, Japan Patent Office and so on.
- CSIR has established an Academy of Scientific and Innovative Research (AcSIR) through a gazette notification by the government which would aim at innovative curricula, pedagogy and evaluation for creating high-quality personnel in trans-disciplinary areas.
- CSIR has set up the CSIR Tech Private Limited, registered at Pune, to catalyse the valorisation of its technologies. The main purpose of CSIR Tech is to hold equity and give feedback loop of technology creation and transfer.
- DSIR has granted or renewed recognition to over 1,600 in-house R&D units of industry. Over ₹10,000 crore of R&D investment by in-house R&D units were reported to Directorate General of Income Tax (Exemptions) for weighted tax deduction under Section 35(2AB) of Income Tax (IT) Act. Support was also extended to 400 innovator's projects (TePP projects), 34 TePP outreach centres and 70 new technology development and demonstration projects.



are emerging as one of the highly creditable alternatives to silicon photovoltaic and to the more recently developed thin film technologies. CEL has proposed to develop the design of systems for a relatively new approach for optimising solar system efficiency and improving reliability with the design and manufacture of micro-inverters that connect to individual solar panels. CEL will establish an R&D Division to cater to the needs for design, development, testing and validation of a range of improved strategic electronic, special purpose vehicle (SPV), surveillance, safety/security products. Harnessing technology advancements and improvement of manufacturing techniques as also the need to enhance manufacturing capacity commensurate with active marketing efforts and business expansion, steps are being taken up by CEL to ensure that the present plan capacity of 10 MW for SPV products is increased to 80 MW. CEL has also proposed through a joint venture to set up a National Silicon Wafer production facility for producing silicon wafers of 1,000 MW/year capacity to reduce the nations' reliance on availability of this critical resource of silicon materials through import from other countries.

#### *National Research Development Corporation (NRDC)*

8.85. NRDC was assigned more than 270 technologies by various R&D institutions in the country, and it signed more than 175 license agreements with industry for commercialisation during the Eleventh Five Year Plan period. The focus of NRDC during the Twelfth Five Year Plan period will be on launching (i) Programme for Inspiring Inventors and Innovators (PIII) and (ii) Programme for Development of Technologies for Commercialisation.

#### *Council of Scientific and Industrial Research*

8.86. CSIR proposes to pursue 10 schemes during the Twelfth Plan. The initiatives are summarised below:

8.87. *Setting Up of New Institutions:* CSIR envisages setting up five new institutes during the Twelfth Five Year Plan, in both physical and virtual mode. These institutes include: CSIR-Institute of Synthetic and Systems Biology (CSIR-ISSB); CSIR-Fourth Paradigm Institute (CSIR-4PI); CSIR-Institute

of Bio-Mimetic Materials (CSIR-IBMM); CSIR-Network Institute of Solar Energy (CSIR-NISE) and CSIR-Network Institute of Manufacturing Technology (CSIR-NIMT).

8.88. *R&D in Clusters through National Laboratories:* During the Eleventh Plan, CSIR has categorised its R&D programmes across seven clusters. The Twelfth Plan envisages strengthening and streamlining the cluster approach substantially. Programmes of the National Laboratories in the Twelfth Five Year Plan would be undertaken across five clusters which are as follows: Biological Science, Chemical Science, Engineering Science, Information Science and Physical Science. There is a specific focus on Human Resource Development in cluster mode. The projects have been formulated to encompass intra-cluster, inter-cluster and trans-cluster entities covering the domains of mega projects, large mission projects, supra-institutional network projects, cross-cluster projects, facility creation/augmentation projects and other small projects.

8.89. *CSIR Outreach Centres:* CSIR during the Twelfth Five Year Plan envisages setting up CSIR Outreach Centres that would essentially function in partnership with stakeholders. The focus is on new States and other such States where CSIR has no presence. CSIR Outreach Centres are envisaged to be operated and managed through CSIR–people partnership mode (CPP), and implemented either through mobile kiosks or pre-fabricated self-inclusive containers placed at identified locations. The centres would also have close coordination and networking with the CICs of the NInC-CSIR initiative.

8.90. *Initiative for Scale-up and Validation of Leads:* In order to ensure that the various leads developed as a result of R&D in CSIR labs attain fruition, CSIR has proposed to upgrade an activity for scale-up and validation of leads towards product/process development into an independent initiative.

8.91. *CSIR Special Centres for North-Eastern States, Lakshadweep and Andaman and Nicobar Islands:* In its endeavour to align with the national approach to achieve faster, sustainable and more inclusive growth

of the country, CSIR during the Twelfth Plan would focus on special eco-regions of the country and facilitate their sustainable development through S&T intervention. The North-East region and the islands of Lakshadweep, Andaman and Nicobar have been chosen in this regard. CSIR's efforts would include promoting innovation and CSIR technologies for the north-eastern States and undertake S&T intervention towards disaster mitigation and sustainable development of the coral reefs in the Lakshadweep, Andaman and Nicobar Islands.

**8.92. R&D Infrastructure Creation and Refurbishment:** Increase in the number of research programmes and the number of scientist calls for a corresponding increase in R&D infrastructure. This includes building new facilities; advanced workplace design; building ancillary facilities such as animal house, test range, fab-labs and so on.

**8.93. Energy Efficient Green Campus Development:** During the Twelfth Plan, it is proposed to continue with this initiative so as to spruce up CSIR laboratories to substantially high standards such as green building. The building of civil infrastructure would also cover increasing the number of staff quarters, student hostels, guest houses and other fringe facilities. Initiatives would be undertaken to renovate and improve the existing staff quarters, hostels, guest houses and so on.

**8.94. Building Excellence:** CSIR during the Twelfth Plan envisages building excellence. Well-focused initiative to pursue innovative ideas and embark upon high-risk, high-impact projects, thus, would be pursued to travel traversed paths and open up newer vistas. Programmes under this category include EMPOWER (Encouraging and Motivating Pursuit of World Class Exploratory Research), RISK (Research Initiative to Scale New Knowledgebase) and U-Excel (Unit for Excellence), targeted at early career scientists, mid-career scientists and late-career scientists, respectively.

**8.95. Innovation Complexes:** CSIR during the Mid Term Appraisal of the Eleventh Five Year Plan had resolved to bolster its translational research

capability through establishment of Innovation Complexes at identified locations across the country. The Innovation Complexes are envisaged to consolidate and sustain the value chain of R&D within the CSIR; consolidate the CSIR brand and make CSIR R&D accessible to society at large; catalyse regionally balanced economic development and promote entrepreneurial culture among the scientific community. During the Twelfth Plan period, CSIR would endeavour to operationalise twelve such complexes all over the country including the three complexes that are initiated during the Eleventh Plan.

**8.96. CSIR 800:** The programme on CSIR 800 that was launched during the Eleventh Five Year Plan for improving the quality of life and augmenting livelihood for the people at the base of the economic pyramid is being expanded during the Twelfth Five Year Plan. As a part of the programme, CSIR would address the needs of rural communities also through implementation of 24 identified CSIR Technology Enabled Villages (TECHVILS) across the country. The programme would be implemented in the following three stages: the REACH-TECH (to be transferred immediately), DEMO-TECH (to be transferred mid-way into the Plan) and INNO-TECH (to be transferred by the end of the Plan period).

**8.97. Open Innovation:** CSIR is building up open innovation as a key vehicle for delivering S&T output to the public at large. CSIR during the Eleventh Plan has achieved significant success through its OSDD initiative. Open Innovation has been identified as a major platform during the Twelfth Plan. It shall cover an expanded version of the OSDD programme (encompassing OSDD, Open Source Drug Delivery, Open Source Drug Development and Open Source Disease Diagnostics), and the Distributed Organic Chemical Synthesis (DOCS) programme that envisages building a national repository of 4,00,000 small molecules by the end of the Plan through open source. Apart from these, Science 3.0, an initiative for open innovation and knowledge-ware development through crowd sourcing would endeavour to engage a large number of engineering institutions to identify

the most vexing problems, and attempt to provide solutions on issues like attaining energy efficiency, reduction in materials use, minimising waste generation and developing business and financial models to increase productivity and profitability of the units.

**8.98. CSIR Initiative on Inclusive, Participative and Collaborative R&D:** This new initiative for CSIR during the Twelfth Plan would comprise the following four sub-components: Grand Challenge Initiative, Inverted Innovation, Participative Science and Participatory Technology Development, and Centres for Collaborative Research.

- *The Grand Challenge Initiative*—would focus on solving unsolved problems or providing a comprehensive solution to an enduring national problem. It will help in creating new core competence in the CSIR system; or create leadership in a new domain in trans-disciplinary/interdisciplinary science that would position CSIR globally;
- *The CSIR Initiative for Inverted Innovation*—a unique paradigm where children/young engineers invent, CSIR laboratories mentor and industries commercialise;
- *CSIR Initiative on Participative Science and Participatory Technology Development*—an initiative to pursue R&D that would provide mutual benefits to all the stakeholders participating in the scheme; inclusive innovation can be achieved, translational research can be carried out, a fluid team with like-minded people can be involved and the scientific outcome can be effectively leveraged.
- *Centres for Collaborative Research—CSIR-Academia, CSIR-R&D Institutes and CSIR-Industry:* The centres would focus on collaborative R&D in the identified domains through desired networking. They would be state-of-the-art set-ups and work in a fluid networked organisation mode. The R&D in such centres would be in domains such as health care, secondary agriculture, civil aviation and green transportation, sustainable energy and infrastructure engineering. It is envisaged that these centres would help develop seamless linkages between CSIR and Academic institutions, CSIR and R&D institutions, and CSIR and industry.

**8.99. National S&T Human Resource Development:** CSIR envisages continuing its endeavour of strengthening S&T human resources in the country through fellowships at various levels. In addition, during the Twelfth Plan, it is envisaged to introduce novel fellowship programmes such as hand-holding support to dyslexic children; provision of analytical ability-based fellowships; and also introduce the PC Ray Innovation Postdoctoral Fellowship.

**8.100. Intellectual Property and Technology Management:** CSIR continues to remain at the fountain-head of innovation through ownership of a large number of patents. During the Twelfth Plan period, the efforts to consolidate this IP portfolio further would be continued.

**8.101. R&D Management Support:** The programme on R&D Management Support comprises the following four components: International Collaboration, Planning and R&D Management, collaborative activities with the National Innovation Foundation, and Science Dissemination. The entire programme is proposed to be strengthened considerably during the Twelfth Plan period and taken to new heights.

**8.102. New Millennium Indian Technology Leadership Initiative (NMITLI):** The NMITLI has been among one of the successful programmes of CSIR during the Eleventh Plan. The programme is envisaged to be strengthened and broadened further during the Twelfth Plan by the following approach:

- Post-NMITLI projects
- Funding with industry (50:50 initiative)
- Co-financing with Venture Capital funds
- NMITLI innovation centres
- Acquisition of early-stage relevant knowledge/IP for portfolio building.

**8.103. National Civil Aircraft Development Programme:** CSIR also envisages being a part of the National Civil Aircraft Development (NCAD) programme to develop the first civil aircraft in the country.

8.104. An indicative plan outlay of ₹17,896 crore at current prices for the Twelfth Five Year has been made for the DSIR including CSIR.

## Department of Space

### Twelfth Plan Objectives/Thrust

8.105. The space programmes are driven through a decade profile and directions for 2025. The broad directions for the space programme for the next decade would include: (i) Strengthening/Expanding of operational services in communications and navigation; (ii) developing enhanced imaging capability for natural resource management, weather and climate change studies; (iii) space science missions for better understanding of the solar system and the universe; (iv) planetary exploratory missions; (v) development of heavy lift launcher, reusable launch vehicles and (vi) the human space flight programme. Innovations in space-based

communications and earth observations (EOs) will be pursued to achieve faster delivery of information to remote areas and finer observations of the earth. Overall, 58 missions are planned for realisation during the Twelfth Plan period which includes 33 Satellite missions and 25 Launch Vehicle missions.

8.106. The significant achievements of DOS during the Eleventh Plan are given in Box 8.7.

### Twelfth Five Year Plan Programmes

8.107. *Satellite Communications Programme:* In the area of Satellite Communications, it is proposed to augment the Indian National Satellite System (INSAT) capacity to bridge the gap between the demand and supply of the transponders for meeting all the requirements of the country and also to maintain sufficient spares capacity to meet contingencies. Development of state-of-the-art technologies and latest applications areas shall also be

#### Box 8.7

#### Significant Achievements/Development of DOS during the Eleventh Plan Period

- During the Eleventh Plan period, 29 major space missions were successfully accomplished, which included 13 launch vehicle missions with the Polar Satellite Launch Vehicle (PSLV) and the Geosynchronous Satellite Launch Vehicle (GSLV) and 16 satellite missions. The most significant achievement of the Eleventh Plan period was the successful launch of India's first unmanned moon mission Chandrayaan-1 on 22 October 2008, thereby achieving the historic feat of placing the Indian tricolour on 14 November 2008 on the moon's surface. The deep space network with two large antennae (18-metre and 32-metre diameter) with associated ground segment was established in Byalalu, near Bangalore to provide Telemetry, Tracking and Command (TTC) support for the mission. High-resolution data of excellent quality from Indian scientific instruments on board Chandrayaan-1 has led to the identification of new lunar features and characteristics around the moon. Analysis of scientific data jointly with international agencies has led to the detection of water molecules on the lunar surface.
- The other important achievements include the launch of (i) 10 satellites including Cartosat-2A and IMS-1 in a single launch of PSLV-C9; (ii) Microwave Radar Satellite RISAT-2 and Mini Satellite Anna University Satellite (ANUSAT) on board PSLV-C12; (iii) high-power satellite INSAT-4CR on board GSLV-F04; (iv) Oceansat-2 satellite along with six Nano satellites (commercial) on board India's PSLV-C14; (v) Cartosat-2B along with three Nano satellites and Student Satellite (STUDSAT) on board PSLV-C15; (vi) Resourcesat-2, Youthsat and Singaporean Satellite, X-Sat, on board PSLV-C16; (vii) GSAT-12 on board PSLV-C17; (viii) Indo-French joint mission Megha-Tropiques on board PSLV-C18; (ix) GSAT-8 through procured launch services; (x) conducting a qualification test of indigenously developed cryogenic stage; (xi) building two state-of-the-art communication satellites (W2M and Hylas) for international customers; (xii) providing launch services for two satellites for international customers (AGILE and TECSAR) on commercial basis by PSLV-C8 and PSLV-C10 and (xiii) establishing GEO and GPS Augmented Navigation System (GAGAN).

- Significant progress has been made towards developing GSLV Mk III, the next-generation advanced launch vehicle. A world-class solid propellant plant has been successfully commissioned at the Satish Dhawan Space Centre SHAR (SDSC-SHAR), Sriharikota, for manufacturing large solid stage booster segments (S-200) for GSLV Mk III vehicles. Two static tests of Solid propellant Rocket Booster stage (S-200), the third largest booster in the world, was successfully conducted to demonstrate the repeatability of S200 motor performance within the specified limits and has reconfirmed its design adequacy. As a part of C25 cryogenic stage development, realisation of thrust chamber test article and its trial suiting at the thrust chamber test facility has been successfully completed. The second static test of L110 stage of the GSLV Mk III vehicle was successfully conducted for its flight duration of 200 seconds.
- During the Eleventh Plan, there were failures of 2 GSLV flights, namely, GSLV-D3 with Indigenous Cryogenic Stage during April, 2010, and GSLV-F06 with Russian Cryogenic Stage during December 2010. The GSLV-D3 mission failed as the Indigenous Cryogenic engine after its ignition couldn't sustain the combustion beyond 1 second. The corrective steps based on Failure Analysis Committee are being effected for future launches.
- A new Remote Sensing Data Policy (RSDP 2011) containing modalities for managing and/or permitting acquisition/dissemination of remote sensing data in support of developmental activities has been approved which will enable the department to provide high-resolution data in time to concerned users.
- An Indian Institute of Space Science and Technology (IIST) was established for developing critical human resources for space S&T and the first batch of fresh graduates from the institute to the ISRO system have been inducted.
- Significant developments have taken place in the area of societal applications of space technology. Some of the important ones are: (i) expansion of tele-education network to over 55,000 classrooms; (ii) tele-medicine facility in 382 hospitals; (iii) setting up of 473 Village Resource Centres (VRCs); (iv) location of drinking water sources using Indian Remote Sensing (IRS) satellite images covering more than 2 lakh habitations in 10 states; (v) wasteland mapping and monitoring of the whole country using IRS data; (vi) space-based Potential Fish Zone mapping benefitting the fishermen community of coastal areas (vii) bio-diversity characterisation of bio-rich areas of the country; (viii) wetland mapping of entire country and (ix) operationalisation of Earth Observation Data Visualisation portal BHUVAN.

pursued. The operational transponder capacity from INSAT/GSAT satellites at the end of Eleventh Five Year Plan is satisfying a demand of around 198 transponders.

**8.108.** Based on the demand, about 400 transponders are planned to be realised by end of the Twelfth Plan period. Towards this, 14 communication satellites are planned to (i) increase the transponder capacity, (ii) introduce new-generation broadband very small aperture terminal (VSAT) systems, (iii) introduce Ka-band systems, (iv) build high-power S-band satellite mobile communications and (v) introduce new-generation geo-imaging satellite.

**8.109.** In terms of spacecraft platforms, it is planned to adopt I-2K, I-3K and I-4K buses for the

communication satellites. I-3K and I-4K buses are planned to be launched using procured foreign launcher. It is also planned to initiate development of High throughput I-6K-12KW bus in higher frequency bands like Ka/Ku and the technologies associated with it.

**8.110.** Maintaining and securing sufficient orbit-spectrum resources for country's Satcom activities will be a thrust area of the Twelfth Plan. It has been planned to pursue rigorously to secure spectrum for 100 additional Ku-band transponders and around 50 C-band/Ext C-band transponders in newer orbital locations.

**8.111. Satellite Based Navigation:** Satellite-based Navigation service is an emerging satellite based

system with commercial applications. To meet the Civil Aviation requirements, ISRO is working jointly with Airport Authority of India (AAI) in establishing the GAGAN system. To meet the user requirements of the positioning, navigation and timing, ISRO is establishing a regional satellite navigation system called Indian Regional Navigational Satellite System (IRNSS).

8.112. The Satellite Navigation Programme (SNP) has the primary objective of establishing a space-based infrastructure, Ground Segment for satellite-based position, navigation and timing services. The SNP also has an objective for the user segment, the task of developing the receivers for IRNSS including Global Navigation Satellite System (GNSS) indigenously through participation of Indian industry.

8.113. The Major Programmatic Targets of the Twelfth Plan are:

1. Implement the final operational phase for satellite-based augmentation system (SBAS) GAGAN over the Indian Airspace jointly with AAI and providing position, navigation and timing services through an integrated receiver.
2. Implement an independent IRNSS over Indian region and encourage the growth of user segment in Indian Market.
3. Develop indigenous expertise in applications of GNSS for critical National applications, identify specific application software development areas and work towards development of receivers for IRNSS including GNSS through participation of Indian industry.
4. Secure sufficient orbit-spectrum resources for country's Sat-Nav Programme activities.
5. There is a need to formulate the Indian Satellite Navigation Policy as ISRO is implementing and going to provide satellite-based navigation services in India.

8.114. IRNSS is an independent and indigenously developed Indian satellite-based positioning system for critical national applications. The main objective is to provide reliable Position, Navigation and Timing services over India and its neighbourhood; to

provide fairly good accuracy to the user and to provide Integrity and Ionosphere correction messages to the user. The IRNSS will basically provide the following two types of services: (i) Standard Positioning Service (SPS); (ii) Restricted Service (RS). Space Segment consists of seven satellites, three satellites in geosynchronous earth orbit (GEO) and four satellites in geostationary earth orbit (GSO). The three GEOs will be located at suitable orbit slots, and the four GSOs have their longitude crossings at two suitable orbit slots (two in each plane). All the satellites will be visible at all times in the Indian region. Ground Segment is responsible for the maintenance and operation of the IRNSS constellation. It provides the monitoring of the constellation status, computation of the orbital and clock parameters and navigation data uploading. The Ground Segment comprises TTC and Up-linking Stations, Spacecraft Control Centre, IRNSS Timing Centre, Code Division Multiple Access (CDMA) Ranging Stations, Navigation Control Centre and Data Communication Links. User segment mainly consists of a single frequency receiver for SPS, dual-frequency IRNSS receiver for both SPS and RS service and a multi-mode receiver compatible with other GNSS providers. The first IRNSS satellite is planned for launch in 2012–13. Thereafter, it is planned to launch two satellites each year and complete the constellation by 2015–16.

8.115. *EO Systems and Atmospheric Science Programme*: The thrust areas of EO for the Twelfth Five Year Plan have been identified based on extensive interactions with users under the aegis of National Natural Resources Management System (NNRMS) as well as after detailed deliberations in the inter-centre committee of ISRO. In terms of spacecraft missions, there are eight EO missions planned for Twelfth Five Year Plan (including special projects) that cover observation in the area of natural resources, ocean and atmosphere, climate and environment, all weather and high resolution imaging. With the realisation of these missions, there would be significant improvements in the areas of short-term weather and ocean state forecasting, natural resources management, high-resolution cartography, large-scale mapping, space-based Essential Climate Variables (ECVs) with enhanced spatial,

spectral, radiometric and temporal resolution. In the area of applications, the focus will be to ensure continuity of services in the areas of Natural Resources Census (1:50000 and 1:250000 scale), groundwater potential mapping, snow and glacier studies, coastal zone management, PFZ, Ocean State forecasting, weather forecast, Space-based Information Support for Decentralized Planning (SIS-DP), Accelerated Irrigation Benefit Programme (AIBP), India-Water Resource Information System (India-WRIS), National Urban Information System (NUIS), including the initiative to help user Ministries in the institutionalisation process for remote sensing-based services (with MoEF, MoES, Ministry of Agriculture [MoA], Ministry of Water Resources [MoWR], already in the forefront).

**8.116. Disaster Management Support (DMS):** The DMS Programme of ISRO is intended to provide near-real-time support and services from imaging and communication satellites towards efficient management of disasters in the country. The major programmatic targets of DMS programme in Twelfth Five Year Plan are:

1. Operationalisation of National Database for Emergency Management (NDEM)
2. Continue impact mapping and monitoring of natural disasters with improved turnaround time and with newer capabilities
3. Risk evaluation and reduction
4. Acquisition of close contour data through Airborne Laser Terrain Mapper (ALTM)
5. Extension of the communication network to the District Emergency Operation centres
6. Geolocation-based services such as Search and Rescue and distress alerts
7. Operational dissemination of the information and products directly to the affected areas
8. Operational utilisation of early warning systems
9. Extension of the Hydro-meteorological network
10. Key areas of R&D
11. Continued participation in international initiatives

**8.117. Space Transportation System:** The main focus of the Space Transportation Systems during the

Twelfth Plan period will be towards achieving self-sufficiency in launching our satellites, developing launch vehicles for enhanced payload capability, adopting appropriate outsourcing strategies for assuring productionisation of launch vehicles, enhancement of infrastructure for launch vehicles and developing technologies for the future programmes of ISRO. The major thrust areas of Space Transportation System during the Twelfth Plan period would include:

1. Enhanced level of production of PSLV systems with vigorous industry participation to meet the projected launch requirements.
2. Complete the development flights and operationalise GSLV MKII with indigenous Cryogenic Upper Stage
3. Complete development and qualification of C25 Engine and Stage
4. Complete the development flights of GSLV MkIII with 4.0 T geostationary transfer orbit (GTO) capability
5. Progress in the development of Semi-cryogenic engine with the establishment of test facilities.
6. Enhancement of infrastructure to meet the launch vehicle requirements and advanced mission requirements.
7. Demonstrate critical technology related to reusable launch vehicle (RLV) and dual-mode ramjet (DMRJ) through technology demonstration
8. Develop the critical technology and subsystems related to Human Space flight programme
9. Develop and demonstrate the critical technologies that will make ISRO's launch vehicle more cost-effective and more capable.
10. Continue the technology development efforts to improve the present capabilities and to contribute for long-term Space Research.
11. The mission profile for meeting the satellite launch demand includes 17 PSLV missions, 6 GSLV MK-II missions and 2 GSLV MK-III missions (this also includes one experimental mission). This demands increased stage and system production rates, expanding human infrastructure and test facilities and substantial technological achievements in cryogenic stage elements.

**8.118. Space Sciences and Planetary Exploration:** Space Sciences and Planetary Exploratory missions contribute significantly towards understanding the mysteries of the universe, our existence, and provide an opportunity towards development of cutting-edge technologies. Through space science investigations, we seek to understand the processes governing solar radiation, evolution of planetary systems, formation of galaxies, evolution of stellar systems and the universe. Successful launch and realisation of Chandrayaan-1, India's first Mission to Moon in 2008, has been a landmark achievement in Indian Space Programme. The major contributions of Chandrayaan-1 were the discovery of water on the lunar surface and exosphere, clear evidence for the production of energetic neutral atoms and the development of detailed Digital Elevation Model of regions mapped by its stereographic camera. The work on Chandrayaan-2, Astrosat-1 and Aditya-1, initiated during the Eleventh Plan, is in progress and all these missions will be realised in the Twelfth Plan. Besides the spillover missions of Chandrayaan-2, Astrosat-1 and Aditya-1, the newer mission that is planned during the Twelfth Plan is Mars mission. In addition, POLIX (to study the X-ray polarisation from bright X-ray-emitting objects) shall also be pursued.

**8.119. Mission to Mars (during November 2013 launch opportunity):** Mars with its many similarities to earth is an important planet to understand the origin and evolution of the solar system. India certainly cannot afford to be behind in its independent exploration of the red planet. India's first Mission to Mars during 2013 would be important more from the technological perspective, namely, entire mission design, planning, management and operations, and communication from a distance of nearly 400 million km. This mission will demonstrate ISRO's capability to undertake deep-space planetary mission where the travel time from earth to Mars is nearly 300 days. The Indian Mission to Mars would also provide an opportunity to the scientific community, to further understand the Martian Science. The present plan is to launch a Mars-orbiter using PSLV-XL during the November 2013 launch opportunity. Mars-orbiter will be placed in an orbit of 500×80,000 km around Mars and will have a

provision for carrying nearly 25 kg of scientific payloads on board.

**8.120.** An indicative plan outlay of ₹39,750 crore at current prices for the Twelfth Five Year has been made for the DOS.

### Department of Atomic Energy

**8.121.** The DAE has been pursuing R&D in nuclear science and engineering and also in advanced mathematics. The Department comprises several multidisciplinary R&D centres, aided institutions and closely linked industrial units that contribute towards basic R&D of technologies so as to harness nuclear science for the growth of the country. R&D by the R&D units of DAE provide valuable support to expand the indigenous Indian nuclear power programme and also to develop non-power applications of nuclear technology for use in industry, agriculture, health care and research. The DAE programmes also support collaborative research, establishment of centres of excellence as a part of efforts to establish linkages with academia.

**8.122. Programmatic Activities of DAE:** The mandate of the Department is to develop and deploy technologies for the production of nuclear power and to harness applications of radiation and isotope technologies for societal benefits. To fulfil this mandate, several technologies need to be developed and it is necessary to carry out basic research to provide a strong foundation to ongoing developments and to spur new developments. To meet all these objectives, human resource development is the most important requirement. Categorisation of the DAE's R&D activities into seven major programmes MP1 to MP7 followed during the previous two Plan periods will be maintained in the Twelfth Plan. Major programmes MP1–MP3 address R&D support to the three-stage Indian nuclear power programmes; MP4 addresses the development of advanced technologies such as accelerators, lasers and so on, and radiation technologies and their applications; MP5 incorporates the basic research in all the relevant branches of science; MP6 facilitates strengthening the research-education linkages and MP7 aims to development of the infrastructure for all the R&D activities.



*Twelfth Plan Objectives/Thrust*

8.123. Right from its inception, the Indian nuclear power deployment is based on a three-stage programme. The first stage is well established and is already in the commercial domain. The second stage is also geared to take off in a big way with the Prototype Fast Breeder Reactor (PFBR) going operational soon. The third stage of nuclear programme is in the R&D phase. The main emphasis of the DAE in the Twelfth plan includes ageing management and safety upgrades of all nuclear plants in operation, and incorporating enhanced safety features in the upcoming plants. Another thrust area, metallic fuel deployment with its associated fuel cycle in the fast reactor, is the key to reducing doubling time, thus accelerating the pace of nuclear power deployment. In short, the thrust areas address pursuit of multiple reactor technologies, safety upgrades to address beyond-design-basis external events, increased emphasis on development of applications

of nuclear technology for societal benefits, outreach programmes to enhance public awareness and acceptance, and strengthening of linkages with universities and national laboratories.

8.124. The significant achievements of DAE under R&D sector during the Eleventh Plan are given in Box 8.8.

*Twelfth Five Year Plan Programmes*

8.125. The details of the projects and programmes planned to be pursued are given below. Programme under MP1–MP3 include experimental verification of safety-related issues, ageing and degradation studies, life-extension assessment and investigation of new safety concepts for incorporation in nuclear power plants to address extreme external events. Thrust would be given to the development of new techniques for further exploration of uranium with a view to augmenting installed nuclear power capacity.

**Box 8.8****Significant Achievements/Development of DAE during the Eleventh Plan Period**

- Bhabha Atomic Research Centre (BARC) and Indira Gandhi Centre for Atomic Research (IGCAR) have developed indigenous Time Domain Electromagnetic (TDEM) systems for airborne survey to locate deep-seated uranium deposits. Other achievements include: development of BARC Containment Model (BARCOM) of 540 MWe Pressurised Heavy Water Reactor (PHWR) at Tarapur, the largest nuclear containment model in the world for ultimate load capacity assessment; installation and commissioning of thermal denitration pilot plant; development of prototype magnetic crawler robot for in-service inspection of boiler tubes at thermal power plants; and establishment of country-wide Indian Environmental Radiation Monitoring Network (IERMON) Stations at 115 new locations to provide online information about the radiation levels.
- Construction of Prototype Fast Breeder Reactor of 500 MWe capacity at Kalpakkam is nearing completion. Other activities for the fast reactor programme include production of mixed oxide fuel pins for PFBR at Advanced Fuel Fabrication facility; alloy characterisation facility for fast reactor fuels, pyrochemical reprocessing and sodium fire facilities, fuel cell and argon glove box for sodium chemistry studies and ultra filtration units for separation of strontium, cesium, lanthanides and actinides from simulated wastes. Robotic device for in-service inspection and indigenous spider-robot for steam generator tube inspection have also been developed.
- Under R&D for future reactors that use thorium-based fuel, ( $\text{ThO}_2\text{-1\%PuO}_2$ ) and ( $\text{ThO}_2\text{-1\%}^{235}\text{UO}_2$ ) Mixed oxide (MOX) fuel pins have been fabricated to be used for experiments in the AHWR Critical Facility. The AHWR fuelling machine has been manufactured, assembled and tested. An AHWR calandria test facility has been commissioned. A scaled semi-transparent experimental set-up of the calandria has been designed, fabricated and installed in house. For U-233 clean-up project, copper vapour laser systems and the tuneable lasers have been fabricated indigenously.

- Starting from raw materials, technologies and processes leading to the fabrication of long lengths of niobium-titanium-based superconducting cable-in-conduit-conductor (CICC) have been realised. These cables are capable of carrying 30 kA current at 5 tesla. These indigenously manufactured cables have applications in accelerator program and also in Steady-state Superconducting Tokamak.
- The Indian synchrotron Indus-2 became operational and the beam life time in Indus-2 has reached 22 hours at 2 GeV and 100 mA. Six beam lines were made operational, and are being used by researchers from the Department as well as other universities in the country. On 6 December 2011, Indus-2 reached a major milestone of 100mA current at the design energy of 2.5 GeV. Raja Ramanna Centre for Advanced Technology (RRCAT) has developed a new technique of laser welding of niobium superconducting radio frequency (RF) cavities, which offers advantages of low-energy deposition and, therefore, less shrinkage and distortion, and is of a much lower capital cost.
- Research in nuclear agriculture has resulted in development of 10 new mutant crop varieties. One hundred and twenty Nisargruna biogas Plants have been installed in various parts of the country. Cancer research in Tata Memorial Hospital has resulted in cost-effective screening method (costing less than ₹100) in breast cancer.
- High-power Nd:YAG lasers along with fibre optic delivery systems and remote control operation developed by RRCAT were commissioned in different units of PHWRs for cutting and welding operations and for cutting of 612 bellow lip weld joints during the En-masse Coolant Channel Replacement (EMCCR). Besides the large savings in time, this technique also reduces the occupational radiation exposure to the workers by a factor of about 40 as compared to the conventional technique.
- The Board of Research in Nuclear Sciences (BRNS) and University Grants Commission–Department of Atomic Energy (UGC–DAE) Consortium for Scientific Research stand out as important initiatives of DAE in the direction of linking research with education. The Homi Bhabha National Institute (HBNI) is fully functional and plays an important role in conducting academic programmes under its own umbrella as well as in linking DAE with other academic institutes in the country and abroad.
- Large experimental facilities that were set up by DAE during the Eleventh Plan period to facilitate basic research include commissioning of High Altitude GAMMA-Ray (HAGAR) array, which consists of seven telescopes, at the high-altitude (4,300 m) station Hanle (in Ladakh) for ground-based gamma ray astronomy, and a high-resolution spectrometer Indian Gamma Ray Array consisting of Germanium clover detectors at the Pelletron Linac Facility at the Tata Institute of Fundamental Research (TIFR). The first phase of parallel supercomputer (Anupam Adhya), delivering 47 terraflop of sustained linpack computational performance, has been developed and released to the users. New campus of TIFR at Hyderabad and two major new centres for basic research—International Centre for Theoretical Sciences at Bengaluru and the TIFR Centre for Interdisciplinary Sciences at Hyderabad are being established. Under ITER-India, design activities of in-kind contribution to ITER, namely, neutron-shielding plates, cryostat, RF and neutral beam systems, and so on, have been completed. Other areas of basic research leading to important findings include radiation biology towards understanding of mechanism of processes involved in response to radiation and other abiotic stresses, utilisation of microbes for bioremediation of radioactive waste, development of stress-resistant crop plants, diagnosis, treatment and research in cancer, establishing the lack of deleterious health and biological effects in people living in high-level natural background radiation areas (HLNRA).
- A total of 11,206 journal papers were published by 13 major DAE institutions during 2007–10. These publications received a total of 49,578 citations during the period. The average number of publications published per year was 2,801.50 and the number of citations per publication during the period was 4.42.
- The first batch of Integrated MSc students joined the National Institute of Science Education Research (NISER) in September 2007. NISER also initiated PhD programmes from 2009 onwards.

For Light Water Reactor (LWR) programme, R&D to develop, design and verify indigenous LWR concepts and development of equipment is planned. The civil construction of the PFBR is in an advanced stage and is expected to be completed by 2012–13. Two 500 MWe MOX-fuelled fast reactors are planned to be set up. For validating the design of the fuel sub-assembly and to gain large-scale experience in the fabrication and irradiation testing of metallic fuels, a 120 MWe metal-fuelled fast reactor will be designed at IGCAR in the Twelfth Plan, with construction proposed in the Thirteenth Plan.

**8.126. R&D related to Thorium-based Reactors:** The development and demonstration of thorium-fuelled Advanced Heavy Water Reactor (AHWR) is an important initiative for thorium utilisation and for the third stage of nuclear power programme. This reactor also already embodies several innovative passive safety features that have now assumed added significance internationally following the Fukushima-Daiichi events. A major programme to experimentally demonstrate the available margins to extreme internal and external events will be carried forward in the Twelfth Plan period to further add to validation of these advanced safety features, many of which are generic in nature.

**8.127. Compact High Temperature Reactor (CHTR) Technologies:** In addition to AHWR, planning for a CHTR is an important step towards the development of advanced reactor technologies required for hydrogen generation. For designing CHTR, consideration of material behaviour as well as technologies for utilisation of high temperature heat warrant investigations for assessing the performance of structural material in corrosive environment of liquid metal and molten salt coolants. Molten salt is a promising coolant for high-temperature application as it also offers the possibility of a thorium-based thermal breeder reactor design suitable in the Indian context with a high level of passive safety. The advanced reactor systems including fusion reactor systems require appropriate materials to be specially developed, characterised, and compatibility issues resolved. Furthermore, special instruments and sensors also need to be developed for measurement of process

parameters in such harsh environment. All necessary studies will be taken up in the Twelfth Plan.

**8.128. Research Reactors:** Cirrus reactor was permanently shut down in December 2010 and presently only Dhruva reactor, which is in operation for more than 25 years, is available for providing the research reactor-based facilities. Further, the requirement of medical isotopes is expected to increase. To meet the increasing requirement of various radioisotopes for use in the field of medicine, industry and agriculture, needs of special materials, and various facilities for basic and applied research, a 125 MW(th) Research Reactor and a 30 MW High Flux Research Reactor (HFRR) are proposed in the Twelfth plan at BARC Campus Vizag. These new reactors will also provide advanced facilities for basic research in frontier areas of science and for applied research related to development and testing of nuclear fuels and reactor materials. An associated isotope processing laboratory is also proposed.

**8.129. Development of Applications of Radiation Technology:** Radioisotopes and their formulations (radio chemicals, labelled compounds and radiopharmaceuticals) and radiation sources (isotope sources, gamma plants and electron accelerators) are required for nuclear applications in health care, industry, food security, agriculture, water resources management and research. A national hadron therapy facility for cancer treatment at Advanced Centre for Treatment, Research and Education in Cancer at Tata Memorial Centre (ACTREC-TMC) will be set up. Accelerators and lasers are very powerful tools for basic as well as applied research. Several new beam lines will be installed at INDUS 2 and the existing ones will be upgraded with modern equipment for supporting high-quality research.

**8.130. International Cooperation in Accelerator Physics and Astronomy:** DAE continues to increasingly participate in international collaborative ventures. Participation in activities at LHC, CERN, Geneva, has led India to get the status of an 'observer state'. Indian participation in the seven-member ITER project will continue during the Twelfth Plan. The test blanket module (TBM) development

for testing in ITER will be another major activity. India's participation in ITER has demonstrated our scientific and technological strength to be a partner in mega science projects. India has joined the multinational, multi-organisational project Facility for Anti-proton and Ion Research (FAIR) being set up in Germany.

**8.131. Participation in Mega Science Projects:** DAE is participating in several Mega Science Projects. The S&T expertise in the Department will be leveraged in order to contribute to these projects. The FAIR and India-based Neutrino Observatory (INO) are the other ongoing projects. Several new projects are proposed, such as LIGO, Thirty Metre Telescope and Square Kilometre Array. Apart from these, setting up of an Indian Synchrotron for Materials and Energy Research is also proposed. These projects will involve several DAE Institutions including BARC, IGCAR, RRCAT, Variable Energy Cyclotron Centre (VECC), TIFR, IPR as well as universities, and the research facilities built will be available for utilisation by the research community of the nation.

**8.132. DAE in Human Resource and Expertise Building:** The research centres and aided institutions lay strong emphasis on frontline research and human resource development for their personnel and also contribute towards human resource development requirement of the country. Units of the Department also maintain strong linkage with the academic and research community in the country. The initiative of the Department to set up HBNI as a deemed-to-be university is another step towards strengthening the linkage between the institutions of the DAE and also with the academic and research community in the country. It will also help DAE in utilising its vast research infrastructure and faculty towards human research development for the country. Similarly, TIFR has increased intake of research students after having been declared a deemed-to-be university. The present methods of collaboration through BRNS and MOUs with select academic institutes will continue to be supported and further strengthened. The Department of Atomic Energy-Science Research Council (DAE-SRC) award scheme, providing

incentive to competent professionals within and outside DAE, will be continued. Increasing linkages with the national higher education institutions (universities, IITs and NITs and so on.) will be continued so as to ensure availability of quality manpower for DAE programmes and projects.

**8.133.** The Global Centre for Nuclear Energy Partnership (GCNEP), the sixth R&D centre of DAE, is being set up in Haryana near Delhi. The main objective of setting up GCNEP is to enable India in establishing the leadership in the field of nuclear energy through research and training and organise workshops, schools and seminars by Indian and international scientists/experts on topical issues. Under GCNEP, the following schools are being set up:

- School for Studies on Applications of Radioisotopes and Radiation Technologies
- School of Advanced Nuclear Energy System Studies
- School of Nuclear Security Studies
- School of Radiological Safety Studies
- School of Nuclear Material Characterisation Studies

**8.134. Strengthening R&D infrastructure:** In order to meet the growing number of programmes and projects, including in greenfield locations, it is necessary to strengthen and expand the investments in infrastructure. The ongoing projects towards strengthening and upgrading existing security systems need to be also continued. New campuses coming up, for example of BARC in Vizag and of TIFR in Hyderabad, would involve considerable efforts and resources. The TIFR Centre for Interdisciplinary Sciences (TCIS), Hyderabad, has started functioning at the transit premises from mid-June 2011. Laboratories for research in chemistry, biology, lasers and optics, magnetic resonance and condensed matter will be set up in this transit campus during the twelfth plan. Development of the new TIFR Hyderabad campus will be given priority. The newly formed International Centre for Theoretical Sciences (ICTS, TIFR) in Bengaluru is a multi- and interdisciplinary effort with a strong component of

human resource development. Emphasis will be on research areas such as biophysics, computational science, complex systems, fluids, the interface between cosmology, particle physics and string theory, new emergent areas of mathematics with applications to biology, and so on.

8.135. An indicative plan outlay of ₹19,878 crore at current prices for the Twelfth Five Year has been made for the DAE under R&D sector.

#### PLAN OUTLAY

8.136. A total Plan outlay of ₹1,20,430 Crore has been approved for Six Scientific Departments/Agencies for the Twelfth Five Year Plan. Table 8.1 provides Department-wise allocation and expenditure for the Eleventh Five Year Plan and the break-up of Outlay for Twelfth Five Year Plan.

**TABLE 8.1**  
**Plan Outlays and Expenditure of Central Scientific Ministries/Departments/Agencies During Eleventh Five Year Plan and Indicative Outlay for Twelfth Five Year Plan**

| Sl. No. | S&T Department/Agencies | Eleventh Plan (2007-12) |                  | Twelfth Plan (2012-17) |
|---------|-------------------------|-------------------------|------------------|------------------------|
|         |                         | Outlay                  | Anti. Expdr      | Outlay                 |
| 1       | DAE (R&D sector)        | 11,000.00               | 8,068.26         | 19,878                 |
| 2       | MoES                    | 7,004.00                | 3,202.30         | 9,506                  |
| 3       | DST                     | 11,028.00               | 8,636.61         | 21,596                 |
| 4       | DBT                     | 6,389.00                | 4,832.24         | 11,804                 |
| 5       | DSIR including CSIR     | 9,000.00                | 6,940.61         | 17,896                 |
| 6       | DOS                     | 30,883.00               | 15,834.79        | 39,750                 |
|         | <b>Grand Total</b>      | <b>75,304.00</b>        | <b>47,514.81</b> | <b>1,20,430</b>        |

## ANNEXURE 8.1

### National Targets for S&T Sector for the Twelfth Plan

#### National Targets for S&T Sector for the Twelfth Plan

|   |   |                               |
|---|---|-------------------------------|
| Global Share of Publications                                | : | >5 per cent                   |
| Global Ranking in SCI publications                          | : | better than sixth             |
| Global Ranking in Number Patent Cooperation Treaties (PCTs) | : | better than tenth             |
| FTEs in R&D Personnel                                       | : | 2,50,000                      |
| PhDs Outputs in Whole Science Sector                        | : | 12,500 per year               |
| Public–Private Sharing of Investments                       |   | 50:50                         |
| Gender Parity in EMR Funding (PI Ratios)                    | : | better than 60:40             |
| The Relative Global Rank in Patent Portfolio                | : | better than ninth             |
| Commercialisation of Patents                                | : | better than 5 per cent levels |
| Share of High Technology Content in Exports                 | : | better than 20 per cent       |
| Global Ranking in Innovation Index                          | : | better than 25th              |
| Establishment of Section 25 Companies                       | : | in select sectors             |

#### DEPARTMENT-BASED DELIVERABLES AND TARGETS FOR THE TWELFTH PLAN

##### DST

- To strengthen Human Capacities, 30,000 new scholars for Scholarship for Higher Education targeted, Award of Overseas Doctoral scholarships—3,000 man years, Overseas postdoctoral fellowships—500 man years, Women mobility scheme for employed scientists—1,000 positions, Start-up research grant for Indian diaspora undertaking faculty assignments in Indian academia—1,000 man years, enlarging the Principal Investigator base—1,500 man years, INSPIRE Award scheme—2 million awards.
- Support under Fund for improvement of S&T Infrastructure (FIST)-1200-1500 departments and 500 colleges, PURSE—50 Universities, CURIE—6 Universities and 50 Women colleges, IRHPA—15 research areas, SAIF—25 new centres and 10 select centres. Autonomous Institutions focused on Institutional Capacities, Water Technology Solutions—20 implementable solutions to be demonstrated in at least 15 clusters, 20 centres to be created for Nano S&T Mission, 5 National Centres in Advanced Research.
- Centre–State Technology partnerships—At least five viable partnerships through programme support, PPP for R&D. One mega PPP for national challenge area, five PPPs for large-scale challenge, 25 PPPs for proof of concepts for technology solutions.
- Technology Development and Transfer, IDP, IS-STAC through the ongoing programmes, 200 technologies demonstrations, 150 proof of concepts, and 25 cooperative investments with other socio-economic Ministries have been targetted.
- Five product designs and prototypes under security technology R&D.
- Solar Energy Research Initiative—Support 250 doctoral-level researchers from 10 institutions.
- Under Natural Resources Data Management System (NRDMS) and National Spatial Data Infrastructure (NSDI), State Spatial Data Infrastructure has been targeted.
- Technology Platforms for four Identified Areas.
- Under Modernisation of SoI and NATMO, 1:10000 scale map has been targeted.

- Under Nano S&T Mission—25 start-up companies under PPP models would be created.
- PPP for R&D—One mega PPP for national challenge areas and five PPPs for large-scale challenge and also 25 PPPs for proof of concepts for technology solutions.
- Hundred projects for Science for Equity, Employment and Development and 50 Model Demonstration Projects.
- To commission 15 Study Reports, 10 Policy Research Studies, 3 Development of STI indicators for India, 5 Inter-country policy comparison studies, 12 External consultations and inter-country and 10 Technology and Innovation (STI) indicator reports have been planned.

### DBT

- Under Human Resource Development, it is proposed to establish 100 Star Undergraduate Colleges, 100 Ramalingaswami fellowships for returning scientists from abroad, 10 finishing schools for industry-ready graduates, award 200 Welcome trust-DBT biomedical fellowships, junior research fellows and 250 postdoctoral fellowships in life sciences.
- Under Promotion of Excellence and Innovation, the targets are to create 25 Centres of excellence in plant sciences, animal sciences, human biology systems and industrial research; 10 new centres for translational science education and innovative research in Medical Schools, 20 IICs connecting basic sciences with translational R&D and 2 centres for policy research in agriculture and health care biotechnology.
- For Biotech Facilities and Research Resources the targets are to establish five research resources and service facilities, upgrade and redesign life science research and education in 38 universities.
- Launching of eight Grand Challenge programmes in health care and agriculture on a mission mode around national priorities in development sectors through bottom-up approach and discovery-led innovation, interdepartmental participation and separate government and management structure.
- Establishment and commissioning of three ongoing bio-clusters at Faridabad, Mohali and Bengaluru and two new bio-clusters with clusters boards to govern, and establish incubators, common technology platforms, contract labs for SMEs, genetically modified products (GMP) facilities, research hospital and so on.
- Establish five national research centres/institutions in the areas of Bioinformatics and Computational Biology; Marine and Microbial Biotechnology; Bio-design; Bioscience and Bioengineering; Chronic Disease Science and Biotechnology; and Infectious Science and Biotechnology Institute in the North-East.
- Strengthening of regulatory system for biotechnology through establishment of BRAI, under the act of Parliament and establishment/strengthening of 10 regulatory testing laboratories with good laboratory practice (GLP) standard.
- Expanding existing AIs threefold in terms of human resource, setting up of Extra Mural Research centres on or off site to promote translational science; starting of number of disease-specific network programmes; and physical infrastructure.
- Establishment and operationalisation of BIRAC and launching of two to three new PPP schemes such as ignition grants, start-up grants, shared technology incubators and bio-parks.
- For translational and strategic research in agriculture, health care and environment, about 50 projects/networks shall be launched in system biology, synthetic biology, computational sciences, nano-biology, pre-breeding of crops, photonics, molecular imaging and tissue engineering, biopharmaceuticals and drug development and other emerging areas.

### MoES

- Augmentation of Agrometeorological Advisory Services (AAS) from the existing district level to the block level. Plan to reach 30–40 per cent (10 million) farmers for providing the agro-met services from the current level of 10 per cent (2.5 million).
- Strengthen HPC facility from the existing 124 T flops to 2.5 P flops.

- Upgradation of facilities of about 100 airports in the country.
- Setting up of an International Training Centre for Operational Oceanography.
- Development of high resolution model of 13 km to provide a credible, integrated ocean information services.
- Development and demonstration of higher-scale offshore desalination of 10 MLD
- Acquisition of three state-of-the art ocean research vessels.
- Commissioning of third station at Antarctic to strengthen research activities in the Polar Regions.
- Drilling a deep bore hole in Koyna–Warna region for better understanding of stable continental region earthquakes and Reservoir Triggered Seismicity.

### DSIR

- Establishment of 40 CICs; support to 1,200 plus innovative proposals from MSME Clusters; acquisition of around 20 Globally Patented Technologies by Indian Industries and value addition.
- Establishment of R&D Facilities for Solar Photovoltaic (SPV) and Solar Thermal (ST) at CEL.

### CSIR

- Development of five game-changing technologies that impact lives of millions.
- Thirty exceptional publications of global impact.
- Development and transfer of 50 advanced products/technologies.
- Setting up 15 spin-off companies.
- Training of 3,000 PhDs in trans-disciplinary areas of science and engineering through AcSIR.
- Establishment of the following five new institutes: CSIR Institute of Synthetic and Systems Biology; CSIR Fourth Paradigm Institute; CSIR Institute of Bio-mimetic Materials; CSIR Network Institute for Solar Energy and CSIR Network Institute for Manufacturing Technology.
- Setting up of 10 CSIR Outreach Centres.
- 1,000 patent applications to be filed in India, 1,000 patent applications to be filed abroad and 75–150 non-patent IPRs to be secured and prosecuted.
- To award 15,000 fellowships under the JRF-NET, 1,000 Syamaprasad Mookherjee Fellowships to be awarded, 100 awards under Trans-Disciplinary Fellowship Scheme yearly, 100 awards under CSIR Nehru Science Post-Doctoral Fellowship Scheme yearly, 250 scholarships for dyslexic students.
- Establish 24 CSIR TECHVILS across the country. Showcase TECHVIL to enroll 1 million citizens in adjoining communities to the benefits of technology.
- Setting up CSIR offshore Joint Centres of Excellence in Malaysia, Sweden and USA. Setting up of 12 world-class Innovation Complexes in identified locations across India.
- Under NMITLI, the target is to launch five to seven new projects per year; launch some unique products such as Micro PCR (a platform technology for diagnostic applications), dental implants benefiting Indian masses, next generation clutch plates and so on.
- Expand OSDD to OS drug discovery, OS drug development, OS drug delivery and OS disease diagnostics for MTb.
- Extending OSDD programme to malaria.
- Launching of three Grand Challenge-driven projects with global participation. Develop at least five technologies in participatory mode and transfer the same to stakeholders. Set up at least five CSIR Centres for Collaborative Research with academia, R&D institutions and industry.

### DOS

- Realisation of total 25 launch vehicle flights—17 PSLVs + 6 GSLVs + 2 GSLV Mk III including one Experimental Mission (as against 14 flights of the Eleventh plan). First Developmental Flights of GSLV Mk III—the next generation launch vehicle.



- Establishment of Indian Regional Navigational Satellite System (IRNSS) with a constellation of seven satellites.
- Implementation of fully operational base of GAGAN.
- Augment the INSAT/GSAT capacity to ~500 Transponders in C, Ku, Ka, MSS and BSS bands.
- Realisation of GSAT-11—Advanced Communication Satellite.
- Realisation of Advanced Remote Sensing Technology for 0.25m resolution.
- Realisation of Geo Imaging Satellite (GISAT) for Disaster Management Support.
- Implementation of Space based Information Support for Decentralised Planning.
- Multi-wavelength Astronomy Observational Satellite—ASTROSAT.
- Undertaking challenging Mars Orbiter Mission.
- Realisation of Chandrayaan-2 with Rover and Lander. Operationalisation of NDEM with multi-thematic, multi-scale database and relevant Decision Support systems.

### DAE

- Apsara Reactor upgradation with indigenously developed fuel.
- Construction and commissioning of AHWR Thermal Hydraulics Test Facility (ATTF) and AHWR Fuelling Machine Test Facility (FMTF).
- Technology development and commissioning of a low energy (20 MeV) linear proton accelerator (LEHIPA) as a part of front end of ADS driver.
- Setting up additional 500 IERMONs (Radiation monitoring stations).
- Setting up an experimental Solar Test Facility (SOTEF).
- Technology development for Electron and Ion Accelerators.
- Augmentation of facilities for Fast Reactor Fuel Reprocessing.
- Establishment of 30 MeV Medical Cyclotron.
- Commissioning of the MACE at Hanle.
- 3m scale optical interferometer as prototype gravitational wave detector.
- Enhancement of INDUS synchrotron user facility.

### NOTE

1. SAC-PM (Scientific Advisory Council to the Prime Minister), *India as a Global leader in Science*, 2010.

## Innovation

9.1. India is the second fastest growing economy in the world, but as the pace of development increases rapidly, the country faces an increasing challenge to ensure that future growth is sustainable and inclusive. Innovation can play a key role in not only driving growth and competitive advantage, but also ensuring that this development includes a larger cross section of people and is socially, economically and environmentally sustainable. Realising that innovation is the engine for national and global growth, employment, competitiveness and sharing of opportunities in the 21st century, the Government of India has declared 2010–20 as the ‘Decade of Innovation’.

9.2. India has unique challenges and large unmet needs across diverse areas such as health, education, skills, agriculture, urban and rural development, energy and so on. We also have significant challenges of exclusion and inequitable access due to multiple deprivations of class, caste and gender—all of which require innovative approaches and solutions, and looking beyond the conventional way of doing things. Innovation is going to be central to providing answers to the most pressing challenges and for creating opportunity structures for sharing the benefits of the emerging knowledge economy. Affordable solutions, innovative business models or processes which ease delivery of services to citizens can enable more people to join the development process.

9.3. In this context, there is a need for an Indian Model of Innovation that focuses on affordability and inclusive growth which can be a model for emulation for countries across the globe facing similar

challenges of sustainable development. Indian entrepreneurs and policymakers are already moving towards this inclusive model of innovation, and three distinctions of this emerging Indian approach to innovation are worth noting. First, it focuses on finding affordable solutions for the needs of people—for health, water, transport, so on—without compromising quality. For instance, extremely low-cost eye surgeries which do not compromise on surgical standards at US\$50 compared to US\$1,650 in the US. Second, in this Indian approach to innovation, desired outcomes are produced by innovations in organisational and process models that deliver to people the benefits of technologies that may be developed in scientific laboratories. An example is the delivery models of mobile telephony services that have expanded the reach of telephony with the cheapest call services in the world. Third, there are innovations in the process of innovation itself to reduce the cost of developing the innovations. An example is the Open Source Drug Discovery (OSDD) process being applied by the Council of Scientific and Industrial Research (CSIR) to develop drugs for treatment of tuberculosis, based on a semantic-search, web-based platform for collaboration developed by Infosys, an innovative approach that has cut down the costs and reduced the time for drug development.

9.4. This new paradigm of innovation, focused on producing ‘frugal’ cost solutions with ‘frugal’ costs of innovation, in which India may be emerging as a global leader, contrasts sharply with the conventional approach, mostly focused on increasing inputs of Science and Technology (S&T) and R&D and

measurement of the numbers of papers and patents produced. Frugal innovation is focused on the efficiency of innovation and on outcomes that benefit people, especially the poor. Industrially advanced countries too are examining their innovation policies to incorporate this broader concept of innovation that moves beyond the R&D paradigm.

9.5. India is also uniquely poised to reap the advantages provided by a nation of a billion connected people, with over 800 million mobile phones, and global leadership in Information and Communication Technology (ICT) and software. This connectivity as well as ICT talent is changing the nature of processes, business, industry, governance, education and delivery systems: and our innovation thinking also has to leverage the unprecedented advantages provided by this changing landscape of connectivity and collaboration.

#### Towards an Innovation Ecosystem: The Role of NInC

9.6. Conversion of R&D to results for people requires an ecosystem of enterprises working in conjunction: entrepreneurs, researchers, finance providers, business enterprises, and policymakers. Therefore, the national strategies for innovation need to focus on various types of institutions in the ecosystem and aim for more effective collaboration amongst them. This must be India's agenda too if India is to accelerate inclusive growth through innovation.

9.7. Government has a critical role to play in strengthening the innovation ecosystem. It must provide the enabling policy interventions, strengthen knowledge infrastructure, improve inter-institutional collaborations, provide a mechanism for funding business innovations at all levels especially small and medium scale enterprises (SMEs) and provide vision through a national-level road map for innovations. Recognising this need, the Prime Minister has set up a NInC with the mandate to formulate a Road Map for Innovations for 2010–20 with a focus on inclusive growth.

9.8. NInC is focused on encouraging and facilitating the creation of an *Indian Model of Innovation* by

looking at five key parameters: Platform, Inclusion, Ecosystem, Drivers and Discourse. The aim is to redefine innovations to go beyond formal R&D parameters and look at innovation as a broader concept that breaks sectoral silos and moves beyond a high-tech, product-based approach to include organisational, process and service innovation where many players can plug into this platform. The core idea is to innovate to produce affordable and qualitative solutions that address the needs of people at the Bottom of the Pyramid, eliminate disparity and focus on an inclusive growth model. NInC's initiatives are also aimed at fostering an innovation ecosystem across domains and sectors to strengthen entrepreneurship and growth, and to facilitate the birth of new ideas. While conceptualising these initiatives, the key drivers are going to be parameters of sustainability, affordability, durability, quality, global competitiveness and local needs. Finally, through its various initiatives, NInC will aim to expand the space for disruptive thinking, dialogue and discourse on innovation.

9.9. Principal initiatives already undertaken by the Council to drive innovation and create an innovation ecosystem in the country are mentioned below.

#### Supporting Financial System and Mentoring: India Inclusive Innovation Fund (IIIF)

9.10. Innovators need financial support at an early stage to develop and test their ideas in the marketplace. Venture funds are recognised globally as the most suitable form of providing risk capital for the growth of innovative technology and breakthrough ideas. While India is amongst the top recipients in Asia for venture funds and Private Equity Funds, these investments are so far focused on relatively large and 'safer' investments. Thus, despite the growth in the venture capital industry in India and some government schemes for supporting entrepreneurs, the seed funding stage in the innovation pipeline, where amounts required may be small but risks high, is severely constricted.

9.11. To plug this gap and to promote inclusive innovation and entrepreneurship focusing on the needs

of people in the lower echelons of society, NInC is creating an India Inclusive Innovation Fund (IIIF). The Fund seeks to promote enterprises engaged in developing solutions in key areas such as health, education, agriculture, handloom, handicrafts and other small business enterprises. The Fund will combine commercial and social returns. The Fund will be capitalised to an eventual target size of ₹5,000 crores to be achieved in phases. It will be kick-started with seed investment from the government and bilateral/multilateral institutions and go to scale with private capital. The Fund will be an autonomous, professionally managed entity with a social investment focus. Government of India has committed seed capital of ₹100 crore to kick-start the Fund and NInC will aim to operationalise this Fund by the year 2013 with an initial close of ₹500 crore.

#### Increasing Skills, Productivity and Competitiveness of Micro, Small and Medium Enterprises (MSMEs) through Innovation

9.12. MSMEs are among the largest job creators in the country. They contribute to 40 per cent of export and are recognised as engines of economic growth. However, to keep up the pace of strong economic growth and to stay globally competitive, MSMEs need to innovate in all aspects of business. Recognising this need, NInC has envisioned the Industry Innovation Cluster initiative.

9.13. The focal point of this initiative would be the creation of a Cluster Innovation Centre (CIC). The CIC will actively seek relationships to address the needs of the cluster and establish frameworks for knowledge and best practice sharing. By connecting and creating local ecosystem encompassing actors and stakeholders who can bring in technology, financing, skills and mentors, the CIC will help enhance productivity, growth and employability. The Pilot Phase of the Innovation Cluster Initiative has been launched and nine clusters (seven industry and two university) have been chosen to be part of this phase. Pilot activities have commenced at the Ayurveda cluster in Thrissur, Kerala; Food Processing cluster in Krishnagiri, Tamil Nadu; Bamboo cluster at Agartala, Tripura; Auto Components cluster at Faridabad, Haryana; Brassware cluster at Moradabad;

Furniture cluster at Ernakulam, Kerala; Life Sciences cluster at Ahmedabad, Gujarat; Delhi University, Delhi; and Maharaja Sayajirao University, Baroda, Gujarat. NInC has been collaborating with State Governments, Ministry of MSME and the Department of Scientific and Industrial Research in this effort.

#### Nurturing Innovation through Education

9.14. Schools are the best places to inculcate a spirit of innovation. To promote creativity and nurture innovations in the education system, NInC has made the following proposals to the Ministry of Human Resource Development (MHRD), including:

1. Creation of a separate scholarship stream of National Innovation Scholarships analogous to the National Talent Search Scheme. This will help identify talented children at the school level who think creatively, laterally and innovatively on issues that they perceive as important in their local environment. It is expected to have a multiplier effect of valuing creativity and innovation by parents, teachers and the learning system.
2. Setting up an Innovation Centre in each DIET (District Institute of Education and Training) to enhance teacher training and enable them to become facilitators of creativity and innovative thinking.
3. Mapping of local history, ecology and cultural heritage by each high School in the country to create critical thinking on their local environment by students.
4. Creation of a National Innovation Promotion Service to replace/add to National Service Scheme in colleges to use college students to identify local innovations. This is a scheme of the Ministry of Youth Affairs and Sports which along with Ministry of Human Resource Development (HRD) has been requested to examine its feasibility.
5. Setting up a Meta University, as a redefinition of the university model in the 21st century by leveraging India's National Knowledge Network to enable multidisciplinary learning and collaborative knowledge creation.

6. Setting up 20 Design Innovation Centres co-located in Institutes of National Importance. Co-location in campuses of national repute like Indian Institutes of Technology (IITs)/National Institutes of Technology (NITs) will help leveraging of academic and industry resources and give a boost to design capacity in the country. Also, setting up an Open Design School; creating an institute for facilitating training of trainers in design and introducing design thinking at the school level.
7. Identifying and facilitating the development of 20 University Innovation Clusters across the country where innovation would be seeded through CICs, as mentioned earlier. The CIC will provide a platform for the university and its partners to forge linkages between various stakeholders from industry and academia, initiate and assist innovation activities, encourage innovations in curricula and act as a catalyst and facilitator. It will also work closely with other industry clusters in its region. As mentioned earlier, initial pilot with University of Delhi and Maharaja Sayajirao University in Baroda have commenced and have received overwhelming response from the student community.

9.15. The Ministry of Human Resource Development has green-lighted the proposals relating to the award of 1,000 Innovation Fellowships at the school level (Classes 9–12); introducing the Mapping of Local History, Local Ecology and Local Culture and Heritage by all high schools and setting up the first Meta University of the world for multi-disciplinary learning and collaborative learning. MHRD has also incorporated steps on re-positioning DIETS in the country in the new Guidelines for the Centrally Sponsored Scheme on Teacher's Training. MHRD is also working on a concept note on design education in consultation with the Council and Planning Commission.

### Connecting India for Innovation: Rural Broadband and Applications

9.16. Government approved the proposal to connect all panchayats through optic fibre and the rural broadband plan on 25 October 2011. NInC is

currently working on applications for rural broadband in collaboration with Ministries of Rural Development, Panchayati Raj, HRD, Health and the Prime Minister's National Council on Skill Development so that even as hardware connectivity is under progress, applications also get addressed. The vision is to transform governance, service delivery in areas such as health, education and agriculture, and unleash local innovation capacity through rural broadband.

### Platform for Best Practices and Innovations

9.17. Currently, there are many enterprises across the country which are delivering benefits to citizens and meeting challenges of inclusion in areas such as health, education energy, low-cost housing and sanitation, through innovative solutions. It is often said that India is a country with many successful experiments that do not achieve scale. Scaling up the impact of such innovations requires that such ideas be spread around rapidly so that others could emulate them. And it also requires that larger business organisations and venture funds become aware of them and support them. We have instances of documentation of these practices in the form of the Honey Bee Network, but no virtual platform exists for the same. Therefore, the strengthening of the innovation ecosystem requires a platform for information sharing and dissemination. While some knowledge portals for innovations in specific areas already exist, the NInC has developed the India Innovation Portal to enable easy access to these as well as to become a wider information repository on innovation and a platform for collaboration as well. ([www.innovation.gov.in](http://www.innovation.gov.in))

### Developing Institutional Framework for Innovation

9.18. An extensive innovation ecosystem requires many lateral connections, often at local levels, between producers, sellers and financiers, and the facilitating government machinery. Sweden has a region-wise process of participation of citizens and enterprises in formulating the innovation agenda. In a much larger and more diverse country, as India is, development of the innovation ecosystem must be even more widely devolved.

9.19. To create a cross-cutting system to boost innovation performance in the country, NInC is facilitating the setting up of State Innovation Councils in each State. These Councils would enlist non-government expertise and are expected to drive the innovation agenda in the States. Using the broad templates suggested by NIC, they will develop interventions to suit their State's specific needs. In this way, the national innovation agenda will combine with other thrusts for improvement of governance and service delivery described elsewhere in the Plan to introduce more flexibility and innovation in centrally sponsored schemes and, thus, improve the efficiency and inclusiveness of the growth process. Currently, 22 States have constituted State Innovation Councils.

9.20. NInC is also encouraging the setting up of Sectoral Innovation Councils aligned to Union Government Ministries to promote innovation ecosystems across sectors and domains. Currently, 24 Ministries have set up Sectoral Innovation Councils.

### Challenge Funds for Innovation

9.21. To induce a culture of innovation in the country, there is a need to offer encouragement through awards and challenges which mobilise people to engage and respond creatively and bring focus on neglected societal challenges. Internationally, examples range from the X Prize to the DARPA Grand Challenges and the World Bank's Development Marketplace. The NInC is also seeking to set challenges for the Indian imagination to incentivise the citizens to come up with solutions, especially those that relate to inclusive innovation. NInC has already announced awards for its challenge to improve work tools, innovate on products and processes that reduce drudgery of the working-class population.

### Partnering for Innovation: Collaboration and Networks

9.22. In an increasingly global world, partnerships and knowledge sharing are critical and can lead to mutual growth and development. NInC is also focused on facilitating and leveraging platforms for international collaboration for driving innovation and multidisciplinary research. To exchange ideas on

fostering international collaborations for innovation, NInC hosted a Global Roundtable on Innovation on 14th–15th November 2011 in New Delhi where heads of innovation policy from 15 governments across the world came together to share cross-country experiences and best practices. This was followed by a Second Global Roundtable on Innovation in 2012 where several collaborative initiatives were outlined.

### Bringing Innovation into Science Museums

9.23. Science Museums and Centres in the country can be an important resource for nurturing creativity and encouraging a spirit of innovation in the country, but their potential remains underutilised. The NInC is partnering with the National Council of Science Museums (NCSM), National Museum of Natural History (NMNH) and others to enhance the impact of existing Science Centres in the country and use them as channels for innovation outreach. NInC will aim to invigorate the existing Science Centres in the country through more interactive exhibits, while leveraging locally available resources to showcase science in a hands-on manner. It will also use the Science Centres for showcasing innovations on a regular basis and improving outreach.

9.24. NIC is currently working on seven pilots of Innovation Spaces at Science Centres/Museums in Ahmedabad, Bangalore, Delhi, Kolkata, Mumbai, Sawai Madhopur and one in the North-East.

9.25. Apart from these initiatives, NInC is also working on several other ideas such as announcing 10 Grand Challenge Awards to leverage public imagination for innovative solutions in critical areas. It is also looking at promotion of projects that create an innovation dividend like the setting up a Knowledge City in Kerala. NInC is also working on the 'Courts of Tomorrow' initiative to give effect to the extensive computerisation plan as laid down by the e-courts Mission Mode Project. This initiative will put the best ICT tools in the hands of judges and the registrars, to aid them in the speedy dispensation of justice. Further, NInC is also working towards creating draft policies on innovation and entrepreneurship

to institutionalise innovation thinking into policy-making for providing the requisite stimulus from the Central Government.

9.26. The efforts of NInC are just a starting point for creating an innovation ecosystem in the country. Apart from the earlier mentioned efforts on stimulating finance for innovation, driving innovation at industry clusters or institutionalising innovation by liaising with States and Central Ministries, focus also has to be on stimulating new models of enterprise where producers are also the owners so that they can not only earn incomes but also share in the wealth created by the enterprise. Organisations like Self Employed Women's Association (SEWA), and companies formed by the Chanderi weavers in Madhya Pradesh, are such examples. Such enterprises require innovations in organisational and legal forms. The Planning Commission is examining changes that would facilitate the multiplication of more such enterprises. Through such innovations, businesses that are of the people (owned by them), and businesses by the people (in which people are a principal resource in production and distribution) can cost-effectively produce products and services for people at the bottom of the pyramid.

9.27. Creating a robust innovation ecosystem will also require focus on Intellectual Property Rights (IPR) issues. Management of IPR has become extremely important in the new knowledge economy with global competition. Adequate rights on the intellectual property produced by an innovator enable innovators to recoup their investments and make profits: thus IPR spurs innovation. Good national IPR systems also enable knowledge of technological advances to be accessible through the patent system to others who can build on them. To obtain both these benefits, India must improve its management of IPR. The administrative machinery for IPR management must be considerably strengthened and professionalised and Department of Industrial Policy and Promotion (DIPP) has taken up this task.

9.28. Holders of IPR have incentives to strengthen and extend their monopolies. However, monopolies

can restrain competition and further innovation, and thus tend to increase costs for customers. This is the fear even in the West, with respect to pharmaceuticals, for example. The concept of monopolising knowledge, albeit for a limited period, that underlies prevalent models of IPR can have perverse effects when it is extended to areas of traditional knowledge, preventing poorer people from continuing to use their own knowledge without payments to those who have 'patented' it under IPR. Also new models of collaborative innovation are emerging, such as OSDD, mentioned before. Concepts of IPR will have to be developed to suit such new models of innovation in which, incidentally, India has great stakes because of their potential to produce 'frugal' innovations for inclusive growth. Therefore, as India aims to become amongst the global leaders in innovation, it will also have to be amongst the leaders in efficient management of IPR and innovations in IPR concepts and policies.

### Technology Innovations in the Government

9.29. Apart from the effort of the NInC to strengthen innovation and provide a policy direction for fostering innovation within the system, there are also several innovative efforts underway within the government structures that aim to improve processes and service delivery, enhance collaboration and generate greater transparency and accountability.

9.30. The *Aadhaar* or Unique Identity Programme is the first 'online' identity system anywhere in the world wherein resident's identity can be authenticated 'in real-time', even on a mobile network, anywhere in India. This programme will create a foundation for more transparent and efficient public service delivery and is internationally considered as a game-changing approach to inclusion. By providing a clear proof of identity, *Aadhaar* will empower India's poorer citizens in accessing services such as the formal banking system and give them the opportunity to easily avail various other services provided by the government and the private sector. It seeks to cover 60 crore residents in India by 2014 and eventually cover the entire country. Twenty crore residents have been enrolled into the system as on March 2012.

9.31. Going forward, the *Aadhaar*-enabled bank account and payment infrastructure will enable e-payments to the beneficiaries' bank accounts for government's social welfare schemes such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and mitigate delays and losses. For trying out the *Aadhaar*-enabled payments for various government schemes, a list of 50 districts in the country for initiation of the programme has been proposed to the Ministry of Finance. The government is also looking at using the *Aadhaar* platform for PDS and achieving substantial economies in subsidy outgo in areas such as Fertiliser, Liquefied Petroleum Gas (LPG) and Kerosene by enabling direct transfer of subsidies. Pilot projects on the above are currently ongoing. Collectively, this will have a transformational impact on the delivery of public services in the country.

9.32. Government is also leveraging ICT to reduce pendency in the legal system, encourage a move towards e-governance, e-procurement, e-tendering and e-office. It is also undertaking an ambitious initiative to connect 2,50,000 panchayats with fiber-based broadband to improve governance and service delivery at the last mile. A national geographic information system (NGIS) organisation is also being thought of to map information, assets and data accurately, which will assist in policy and works planning and improve delivery of services in urban and rural areas.

9.33. The National Knowledge Network (NKN) of the Government of India which is a high-speed multi-gigabit network is not only connecting educational and research institutes in the country, but is getting connected to global research networks to enable real-time collaboration and research. The NKN is allowing students and researchers to move towards a new paradigm of education and research based on a virtual platform that breaks silos of geography and boundaries.

9.34. Other innovations are in the management of performance of government Ministries. The government has initiated a performance management system which requires every ministry and department to undertake a stakeholder consultation to assess the

gaps between its stakeholders' expectations and its actual delivery. Ministries must develop innovative strategies to bridge these gaps, and must accordingly specify the measures of its performance by which it should be judged. After initial trial runs and adjustments in its design, this system, generally called the Results Framework Document (RFD), is now adopted by almost all Ministries at the Centre. Some State Governments such as Kerala and Himachal Pradesh have also begun to adopt this approach.

9.35. There are also other complementary actions by multiple agencies of the government to facilitate innovation in the public systems. For instance, on the initiative of the Office of the Prime Minister, the Cabinet Secretariat issued orders to have the agenda of innovation embedded in all proposals to the Cabinet where action on innovation is reported specifically in each proposal to the Cabinet. The 13th Finance Commission which predated NInC provided for ₹1 crore (₹10 million) for each of the over 600 districts as a District Innovation Fund in the country to promote innovation. Further, on the suggestion of the 13th Finance Commission, a new institution to create a 'climate and nurture a culture of accelerating and diffusing innovation in public systems' has been set up in the Administrative Staff College of India (ASCI) in Hyderabad called the Centre for Innovations in Public Services. Also, as mentioned above, an initiative of the CSIR, the portal for OSDD, has been created as a platform for global partnership to provide affordable health care to poorer people afflicted by diseases.

9.36. Apart from the above, the Department of Science & Technology has launched an INSPIRE programme to identify and reward young talent in science, and it covers students from high schools, Bachelor of Science and Master of Science levels. Finally, to encourage local responses to local problems and encourage local problem solving, flexi-funds have become an integral part of major flagship programmes like Sarva Shiksha Abhiyan (Elementary Education) and the National Rural Health Mission (Basic Health). The National Rural Employment Guarantee Act (NREGA), the largest flagship programme, promotes local innovation by



providing for comprehensive planning with funds directly given to panchayats.

9.37. *To summarise*, innovation can play a very important role in the development discourse, because it can offer a new approach to a system that is currently over-burdened by the multiple demands and has limited resources at its disposal. Enhanced focus

on innovation can have an impact much beyond the realm of S&T in diverse areas such as health and education delivery, governance, enterprise development and much more. Collectively, this can herald a generational change in the country and can lay out a chart for a more sustainable and inclusive growth paradigm.

# 10

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## Governance

10.1. Good governance is increasingly viewed as an essential element of any well-functioning society. It ensures effective use of resources and deliverance of services to citizens and also provides social legitimacy to the system. Rising income levels in a democracy also bring with them rising expectations and a demand for good governance, both at the level of the Centre and the States, and also lower down in the third tier of government.

10.2. Good governance is critical to translating Plan outlays into significant outcomes on the ground. It is critical because without good governance, resources that are allocated are not efficiently utilised; management of public service delivery is sub-optimal; efficiency of public expenditure is affected; and finally, it impacts the effective management of natural resources which are sovereign wealth under sovereign ownership.

10.3. The problem of governance that has to be tackled surfaces in three different ways. The first relates to systemic improvements, which increase the effectiveness of government plan expenditure on new programmes. The second relates to improvements in customer satisfaction on the delivery of services by government agencies. The third relates to the perception of corruption and what we can do to tackle it.

### IMPROVING THE EFFECTIVENESS OF PLAN PROGRAMMES

10.4. The pace of public expenditure in the last few years has increased dramatically and a large part of this expenditure is aimed at promoting the welfare of

the weaker and more vulnerable sections of the population. Nearly ₹7 lakh crore have been spent on the 15 major Flagship programmes during the Eleventh Plan period. This sharp rate of increase is unprecedented. A number of legislative steps have also been taken at securing rights to the people, like the Right to Information Act, the Mahatma Gandhi National Rural Employment Guarantee Act, the Forest Rights and the Right to Education Act. Nevertheless, questions remain on whether these programmes which involve a large volume of resources are actually delivering benefits as expected. In other words, the funds are in place, the rights constitutionally guaranteed, and many achievements have also been recorded but much more work needs to be done to translate the immense promise of these initiatives into reality.

10.5. There is a need for an in-depth review of administrative processes at various levels to ensure expeditious decisions that can advance development priorities of the nation. The administrative system must promote and encourage decision making without delay to promote efficiencies in governance, and to prevent cost overrun where major development projects are concerned. An essential requirement for this is to ensure that the administrative system and ethos protects civil servants, who act *bona fide*, and in good faith.

10.6. A key lacuna is that implementation continues to be in a business-as-usual mode, while these new programmes demand a new architecture based on innovative breaks with the past in significant respects. A number of changes are being

instituted in the architecture of implementation of Plan programmes in the Twelfth Plan to overcome the universalization without quality ('U without Q') syndrome.

### Strengthening Local Institutions

10.7. A key diagnostic conclusion regarding the relative lack of success of Plan programmes is that these are designed in a top down manner and do not effectively articulate the needs and aspirations of the local people, especially the most vulnerable. With the 73rd Constitutional Amendment, several functions were transferred to Panchayati Raj Institutions (PRIs). Since 2004, there has also been massive transfer of funds, especially after the enactment of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). But institutionally, the PRIs remain weak and they do not have the capacity to plan or implement programmes effectively. Many studies show that the impressive figures on the formation of self-help groups (SHG) under Swarnjayanti Gram Swarajgar Yojana (SGSY) hide a lot of poor quality work. The potential power of the National Rural Livelihoods Mission (NRLM) lies in the economies of scale created by SHG Federations (comprising 150–200 SHGs each). This is evident, for example, in bulk purchase of inputs (seeds, fertilisers and so on) and marketing of outputs (crops, vegetables, milk, NTFPs and so on). They can also provide larger loans for housing and health facilities to their members by tying up with large service or loan providers. A variety of insurance services can be made available through this route, including life, health, livestock and weather insurance. It has also been shown how doing business with SHG Federations can help public sector bank branches in remote rural areas becoming viable entities. However, for all this to happen, consistent efforts are needed to strengthen these institutions. Watershed Committees and Water Users Associations need strengthening, as do the Forest Protection Committees. When these local institutions are stronger, the sustained impact of Plan programmes can be ensured with careful maintenance and upkeep of the assets created with their active involvement. These institutions also strengthen the fabric of Indian democracy at the grass-roots. Only strong PRIs can ensure effective implementation of Panchayats (Extension to the Scheduled Areas)

Act 1996 (PESA) and Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act.

10.8. The Twelfth Plan, therefore, proposes a complete break from the past and provides sizeable resources to the Ministry of Panchayati Raj. From an Eleventh Plan allocation of ₹636 crore to a Twelfth Plan outlay of ₹6,437 crore, the increase from the second year of the Twelfth Plan, the first year being devoted to strengthening the capacities of the States and the Ministry to absorb these additional funds will be deployed for the Rajiv Gandhi Panchayat Sashaktikaran Abhiyan meant for strengthening human resource and systems capacities of PRIs.

### Social Mobilisation

10.9. The experience with Plan programmes has clearly established the central role of a socially mobilised and aware community as a decisive determinant of success. However, it is also clear that romanticizing community action and presuming that this will happen automatically, is to perpetuate a myth that actually hurts the poor. Local communities, left to themselves, will not necessarily allow the poor, Dalits, Adivasis and women, to express themselves. The States that have emphasised the role played by social mobilisers and have made specific financial and human resource provisions have, invariably, succeeded. It is the participation of users in planning, implementation and social audit of these programmes has proved critical to their success. It is only when we recognise the key role of social mobilisers in raising awareness and engendering active participation of local people, especially women, that the true potential of demand-driven and bottom-up programmes such as MGNREGA, TSC and NRLM are effectively realised.

10.10. In this background, specific provisions are being made during the Twelfth Plan in each flagship programme for dedicated time and human and financial resources for social mobilisation, awareness generation and social audit. The new Operational Guidelines for MGNREGA, for example, provide that those blocks of the country where either scheduled castes plus scheduled tribes form  $\geq 30$  per cent of the population or the annual MGNREGA

expenditure was more than ₹12 crore in any year since the programme started, will mandatorily have at least three Cluster Facilitation Teams (CFT). Each CFT will service a cluster of Gram Panchayats (CGP), being accountable to each GP within their Cluster. Each CGP will cover around 15,000 job cards or an area of about 15,000 ha, broadly corresponding to the boundaries of a mini-watershed and local aquifer. The CFT will comprise a fully dedicated, three-member professional support team for MGNREGA. The CFT will be a multidisciplinary team led by an Assistant Programme Officer and will comprise specialists in earthen engineering, community mobilization, hydrogeology, agriculture/allied livelihoods.

**10.11.** Civil Society has a crucial role to play in social mobilisation and capacity building to help PRIs to take up the tasks assigned to them. Government must strongly encourage partnerships with civil society including not only NGOs but also academic institutions, local colleges and universities. Students and teachers play a significant role in supporting development programmes by providing vital inputs that are scarce, particularly in the remote areas. The precise institutional arrangements within which these are embodied could vary, depending on the requirement and context but these spaces do need to be mandated. For instance, they could, as considered appropriate, be either in-sourcing or out-sourcing types of relationships, so that the synergy of state and civil society can truly be harnessed. Both types of relationships have already been tried out with great success as, for example, the network of volunteers mobilised under the National Service Scheme (NSS). These examples must be built upon and taken to scale.

**10.12.** The Twelfth Plan proposes setting up of a dedicated institution meant to foster state-civil society partnerships. The Bharat Rural Livelihoods Foundation (BRLF) is proposed to be set up to foster and facilitate civil society action in partnership with government for transforming the livelihoods and lives of people in areas such as the Central Indian Adivasi belt. Initial BRLF support will be provided to civil society partners as ‘trigger funding’, that is, to

develop proposals that reflect this partnership with State Governments/PRIs/banks. BRLF will assist its civil society partners in ensuring that the design of their proposals incorporates a collaborative mode of functioning with governments/PRIs/banks. The aim is to support grassroots level action towards empowerment of people, particularly the Adivasis and scaling up of approaches that are innovative both in terms of programme content and strategy. Innovation can be in many directions—technology, social mobilisation approaches, local institution building, architecture of partnerships, management techniques and so on. Each project supported by BRLF will attempt to leverage the vast resources being made available by both banks and government for a large number of programmes, such as MGNREGA, NRLM, IWMP, BRGF, IAP, RKVY, RADP, NHM, IAY, NRDWP, TSC and so on. The aim is to provide support through the BRLF to projects that largely seek to leverage government programmes and funding already available on the ground.

**10.13.** Beginning with an initial amount of ₹200 crore, the Government of India (GOI) will provide a Corpus of ₹500 crore in three tranches over the next three years to BRLF, against achievement of well-defined milestones. Funds would also be sourced from concerned State Governments and philanthropic foundations in India and abroad as also high net worth individuals and the Indian diaspora.

### Voluntary Sector

**10.14.** To strengthen governance at the panchayat, block, district, State and Central levels with special focus at the critical level of the district planning board, it is essential to build mechanisms that institutionalise consultative planning to enable greater representation of the stakeholders. One way of achieving the same is through institutionalised consultations with the voluntary sector. The Voluntary Sector can help build a self-reliant, motivated and harmonious social order by enabling people and people’s groups to access democratic processes and entitlements that lead to empowerment. It can also present a critique of public functioning and provide alternatives. Its inherent objective being to ensure enhanced participation of people and articulation of agreement or dissent

against use of excessive power by State and failure of the market institutions to reach the poor. The Voluntary Sector thus contributes to:

1. strengthening democracy and governance through improved participatory representation. awareness of rights and capacity building of local institutions;
2. advancing rural and urban development through grass-roots-level innovation and human resource and talent management;
3. transforming inter-personal, familial and community spaces through awareness generation and sensitisation;
4. providing platforms for dialogue and dissent for appreciation of and respect for differences in opinions and affiliations; and
5. promoting art, culture, environment protection and other forms of public enquiry; alternatively, it may be said that the sector should cover the spaces of social defence, social security, social service and social change.

10.15. The Twelfth Plan should institutionalise the Joint Consultative Groups/Forums/Joint Machineries recommended by the National Policy on the Voluntary Sector in all forms of planning, right from the grass-roots levels up to the level of Central Government Ministries. Within the Joint Consultative Groups/Forums/Joint Machineries structure, members of civil society, including the voluntary sector would be made partners in the debates that precede designing and development of policies/schemes/programmes, and also be involved in mid-course corrective measures to create a window for improvements as well as incorporation of regional/cultural specificities. Further, mechanisms would be set up to identify and up-scale innovations that have made visible changes in the lives of beneficiary communities. Experiments in health, women's empowerment and watershed management have yielded particularly impressive returns. This approach should now be extended to other domains of governance.

10.16. States would be encouraged to formulate state voluntary sector policies on the lines of the

national policy on the voluntary sector to enable and empower an independent, creative and effective voluntary sector in each state, which can contribute to the social, cultural and economic advancement of its people.

#### *Financing the Sector*

10.17. In keeping with the letter and spirit of the National Policy on the Voluntary Sector, there is a need to facilitate funding to voluntary organisations in order to enable them to mobilise people as agents of social transformation.

#### *Strengthening Data Collection and Management Systems*

10.18. With increase of voluntary organisations in India, there is an urgent need to identify and list organisations based on their registration, expertise, size, activities and so on. A national data bank that lists VOs on the basis of the registration (trust/society/non-profit company), thematic area of expertise (women's empowerment/health/environment and so on) and nature of work (research/implementation/evaluation/designing and so on) would be developed to make the present system of engagement more rewarding and efficient.

#### *Accreditation and Certification*

10.19. Accreditation and certification of voluntary agencies to enhance their credibility, transparency and accountability, and also ensure their capability in performing certain activities will help improve standards. A system that is acceptable to all VOs and other stakeholders would be set up to bring in certain minimum standards for the VOs. A national accreditation authority and its mechanisms would be designed.

#### *Partnership between Public, Private and Voluntary Sectors*

10.20. While expected roles of the Voluntary, Public and Private Sectors are well understood, each has contributed to the domain of the other. Many evolved, multinational Indian companies are increasingly participating in allocating both financial and human resources support to VOs over and above self-managed initiatives of Corporate Social Responsibility (CSR).

CSR initiatives and Corporate-VO Partnerships should also include affirmative action to ensure equity, reduce ethnic and social conflicts and make public/private spaces more sensitive to diversity and social justice. There is also a need to create a cadre of professionals who can deal with governance issues within the voluntary sector. Capacity building of people involved in voluntary action is necessary to improve governance at all levels.

### Restructuring of Centrally Sponsored Schemes

10.21. Over a period of several Plans, the number of Centrally Sponsored Schemes (CSSs) has been growing. Large funds are being transferred to States under these Schemes. In view of the large diversity of physical and economic infrastructure in the States, their potential for development and investment requirements, the Schemes need to provide greater flexibility in their design. The Planning Commission had appointed a Committee under Shri B.K. Chaturvedi, Member, Planning Commission to suggest measures and identify changes required in the restructuring of the CSSs. The Committee has suggested:

1. The number of CSS should be limited and only those schemes which are required as a part of the convergence process as a broader scheme have large outlays so as to make impact across the states to be implemented, the rest to be weeded out and to be converged with other schemes.
2. The existing CSS should be categorised into Flagship schemes that have large outlays and address major national issues; major sub-sectoral schemes to address developmental problems of major sectors like agriculture, education and health and Sector-umbrella schemes which deal with the range of problems of concerned sector.
3. Distribution of CSS funds among States should be based on transparent notified guidelines which should be put on the website of the concerned Ministries. The State may be incentivised to provide larger outlay in certain sectors like health, education, skill development and rural infrastructure. The incentives could be by provisions of additional funds based on the

State's own efforts to increase outlays for the sector.

4. The physical and financial norms for the Schemes may be varied depending on the requirement of the State. A mechanism for developing flexibility in such norms as against the normal CSS prescription has been suggested. This should take care of large variation often requested by North East States or States like Kerala, Rajasthan, Uttarakhand and Himachal Pradesh which have special needs.
5. All CSS must have 20 per cent flexi funds (10 per cent for Flagship schemes). These should be utilised by the States to prepare schemes which are especially suited for the requirement of that State.
6. Each flagship programme will provide a flexible pool of financial resources to be used to facilitate and incentivise innovative practices that blaze a trail for others to follow during the Twelfth Plan period.
7. There should be a concurrent monitoring and evaluation of the CSS. This should be done by independent monitors and put on the website of the concerned Ministry and the Planning Commission. This assessment could be done by professional institutions, visit of experts to major project-implementing States or assessment by individual experts by visits to the field.

10.22. The Twelfth Plan will restructure the CSSs and provide flexibility in the light of the recommendations of the BKC Committee.

### Convergence

10.23. A key deficiency of Plan programmes is that they continue to function within the confines of departmental silos without requisite convergence and with a high degree of duplication of effort. The Twelfth Plan visualises a convergence of implementation across programmes to pool financial and physical resources across sectors to attain synergy to benefit the target group. For example, rural drinking water and sanitation programmes should be converged so that the two objectives are attained in a mutually consistent manner. Similarly, it is proposed that under the JNNURM, every water supply

project will necessarily also be a sewage treatment project and green buildings will require linkages with the energy sector. Creating common sanctioning authorities within districts for the IWMP and RKVY programmes so that the IWMP has a livelihoods focus and the RKVY based on watershed principles is another step in this direction. Similarly convergence is required between Women and Child Development programmes, Public Health and Drinking Water; nutrition, mid day meals (MDMs) and physical education in schools; and skill development programmes that will call for backward linkages with school programmes and forward linkages with industry and other service sectors who will be potential employers of skilled manpower.

#### *Effective Design and Implementation*

10.24. While formulating schemes, it is important to ensure that they are well-designed for the objective at hand and also that the guidelines and procedures help in effective implementation. Some of the areas which will need focus in ensuring good architecture of the schemes will be:

1. While preparing the schemes, the central ministries role would be to act as a knowledge partner and enabler to the project implementation, which will be typically in the states. For this ministries will prepare capabilities in preparing for scheme design and creation of learning systems and networks from which the states and local implementers can learn.
2. These schemes would have specific strategic outcomes. For example, it could result in improved number of patents, employment generation, providing learning support to the disabled or improved energy efficiency.
3. While, capabilities are prepared in the ministries, time should be devoted to preparation of good scheme, as mentioned earlier. The Ministry would use funds to design schemes which might require higher consultation experts/expertise or reaching out to numerous stake holders. There has been so far very little investment made in this area. Often, not enough time and energy is devoted to this. The schemes after a proposed

design have a good chance of delivering the desired outcomes.

4. The consultation with the stakeholders is one of the key requirements for ensuing that the architecture of these schemes meet the objectives. Often, the consultation process is not mandatory. The schemes which may require formulation of laws or guidelines would need to have extensive consultative machinery. Resources would need to be provided to improve the quality of consultations.
5. The architecture of this scheme must have evaluation and feedback mechanisms. It is important to evaluate the schemes against the strategic outcomes to ensure effective use of money being spent. Not enough attention is devoted to this aspect. Often this is left to the audit function. It is not a good use of public money and resources. An effective evaluation can lead to improved versions of these schemes, leading to better outcomes and more efficient use of public resources.

10.25. Some of the areas which will need to be kept in mind for effective implementation are:

1. Developing flexibility and its effective use during the implementation of these schemes for improving their outcomes would need collective action. It is important to have learning and feedback mechanisms in place to ensure that implementation effectiveness improves. This would help in diagnosis of issues during implementation and rectifying problems identified, using flexibility components of the scheme.
2. It is important to prioritise, sequence and create momentum through results. Often it takes time for results of policy recommendation to become visible. To ensure that the implementation process does not lose momentum, it is important to have some early wins. These would help build confidence and commitment to the policy.
3. Public programmes must have clear outcomes. It is imperative that time is spent upfront to find outcomes in consultation with stakeholders. Failure to do this causes the system to adopt simplistic measures of performance against the targets.

*Capacity Building for Implementation*

10.26. The Twelfth Plan must address capacity building at the local level as a key instrument for improving outcomes. Some of the specific measures required are:

1. While, functions have been devolved to PRIs/ULBs, there has not been a commensurable devolution of functionaries and funds or effort to build human capacity at the lower level. Unless PRIs/ULBs get good quality personnel, they cannot perform the functions devolved upon them. A pooled fund across programmes should be created from which resources could be drawn for capacity building. Given the considerable overlap in both the people to be trained and the issues their capacities need to be built for across programmes.
2. Government institutions charged with capacity building have, by and large, under-performed and are in urgent need of reform. They need to be thoroughly professionalised and also need to develop powerful partnerships with carefully selected civil society organisations which have a commendable track-record in this sphere. A number of institutes of the government, which have otherwise limited staff can be upgraded by entering into public-private partnership (PPP) and thus, strengthen the excellence of the faculty as well as, the quality of training imparted. This will improve the capacity building capability across the States.
3. To meet shortage of personnel in the short to medium term, recruitment from the private sector and hiring of external consultants through a fast track process needs to be enabled by an appropriate hiring policy. A list of empanelled professional institutions to streamline the recruitment process and enable PRIs/ULBs to access external talent in a timely manner.

10.27. Keeping the needs of the capacity building both for ULBs/PRIs, the Twelfth Plan would make adequate provisions in each Plan programme that would serve the requirements of capacity building at the cutting-edge level of implementation.

10.28. The Eleventh Plan period has seen many examples of the use of modern technology to improve transparency, access and efficiency of Plan programmes. The transfer of funds in an unmediated and timely manner to the target beneficiaries has seen great improvement. However, the spread of such good practices remains uneven across States. The Twelfth Plan will see the roll-out of the unique identification (UID) platform across the country that will enable efficient and expeditious transfer for funds to ultimate beneficiaries without leakage.

*Independent Evaluation Office*

10.29. Government programmes can benefit enormously from independent evaluation. At present concurrent evaluation is done by the Ministry concerned on a on-going parallel process. Expert evaluation of programmes that have been in operation is done by the Programme Evaluation Organisation (PEO) of the Planning Commission. This evaluation function is being strengthened by setting up an Independent Evaluation Office (IEO), under the aegis of Planning Commission. The new IEO would be an important instrument in evaluating some of these programmes and could come up with recommendations which would highlight need for reforms and programmes which were successful.

*IMPROVING PUBLIC SERVICE DELIVERY*

10.30. A number of services are today provided by the State Governments and Central Ministries. These include ration cards, caste certificates, income certificates, certificates for proof of residence, passports and similar other services. It is important that these are available within a prescribed time line. Failures and deficiencies in delivery of public services lead to dissatisfaction and public anger against the government.

10.31. A number of States have taken the initiative to notify services and time-limits within which these are to be available to the citizens. Simultaneously, necessary simplified procedures should be put in place within the government to enable these services to be available. Failure to deliver the service must result in swift punitive action. The legislations which have been passed by Bihar, Madhya Pradesh, Delhi



and number of other States are excellent examples of efforts to provide public services expeditiously.

**10.32.** An important aid to delivery of services can be the use of e-governance and technology. A number of areas had been taken up in the Eleventh Plan for e-governance. These included reforms in the Ministry of Corporate Affairs and 27 areas for introduction of e-technology and reforms. The experience in the Railways earlier for reservation, and in refund of customs duty by the Department of Customs have been very positive. By the end of Eleventh Plan, 60,000 common service centres are in place to provide delivery of public services across the country. It is also planned now to expand the optical fibre network and expand broadband connectivity to each panchayat levels. This would help in providing all services which are available at the panchayat level through e-mode to the citizens.

**10.33.** Another area which has been thrown open for use of technology is development of unique ID numbers with biometrics to establish proof of identity. The expansion of UID in the Twelfth Plan, along with the National population register should result in a UID Number by the end of Twelfth Plan to every resident. This would help in providing services to various users and results in controlling fake cards and thereby bring enormous savings. The financial inclusion services are also feasible by using UID and the telecom services. It is also possible to use technology for expanding banking correspondence and thereby expand the extent of banking services. The use of technology in delivery of public services will need to be expanded rapidly to reduce delays and discretion used to the advantage of the citizen.

### Dissemination of Information

**10.34.** Government needs to communicate more effectively with the citizens. Citizens are not aware of many schemes set up by central and state governments for their benefit. Stakeholders, who will be affected by new government policies, realise only after the policies are announced, that they have great concerns whereas government departments claim that the policies were posted on their websites

and views had been invited. Further, dissemination of information on existing policies, on availability of documents, written communications in the electronic media as well as newspapers can help citizens avail of benefits of governments schemes. Governance can be much more interactive if extensive use is made of all channels of communication including print and electronic media, social media, electronic boards in public places, written materials, website, an internet and other methods that have a wide reach and are able to convey messaging directly and swiftly.

**10.35.** Government must become much more effective in communicating with the public. Citizens are not aware of many schemes set up by Central and State Governments for their benefit. Stakeholders, who will be affected by new government policies, realise only after the policies are announced, that they have great concerns whereas Government Departments claim that the policies were posted on their websites and views had been invited. Moreover, with the ubiquity of electronic communications, including 24 × 7 TV news and the advent of social media, government's communication processes must be modernised, become more proactive, and reach out to citizens more effectively.

### Combating Corruption

**10.36.** The third major area of concern in achieving good governance is the elimination of corruption. Corruption is a problem which arises in all countries, developed or developing, and it is self evident that corruption is not only morally objectionable, but also that it leads to serious economic distortions. No country can afford to ignore the problem of corruption and all must find ways of combating it. Governance reform aims at improving the working efficiency of government departments, providing mechanisms to ensure efficient delivery of public services, transparency and accountability of public officials, and an efficient civil service. Public service delivery is the window through which government is viewed, and deficient tardy and defective delivery breeds corruption.

**10.37.** The concern with corruption is inevitably greater in a democracy committed to open government and transparency, and it is not surprising that concern about the extent of corruption in our society has increased. The indices of corruption produced by the World Bank and the Transparency International do not support the view that corruption has increased. According to both these indices the corruption level in the last decade has been high, but has remained almost at the same level. The fact that perception of corruption has increased is a different issue and reflects the consequence of greater transparency and awareness. The point that is indisputable is that whatever be the indices, strong measures need to be taken to combat corruption.

**10.38.** The best way to prevent corruption is to have procedures, which provide minimum scope for such malpractices. This would require large use of e-governance and other technologies. It will also simultaneously need an extensive review of procedures so that the rules are simple, and do not provide scope for interpretations. Simultaneously, if the delivery of a public service is through an e-mode and automaticity is brought in decision-taking based on facts furnished, the scope for illegal gratification reduces substantially. During the Plan, it is proposed to further expand e-governance. Already a scheme for expanding connectivity up to the village panchayat level is being implemented. Earlier, common service centres had been opened to provide e-services. These efforts will have to continue.

**10.39.** The other aspect of corruption is development of transparent procedures in award of government contracts, government procurement and award of licences for permitting various activities including mining or the use of other natural resources. It is important that the use of e-tendering, mandatory posting of all major procurements on the websites and other transparent procedures are adopted for all major procurements. Similarly, in awarding of contracts, transparency in selection of contractors and the bids is must. This can be strengthened by using e-technology more extensively. In award of natural resources to private players, while transparency is a

must, public policy must simultaneously ensure the pricing policies do not lead to exorbitant rise in the price of services which benefit the ordinary consumers. It has to be appreciated that communication, power and water are today basic necessities for all citizens. The allocation award procedures for these natural resources must keep these factors in mind.

**10.40.** The economic reforms successfully eliminated discretionary decision making in areas such as industrial licences and import licences. With the lowering of tariffs and abolition of license and permits, the transaction costs went down dramatically and this led to an enormous reduction in corruption. With the growth of the economy at a rapid rate, new areas have emerged. It is important that the corruption is controlled by ensuring that services, which are to be given by the government are also available from a number of other competing suppliers.

**10.41.** While steps to reduce the likelihood of corruption are extremely important, it is necessary to put in place a system that will investigate allegations of corruption and also punish the guilty expeditiously. The existing methods of enquiry have often been long drawn and delays in the delivery of justice only encourage corruption further. Special courts may need to be set up to expeditiously try such cases. The government has also recently introduced a legislation to create Lokpal as an institution to enquire into corruption at higher levels.

### **Civil Services' Reforms**

**10.42.** The Civil Services over a period of years have acquired a very large role covering both development and regulatory functions. Reforms are necessary to enable them to perform these roles better. There has also been recent criticism of the civil service for its inability to deliver public services satisfactorily. The Second Administrative Reforms Commission (ARC) in its Report has given a number of recommendations. While these need to be implemented, three specific areas need special focus. First, the service should be young and the recruitment should, therefore, take place around 21 years of age. Second, the training for enabling the services to handle the vast variety

of economic and management problems should be extensive and done periodically. Third, the officers must have long tenures to enable them to understand the intricacies of an assignment and make effective contribution. Unfortunately, over a period of years, the services that were expected to perform their responsibilities in a very unbiased manner, have often failed to do so. These values of uprightness, integrity and fairness need to be strengthened both in the Civil Services and by the political executive, respecting and supporting these values.

10.43. The Second Administrative Reforms Commission has made several important recommendations that have expressed need for extensive measures for reforming the Civil Service. It has recommended (ARC Report on *Refurbishing of Personnel Administration—Sealing New Heights*) changes in the career structure of the administrative services that will ensure that senior postings have adequate tenure. It has also recommended an ‘up or out’ evaluation system so that only the better officers will stay in service and move to postings at the top. It has, also, provided for lateral entry from outside Government, of suitably qualified personnel for such top positions. These are important areas and need to be implemented expeditiously.

10.44. An important area of Reform is the need for developing greater accountability, improved management, effective service delivery and empowerment of the front line staff. With this objective, the ARC has in its report (organisational structure of Government of India), suggested that policymaking functions of Government and execution functions be separated and organized in appropriate structures. For ‘execution’ functions, the ‘agency’ structure has been strongly recommended. The concept of ‘agen-cification’ is to carve out of government departments, ‘executive agencies’ to carry out, specific executive functions within a framework of policy and resources. Each such agency is institutionalised in a framework document which spells out its mandate, mission and objectives, structure, accountability, standards and targets, financial arrangements and so on, and is mandated to release an annual

performance report and accounts. The agency has the freedom to mould its management style, strategy, operations, systems, workforce and so on within broad government guidelines. The advantage of the ‘agency’ structure is that it leads to clarity about outcomes. It also allows for an inculcated culture of service delivery, empowerment of frontline staff, greater accountability and openness, improved management, transparency and so on. Once this policy is adopted, it will be necessary for ministries, both in the Central and State Government to scrutinize their functions and keep only those with them which relate to policy analysis, strategy decisions and other key areas which have to be performed by them only. The executive arm can then be empowered to execute the policies effectively. Right balance between autonomy and accountability needs to be struck while designing the framework of institutional agencies.

### Accountability

10.45. It is widely accepted that government’s accountability is a primary concern that needs to be addressed on an urgent basis in India. We need to move from goals of meeting expenditure targets in government programmes to goals of meeting physical targets and, even more, towards increasing satisfaction of the range of stakeholders of government policy.

10.46. It may be useful to look at the difference between the accountability related to government and that related to private organizations. Private, profit-motivated organisations have a narrower set of stakeholders to whom they are accountable, principally their shareholders and customers of their specific products or services and their performance is directly reflected in their profits. On the other hand, governments are compelled to account to citizens at large and a much broader set of stakeholders and poor performance does not trigger internal financial penalties. In other words, private organisations are characterised by ‘intensive accountability’, that is, being answerable to a narrower set of masters in a far more focused way; governments require ‘extensive accountability’.

10.47. Because governments' accountability is broader, management of public programmes require much more attention to the definition and measurement of the accountability. In a recent reform initiative, a number of central ministries have adopted a Results Framework Document, which provides a summary of the most important results that the concerned departments and ministries expect to achieve in the year. The main purpose of this is to move the focus of the department from the current resource-allocation mode to result orientation, and to provide an objective and fair basis to evaluate the departments' or ministries' overall performance. In the first round, the RFD targets had emphasised financial and physical targets. It was observed that 'outcomes' from the citizens' and stakeholders' perspectives were generally missing. Therefore in the later round, stakeholder consultation and feedback has been built into the RFD framework. By ensuring a broad range of well-managed consultations to determine goals, 'extensive accountability' can be brought about.

10.48. While the above system of accountability under RFDs has led to some very interesting results and has been an important development for improving accountability, the physical targets often tend to be kept at a very moderate level by the concerned ministries while framing the annual plans. This defeats the very purpose of developing a document which can ensure physical progress consistent with the needs of the economy. Unless, the targets are kept at a challenging level, the document is likely to give a wrong picture of departments, and its accountability. There is a clear need to guard against this while RFDs are prepared.

10.49. Many, and often the most important outcomes that citizens and the economy need are not within the ambit of any single ministry. Collaboration is required among several departments and ministries. The roles of departments and ministries to achieve these outcomes requires a systemic analysis of the issues from which the actions required of the various departments/ministries can be determined and their goals developed. This critical "system's input" to the RFD process can be provided by the Planning Commission.

## Regulatory Structures

10.50. Regulatory authorities have been set up in several areas including power, oil and gas, airports, telecom and warehousing where public services are being provided by private players and competition is not viewed as a sufficient discipline. Regulators are also proposed in the field of water in a number of states. Although regulators have proliferated, there is no clear assessment of the functioning of individual regulators. It is also not very clear as to what extent they are answerable and accountable and to whom. Regulatory authorities without any accountability would in the long run lead to functioning of government arms not responsible to any one and, therefore, may not meet the overall objective of government policy. It is necessary that these regulatory authorities are made accountable and assessed for their performance. Necessary legislation in this regard needs to be finalised quickly.

## GETTING THINGS DONE

10.51. Research on success of countries that built effective systems for improving the quality and timelines of implementation of policies and projects in multiple sectors provides some principles for a robust implementation process.

- *Build an implementation system, don't just do the task:* Explicit attention to the process of policy development and implementation has been lacking to a large extent in the Indian context. An effective implementation system is not limited to the success of a single initiative. It builds broad-based capabilities across several industries.
- *Systemic experimentation and learning help to progressively, and rapidly improve implementation:* Even carefully designed programmes are likely to face challenges from unforeseen changes in the environment. Therefore, it is important to have learning and feedback mechanisms in place to ensure that implementation effectiveness improves through successive cycles. Good policy development (and implementation) should follow the PDCA cycle (Plan—develop strategy; Do—implement strategy; Check—diagnose issues in strategy and its implementation; Act—rectify issues identified).

- *Prioritize, sequence and create momentum through results:* Often it takes time for results of policy recommendations to become visible. When results are not visible, the implementation process may lose momentum. Therefore, to build momentum, some early wins must be targeted. They build confidence and commitment to the process.
- *Performance measures for government programmes have to be defined consultatively:* The old management adage—‘you can’t manage what you don’t measure’—is especially true with regards to complex government programmes. The need for performance measures is well accepted. However, it is also very important to define these measures appropriately. A key difference between public sector and private sector programmes is that the value required to be produced by public programmes is generally more intangible than in private programmes where shareholder value and profit may be good measures. Outcomes of public programmes must deliver against expectations of diverse public stakeholders.

Therefore, it is imperative that time is spent, up front, to define outcomes in consultation with key stakeholders. Failure to do this causes the system to adopt simplistic measures of performance against expenditure targets, which are not good indicators of the outcomes that were desired.

- *Co-ordination between government departments is critical:* Given the complexity of policy issues relating to manufacturing, most solutions are likely to require co-ordinated actions between a number of government departments. While the default solution is to create another agency/committee to oversee this co-ordination, this is not always the optimal solution. Before setting up such an agency/committee, the tasks required to be performed by such an agency/committee must be analysed and the existing system of agency/committees must be mapped to eliminate any overlaps and redundancies.

Additional agencies/committees can increase the clutter in the system rather than improve its performance. Since co-ordination is an essential function to improve system performance, co-ordination/oversight should be accountable for

performing its task and its performance must be measured too in terms of decisions taken which are then implemented.

- *Stakeholder consultations are key to improve the quality of policy development and implementation:* Rather than seeking to a priori design a detailed plan in an unpredictable environment, it is better to create effective forums to identify problems, and for joint teams to be formed to tackle them. These forums should be broad-based and inclusive to ensure that all stakeholders can contribute to the process.

### Collaboration and Implementation

10.52. Poor implementation has been the root cause for India’s poor performance in building its infrastructure and growing its manufacturing sector too. In China, Japan and Germany—countries that have developed very competitive manufacturing sectors and good infrastructures—things get done. In contrast, things do not get done as seamlessly in India. Two root causes identified for poor implementation are: inadequate consensus amongst stakeholders for policy changes, and very poor co-ordination amongst agencies in execution. These challenges are not restricted only to the infrastructure and manufacturing sectors in India. They exist in almost all sectors. Therefore solutions to these root cause problems, can improve outcomes in many sectors.

10.53. The traditional approach to address co-ordination and implementation failures is to (i) appoint committees to co-ordinate, and (ii) set up monitoring agencies. Thus, the system has become cluttered with committees for co-ordination, and co-ordination amongst them has become another problem! Monitoring can point out that things are not happening—which is useful information. But more useful is the ability to get things done.

10.54. Broad based consensus-building processes, therefore, need to be institutionalised to ensure successful implementation of plans. This is true for many sectors. Institutions for representation, such as employee unions, employer associations, and civil society organisations (CSOs), must become more

professional, more democratic, and more competent in arriving at agreements that ensure fairness to all stakeholders. It is worth noting that the strength of such organisations of representation and the processes of consultation amongst them can explain the continuing competitive strengths of the German and Japanese manufacturing ecosystems, even though wages in these countries are amongst the highest in the world, and their currencies are very strong too. In other words, low wages and cheap currencies need not be the only sources of competitive advantage in manufacturing. The ability of people to work together is a more sustainable, and a more satisfying, source of national competitive advantage.

10.55. There are examples internationally of successful implementation of similarly ambitious and complex transformation plans in a democratic context—and these illustrate processes created with deliberate intent to improve multi-stakeholder collaboration and implementation. In economies as diverse as Malaysia and Brazil, this role has been played by often small organisations that: facilitate a common vision; act as a disinterested party in finding solutions to common problems; maintain momentum through transparent monitoring and evaluation; store and distribute learning and induce effective stakeholder consultation. Such a role is often modest and unobtrusive, but can be the key to implementation and growth.

10.56. In a highly diverse as well as democratic country, such as India, a broad consensus is required for all stakeholders to move together, forward and faster. This consensus cannot be commanded. We need another mechanism specifically designed to bring people with different perspectives together: to listen to each other, to distil the essence of their shared aspiration for the country and the critical principles they will adhere to in the work they have to do together as partners in progress.

10.57. An ongoing process of public reasoning, conducted with good techniques of dialogue, in which people from many walks of life participate, and people with different ideologies listen to each other, could provide the glue we need. The all-round

development of India will not happen in spite of our being a democracy. It will happen because we are a democracy, provided we improve our abilities to deliberate and decide democratically and effectively.

10.58. Hence, there is a need to establish an effective ‘backbone’ capability which will provide strength to multi-stakeholder policy and implementation processes. Cohesion can be brought about through more effective co-ordination amongst agencies, and more effective consultation amongst stakeholders. The common feature of successful cases of new policy implementation in countries, especially democratic countries which provide freedom for independent actions to multiple agencies, has been the creation of a web of institutions, processes and other mechanisms. For this web to be effective, it must have strong ‘backbone’ capabilities to give it coherence and direction. For this, the government will require specialised skills such as consensus building and programme management to manage this process.

10.59. The ‘backbone’ capability does not require an organisation with a large amount of resources and manpower; nor one with the power to command top-down. The term ‘organisation’ may connote the creation of a new unit that would do the job itself. However, there are too many projects and implementation challenges all over the country. Therefore the ‘backbone’ capability must essentially comprise of small catalytic units located in many parts of the system, which can provide the ‘tools and techniques’ to the various states and ministries to effectively co-ordinate, design and implement their programmes.

10.60. We must take advantage of the political set-up in the country which has put in place many institutions to govern and to manage these challenges, and which are given authority and financial resources for their responsibilities. The ‘backbone’ capability must enable these institutions to fulfil their co-ordination and implementation roles more effectively, rather than aim to be a master co-ordinator over them. If the backbone organisation was set up as a new, over-arching authority, which is a tempting idea, it would start competing with existing

authorities and that would make the co-ordination problems even more complicated.

10.61. The backbone capabilities must be delivered by a network of backbone units spread across the country. The backbone units must not be positioned as higher authorities positioned over other agencies. Instead, they must enable the ministries and departments to unlock the constraints that are impeding them from successfully planning, co-ordinating and implementing.

#### A 'Movement' of Learning and Improvement

10.62. The distinction between creating yet another 'organisation' and stimulating a 'movement' is crucial. For widespread acquisition of capabilities, across a large, diverse, and democratic system, a movement of learning and change is required.

10.63. The improvement of quality across Japan in the 1970s provides a good example of a successful national movement that transformed a nation's economy. Japan, in the 1950s and 1960s had the reputation of being a producer of low quality, cheap, goods. By the 1980s, Japan had become the hall-mark of quality across many industries, and its infrastructure of rail and road transportation had become a benchmark for efficiency and punctuality. The widespread improvement of quality was brought about through Total Quality Management (TQM), whereby seven simple tools of quality and other techniques were widely disseminated throughout Japan. The dissemination was done by multiple agencies. The Japanese Union of Scientists and Engineers was one of the leaders, and several business associations, government agencies and voluntary organisations came together to promote quality across the country. A variety of channels including public radio, daily newspapers and professional journals were used to infect the country with the challenge to improve quality everywhere and to disseminate useful techniques.

10.64. The subject of the TQM movement in Japan was 'quality'. Relevant principles, techniques and tools were provided by many persons

and organisations, notable amongst them were Professors Deming and Ishikawa, and Taichi Ohno of Toyota. These principles and tools were deployed by the movement. The need for democratic management of multi-stakeholder collaboration processes has been felt in many countries. In response to this, many initiatives have been taken over the past three decades, in several countries, to facilitate such processes. Experience has been gained from these interventions, and a body of practice, with established principles, and tools has emerged. These principles and tools, with case studies, have been recorded by several organisations. A 'movement' to disseminate and use such tools and processes will accelerate implementation and growth.

#### DISASTER MANAGEMENT

10.65. A development strategy under the planning process has risk management as one of its key components. Globally, there is an increasing recognition that disasters affect growth and the poorer sections of society gets a major share of the impact. Therefore, there is a consensus that investing in prevention and mitigation is economically and socially more beneficial than expenditure in relief and rehabilitation. In a recent World Bank Study, it has been established that one dollar spent on prevention is ten times more valuable than a dollar spent on relief in net present value.

10.66. The large size of the Indian continent, varied geography, national features, climate, and effects of economic development and growth process results in number of risks. These are clearly both due to natural hazards and effect of human development process on nature. The human and economic losses from disaster are economically high in the country as compared to the other development nation of the world. According to a World Bank study titled 'National Hazards, Unnatural Disasters', India faces losses up to 2 per cent of its GDP due to natural disasters. Disasters impact growth particularly of the poor and vulnerable sections of society. Table 10.1 gives details of the losses caused due to natural disasters in the decade of 2001–10.

**TABLE 10.1**  
**Year-Wise Damage Caused Due to Floods, Cyclonic Storms, Landslides and so on during Last 10 Years in India**

| Year    | Live Last Human<br>(In No.) | Cattle Lost<br>(In No.) | Houses Damaged<br>(in No.) | Cropped Areas Affected<br>(in Lakh ha) |
|---------|-----------------------------|-------------------------|----------------------------|--|
| 2001-02 | 834                         | 21,269                  | 3,46,878                   | 18.72                                  |
| 2002-03 | 898                         | 3,729                   | 4,62,700                   | 21.00                                  |
| 2003-04 | 1,992                       | 25,393                  | 6,82,209                   | 31.98                                  |
| 2004-05 | 1,995                       | 12,393                  | 16,03,300                  | 32.53                                  |
| 2005-06 | 2,698                       | 1,10,997                | 21,20,012                  | 35.52                                  |
| 2006-07 | 2,402                       | 4,55,619                | 19,34,680                  | 70.87                                  |
| 2007-08 | 3,764                       | 1,19,218                | 35,27,041                  | 85.13                                  |
| 2008-09 | 3,405                       | 53,833                  | 16,46,905                  | 35.56                                  |
| 2009-10 | 1,677                       | 1,28,452                | 13,59,726                  | 47.13                                  |
| 2010-11 | 2,310                       | 48,778                  | 13,38,619                  | 46.25                                  |

*Source:* Ministry of Home Affairs (MHA).

**10.67.** The strategy in the initial years of the planning process has been to handle only some of the natural hazards, like floods and water proofing against drought. It has, however, been gradually realised that a more comprehensive approach is called for. This must lead to mitigation of ill-effects of disasters, and a development process which encompasses within itself, a strategy for mitigation of human misery and adverse consequences of the disaster.

**10.68.** The Tenth Five Year Plan initiated the process of shift from relief and response centric disaster management to prevention, mitigation, and preparedness as means to revert or more effective handling of the disasters. The Plan prescribed a strategy of disaster management which included three important components: first, policy guidelines on preparation of developmental plans across sectors for integrating disaster management into developmental plans and a specific scheme; second, a multi-pronged strategy for the total risk management and third, recognition of a need for plan expenditure on disaster management and preventive measures in addition to calamity relief fund. In pursuance of this strategy, the National Disaster Management Authority was proposed under National Disaster Management Act 2005. The process of strengthening disaster preparedness was further strengthened in the Eleventh

Plan. The disaster management authority was set up at the national level. It formulated extensive guidelines and a national policy on disaster management. Similar to above, state and district level authorities were also set up gradually.

**10.69.** The Twelfth Plan will further build on the developments of the last few years and specifically undertake programmes in several areas. First, setting up of early warning systems in all hazards prone areas of the country would need a special focus. Specifically, we will need to utilise our science and technology in disaster risk and warning communities well in advance to save life and property. Effective communication systems have to be set up in all the levels to ensure timely and accurate dissemination of warning signals to vulnerable communities. It is proposed that disaster risk reduction in respect of earthquake, flood, drought, Tsunami, cyclones, forest fire, chemical nuclear and biological disasters be set up. Necessary innovative technologies and their application would need to be accordingly taken up in the plan.

**10.70.** Second, mainstreaming disaster risk reduction in all major schemes would need to be an important area of focus. The development programmes and policies would need specifically to keep the disaster



risk reduction in mind. These would, therefore, have to while, preparing programmes, focus on its impact on increasing disaster risks and how its mitigation is proposed in the concerned schemes. Disaster risk reduction will need to be thus incorporated in all major schemes, specifically the flagship schemes, for reducing the vulnerability in the hazards prone areas of the country. For example, safety of the school buildings, especially in earthquake prone areas has to be ensured.

**10.71.** Capacity building would be an important area proposed for development during the plan. The current experience has been with authorities primarily on handling national disasters after these have occurred. It is important that community awareness and capacity building within the community and government is undertaken at all the three levels: National, State and Districts including villages. These would need to cover education and research,

public sensitisation and awareness and institutional strengthening and development.

**10.72.** The indicative Gross Budgetary Support for the Twelfth five Year Plan for the Ministries/ Departments dealing with governance issues is given in Table 10.2.

**TABLE 10.2**  
**Gross Budgetary Support for the Twelfth Five Year Plan**

| S. No. | Ministry/Department                                  | ₹ Crore |
|--------|--|---------|
| 1      | Ministry of Home Affairs                             | 52,839  |
| 2      | Ministry of Panchayati Raj                           | 6,437   |
| 3      | Ministry of Law, Justice and Company Affairs         | 5,802   |
| 4      | Ministry of Personnel, Public Grievance and Pensions | 1,385   |

*Source:* Planning Commission.

## Regional Equality

### INTRODUCTION

11.1. With its wide diversities in physiography, history, demography and sociology, India has been characterised by regional disparities in socio-economic development not only between States but also between districts of a State and between areas and social groups within districts. Therefore, an important objective of the Five Year Plans has been to address the problem of regional imbalances. The main instruments have been the formula for distribution of Central Assistance to the States, Special Area Programmes and various Centrally Sponsored Schemes (CSS) for poverty alleviation.

11.2. Prior to the Tenth Plan, the general approach was that planning and development of an area and allocation of funds for the purpose were primarily the responsibility of the respective State Governments. Government of India (GOI) merely supplemented the efforts of State Governments with Special Area Programmes targeted at areas with certain geographic characteristics that called for additional funding. Examples of such supplemental programmes are the Hill Areas Development Programme (HADP), Western Ghats Development Programme (WGDP) and the Border Area Development Programme (BADP).

11.3. During the Tenth Plan for the first time the GOI introduced an area development scheme targeted at backward areas. The Rashtriya Sam Vikas Yojana (RSVY) was initiated in 2003–04 for putting in place activities for backward areas covering 147 districts which would help reduce imbalances and

speed up development. In 2006–07, this programme was replaced by the Backward Regions Grant Fund (BRGF). The BRGF enlarged the Districts Component to cover 250 districts. In 2010–11, a new component was added, namely, the Integrated Action Plan (IAP) for Selected Tribal and Backward Districts. This covers 82 districts of which 76 districts are already part of BRGF.

11.4. This chapter summarises the latest available evidence on inter-regional disparities in India, reviews the performance of the various programmes aimed at promoting inter-regional equity and describes the changes being proposed to these programmes in the Twelfth Plan.

### INTER-STATE INEQUALITIES

11.5. The inter-State inequalities in PCIs have been a cause of concern. These have been rising in the last three decades for two reasons. First, the rates of growth of State Domestic Product (SDP) of many of the States in the south, west and northern regions, like Punjab, Himachal Pradesh, Gujarat, Karnataka and Tripura, have been quite high as compared to some of the other States, like Uttar Pradesh (UP), Bihar and Rajasthan. Second, the rate of growth of population in some of the low PCI States has been fairly high. This has resulted in widening of PCIs and consumption in different States.

11.6. The second nature of inequality has been within the States themselves. A number of these States of the Indian Union have large areas and growth in them is uneven. Even in some of the States

with comparatively small geographical area, the levels of development are very uneven, especially in the Himalayan region of Nagaland, Mizoram, Arunachal Pradesh, Jammu & Kashmir (J&K), Himachal Pradesh and Uttarakhand. The unequal levels of development in the larger States, including several regions like Vidarbha region of Maharashtra; Koraput, Bolangir and Kalahandi (popularly known as KBK districts) of Orissa; Bundelkhand region, Eastern UP and parts of Central UP, northern Bihar, tribal areas of Jharkhand and Chhattisgarh, Andhra Pradesh, Maharashtra, UP and north Karnataka are a few examples.

11.7. The third nature of inequality is between the rural and the urban and within the rural societies and the urban societies themselves. While the development strategy for the last-mentioned inequality is being separately addressed in the Plan, this chapter deals with the inter-State and intra-State regional inequalities and strategies to deal with these during the Plan.

11.8. Regional inequalities, both between States and within States, present a serious development challenge to the Indian economy. Existing literature attributes the growing regional disparities in India to inequities in access to social and physical infrastructure. Recent scholarly works also suggest that private sector investment tends to move to places where the enabling environment, that is, investment climate is better (infrastructure availability and good regulations facilitate growth). Purfield<sup>1</sup> estimates the impact of several policy variables on PCIs over a 30-year period and finds that investment climate variables, measured by days lost in industrial disputes, the relative size of government expenditures, and the predominance of the share of agriculture in the economy and lower investment—all adversely affect growth rates. Another factor which explains regional disparity is the quality of human capital, which in turn depends on the level of education and health of the population. Finally, institutions matter, and regions with better law and order and governance benefit in the form of higher and sustained growth. Kochar et al.<sup>2</sup> find that States with weaker institutions and poorer infrastructure did worse in terms of industrial and Gross Domestic Product

(GDP) growth. Besley et al.<sup>3</sup> find that variables such as property rights (defined primarily as land rights); access to credit; labour market flexibility; presence of media that holds governments accountable and literacy and human capital are significant in explaining inter-State disparities.

11.9. An important objective in the Eleventh Plan was to reduce the inter-State inequalities in PCIs. This is feasible if the growth rate growth rates accelerate but the growth rate of population and related indicators, including Total Fertility Rate, show a decline. The experience in the last two decades has been that number of these States which have low growth rates, like UP, Bihar, Rajasthan, Orissa and Madhya Pradesh (MP), had high growth rates of population, too. However, the GDP growth trend has been reversed during the Eleventh Plan. During the Eighth, Ninth and Tenth Plans, States with lowest average PCI, along with the growth rates are given in the Table 11.1.

11.10. The above indicates clear trends. Five States, namely, Bihar, Orissa, UP, MP and Rajasthan, had the lowest PCI in the Eighth Plan. All of these gradually improved their growth rates, particularly in the Eleventh Plan. The average GDP growth rate of these States increased from 4.6 per cent in the Eighth Plan to 6.76 per cent in the Tenth Plan and 8.58 per cent in the Eleventh Plan. Also, individually, several of them recorded excellent growth. Bihar, which was for quite some time a cause of worry for planners, has been able to record growth rate of 12.11 per cent in the Eleventh Plan. Similarly, MP, UP and Rajasthan have all recorded growth rates of 7 per cent or more in the Eleventh Plan. This is an encouraging and positive trend. Please refer to Figure 11.1 and Table 11.3.

11.11. The Following table indicates the growth rates of the SDPs of different States (Table 11.2).

11.12. The growth rates of SDP show several interesting convergence trends. First, the average GDP growth rate of States with lowest PCI over the last three Plans is increasing continuously and during the Eleventh Plan, it exceeded the average growth rates of general category States. Second, these also exceeded the growth rates of all States (including

**TABLE 11.1**  
**Comparative Growth Rates of Selected Low-Income States**

| Eighth Plan      | Ninth Plan        | Tenth Plan        | Eleventh Plan     |
|------------------|-------------------|-------------------|-------------------|
| Bihar (2.2)      | Bihar (4.0)       | Bihar (4.7)       | Bihar (12.11)     |
| Orissa (2.1)     | UP (4.0)          | UP (4.6)          | UP (6.9)          |
| UP (4.9)         | Orissa (5.1)      | MP (4.3)          | MP (8.93)         |
| MP (6.3)         | MP (4.0)          | Jharkhand (11.1)  | Jharkhand (7.27)  |
| Rajasthan (7.5)  | Rajasthan (3.5)   | Orissa (9.1)      | Rajasthan (7.68)  |
| 4.6 <sup>a</sup> | 4.12 <sup>a</sup> | 6.76 <sup>a</sup> | 8.58 <sup>a</sup> |

Source: Planning Commission.

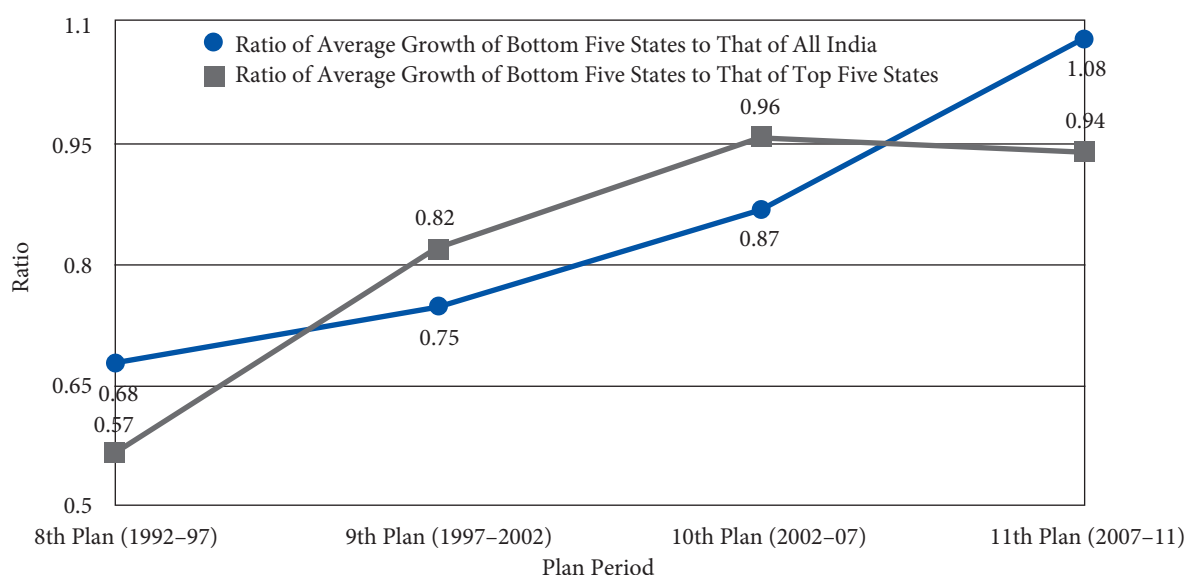
Note: <sup>a</sup>Average GDP growth rates of five States with lowest PCI, amongst General Category States. Updated version with the latest CSO data has been included in Annexure 11.1(a).

special category) during the Eleventh Plan. Third, the ratio of average growth rates of States with lowest PCI, as against those of five highest PCI States, increased from 57 per cent (Eighth Plan) to 94 per cent (Eleventh Plan). Fourth, the coefficient of variation indicating the extent of inequality in growth rates amongst different States also shows an increasing convergence of Gross State Domestic Product (GSDP) growth rates over successive Plan periods.

### Disparities in Per Capita Income

11.13. While the acceleration of SDP growth rates is a very positive trend, the PCI does not show

any significant improvement in income disparities. Regional differences in PCI levels are further reflected in a study of per capita State GDP figures from 1981 to 2008, which enabled the computation of the Gini coefficient,<sup>4</sup> which has been updated to include Gini coefficient computations up to year 2010–11. Figure 11.2 shows a continuing upward march of the coefficient and inter-State inequality.<sup>5</sup> The average Gini coefficient during 1981–90 is 0.15 which increased to 0.19 during 1991–2000. The average Gini coefficient for the period of 2000–10 is 0.224, which remains stagnant for the year 2010–11. This indicates the growing income disparity in India. The inter-State Gini for 2005 which is, 0.22 is far lower



Note: Updated version with the latest CSO data has been included in Annexure 11.1(e).

**FIGURE 11.1: Convergence of GDP Growth Rates during Successive Plans**

**TABLE 11.2**  
**Growth Rates in SDP in Different States**

| Sl. No.                        | States/Union Territories | (% per annum) |            |                         |               |
|--------------------------------|--------------------------|---------------|------------|-------------------------|---------------|
|                                |                          | Eighth Plan   | Ninth Plan | Tenth Plan <sup>a</sup> | Eleventh Plan |
| 1                              | Andhra Pradesh           | 5.4           | 4.6        | 6.7                     | 8.33          |
| 2                              | Bihar                    | 2.2           | 4.0        | 4.7                     | 12.11         |
| 3                              | Chhattisgarh             | NA            | NA         | 9.2                     | 8.44          |
| 4                              | Goa                      | 8.9           | 5.5        | 7.8                     | 9.02          |
| 5                              | Gujarat                  | 12.4          | 4.0        | 10.6                    | 9.59          |
| 6                              | Haryana                  | 5.2           | 4.1        | 7.6                     | 9.10          |
| 7                              | Jharkhand                | NA            | NA         | 11.1                    | 7.27          |
| 8                              | Karnataka                | 6.2           | 7.2        | 7.0                     | 8.04          |
| 9                              | Kerala                   | 6.5           | 5.7        | 7.2                     | 8.04          |
| 10                             | MP                       | 6.3           | 4.0        | 4.3                     | 8.93          |
| 11                             | Maharashtra              | 8.9           | 4.7        | 7.9                     | 9.48          |
| 12                             | Orissa                   | 2.1           | 5.1        | 9.1                     | 8.23          |
| 13                             | Punjab                   | 4.7           | 4.4        | 4.5                     | 6.87          |
| 14                             | Rajasthan                | 7.5           | 3.5        | 5.0                     | 7.68          |
| 15                             | Tamil Nadu               | 7.0           | 6.3        | 6.6                     | 8.32          |
| 16                             | UP                       | 4.9           | 4.0        | 4.6                     | 6.90          |
| 17                             | West Bengal              | 6.3           | 6.9        | 6.1                     | 7.32          |
| <b>Special Category States</b> |                          |               |            |                         |               |
| 18                             | Arunachal Pradesh        | 5.1           | 4.4        | 5.8                     | 9.42          |
| 19                             | Assam                    | 2.8           | 2.1        | 6.1                     | 5.50          |
| 20                             | Himachal Pradesh         | 6.5           | 5.9        | 7.3                     | 5.50          |
| 21                             | J&K                      | 5.0           | 5.2        | 5.2                     | 4.40          |
| 22                             | Manipur                  | 4.6           | 6.4        | 11.6                    | 4.60          |
| 23                             | Meghalaya                | 3.8           | 6.2        | 5.6                     | 7.50          |
| 24                             | Mizoram                  | NA            | NA         | 5.9                     | 8.70          |
| 25                             | Nagaland                 | 8.9           | 2.6        | 8.3                     | 3.50          |
| 26                             | Sikkim                   | 5.3           | 8.3        | 7.7                     | 12.20         |
| 27                             | Tripura                  | 6.6           | 7.4        | 8.7                     | 8.00          |
| 28                             | Uttarakhand              | NA            | NA         | 8.8                     | 9.30          |

*Source:* Central Statistical Office (CSO) (base 1999–2000 constant price) as on 31 August 2007 and Eleventh Plan (base 2004–05 constant price).

*Note:* <sup>a</sup> Average of 2002–03 to 2005–06 for all States except J&K, Mizoram, Nagaland (2002–03 to 2004–05) and Tripura (2002–03 to 2003–04).

Updated version with the latest CSO data has been included in Annexure 11.1(b).

than the Gini for India as a whole (0.36 for the year 2005 from HDR of United Nations Development Programme [UNDP]) revealing that the geographic disparity of income is much lower than the social disparity between the richest and poorest people in the country.

11.14. The following table, however, indicates the disparities in PCI since 2004–05 (Table 11.4).

11.15. The variation in PCIs amongst various States has been worsening in the last two decades. The

**TABLE 11.3**  
**Convergence of GDP Growth Rates in Successive Plans**

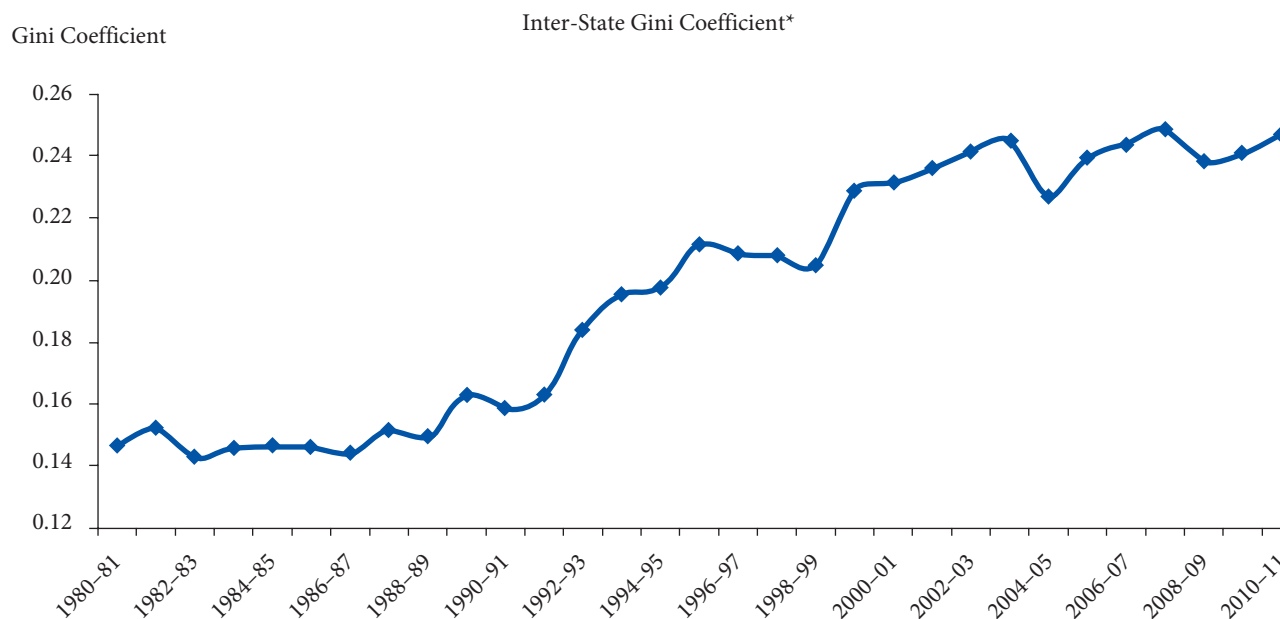
|  | Eighth Plan | Ninth Plan | Tenth Plan | Eleventh Plan |
|--|-------------|------------|------------|---------------|
| Average GDP Growth of Top Five States, amongst General Category States                             | 8.02        | 5.00       | 7.00       | 9.10          |
| Ratio of Average Growth of Bottom Five States to That of All India                                 | 0.68        | 0.75       | 0.87       | 1.08          |
| Ratio of Average Growth of Bottom Five States to That of Non-special Category States               | 0.73        | 0.84       | 0.96       | 1.02          |
| Ratio of Average Growth Rate of Bottom Five States with That of Top Five (General Category States) | 0.57        | 0.82       | 0.96       | 0.94          |

*Source:* Planning Commission.

*Note:* Updated version with the latest CSO data has been included in Annexure 11.1(c).

coefficient of variation had increased from 34 per cent (1993–94) to 36 per cent (2004–05) and further to 41 per cent in 2011–12 as mentioned in the above table and the following graph. But the ratio of lowest to highest PCI has improved from 21 per cent in the year 2004–05 to 24 per cent in the year 2011–12.

11.16. The widening disparities in PCIs across States show that convergence in growth rates does not appear to have resulted in convergence in income levels across States. Figure 11.4 plots the growth rate of the States for the period 2001–10 against the log of income per capita in 2001. If there was convergence in income levels, the relationship would



*The Gini coefficient is calculated assuming that all individuals within each state have gross income equal to per capita GSDP. This method ignores the inequality arising out of the unequal distribution within each state, and focuses only on inequality arising from interstate differences in per capita GSDP.*

*Source:* MS Ahluwalia, 'Prospects and Policy Challenges in the Twelfth Plan', *Economic and Political Weekly of India* XLVI, no. 21 (21 May 2011).

**FIGURE 11.2: Trends in Inter-State Inequality**

**TABLE 11.4**  
**Disparity in PCI (Per Capita NSDP) at 2004–05 Prices**

| Year    | State with Lowest PCI | PCI (₹) | State with Highest PCI | PCI (₹) | Ratio of Lowest to Highest PCI (%) | Coefficient of Variation in PCI (%) |
|---------|-----------------------|---------|------------------------|---------|------------------------------------|-------------------------------------|
| 2004–05 | Bihar                 | 7,914   | Haryana                | 37,972  | 21                                 | 36                                  |
| 2005–06 | Bihar                 | 7,813   | Maharashtra            | 43,651  | 18                                 | 39                                  |
| 2006–07 | Bihar                 | 9,150   | Maharashtra            | 45,582  | 20                                 | 40                                  |
| 2007–08 | Bihar                 | 9,685   | Maharashtra            | 50,138  | 19                                 | 40                                  |
| 2008–09 | Bihar                 | 10,994  | Maharashtra            | 50,183  | 22                                 | 39                                  |
| 2009–10 | Bihar                 | 12,012  | Maharashtra            | 54,166  | 22                                 | 41                                  |
| 2010–11 | Bihar                 | 13,632  | Maharashtra            | 59,735  | 23                                 | 41                                  |
| 2011–12 | Bihar                 | 15,268  | Maharashtra            | 64,951  | 24                                 | 41                                  |

Source: Directorate of Economics and Statistics of respective State Governments.

Note: Updated version with the latest CSO data has been included in Annexure 11.1(d).

be downward sloping. But, as Figure 11.4 indicates, the relationship is upward sloping. States with higher initial income (per capita Net State Domestic Product [NSDP]) on average grew faster, suggesting that the inequality across States is actually increasing. Thus, despite the strong growth performance of the hitherto laggard States (Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh [BIMARU] States), we do not see the phenomenon of convergence across Indian States, whereby the poorer States, by virtue of growing faster than the richer States, start catching up with the level of income of the latter. Of course,

it is important to clarify that although we see no unconditional convergence (reducing dispersion of income), there still might be conditional convergence. Conditional convergence can be consistent with divergence in PCIs over a certain period of time. It is possible that Indian States are converging to increasingly divergent steady States.<sup>6</sup>

11.17. There are some positive trends recently. The gap between the highest and lowest PCI States is declining in recent years, as evident from the above figure. This trend was not so evident during the

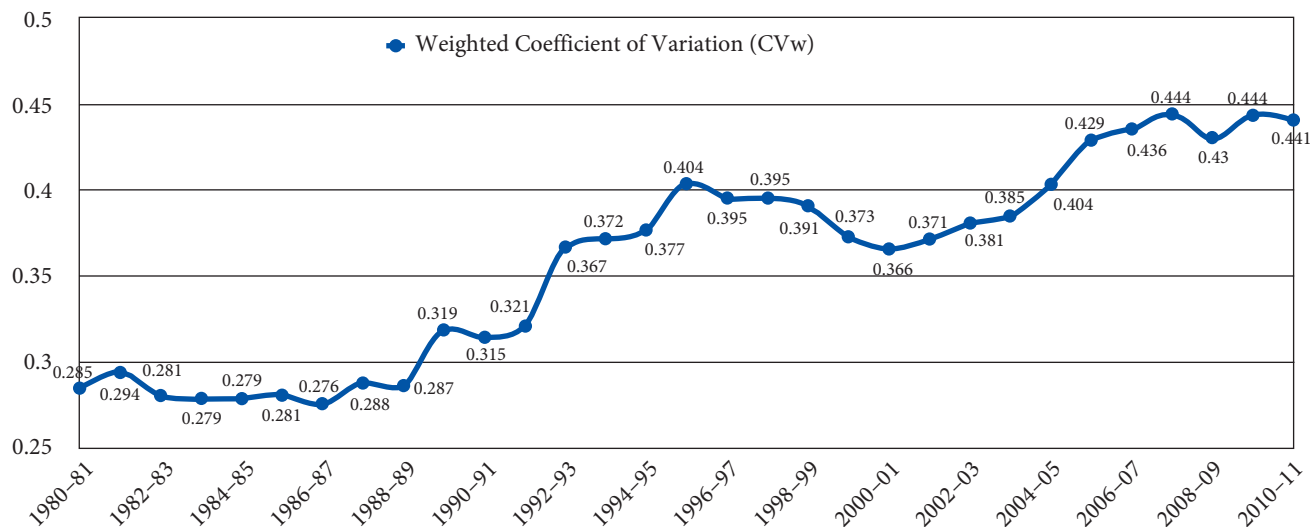


FIGURE 11.3: Inter-State Income Inequalities (Bases on States' GSDP Per Capita on Current Price)

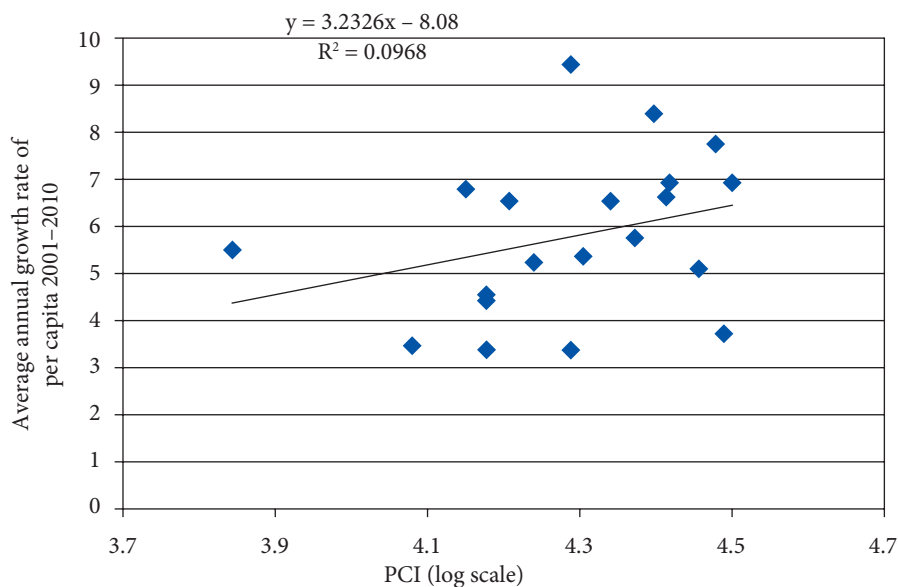


FIGURE 11.4: Growth during 2001–10 and Income in 2001

Tenth Plan. The income of lowest PCI State was 27.586 per cent of the highest PCI State in 1996–97. It deteriorated to 20.105 per cent in 2004–05. In recent years, however, with the growth rates picking up, especially in the low-income States, as mentioned above, the disparity between the lowest and the highest PCI States is also reducing. It has now improved to 24 per cent in 2011–12. Two factors have contributed to this recent improvement. First, the growth rates of GDP of low PCI States have accelerated. Second, the rate of growth of population has gradually decelerated and getting closer to that of high PCI States. These two trends, if continued in the next two Plans, will lead to much higher degree of convergence and further reduce inter-State inequalities in the next decade.

### Performance on Human Development Indicators

11.18. Disparities in regional performance are a matter of concern not just in terms of income indicators, but also human development indicators. State-wise data on human development indicators<sup>7</sup> display considerable variation in performance across States. Kerala was the best performer, witnessing a literacy rate of 93.91 per cent, sex ratio of 1,084 and infant mortality rate of 12 per thousand. At the other end of the spectrum, the worst performance on these

indicators was displayed by Bihar (lowest literacy rate of 63.82 per cent), Haryana (sex ratio of 877) and MP (infant mortality rate [IMR] of 67). Importantly, the BIMARU States, despite witnessing impressive growth rates, continued to remain at the bottom of the distribution in terms of performance on human development indicators. However, the richer States too were not immune from poor performance on these indicators. The below-average performance of Haryana and Punjab, two of India's richest States, on indicators such as sex ratio and female literacy rates points to the inadequacy of PCIs in measuring the economic and social progress in society.

11.19. The India Human Development Report 2011 (IHDR-2011), which estimates the Human Development Index (HDI) for States at beginning of the decade and for the year 2007–08, allows us to compare HDI across States and over time. The top five ranks in HDI in both years are occupied by Kerala, Delhi, Himachal Pradesh, Goa and Punjab. At the other end of the spectrum are States such as Chhattisgarh, Orissa, Bihar, MP, Jharkhand, UP and Rajasthan. These States have over time shown tremendous improvement in their HDI and its component indices over time, leading to a convergence in HDI across States<sup>8</sup>. The coefficient of variation of the HDI for States in 2000 was 0.313 and this had fallen



**TABLE 11.5**  
**Disparities in Human Development Indicators**

| State            | Literacy Rate (2011) | Female Literacy (2011) | Sex Ratio (2011) | IMR (2009) |
|------------------|----------------------|------------------------|------------------|------------|
| Andhra Pradesh   | 67.66                | 59.74                  | 992              | 49         |
| Assam            | 73.18                | 67.27                  | 954              | 61         |
| Bihar            | 63.82                | 53.33                  | 916              | 52         |
| Jharkhand        | 67.63                | 56.21                  | 947              | 44         |
| Gujarat          | 79.31                | 70.73                  | 918              | 48         |
| Haryana          | 76.64                | 66.77                  | 877              | 51         |
| Himachal Pradesh | 83.78                | 76.6                   | 974              | 45         |
| J&K              | 68.74                | 58.01                  | 883              | 45         |
| Karnataka        | 75.6                 | 68.13                  | 968              | 41         |
| Kerala           | 93.91                | 91.98                  | 1084             | 12         |
| MP               | 70.63                | 60.02                  | 930              | 67         |
| Chhattisgarh     | 71.04                | 60.59                  | 991              | 54         |
| Maharashtra      | 82.91                | 75.48                  | 925              | 31         |
| Orissa           | 73.45                | 64.36                  | 978              | 65         |
| Punjab           | 76.68                | 71.34                  | 893              | 38         |
| Rajasthan        | 67.06                | 52.66                  | 926              | 59         |
| Tamil Nadu       | 80.33                | 73.86                  | 995              | 28         |
| UP               | 69.72                | 59.26                  | 908              | 63         |
| Uttarakhand      | 79.63                | 70.7                   | 963              | 41         |
| West Bengal      | 77.08                | 71.16                  | 947              | 33         |

*Source:* Literacy data and sex ratio are from Census of India, 2011; IMR data are from *SRS Bulletin*, January 2011.

sharply to 0.235 in 2008. Furthermore, the IHDR-2011 finds that the absolute improvements in health and education indices for low PCI States such as Chhattisgarh, Jharkhand, MP and Orissa have been better than for all India, with their gaps with the all-India average narrowing over time. In six of the low HDI States—Bihar, Andhra Pradesh, Chhattisgarh, MP, Orissa and Assam—the improvement in HDI (in absolute terms) is considerably more than the national average. In fact, if we look at absolute changes in HDI over the decade (Table 11.6), the conclusion that the poorer States are catching up with the national average is strengthened. For instance, in Uttarakhand, the increase in HDI has been 0.151 points between 1999–2000 and 2007–08 compared to the national average of 0.080 points. Other relatively poor States that have seen an improvement in HDI greater than the all-India average are Assam (0.108 points), Jharkhand (0.108 points),

MP (0.090 points) and Orissa (0.087 points). Chhattisgarh with an improvement of 0.080 points has performed as well as the national average in terms of HDI. However, among the relatively poor States, the increase in HDI in Bihar (0.075 points) and UP (0.064 points) was less than the national average. But the relative improvement (that is, percentage change) in HDI is greater in Bihar than the national average. As Table 11.6 shows, the percentage change in HDI is greater for the majority of low PCI States than the HDI improvement for India as a whole. In the backdrop of widening regional disparities in terms of per capita NSDP in the first decade of the 21st century, it is encouraging to observe convergence in HDI.

#### DISTRICT-LEVEL ANALYSIS

**11.20.** There are considerable regional disparities in socio-economic development not only between

**TABLE 11.6**  
**Human Development Index (1999–2000 and 2007–08)**

| State                        | HDI<br>(2007–08) | HDI<br>(1999–2000) | Change in<br>HDI | Percentage<br>Change |
|------------------------------|------------------|--------------------|------------------|----------------------|
| Uttarakhand                  | 0.49             | 0.339              | 0.151            | 44.54                |
| Kerala                       | 0.79             | 0.677              | 0.113            | 16.69                |
| Assam                        | 0.444            | 0.336              | 0.108            | 32.14                |
| Jharkhand                    | 0.376            | 0.268              | 0.108            | 32.14                |
| Andhra Pradesh               | 0.473            | 0.368              | 0.105            | 28.53                |
| North-East (excluding Assam) | 0.573            | 0.473              | 0.100            | 21.14                |
| MP                           | 0.375            | 0.285              | 0.090            | 31.58                |
| Tamil Nadu                   | 0.57             | 0.48               | 0.090            | 18.75                |
| Karnataka                    | 0.519            | 0.432              | 0.087            | 31.64                |
| Orissa                       | 0.362            | 0.275              | 0.087            | 31.64                |
| All India                    | 0.467            | 0.387              | 0.080            | 20.72                |
| Chhattisgarh                 | 0.358            | 0.278              | 0.080            | 28.78                |
| Bihar                        | 0.367            | 0.292              | 0.075            | 25.68                |
| Himachal Pradesh             | 0.652            | 0.581              | 0.071            | 12.22                |
| Maharashtra                  | 0.572            | 0.501              | 0.071            | 14.17                |
| West Bengal                  | 0.492            | 0.422              | 0.070            | 16.59                |
| J&K                          | 0.529            | 0.465              | 0.064            | 13.76                |
| UP                           | 0.38             | 0.316              | 0.064            | 20.25                |
| Punjab                       | 0.605            | 0.543              | 0.062            | 11.42                |
| Gujarat                      | 0.527            | 0.466              | 0.061            | 13.09                |
| Haryana                      | 0.552            | 0.501              | 0.051            | 10.18                |
| Rajasthan                    | 0.434            | 0.387              | 0.047            | 12.14                |
| Goa                          | 0.617            | 0.595              | 0.022            | 3.70                 |
| Delhi                        | 0.75             | 0.783              | -0.033           | -4.21                |

Source: IHDR, 2011.

States but also within States. The fallacy of taking the State as a unit for judging economic advancement/laggardness has been well known for years. Human development reports (HDRs) of various States bring out starkly the extent to which intra-regional disparity prevails within the very advanced States. For example, though Maharashtra, Karnataka and Andhra Pradesh are regarded as rapidly developing States, the fact of the matter is that there are a few pockets within these States which, due to their better physical and social infrastructure, have been able to attract large investments and register a faster rate of economic growth. State-level analysis does not reveal anything about what might be taking place

in different regions within States. In fact, intra-State disparities are as much a cause of concern as inter-State disparities.

### Disparities in Gross District Domestic Product (GDDP)

11.21. We begin our analysis at the district level by examining GDDP. Data for this are available starting 1999. Table 11.7 calculates the coefficient of variation of per capita GDDP for 1999–2000 and for the most recent time period, till which data are available. It is interesting to note that while some States witnessed an increase in the dispersion of per capita GDDP, others witnessed a decline. The coefficient

of variation of per capita GDDP increased in several States, with the largest increase being in Bihar from 0.671 in 1999–2000 to 0.823 in 2004–05. Karnataka, Orissa and West Bengal also witnessed increases in dispersions of per capita GDDP. Barring Rajasthan, all the other BIMARU States witnessed an increase in the dispersion of per capita GDDP. It appears even though the BIMARU States are being lauded for their impressive growth rates in the 2000s, disparities within these States are increasing, suggesting that development and growth are being concentrated in a few pockets. Importantly, States such as Maharashtra, Assam and Chhattisgarh witnessed a decrease in dispersion of per capita GDDP.

11.22. We can also get a measure of the extent of intra-State disparities by comparing the ratios of per capita GDDP of the richest district to the poorest

district in the State (Table 11.8). Bihar is suffering from growing intra-State disparity. The per capita GDDP for Patna district is by far the highest among the State's districts. The difference has increased in recent years with the ratio of per capita GDDP in Patna district to that of Sheohar district, which has the lowest income in Bihar, increasing from 6.68 in 1999–2000 to 8.65 in 2006–07. In UP the ratio of per capita GDDP in Gautambudhnagar district to that of Shravasti district has increased from 6.80 in 1999–2000 to 9.20 in 2005–06. The rise in intra-State disparities is particularly stark in the case of Haryana, where the ratio of per capita GDDP in the richest district in the State (Gurgaon) to the poorest district (Mahindergarh in 1999–2000 and Mewat in 2005–06) has increased from 3.47 in 1999–2000 to 9.87 in 2005–06. In Karnataka, the ratio of per capita GDDP in the richest district in the State to the poorest

**TABLE 11.7**  
**Weighted Coefficient of Variation in District-level Domestic Product**

| State            | 1999–2000 | Most Recent Time Period for Which Data Are Available |
|------------------|-----------|--|
| Andhra Pradesh   | 0.239     | 0.235 (2005–06)                                      |
| Assam            | 0.444     | 0.357 (2007–08)                                      |
| Bihar            | 0.671     | 0.823 (2004–05)                                      |
| Jharkhand        | 0.283     | 0.296 (2005–06)                                      |
| Haryana          | 0.326     | 0.764 (2005–06)                                      |
| Himachal Pradesh | 0.358     | 0.321 (2005–06)                                      |
| Karnataka        | 0.359     | 0.539 (2005–06)                                      |
| Kerala           | 0.181     | 0.211 (2006–07)                                      |
| MP               | 0.380     | 0.426 (2007–08)                                      |
| Chhattisgarh     | 0.622     | 0.521 (2006–07)                                      |
| Maharashtra      | 0.434     | 0.396 (2006–07)                                      |
| Orissa           | 0.377     | 0.434 (2004–05)                                      |
| Punjab           | 0.100     | 0.149 (2005–06)                                      |
| Rajasthan        | 0.251     | 0.232 (2005–06)                                      |
| Tamil Nadu       | 0.229     | 0.239 (2005–06)                                      |
| UP               | 0.414     | 0.452 (2005–06)                                      |
| Uttaranchal      | 0.218     | 0.238 (2008–09)                                      |
| West Bengal      | 0.197     | 0.302 (2006–07)                                      |

*Source:* Directorate of Economics and Statistics, Respective State Governments.

**TABLE 11.8**  
**Ratio of Per Capita GDDP in Richest District to Poorest District**

| State            | 1999–2000 | Most Recent Time Period for Which Data Are Available |
|------------------|-----------|--|
| Andhra Pradesh   | 2.33      | 2.23 (2005–06)                                       |
| Assam            | 3.37      | 3.66 (2007–08)                                       |
| Bihar            | 6.68      | 8.65 (2004–05)                                       |
| Jharkhand        | 2.72      | 2.83 (2005–06)                                       |
| Haryana          | 3.47      | 9.87 (2005–06)                                       |
| Himachal Pradesh | 3.72      | 3.10 (2005–06)                                       |
| Karnataka        | 2.76      | 4.42 (2005–06)                                       |
| Kerala           | 1.97      | 2.23 (2006–07)                                       |
| MP               | 4.17      | 3.92 (2007–08)                                       |
| Chhattisgarh     | 5.42      | 5.20 (2006–07)                                       |
| Maharashtra      | 4.31      | 3.41 (2006–07)                                       |
| Orissa           | 4.02      | 4.55 (2004–05)                                       |
| Punjab           | 1.51      | 1.59 (2005–06)                                       |
| Rajasthan        | 2.48      | 2.22 (2005–06)                                       |
| Tamil Nadu       | 2.31      | 3.30 (2005–06)                                       |
| UP               | 6.8       | 9.20 (2005–06)                                       |
| Uttaranchal      | 1.91      | 2.27 (2008–09)                                       |
| West Bengal      | 2.37      | 3.27 (2006–07)                                       |

*Source:* Directorate of Economics and Statistics, Respective State Governments.

district increased from 2.76 in 1999–2000 to 4.42 in 2005–06. In Orissa, too, the income of richest district has continued to remain more than four times that of the poorest district. It is also worth noting that though the ratio of per capita GDDP of the richest district to the poorest district has declined over time in some States, the disparity continues to remain large. For instance, in the case of Maharashtra despite a decline in this ratio, the richest district (Mumbai) still has a per capita GDDP which is 3.4 times that of the poorest district. Similar is the case of MP and Chhattisgarh, where the income of the richest district is still almost four to five times that of the poorest district.

**11.23.** This then leads us to the question of which of these States witnessed convergence (or divergence) in PCIs across districts during the first decade of the 21st century. This exercise is important to understand if districts with higher initial incomes were also the ones that grew relatively faster, and continued to enjoy a cumulative advantage causing some districts in the States to be left behind. But, district-level analysis of convergence is difficult as there are serious data limitations at the district level. We, therefore, attempt to provide an initial answer to this question by plotting the average growth rates during the time period under study against the (log of) initial PCI.

**11.24.** Recent studies for growth in incomes since 1999 to recent periods (for which data are available) indicate interesting trends in the States of Bihar, Karnataka, West Bengal, Haryana, Jharkhand and Kerala; the relationship is upward sloping. This suggests divergence in growth performance across districts, that is, districts which were richer to begin with grew faster, suggesting that inequality between districts in these States was increasing. Each of these States witnessed very high growth rates in the first decade of the 21st century, and the fact that they also observed rising intra-State disparities indicates that growth was concentrated in a few pockets. This, in turn, may have contributed to overall inequality in the State, which explains why States such as Bihar did not perform well in terms of poverty reduction despite recording impressive growth rates.

**11.25.** In the States of MP, UP, Tamil Nadu, Orissa and Uttarakhand, the relationship is upward sloping, but the trend lines are quite flat and no clear pattern emerges in terms of divergence. Interestingly, in Maharashtra, Rajasthan, Himachal Pradesh and Andhra Pradesh, the relationship is downward sloping, indicating that districts with lower initial income were indeed growing faster.

### Disparities in Poverty Ratios and Human Development Indicators

**11.26.** A remarkable characteristic of regional disparities in India is the presence of backward areas even within States that have grown faster and are at relatively high income levels on average. Debroy and Bhandari,<sup>9</sup> in a study that identifies India's most deprived districts, identify those districts that fall in the bottom 25 per cent under various categories such as head count ratio (HCR), food sufficiency, IMR and literacy rate.<sup>10</sup> On examining this dataset, we find that the most backward districts in terms of these parameters lie not just in the undivided BIMARU States, but also in States that have grown faster and are at a relatively high income level on average. This reveals the extent of intra-State disparities. For instance, district-level poverty estimates show that the poorest districts in India lie not only in undivided BIMARU States and Orissa, but also in rich States such as Maharashtra, Karnataka and Tamil Nadu. The disparity across district-level HCR is stark in the case of Maharashtra. At one end of the spectrum, there are districts with poverty HCR exceeding 40 per cent such as Wardha (44.9 per cent), Washim (43.1 per cent), Akola (43.1 per cent), Amravati (47.6 per cent), Bhandara (44.7 per cent), Buldana (46.6 per cent), Dhule (40 per cent), Gondiya (44.7 per cent), Nanded (43.9 per cent) and Nandurbar (40 per cent). While at the other end of the spectrum, there are districts such as Mumbai and Pune with HCR of 11.3 per cent and 14.1 per cent, respectively. Similarly in the case of Karnataka, there are districts with extremely high poverty HCRs, such as Bellary (43.3 per cent), Gulbarga (42.2 per cent), Koppal (48.8 per cent) and Raichur (48.8 per cent); while there are also districts with extremely low percentage of poor such as Kodagu (6.7 per cent) and Bangalore (8.6 per cent). In Tamil Nadu, too, we

find the range in district-level HCR is wide with Tiruvanmalai, having an HCR of 60.2 per cent and Toothkudi, having an HCR of 3.3 per cent. The fact that these three States have lower poverty HCRs than the national average and yet have the poorest districts in India is an indicator of the extent of intra-State inequalities.

11.27. On further examination of this dataset, we find that disparities are not just in terms of income, but also non-income indicators. Importantly, non-income indicators, such as hunger (defined in National Sample Survey (NSS) terms) exhibit a spatial distribution too. Even the rich States with their higher levels of PCI have some of the most hungry districts in the country. These include Andhra Pradesh (East Godavari, Khammam, Mahbubnagar), Haryana (Fatehbad, Hisar), Karnataka (Gulbarga) Kerala (Malappuram, Palakkad, Thiruvananthapuram, Thrissur), Maharashtra (Kolhapur, Ratnagiri, Satara, Sindhudurg). In terms of infant mortality, the worst districts are located not just in the BIMARU States of UP, Orissa, MP, Chhatisgarh and Rajasthan, but also a few neighbouring districts of Karnataka and Andhra Pradesh. Also, even though Maharashtra's IMR is near the best in the country, its worst districts have IMRs that are higher than those of States with lower ranks. Districts identified as backward under the literacy criterion while concentrated in Orissa, undivided BIMARU, are also present in richer States such as Karnataka (Gulbarga, Koppal, Raichur, Chamarajanagar) Andhra Pradesh (Adilabad, Karimnagar, Kurnool, Mahbubnagar, Medak, Nizamabad, Srikakulam, Vizianagaram), Gujarat (Banas Katha, Dohad, Kachchh), Himachal Pradesh (Kinnaur) and Punjab (Mansa). Importantly, all these States, barring Andhra Pradesh, had a literacy rate higher than the national average. The fact that such States would include those districts that fall in the category of the lowest 25 per cent in terms of literacy highlights the extent of intra-State disparities. In addition to revealing the extent of disparities between districts in a State, the fact that the richest States in India have districts with the highest poverty, highest IMR and lowest literacy rates also highlights the limitations of PCIs in measuring the economic and social progress in society.

## INTRA-DISTRICT INEQUALITIES

11.28. A discussion on regional disparities in India would be incomplete without mentioning that there is considerable intra-district inequality too, with some blocks in a district better off than others. An analysis at the block level is severely constrained by data availability. An India Development Foundation study,<sup>11</sup> which estimates poverty headcount ratios at the block level, allows us to get a sense of intra-district disparities. For instance, in the Madhepura district of Bihar, poverty HCR varies from 19.83 per cent in Bihariganj block to 71.01 per cent in Puraini block. In the Darbhanga district, poverty HCR varies across blocks from 42.63 per cent to 88.16 per cent. In the Osmanabad district of Maharashtra, poverty HCR ranges from 36 per cent to 62 per cent. Of the 4,869 blocks covered in this study, 2,445 (50 per cent) blocks have a poverty HCR exceeding 50 per cent. Another interesting observation that emerges from this dataset is that the poorer blocks in a district sometimes tend to be the ones populated by a greater percentage of Scheduled Tribes (STs). For instance, in the Yavatmal district of Maharashtra, poverty HCR ranges from 38.37 per cent in the Ner block to 73.79 per cent to Kelapur block. The former has a tribal population of 7.19 per cent while the latter has a tribal population of 36.88 per cent. In the Kalahandi district of Orissa, poverty HCR ranges from 38.1 per cent in Kokasara (which has a tribal population of 32.59 per cent) to 99.99 per cent Thuamul Rampur (which has tribal population of 57.55 per cent). Similarly, in the Kendujhar district, poverty in the Nandipada block, which has a 5 per cent tribal population, stands at 32.31 per cent, while poverty in the Kanjipani block, which has 84.69 per cent tribal population, stands at 89.84 per cent. In the Betul district of MP, too, we find that the poorest block, Shahpur (poverty HCR of 97.49 per cent) has a tribal population of 64.4 per cent while the Multai block (poverty HCR of 64.5 per cent) has a tribal population of 17.14 per cent. In this dataset, 897 blocks can be classified as tribal blocks, that is, having a tribal population exceeding 20 per cent. Of these 897 tribal blocks, 649 blocks (72 per cent) have poverty HCR exceeding 50 per cent and 577 tribal blocks (64 per cent) are rainfed. It appears, therefore, that there is a high correlation between tribals,

rained areas and incidence of high poverty. The fact that the blocks inhabited by greater percentage of tribals tend to be the poorest blocks is a matter of serious concern. When spatial inequalities align with differences in group identity, they pose a great threat to national unity and peace and could be regarded as a contributory factor to Maoist violence.

### INFRASTRUCTURE DEVELOPMENT

11.29. One of the key strategies for growth has been development of infrastructure. As low-income States invest in infrastructure supported by Central investments and private investments, the growth potential

improves significantly. During the Eleventh Plan, this process was strongly emphasised. This was specially supported by investment under Public–Private Partnerships (PPP). This helped increase the level of investment in Infrastructure Sector from 5.6 per cent (2006–07) to 7.27 per cent (2011–12). The States have also invested in development of agriculture, communication, energy and transport. An inter-State Infrastructure Index was developed earlier by the Eleventh Finance Commission. The index developed by the Commission was composite index of social and economic infrastructure. It classified physical infrastructure into five sectors: agriculture,

**TABLE 11.9**  
**Index of Infrastructure**

| Sl. No. | States            | 1999–2000 (FC) |            | 2008–09 (Working Group of PC) |      |
|---------|-------------------|----------------|------------|-------------------------------|------|
|         |                   | Index          | Rank (PCI) | Index                         | Rank |
| 1       | Andhra Pradesh    | 103.3          | 11         | 112.84                        | 11   |
| 2       | Arunachal Pradesh | 69.71          | 13         | NA                            | NA   |
| 3       | Assam             | 77.72          | 16         | 62.02                         | 19   |
| 4       | Bihar             | 81.33          | 19         | 78.79                         | 20   |
| 5       | Chhattisgarh      | NA             | NA         | 70.14                         | 18   |
| 6       | Goa               | 200.57         | 1          | 215.11                        | 1    |
| 7       | Gujarat           | 124.31         | 8          | 124.72                        | 7    |
| 8       | Haryana           | 137.54         | 4          | 136.43                        | 6    |
| 9       | Himachal Pradesh  | 95.03          | 5          | 164.20                        | 4    |
| 10      | Jharkhand         | NA             | NA         | 52.09                         | 21   |
| 11      | J&K               | NA             | NA         | 81.40                         | 16   |
| 12      | Karnataka         | 104.88         | 9          | 124.35                        | 8    |
| 13      | Kerala            | 178.68         | 7          | 197.36                        | 2    |
| 14      | MP                | 76.79          | 15         | 78.91                         | 17   |
| 15      | Maharashtra       | 112.80         | 3          | 115.56                        | 10   |
| 16      | Orissa            | 81.00          | 17         | 81.83                         | 15   |
| 17      | Punjab            | 187.57         | 2          | 175.81                        | 3    |
| 18      | Rajasthan         | 75.86          | 14         | 84.11                         | 14   |
| 19      | Sikkim            | 108.99         | 12         | NA                            | NA   |
| 20      | Tamil Nadu        | 149.1          | 6          | 152.24                        | 5    |
| 21      | UP                | 101.23         | 18         | 86.99                         | 13   |
| 22      | Uttarakhand       | NA             | NA         | 118.38                        | 9    |
| 23      | West Bengal       | 111.23         | 10         | 97.01                         | 12   |

Source: Eleventh Finance Commission Report, PCI of States—CSO.

Note: FC = Finance Commission; PC = Planning Commission; PCI = Per Capita Income.

communications, banking, electricity and transport. Each one of these different variables was studied and the index was developed. Centre for Monitoring of Indian Economy (CMIE) had developed 'CMIE, 2000', an Infrastructure Development Index based on 13 indicators, covering seven major infrastructure sectors. These included transport, energy, irrigation, banking, communications, education and health facilities. Subsequently, efforts have been made by other analysts to develop an Index based on Principal Component Analysis. All these indices have indicated a strong correlation between infrastructure, PCIs and poverty ratios.

11.30. Based on the earlier studies, a slightly more comprehensive index has been developed by the Working Group constituted by the Planning Commission. It identified 6 sectors and took into account 12 indicators to develop Infrastructure Index. The broad areas included agriculture, communications, banking, electricity, road transport and railways. It used four alternative methodologies and recommended use of Principal Component Analysis for developing the Infrastructure Index. Table 11.9 indicates the comparative picture.

11.31. The correlation of Infrastructure Index with PCI and poverty is quite strong (Table 11.10).

11.32. There exists a direct negative relationship between infrastructure development and levels of poverty and the relative strength of this correlation suggests that infrastructure affects poverty primarily due to increased economic activity resulting in higher PCIs. An analysis of the States in this context

indicates that Kerala has improved its ranking from 7 (Finance Commission) to 2. This is primarily due to improved efforts in road, rail density, power and tele-density. UP has also recorded an improvement in the ranking from 18 (Finance Commission) to 13, primarily due to surface roads, railways, rural electrification and, most importantly, irrigation. Gujarat, Himachal Pradesh, Karnataka and Tamil Nadu had shown marginal improvement.

11.33. Maharashtra, however, had a deceleration with the ranking declining from 3 (Finance Commission) to 10, primarily because of poor road-density, railway route length as well as irrigation. Haryana, too, performed badly. Bihar, MP and West Bengal, however, improved their ranking.

#### TARGETED TWELFTH PLAN GROWTH RATES

11.34. The Twelfth Plan growth rates of GSDP have been worked out for different States. National growth rates of GDP and State-wise break-up of specific economic performance since 2004–05, the potentialities and constraints present in each State and scope for growth based on an assessment within the Planning Commission have been taken into account in computing this. For this purpose, the aggregate performance of each State has been broken into sectoral components. The distribution of the national growth rates among the three major sectors of the economy—agriculture, industry and services—has been done keeping the sectoral consistency across the projected growth rate of the States in mind. The State-specific growth rates for each sector have been pro-rated to the

**TABLE 11.10**  
**Rank Correlation between Infrastructure Index, Poverty Ratio and Per Capita Income of States**

|                                       | 1999–2000 | 2007–08 <sup>a</sup> | 2008–09 <sup>b</sup> |
|---------------------------------------|-----------|----------------------|----------------------|
| Between Infra Index and PCI           | 0.7895    | 0.8623               | 0.8506               |
| Between Infra Index and Poverty Ratio | 0.6386    | 0.8727               | 0.8208               |
| Between PCI and Poverty Ratio         | 0.8193    | 0.7390               | 0.7481               |

*Source:* Planning Commission, Report of the Working Group on 'Issues Relating to Growth and Development at Sub-national Level'.

*Note:* PCI = Per Capita Income.

<sup>a</sup> Poverty Ratio (2009–10) and PCI of States (2007–08).

<sup>b</sup> PCI (2008–09) and Poverty Ratio (2009–10).

**TABLE 11.11**  
**State-wise and Sector-wise Growth Rates for the Twelfth Five Year Plan (2012–2017)**

| Sl. No.                            | States/UTs        | Sector-wise Growth Rates |            |            | Total      |
|------------------------------------|-------------------|--------------------------|------------|------------|------------|
|                                    |                   | Agriculture              | Industry   | Services   |            |
| <b>Non-special Category States</b> |                   |                          |            |            |            |
| 1                                  | Andhra Pradesh    | 5.2                      | 8.6        | 9.5        | 8.4        |
| 2                                  | Bihar             | 6.0                      | 10.0       | 10.0       | 9.1        |
| 3                                  | Chhattisgarh      | 5.0                      | 10.0       | 10.0       | 9.1        |
| 4                                  | Goa               | 0.5                      | 7.7        | 10.0       | 8.6        |
| 5                                  | Gujarat           | 4.0                      | 8.3        | 9.5        | 8.4        |
| 6                                  | Haryana           | 4.2                      | 7.5        | 9.5        | 8.1        |
| 7                                  | Jharkhand         | 6.0                      | 7.0        | 9.0        | 7.8        |
| 8                                  | Karnataka         | 4.5                      | 6.5        | 9.0        | 7.6        |
| 9                                  | Kerala            | 1.0                      | 7.0        | 9.5        | 8.2        |
| 10                                 | MP                | 7.0                      | 10.0       | 9.0        | 8.8        |
| 11                                 | Maharashtra       | 3.5                      | 9.0        | 9.5        | 8.9        |
| 12                                 | Odisha            | 4.0                      | 9.0        | 9.0        | 8.2        |
| 13                                 | Punjab            | 1.6                      | 7.5        | 8.0        | 6.4        |
| 14                                 | Rajasthan         | 4.6                      | 7.0        | 9.0        | 7.4        |
| 15                                 | Tamil Nadu        | 4.0                      | 7.7        | 8.5        | 7.9        |
| 16                                 | UP                | 3.5                      | 8.2        | 9.0        | 7.6        |
| 17                                 | West Bengal       | 3.2                      | 7.0        | 9.0        | 7.6        |
| <b>Special Category States</b>     |                   |                          |            |            |            |
| 18                                 | Arunachal Pradesh | 5.5                      | 9.0        | 10.0       | 8.3        |
| 19                                 | Assam             | 4.8                      | 4.7        | 9.0        | 7.1        |
| 20                                 | Himachal Pradesh  | 3.0                      | 8.7        | 9.0        | 7.9        |
| 21                                 | J&K               | 1.5                      | 7.0        | 8.5        | 6.7        |
| 22                                 | Manipur           | 5.3                      | 5.0        | 8.5        | 6.6        |
| 23                                 | Meghalaya         | 3.1                      | 8.8        | 9.0        | 8.0        |
| 24                                 | Mizoram           | 6.9                      | 9.9        | 9.0        | 8.6        |
| 25                                 | Nagaland          | 4.5                      | 9.0        | 8.0        | 7.2        |
| 26                                 | Sikkim            | 4.0                      | 8.0        | 10.0       | 8.4        |
| 27                                 | Tripura           | 5.0                      | 8.0        | 9.0        | 7.9        |
| 28                                 | Uttarakhand       | 3.0                      | 9.3        | 10.0       | 9.0        |
|                                    | <b>All India</b>  | <b>4.0</b>               | <b>8.1</b> | <b>9.1</b> | <b>8.2</b> |

*Source:* Planning Commission.

*Note:* UT = Union Territory.

National growth rate so that contribution of each State to all-India level in sector-specific growth is maintained at the levels achieved during 2004–05 to 2009–10. This has then been adjusted for the Twelfth Plan keeping in view the potentialities and

constraints present in each State and the need for improvement so that the erstwhile slow-growing States realise their full potential. GSDP growth rates arrived on the basis of above methodology are indicated in Table 11.11.



**TABLE II.12**  
**Financial Transfers under Normal Central Assistance (Plan) and Thirteenth Finance Commission**

| Sl. No.                            | States            | Per Capita GSDP 2011–12 at 2004–05 Price (₹) | Population (2011 Census) | Share in NCA <sup>a</sup> during Eleventh Plan (2007–12) | Share % as per 13th FC |
|------------------------------------|-------------------|--|--------------------------|--|------------------------|
| <b>Non-special Category States</b> |                   |  | <b>Within Group (%)</b>  |  |                        |
| 1                                  | Andhra Pradesh    | 42,710                                       | 7.60                     | 6.260  | 7.642                  |
| 2                                  | Bihar             | 15,268                                       | 9.30                     | 11.320   | 11.578                 |
| 3                                  | Chhattisgarh      | 29,635                                       | 2.30                     | 2.832  | 2.812                  |
| 4                                  | Goa               | 1,12,372                                     | 0.13                     | 0.475  | 0.293                  |
| 5                                  | Gujarat           | 52,708                                       | 5.43                     | 3.918  | 3.601                  |
| 6                                  | Haryana           | 63,045                                       | 2.28                     | 1.848  | 1.303                  |
| 7                                  | Jharkhand         | 22,902                                       | 2.84                     | 3.409  | 3.205                  |
| 8                                  | Karnataka         | 41,545                                       | 5.42                     | 4.386  | 4.979                  |
| 9                                  | Kerala            | 53,427                                       | 3.00                     | 3.217  | 2.699                  |
| 10                                 | MP                | 22,382                                       | 6.56                     | 7.131  | 7.806                  |
| 11                                 | Maharashtra       | 62,729                                       | 10.10                    | 6.883  | 6.139                  |
| 12                                 | Orissa            | 26,900                                       | 3.78                     | 5.983  | 5.287                  |
| 13                                 | Punjab            | 46,688                                       | 2.48                     | 2.238  | 1.719                  |
| 14                                 | Rajasthan         | 26,436                                       | 6.18                     | 5.936  | 6.550                  |
| 15                                 | Tamil Nadu        | 56,461                                       | 6.48                     | 5.885  | 5.586                  |
| 16                                 | UP                | 18,103                                       | 17.89                    | 20.134   | 20.897                 |
| 17                                 | West Bengal       | 34,229                                       | 8.23                     | 8.144  | 7.899                  |
|                                    |                   |  | 100                      | 100  | 100                    |
| <b>Special Category States</b>     |                   |  | <b>Within Group (%)</b>  |  |                        |
| 1                                  | Arunachal Pradesh | 38,130                                       | 1.84                     | 7.929  | 4.274                  |
| 2                                  | Assam             | 22,956                                       | 41.49                    | 19.535   | 27.153                 |
| 3                                  | Himachal Pradesh  | 49,817                                       | 9.13                     | 9.659  | 10.184                 |
| 4                                  | J&K               | 28,932                                       | 16.72                    | 19.137   | 18.986                 |
| 5                                  | Manipur           | 24,327                                       | 3.63                     | 5.840  | 6.370                  |
| 6                                  | Meghalaya         | 38,944                                       | 3.94                     | 4.852  | 4.621                  |
| 7                                  | Mizoram           | 36,732                                       | 1.45                     | 5.590  | 4.134                  |
| 8                                  | Nagaland          | 41,522                                       | 2.63                     | 5.910  | 6.453                  |
| 9                                  | Sikkim            | 47,655                                       | 0.82                     | 3.770  | 2.125                  |
| 10                                 | Tripura           | 40,411                                       | 4.88                     | 8.244  | 6.164                  |
| 11                                 | Uttarakhand       | 47,831                                       | 13.47                    | 9.536  | 9.535                  |
|                                    |                   |  | 100                      | 100  | 100                    |

*Source:* Planning Commission.

*Note:* FC = Finance Commission; NCA = Normal Central Assistance.

<sup>a</sup> Calculation including a notional loan component.

**TABLE 11.13**  
Criteria and Weights for Tax Devolution

| Sl. No. | Criteria                 | Weight (%) |
|---------|--------------------------|------------|
| 1       | Population (1971)        | 25.0       |
| 2       | Area                     | 10.0       |
| 3       | Fiscal Capacity Distance | 47.5       |
| 4       | Fiscal Discipline        | 17.5       |

*Source:* Thirteenth Finance Commission Report, December 2009.

### STRATEGY TO ADDRESS REGIONAL INEQUALITY

11.35. The inter-State and intra-State disparities are a major source of concern for faster and more inclusive development at national level. Different States of the country, if are not able to access the fruits of development equitably so that the levels of services and benefits to them are fair and just, the overall stress in the national polity is increased. This gets reflected in the handling of various national issues and acts as a drag on overall economic growth of the country.

11.36. There are, therefore, several policy instruments within the government for addressing these problems, apart from Constitutional transfers of Finance Commission. The two major sources of financial transfers to the States have been transfers under the Finance Commission awards and Plan transfers. The successive Finance Commissions have tried to make these more equitable. Specifically, the formula for Plan transfers has been based on consideration of PCIs, population, geographical areas and similar other factors which are reflective of low PCI States. Thirteenth Finance Commission award indicates transfers as mentioned in Table 11.12.

11.37. The principle of criterion for horizontal sharing in Thirteenth Finance Commission has been indicated in Table 11.13.

11.38. The above incorporates major disability of States, namely low PCI, resulting in poor investment capability, which in turn results in slow growth rates. In the other criterion for horizontal transfers too, similar progressive approach has been used. This has resulted in more equitable sharing of resources by

**TABLE 11.14**  
Criteria and Weights under Gadgil-Mukherjee Formula

| Sl. No. | Criteria   | Weight (%) |
|---------|--|------------|
| 1       | Population (1971)  | 60         |
| 2       | PCI  |            |
|         | 1. For States with Lower than National Average                   | 20         |
|         | 2. For all States  | 5          |
| 3       | Performance (Tax Effort, Fiscal Management, National Objectives) | 7.5        |
| 4       | Special Problems   | 7.5        |

*Source:* Planning Commission.

*Note:* PCI = Per Capita Income.

the Centre. Since, of the total transfers to the States, the major share is that of the Finance Commission, the above horizontal transfer formula has helped the States to meet their expenditure requirements and have more equitable growth strategy.

11.39. The second strategy for transfers is that of the Planning Commission, which is based on Plan transfers. These again are clearly progressive in nature and support low income States. The total transfers consist of Normal Central Assistance (NCA), transfers under the CSS and transfers under Additional Central Assistance (ACA) under special scheme. The NCA transfers are under the Gadgil-Mukherjee Formula, as depicted in Table 11.14.

11.40. The share of NCA in the overall transfers to the States is, however, comparatively small. During 2011–12 it was estimated at 4.5 per cent of the total Plan transfers to States.

11.41. The transfers under CSS have been fairly large and focused on major areas of social and economic development. In the Eleventh Plan, the focus was on 14 Flagship Schemes, which covered the areas of agriculture, education, health, employment, urban development, rural and urban infrastructure and energy. This has led to substantial transfers to the States, which has impacted both the overall development and infrastructure levels. The Central Plan transfers under these Flagship Schemes are given in Table 11.15.

**TABLE II.15**  
**Allocation of Funds to States/Union Territories during 2011–12 under Various Centrally Funded Schemes**

| State                              | Population<br>(2011) (% Share) | SSA             | NRHM             | ICDS            | PMGSY            | NREGS            | AIBP            | Total Incl.<br>Others* |
|------------------------------------|--------------------------------|-----------------|------------------|-----------------|------------------|------------------|-----------------|------------------------|
| <b>Non-special Category States</b> |                                |                 |                  |                 |                  |                  |                 |                        |
| Andhra Pradesh                     | 7.114                          | 3.032           | 5.530            | 8.438           | 7.016            | 11.267           | 15.65           | 8.644                  |
| Bihar                              | 8.722                          | 9.570           | 6.080            | 8.742           | 7.779            | 3.112            | 4.168           | 7.500                  |
| Chhattisgarh                       | 2.146                          | 4.370           | 1.989            | 2.735           | 4.216            | 2.464            | 0.725           | 2.824                  |
| Goa                                | 0.123                          | 0.433           | 0.0979           | 0.151           | —                | 0.00063          | 0.270           | 0.054                  |
| Gujarat                            | 5.074                          | 1.575           | 3.792            | 3.080           | 1.134            | 2.329            | 0.072           | 3.260                  |
| Haryana                            | 2.130                          | 2.170           | 1.741            | 1.869           | 2.218            | 0.369            | 1.208           | 1.377                  |
| Jharkhand                          | 2.770                          | 5.576           | 1.570            | 3.696           | 2.163            | 2.393            | 0.0539          | 2.671                  |
| Karnataka                          | 5.137                          | 3.476           | 3.420            | 5.900           | 4.216            | 8.252            | 11.130          | 6.172                  |
| Kerala                             | 2.805                          | 0.943           | 1.927            | 2.731           | 0.742            | 1.393            | 0.0454          | 1.472                  |
| MP                                 | 6.100                          | 8.90            | 4.766            | 5.343           | 13.000           | 10.480           | 9.111           | 7.765                  |
| Maharashtra                        | 9.442                          | 4.440           | 7.495            | 6.582           | 2.879            | 0.723            | 17.000          | 6.429                  |
| Orissa                             | 3.525                          | 4.960           | 3.625            | 4.548           | 7.616            | 1.494            | 11.750          | 4.287                  |
| Punjab                             | 2.328                          | 1.576           | 2.796            | 1.380           | 1.180            | 0.427            | 0.418           | 1.055                  |
| Rajasthan                          | 5.766                          | 9.993           | 5.920            | 4.164           | 4.710            | 17.700           | 2.233           | 8.572                  |
| Tamil Nadu                         | 6.062                          | 3.802           | 5.177            | 3.934           | 3.754            | 4.140            | 1.744           | 4.328                  |
| UP                                 | 16.77                          | 15.41           | 16.28            | 17.27           | 20.10            | 15.70            | 5.502           | 14.72                  |
| West Bengal                        | 7.676                          | 8.186           | 5.744            | 6.277           | 3.612            | 5.32             | 2.840           | 5.734                  |
| <b>Special Category States</b>     |                                |                 |                  |                 |                  |                  |                 |                        |
| Arunachal Pradesh                  | 0.116                          | 0.898           | 0.414            | 0.506           | 1.463            | 0.106            | 0.536           | 0.603                  |
| Assam                              | 2.619                          | 3.732           | 6.067            | 5.150           | 6.737            | 2.317            | 8.231           | 4.227                  |
| Himachal Pradesh                   | 0.576                          | 0.677           | 0.944            | 1.244           | 0.519            | 1.319            | 1.595           | 0.983                  |
| J&K                                | 1.054                          | 2.937           | 10.330           | 1.241           | 1.393            | 0.516            | 2.708           | 2.350                  |
| Manipur                            | 0.228                          | 0.118           | 0.663            | 0.606           | 1.137            | 1.301            | 0.7039          | 0.796                  |
| Meghalaya                          | 0.249                          | 0.738           | 0.604            | 0.921           | —                | 0.624            | 0.269           | 0.561                  |
| Mizoram                            | 0.092                          | 0.520           | 0.367            | 0.513           | 0.275            | 0.825            | 0.434           | 0.486                  |
| Nagaland                           | 0.166                          | 0.386           | 0.557            | 0.960           | 0.578            | 1.677            | 0.715           | 0.821                  |
| Sikkim                             | 0.051                          | 0.137           | 0.186            | 0.183           | 0.209            | 0.264            | 0.388           | 0.226                  |
| Tripura                            | 0.309                          | 0.587           | 0.825            | 1.275           | 0.909            | 2.640            | 0.467           | 1.220                  |
| Uttarakhand                        | 0.850                          | 1.258           | 1.085            | 0.560           | 0.491            | 0.833            | —               | 0.866                  |
| <b>Total (₹in crore)</b>           | <b>119.01</b>                  | <b>12,721.9</b> | <b>14,048.12</b> | <b>8,059.62</b> | <b>10,390.13</b> | <b>33,569.37</b> | <b>83,92.67</b> | <b>1,31,189.48</b>     |
| <b>(% Share)</b>                   | <b>(100)</b>                   | <b>(100)</b>    | <b>(100)</b>     | <b>(100)</b>    | <b>(100)</b>     | <b>(100)</b>     | <b>(100)</b>    | <b>(100)</b>           |

Source: Planning Commission.

Note: AIBP = Accelerated Irrigation Benefit Programme; ICDS = Integrated Child Development Services; NREGA = National Rural Employment Guarantee Scheme; NRHM = National Rural Health Mission; PMGSY = Pradhan Mantri Gram Sadak Yojana; SSA = Sarva Shiksha Abhiyan; UT = Union Territories.

## SPECIAL AREA PROGRAMMES

11.42. Interventions to tackle regional disparities being taken up by the Union Government fall into two categories. The first is to direct investments into less developed States under CSS through more favourable norms for distribution of assistance. For instance, under the Indira Awas Yojana, funds are allocated State-wise based upon the housing shortage and population below the poverty line. Consequently in 2010–11, Bihar received about 25 per cent of the allocation under the programme. Similarly, in the case of the National Rural Health Mission (NRHM), 17 States have been identified for focused attention. However, the most important intervention of the Central Government are the special area development programmes that have a clear focus on some aspect of development in identified backward areas. These programmes are:

1. The BRGF
  - a. The District Component
  - b. The IAP for Selected Tribal and Backward Districts
  - c. The special package for Bundelkhand region
  - d. The Special Plan for Bihar
  - e. The Special Plan for West Bengal
  - f. The Special Plan for the KBK Districts of Orissa
2. The HADP/WGDP
3. The Border Areas Development Programme (BADP)

### BRGF

11.43. The BRGF, launched in late 2006 at the end of the Tenth Plan, was designed to redress regional imbalances in development. It aimed at catalysing development in backward areas by converging, through supplementary infrastructure and capacity building, the substantial existing development inflows into these districts as part of a well-conceived, participatory district plan.

#### *District Component of the BRGF*

11.44. The BRGF District Component provides financial resources for supplementing and converging existing developmental inflows into identified districts, so as to:

1. bridge critical gaps in local infrastructure and other development requirements that are not being adequately met through existing inflows;
2. strengthen, to this end Panchayat- and Municipality-level governance with more appropriate capacity building, to facilitate participatory planning, decision-making, implementation and monitoring, to reflect local felt needs;
3. provide professional support to local bodies for planning, implementation and monitoring their plans; and
4. improve the performance and delivery of critical functions assigned to Panchayats, and counter possible efficiency and equity losses on account of inadequate local capacity.

11.45. The BRGF District Component subsumed the ongoing RSVY. The management of the scheme was also shifted from the Planning Commission to the Ministry of Panchayati Raj (MoPR), given that planning was to be through Panchayati Raj Institutions (PRIs), culminating in a Draft Development Plan prepared by the District Planning Committee (DPC). It was hoped that the focus on decentralised participative planning in the implementation framework for the scheme would catalyse the formation and functioning of constitutionally mandated DPCs, an arrangement that had hitherto been neglected in most States.

11.46. All funds sanctioned by MoPR under the Programme are transferred to the Consolidated Funds of the concerned State Governments. The funds are required to be transferred to the Panchayats, the Municipalities and other implementing authorities such as the State Institutes of Rural Development, and so on, by the State Governments within 15 days of the release of funds to the Consolidated Fund following the same approach as mandated in the case of transfer of Twelfth Finance Commission Grants. States were requested to adopt the mechanism of bank transfer to local governments through core banking arrangements.

11.47. Under the BRGF, for bridging identified critical gaps in infrastructure, participative plans are required to be prepared by each Panchayat and

Municipality for its functional domain. These plans, which should take into account all development inflows into the area, including those other than BRGF, are then to be consolidated into district plans by the DPCs. The funds provided under BRGF are untied and can be used to meet any development gap identified by the community in its interaction with the Panchayats and Municipalities.

#### Physical Performance

11.48. As far as physical achievements under the programme are concerned, the analysis of the District Plans and Progress Reports received in the Ministry so far from the various States indicates that the untied fund allocated to the districts are generally being used for filling infrastructure gaps in drinking water, health, education, social sectors, electrification, and so on. The basket of works taken up includes construction of school buildings/classrooms, toilets, playgrounds, health sub-centre, bore wells, drinking water facility, sanitation facilities, anganwadi buildings, Panchayat buildings, irrigation tanks/channels, agriculture and animal husbandry facilities, electrification, street lights, link roads, market yards, Haat Bazaars, flood control structures, soil and water conservation measures, cremation/burial grounds, houses for below poverty line (BPL) families, training and marketing facilities for self-help groups (SHGs), culverts, suspension bridges, and so on.

11.49. The Ministry has adopted the principle of 'Rolling Plans and Revolving Funds' under which incomplete works of a year are to be included in Action Plan for the next year.

#### Financial Performance

11.50. The details of achievement of the financial targets for the Eleventh Plan, up to 2010–11, are given below (Table 11.16).

#### Evaluation of the Programme

11.51. The programme has been evaluated by a World Bank Mission on the request of the MoPR in 2009, which visited two districts each in eight States in July 2009. The MoPR also constituted a National Advisory cum Review Committee for BRGF. Among the strengths of the programme, the evaluations have identified the fact that the programme has pioneered implementation through the Panchayats, Municipalities and the DPCs, making decentralised planning more meaningful. It is also found that focus on capacity building of local bodies has enhanced the confidence, awareness and performance of their elected representatives and officials. The discretionary nature of the BRGF development funds has been appreciated by the Local Bodies as the most significant feature of the programme.

11.52. The major weaknesses identified include the criteria for identification of BRGF districts, the very low quantum of grant per Panchayat, which averages to ₹2 to 3 lakh per year and is regarded as too small to have any significant impact, cumbersome procedures for release of funds and the fact that PRIs/Urban Local Bodies (ULBs) still suffer from inadequate quality of human resource and infrastructure support.

**TABLE 11.16**  
**Eleventh Plan Expenditure**

| Financial Year | Allocation (₹ Cr.) |          | Expenditure Achievement |         |         |
|----------------|--------------------|----------|-------------------------|---------|---------|
|                | BE                 | RE       | ₹ Cr.                   | % of BE | % of RE |
| 2007–08        | 4,670.00           | 3,600.00 | 3,600.00                | 77.09   | 100.00  |
| 2008–09        | 4,670.00           | 3,890.00 | 3,889.75                | 83.29   | 99.99   |
| 2009–10        | 4,670.00           | 3,670.00 | 3,669.97                | 78.59   | 100.00  |
| 2010–11        | 5,050.00           | 5,050.00 | 5,050.00                | 100.00  | 100.00  |
| 2011–12        | 5,050.00           | 3,717.00 | 3,917.00                | 77.56   | 105.38  |

Source: Planning Commission.

Note: Expenditure are till 2010–11 and do not cover the last year of the Plan.

11.53. Based on the insights drawn from the reviews of the BRGF and many other considerations, we are proposing a completely new architecture from the second year of the Twelfth Plan (see below).

#### *Special Plan for Bihar*

11.54. The Special Plan for Bihar is one of the components of the BRGF, designed to reduce regional imbalance more holistically in the region. The Special Plan has been formulated to bring about improvement in sectors such as power, road connectivity, irrigation, forestry and watershed development.

11.55. An allocation of ₹1,000 crore per annum was being made for the Special Plan during the Tenth Plan period. The same allocation was approved for the Eleventh Plan period. However, this allocation has been enhanced to ₹2,000 crore for 2010–11 and ₹1,468 crore for 2011–12. The Planning Commission is administering the Special Plan and funds are being released on a 100 per cent grant basis.

11.56. Most of the projects started under the Plan are still incomplete and would require funding in the Twelfth Plan period. Further, revised cost estimates have been received for the State Highways Project and the Rail Road Bridge at Digha near Patna. Special Plan for Bihar needs to continue as infrastructure and development gap is still quite high between Bihar and other States, and there is some obligation arising from the preamble to the Bihar Re-organization Act. Further the Inter-Ministerial Group (IMG) to consider a Memorandum for Special Category status to Bihar has also recommended continuation of Special Plan for Bihar in the Twelfth Plan.

#### *Special Plan for the KBK Districts of Orissa*

11.57. The undivided districts of Koraput, Bolangir and Kalahandi (later reorganised into eight districts since 1992–93) cover 47,646 sq km area and comprise 14 Sub-divisions, 37 Tehsils, 80 CD Blocks, 1,437 Gram Panchayats and 12,293 Villages. The KBK districts, with population of 72.87 lakh (19.80 per cent of the State's population) have 89.95 per cent rural and 54.66 per cent ST (38.41 per cent) and Schedule Caste (SC) (16.25 per cent) population as per 2001 Census. Demographically, tribal communities dominate this region.

11.58. The backwardness of the KBK region is rooted in its history. Recurrent droughts and floods have adversely affected lives of the people and their economies in these districts. Hostile agro-climatic conditions, poor connectivity and infrastructure and physical isolation characterise this region.

11.59. More than 50 per cent of forest area of these districts has been considerably degraded. These are mostly revenue forests on hill slopes which have not been surveyed. Whereas the total area of forest under KBK districts on record is 15,957 sq km (that is, 33.5 per cent), actual forest cover is only 12,690 sq km. This includes 5,703 sq km of dense forests, 6,987 sq km open forests and 3,267 sq km barren forests. The continuous process of forest degradation adversely affects livelihoods options of the poor.

11.60. The KBK districts have been the focus of attention since the 1980s. A Long-term Action Plan for a period of seven years was launched in 1995–96. This plan was further revised in 1998–99 and the Revised Long Term Action Plan (RLTAP) was put in place for a period of nine years. This RLTAP was actually a sum total of the allocations made by various Central Ministries for CSS and the ACA allocated by the Planning Commission to fill critical gaps. This ACA was released in the form of 70 per cent loan and 30 per cent grant.

11.61. On the advice of the Planning Commission, the State Government started preparing the Special Plan for the KBK districts from 2002–03 onwards. An allocation of ₹200 crore was made for the Special Plan for the year 2002–03, which was later enhanced to ₹250 crore after approval to the scheme in 2003–04. Thus, an allocation of ₹250 crore was made for the Special Plan during the Tenth Five Year Plan period, from 2003–04 to 2006–07, under the RSVY on 100 per cent grant basis. The RSVY was replaced by the BRGF from 2006–07. The Districts Component of the BRGF covers 19 districts of Orissa. All the eight KBK districts are included in the 19 districts of Orissa covered under the Districts component.

11.62. In 2006–07, it was decided that the eight KBK districts will be funded under the BRGF district

norms, with the balance being provided under the KBK Special Plan. Accordingly, an annual allocation of ₹120 crore is being made under the Districts Component of the BRGF for the eight KBK districts and the remaining allocation of ₹130 crore is being made through the Special Plan for the KBK districts from 2007–08. In all, funds to the order of ₹3,080.06 per head have flowed to this region under the aforesaid programmes since 1995–96 to 2010–11. In addition, this region has been recently receiving development funds under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Pradhan Mantri Gram Sadak Yojana (PMGSY), SSA, NRHM and other development programme. With improvement in the fiscal conditions of the State, flow of the State funds to this region has also improved in recent years.

#### 11.63. Impacts:

- A preliminary analysis of NSS data has indicated that poverty reduced by 24.6 percentage points from 87.1 per cent in 1999–2000 to 62.5 per cent in 2004–05 as per MRP Methodology.
- Enrolment rate in primary schools in KBK districts has gone up from 75.89 per cent in 1996–97 to 94.11 per cent in 2008–09. Similarly, the enrolment rate in upper-primary schools in KBK districts has gone up from 56.39 per cent in 1996–97 to 95.29 per cent in 2008–09.
- Dropout rate in primary schools in KBK districts has been reduced from 57.13 in 1996–97 to 6.79 in 2008–09.
- Female literacy rate has increased from 15.87 in 1991 to 29.10 in 2001. At the same time, the overall literacy rate has increased from 29.24 in 1991 to 43.30 in 2001. Literacy levels in 2011 have significantly improved to 57.56 per cent (that is, male literacy—69.5 per cent, and female literacy—45.9 per cent).

11.64. There are several reasons as to why the Special Plan for the KBK region should be extended beyond the Eleventh Five Year Plan with increased Special Central Assistance (SCA). Briefly these are:

- *Geographic and Demographic Characteristics Have Meant Slower Development:* The demographic and geographic characteristics of the region indicate that the inter-habitation and inter-village connectivity in the region is still poor. Public infrastructure such as schools, Anganwadi centres and health institutions are still not available in sufficient numbers. The implementation of national Flagship Schemes, such as PMGSY, to improve connectivity has not yet been able to close the gap, because of the scattered habitations in the region.
- *Human Development Gaps Still Exist:* While there has been improvement in human development indicators, they are still far below the desirable levels. For instance, literacy is still below the State average of 73.4 per cent (male literacy—82.4 per cent, and female literacy—64.3 per cent). Female tribal literacy rates are much lower than the State averages. Though poverty came down to 62.5 per cent in 2004–05, that still is a high and perturbing level of incidence.
- *Flow of Development Funds Has Not Yet Closed the Gap of Insufficient Funding in the Past:* Though the flow of public investments has considerably improved in recent times, the region was grossly neglected in the past and did not receive any appreciable flow of development funds.

#### *IAP for Selected Tribal and Backward Districts*

11.65. An IAP for 60 selected tribal and backward districts in 9 States was approved by the government on 25 November 2010 with a block grant of ₹25 crore and ₹30 crore per district for 2010–11 and 2011–12, respectively.

11.66. The main principles which underline the IAP are flexibility and local autonomy, clear-cut accountability, frequent communication and monitoring, interaction for problem solving and horizontal learning through video conferences/meetings and early audit. In furtherance of these principles, the funds under the scheme are placed at the disposal of a committee headed by the District Collector and consisting of the Superintendent of Police of the district and the District Forest Officer. The district-level committee has the flexibility to spend

the amount for development schemes according to need, as assessed by it. The State Governments and the District Collectors/District Magistrates have also been advised to ensure a suitable form of consultation with the local Member of Parliament on the schemes to be taken up under IAP. The district-level committee has to draw up a Plan consisting of concrete proposals for public infrastructure and services such as School Buildings, Anganwadi Centres, Primary Health Centres (PHCs), Drinking Water Supply, Village Roads, Electric Lights in public places such as PHCs and schools, and so on. The Development Commissioner/equivalent officer in charge of development in the State is responsible for scrutiny of expenditure and monitoring of the IAP. Total releases under IAP have been ₹5,100 crore.

11.67. An online MIS system has been set up to facilitate reviews and special reviews. In addition, the Review Group headed by the Cabinet Secretary also reviewed the progress of implementation of IAP with the Chief Secretaries of nine States through Video Conferences on 21 March and 8 September 2011.

11.68. Apart from special schemes as above, the GOI has also been focusing on channelising funds from existing programmes, coupled with better monitoring, to ensure the effective implementation of all-India schemes in the IAP districts. One of the recent initiatives in this regard is the setting up of an Empowered Group of Officers for this purpose with Member-Secretary, Planning Commission, as chairperson; Secretary, Ministry of Rural Development, Secretary, MoPR and Secretary, Ministry of Tribal Welfare, as Members; and Special Secretary, Ministry of Home affairs as Member-Secretary. The Empowered Group, inter alia, has overriding powers to modify existing norms/guidelines of various development programmes and Flagship Schemes in consultation with the Ministries/Departments concerned. As decided by the Empowered Group, following relaxations of norms have been effected for the 60 IAP districts:

1. Under the PMGSY, the norms for maximum length of bridges has been relaxed from 50 m to 75 m and the population norm of 500 for habitations coverage has been relaxed to 250.

The minimum tender package amount under PMGSY has been reduced to ₹50 lakh.

2. Under the Indira Awaas Yojana (IAY), the ceiling of per unit cost of IAY house has been increased from ₹45,000 to ₹48,500.
3. The Empowered Group recommended to the Ministry of Environment and Forests that the grant of general approval under section 2 of the Forest (Conservation) Act, 1980, for diversion of forest land for activities like schools, dispensaries/hospitals, electrical and telecommunication lines, drinking water, water/rain water harvesting structures, minor irrigation canal, non-conventional sources of energy, skill up gradation/vocational training centre, power sub-stations, rural roads, communication posts; and police establishments like police stations/outposts/border outposts/watch towers in sensitive areas and underground laying of optical fibre cables, telephone lines and drinking water supply lines should be relaxed. This was agreed to by the Ministry of Environment and Forests. Ministry of Environment and Forests have also agreed that no compensatory afforestation in lieu of the forest land diverted in accordance with the above-said general approval shall be insisted upon for 60 IAP districts.
4. The stipulation of 80 per cent utilisation of funds for further release of funds under BRGF has been revised to 60 per cent utilisation of funds. Changes have been made to ensure quick release of fund from State to the local bodies under BRGF. Also DPCs have been given power to approve the district Plans under BRGF and the High Powered Committee (HPC) will act not as approval granting bodies but as oversight committees and issue broad guidelines.
5. For effective implementation of electrification projects in 60 IAP districts, Empowered Group had approached the Ministry of Power to relax the conditions in the Decentralized Distributed Generation (DDG) guidelines relating to non-availability of grid for implementation of the scheme. This has been agreed to by the Ministry of Power.
6. The Empowered Group raised the subsidy limit for a scheme for providing solar charging stations from 30 per cent to 90 per cent. Accordingly,



Ministry of New and Renewable Energy proposes to provide solar charging station consisting of 50 LED solar lanterns with solar panels, and so on, in villages/habitations of the 60 IAP districts.

**11.69.** The Twelfth Plan Working Group on Special Area Programmes has remarked that although

the Planning Commission has been espousing the cause of decentralised planning at the level of each Panchayat, the IAP has put in place exactly the opposite approach. The schemes/works to be taken up under this programme are decided by a Three Member Committee headed by the District Collector and consisting of the Superintendent of Police of the District and the District Forest Officer. This system is totally against the letter and spirit of the 73rd & 74th Amendments and considerably dilutes the stand of the Planning Commission in favour of decentralised participative planning. We suggest strongly that the implementation mechanism under the scheme should not in any way differ from that prescribed by the Planning Commission in its own Decentralised Planning Guidelines.

**11.70.** The IAP is being recast from the second year of the Twelfth Plan accordingly.

#### *The Bundelkhand Region*

**11.71.** The Bundelkhand region comprises seven districts of UP—Banda, Chitrakoot, Hamirpur, Jalaun, Jhansi, Lalitpur and Mahoba and six districts of MP—Chhatarpur, Damoh, Datia, Panna, Sagar and Tikamgarh. Keeping in view the consecutive deficient rainfall experienced in this region since 2004–05, on 19 November 2009, the Union Government approved a special package for implementing drought mitigation strategies in Bundelkhand region at a cost of ₹7,266 crore comprising ₹3,506 crore for UP and ₹3,760 crore for MP, to be implemented over a period of three years starting 2009–10. Of the entire package, ₹3,650 crore (₹1,696 crore for UP and ₹1,954 crore for MP) are

additional allocations through an ACA (including ₹100 crore each for UP and MP to provide drinking water in the region, approved on 19 May 2011). The balance of the funds is to be met by converging resources from the Central sector and CSS by dedicating specified amounts. The responsibility for implementation of projects under the special package rests with the State Governments of UP and MP. It is reported that activities under the package are at different stages of implementation. A total of ₹1,921.43 crore has been released as ACA so far. With expenditure being ₹630.81 crore, the activities have taken time to settle down and pick up pace.

**11.72.** The progress of implementation is monitored by the Planning Commission and National Rainfed Area Authority (NRAA). The Planning Commission has set up a Monitoring Committee with Members of Planning Commission in charge of UP and MP as Chairman and Co-chairman, respectively; the Chief Secretaries of both States and the Secretaries of the Departments concerned as Members. An Advisory Committee under the Chairmanship of the Deputy Chairman, Planning Commission, with all Members of the Lok Sabha from Bundelkhand as its Members, also reviews the progress of the implementation of the projects.

**11.73.** In view of the short period, the project is yet to give full results. There is need to continue this and step up flow of ACA.

#### *Special Plan for West Bengal*

**11.74.** Additional Central Assistance is being provided for the Special Plan for West Bengal to address the development needs of the backward regions of the State through focused projects in the year 2011–2012 and during the Twelfth Plan period. The Special Plan for West Bengal was approved on 7 December 2011 with an allocation of ₹8,750 crore. Schemes with allocation of ₹8,791.97 crore have been approved in sectors such as power, health, road connectivity, water supply and sanitation, education, micro- and small-scale enterprises, irrigation, rural housing, skill development and so on. An amount of ₹2,903.66 crore has been released to the State Government.

### Hill Areas Development Programme/Western Ghats Development Programme (HADP/WGDP)

11.75. The HADP/WGDP has been in operation since the Fifth Five Year Plan in identified hill areas. Its main objective is to ensure ecologically sustainable socio-economic development of hill areas, keeping in view the basic needs of the people there. The main objectives of both programmes are eco-preservation and eco-restoration with a focus on sustainable use of biodiversity. They also focus on the needs and aspirations of local communities, particularly their participation in the design and implementation of the strategies for conservation of bio-diversity and sustainable livelihoods.

11.76. The Designated Hill Areas covered under HADP were identified in 1965 by a Committee of the National Development Council (NDC). These included eight (later bifurcated into 12) districts of UP. However, consequent on the formation of Uttarakhand as a separate State, HADP is no longer in operation in the hill districts of erstwhile UP. Presently, the designated Hill Areas covered under HADP include two hill districts of Assam—North Cachar and Karbi Anglong, the major part of Darjeeling district of West Bengal and the Nilgiris district of Tamil Nadu.

11.77. Out of the total SCA outlay under the programme, 90 per cent is a grant and the remaining 10 per cent is State share. These funds are allocated to identified hill areas under HADP and blocks/talukas under the WGDP. Funds under the SCA are apportioned between the HADP and WGDP in the ratio of 60:40. Under HADP, funds are distributed to States implementing the programme on the basis of equal weightage to area and population. Under the WGDP, the weightage for allocation is 75 per cent to area and 25 per cent to population. The 1981 Census is taken as the baseline for calculation.

11.78. The schemes being implemented under HADP/WGDP are mainly in the sectors of Agriculture and Soil Conservation, Forestry, Social Forestry, Animal Husbandry, Horticulture, Sericulture, Apiculture,

Minor Irrigation, Veterinary, Fisheries, Link Roads and Foot Bridges, Livelihood Activities, Small Scale Industries, Watershed Development, Welfare of SCs/STs, Rural Energy Conservation, Administration and Training.

### Western Ghats Development Programme (WGDP)

11.79. The main problems of Western Ghats region are the pressure of increasing population on land and vegetation. These factors have contributed to the ecological and environmental problems in the region. The fragile ecosystem of the hills has come under severe pressure because of submergence of large areas under river valley projects, damage to area due to mining, denudation of forests, clear felling of natural forest for raising commercial plantation, soil erosion leading to silting of reservoirs and reduction in their lifespan and the adverse effects of floods and landslides, encroachment of forest land and poaching of wildlife.

11.80. The WGDP was launched in 1974–75 to cover contiguous talukas/blocks along the Ghats that have at least 20 per cent of their area above an elevation of 600 m above mean sea level (MSL). Currently, the programme is being implemented in 175 talukas (Maharashtra—63, Karnataka—40, Kerala—36, Tamil Nadu—33 and Goa—3). Allocation during the Eleventh Plan under this programme is ₹594 crore, including ₹59.60-crore State share.

11.81. At present, the main emphasis has been on watershed development with small gap-filling infrastructure. The SCA may be used for livelihood schemes which preserve and even increase productivity without disturbing the environment such as, minor forest produce, afforestation, horticulture, pisciculture, and so on. In the case of watershed schemes, the cost norms of the guidelines of the NRAA/Ministry of Rural Development may be followed.

11.82. Given the great longevity of these programmes and lack of tangible outcomes on the ground, it is proposed that the HADP and WGDP be restructured.

### Border Area Development Programme (BADP)

11.83. The BADP is a 100 per cent Centrally Funded Programme initiated in the border areas of the western region during the Seventh Five Year Plan period for ensuring balanced development through development of infrastructure and promotion of sense of security among the border population. Since then the BADP has been implemented by the GOI together with State Governments as part of a comprehensive approach to border management. The programme now covers 358 border blocks of 94 border districts of 17 States located along the international land border (Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, J&K, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Rajasthan, Sikkim, Tripura, UP, Uttarakhand and West Bengal). Under the BADP, priorities are given to the areas closer to the border. Works under BADP are taken up by the States under various sectors such as strengthening of social and economic infrastructure; filling up of critical gaps in the road network, especially link roads, bridges, culverts, and so on; schemes for employment generation, education, health, agriculture and allied sector and schemes which provide for critical inputs in the social sector.

11.84. As per the Report of the Working Group on BADP for the Twelfth Five Year Plan, BADP has contributed towards creating a conducive environment for undertaking normal economic activities in border areas and has potential to bring about an improvement in the quality of life of the people living there. Furthermore, the programme has created confidence amongst the people and helped security forces in obtaining the cooperation of the local population in carrying out their functioning smoothly and peacefully.

11.85. The weaknesses reported in the programme are that the level of assistance is supplemental nature and it does not permit undertaking major infrastructure projects. Thus, funds are utilised for small schemes and programmes. The allocations under the programme are too small to address the livelihood and other socio-economic issues. Fragmentation

of the programme leads to it not receiving focused attention of the implementing agencies. Difficulties are also experienced in converging various Central/State schemes with the BADP.

11.86. To address these issues, flexibility in implementation has been supported by the revised guidelines, which enable the involvement of local governments, communities, non-governmental organisations (NGOs) and SHGs that do not receive foreign aid assistance, for executing schemes. These measures can be adopted by the State-level Screening Committees under intimation to the Ministry of Home Affairs. Projects not exceeding ₹5.00 lakh are to be strictly implemented through local governments alone. State Governments are encouraged to involve the community in sharing of 10 per cent to 15 per cent of the cost of social infrastructure wherever possible. Security-related works can also be taken up under BADP to the extent of 10 per cent of the total allocation in a particular year.

11.87. Border areas should have a high standard of living so that they serve as a demographic buffer. Infrastructure should not only cater to the current needs of these areas but also include scope for further expansion. Participatory plans for border villages and blocks should be prepared based on the instructions of the Planning Commission on the formulation of district plans. These village-/block-level plans will be a part of the comprehensive district plan. The preparation of plans will be preceded by baseline surveys in all villages in the border blocks to assess gaps in physical and social infrastructure. The district plans would help ensure convergence/dove-tailing of CSS with BADP. It is also important that the States ensure earmarking of due share of resources from Centrally Sponsored and State Plan Schemes to the Border Areas.

11.88. While the BADP has helped in supplementing infrastructure development in border areas and addressing livelihood and other socio-economic issues of the border areas, the allocation under the programme has been relatively too small to ensure a focused attention of the State Governments. A much larger effort is, therefore, required to develop these

areas not only in terms of funds for creation of infrastructure but also to have a re-look at the policies which distort the development process and increase the sense of alienation of the border population.

11.89. The current level of funding for BADP is inadequate. An outlay of ₹7,230 crore is proposed for the Twelfth Plan.

#### New Approach to BRGF in the Twelfth Plan

11.90. The experience of Special Area Programmes has made it abundantly clear that the persistence of backwardness is not a problem that can be solved merely with a generous infusion of funds. It is increasingly clear that overcoming underdevelopment is critically dependent upon the robustness of the institutional structure of governance in these areas. This is the key binding constraint on their very capacity to absorb more development funds.

11.91. The principle of subsidiarity is now well established in development literature across the world.<sup>12</sup> The role of local governments in ensuring efficient and accountable delivery of basic services is now well understood. The instrumentality of participative planning, as the thin end of the wedge to energise local governments, has been repeatedly endorsed by the Planning Commission. Development experience within India's States shows that the best examples of implementation are where people feel a sense of ownership over the programmes. Involving people in the monitoring of performance also ensures greater accountability in the programme. This is the experience, for example, of midday meals in Tamil Nadu; health in Maharashtra; watershed development and MGNREGA in MP, drinking water and sanitation in Haryana; public distribution system (PDS) in Chhattisgarh; groundwater management, social audit and Girijan Co-operative Corporation for Minor Forest Produce in Andhra Pradesh; participatory irrigation management (PIM) in Karnataka; power reforms and agricultural extension in Gujarat; Kudumbashree in Kerala and IAP in Orissa. However, these examples also show that participatory approaches work only when the necessary conditions for their success are in place. The new approach to the BRGF during the Twelfth Plan seeks

to incorporate these key lessons so that real potential of devolution can be realised.

11.92. The support being provided in the Twelfth Plan through this BRGF window for these districts would be used in building capacities and developing and implementing Plans in a bottom-up and participatory manner. The Centre will not specify anything beyond this about the heads on which this money would be spent, so long as the districts adhere to this decentralised process of formulating the programmes in convergent manner. The Twelfth Plan Working Group on Special Area Programmes illustrates the dangers of non-convergence in Box 11.1.

#### Box 11.1

##### From the Report of the Twelfth Plan Working Group on Special Area Programmes

Currently, the KBK districts receive funding under three components of the BRGF—₹130 crore under the Special Plan, ₹120 crore under the District Component and ₹240 crore under the IAP. However, the mode of utilisation is different and the authorities choosing the schemes are different! The State Government decides the schemes to be taken up under the Special Plan, the PRIs the schemes under the District Component and the three-member committee comprising of the Collector, the SP and the DFO, under the IAP. Needless to say, a lot of money swirls around in the district, but there is no district plan, only a health plan, an education plan, a BRGF plan and an IAP plan!

11.93. It is in view of this understanding that the Approach Paper to the Twelfth Plan proposed to address these issues by creating a 'Plan within a Plan'. The Approach Paper suggested a special arrangement whereby in the next two years of the Twelfth Plan, funds would be unconditionally released for Special Area Programmes to facilitate:

- capacity building of PRIs, in terms of both human resources capacities and systems of implementation;
- improved implementation of flagship programmes;
- speedy implementation of Panchayat (Extension to the Scheduled Areas) Act (PESA) in tribal areas; and
- speedy implementation of Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act in tribal areas.<sup>13</sup>

11.94. This would improve the absorptive capacities of these districts for outlays provided under various schemes and also for the use of additional funds to be provided to those districts that are able to move in the direction specified in the next two years of the Plan. This progress would be monitored against the list of indicators developed by the Planning Commission and additional funds provided in the next two years to those districts which show progress against these indicators.

11.95. The restructured BRGF will be based on the following formulation:

1. *Focus on all three levels: district, sub-district and supra-district:* Among the major lessons of the experience of BRGF implementation, as emphasised by the Union Ministries of Panchayati Raj, Tribal Affairs and Rural Development, as also several State Governments, is that there is a need to focus on the sub-district level for effective realisation of outcomes. The restructured BRGF, therefore, seeks to make a special emphasis on the sub-district level. However, it is also the experience of the BRGF and other Special Area Programmes, that there are many activities that require a district-level focus, and some even require a supra-district thrust, especially when we consider important infrastructure projects.

Thus, the restructured BRGF will focus on all three levels: district, sub-district and supra-district. Bihar and West Bengal Special Plans, as also the Supra-district Components of the KBK and Bundelkhand packages, will continue to be overseen by the Planning Commission. The district-level programmes like the IAP and the District Component of existing BRGF will be reorganised into a new programme, where some flexi-funds would be made available to the district administration (more in Left Wing Extremism [LWE] districts) to fill in the critical gaps, while the bulk of the programme will be implemented through PRIs.

2. *Criteria for Selection:* The criteria for selection of areas under BRGF have also come in for criticism. The Twelfth Plan proposes that we rely only on the relatively unimpeachable data made available through Census, 2011, for selection of

districts and sub-districts. The criteria of inclusion of districts and sub-districts under the new BRGF would be:

- a. Percentage of agriculture workers/total workers (economic backwardness)
- b. Percentage of SC + ST population (social backwardness)
- c. Female literacy rate (educational backwardness)
- d. Percentage of households without electricity (infrastructure backwardness)

Based on these criteria, it is proposed to include the 200 most backward districts and 1,500 most backward sub-districts<sup>14</sup> under the restructured BRGF.

3. *Financial Allocations:* We propose to substantially raise the financial allocations to overcome the criticism that BRGF is inadequately funded and lacks the critical mass to make a significant difference on the ground. What is more, the greater the intensity of deprivation of a district or sub-district, the higher the allocation it will receive. Thus, a rainfed district will get a higher allocation and sub-districts with a significant proportion of STs will also receive more. This is because rainfed areas and tribal populations have been highly correlated with poverty and backwardness in various dimensions.
4. *Plan Outlay:* The indicative allocation for the Supra-district (State) Component in the Twelfth Plan is likely to be ₹30,000 crore, which will include the Bihar and West Bengal Special Plans, as also the KBK and Bundelkhand Packages. The allocation for the revamped District/Sub-district Component is likely to be around ₹46,500 crore. Thus, the total indicative allocation for BRGF during the Twelfth Plan is ₹76,500 crore, which includes both State and District Components.

### Rajiv Gandhi Panchayat Sashaktikaran Abhiyan (RGPSA)

11.96. Even as we restructure the BRGF, a concomitant initiative critical for the success of the new BRGF, as shown by all evaluations of the programme, is also being launched by the MoPR in the Twelfth Plan. This is the RGPSA, which not only amalgamates the

existing small schemes of the MoPR, but also empowers PRIs. The RGPSA is backed by a tenfold increase in resources for MoPR in the Twelfth Plan as compared to the Eleventh Plan. The RGPSA will be a decisive move in favour of empowering PRIs, which will greatly strengthen the implementation of BRGF and many other flagship programmes. The RGPSA seeks to enhance capacities and effectiveness of Gram Panchayats and the Gram Sabhas by strengthening the institutional structure for knowledge creation and capacity building and by providing them necessary human resource and infrastructure support. RGPSA will provide performance-linked funds from 2014–15 onwards. Twenty per cent scheme funds will be tied to State performance on identified deliverables in the State Plan. Strengthening the Panchayati Raj system involves not just provision of capital and human resource such as buildings, training, technical expertise, and so on, but also adequate devolution, bottom-up planning, convergence, accountability and free and fair elections. Under RGPSA, States are expected to show progress on these fronts as a condition for accessing funds under this scheme.

11.97. The indicative allocation for BRGF during the Twelfth Plan is ₹76,500 crore which includes both State and District Components.

#### NORTH-EASTERN REGION DEVELOPMENT

11.98. NEER comprises of eight States of the North-East (NE), including Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. Special requirements of the NEER and the need for significant levels of investment are now well recognised. Accordingly, efforts have been made since inception of the planning process to address the problems in the critical areas of development with special programmes and funding arrangements. There has also been continuous attempt to supplement development efforts of the Special Category States of NEER by the Centre by providing Central Plan Assistance. Some of the programmes, like BADP, HADP, grants under Article 275(1) and BRGF are attempts to address some of the area-specific problems in a limited way. Setting up of the North-Eastern Council (NEC) under NEC Act, 1971, as regional planning body has been another sincere

step for balanced development of the region. In the latter part of the Ninth Plan, the announcement of 'New Initiatives for the North Eastern Region' in October 1996 gave further boost to the development process. Earmarking of at least 10 per cent of the Plan Budget of the Central Ministries/Departments for NEER and creation of Non-lapsable Central Pool of Resources (NLCPR) were the outcome of this announcement. Both of these helped transfer of resources to the region.

#### Plan Expenditure

11.99. In terms of flow of development fund, a positive impact is visible after the policy decision of earmarking 10 per cent of Gross Budgetary Support (GBS) of the Departments for the NE. At present, more than 50 Non-exempted Central Ministries/Departments earmark 10 per cent of the GBS for the NEER. Seventeen Ministries/Departments are exempted from 10 per cent mandatory earmarking due to nature of their functions. According to the assessment made by Ministry of Development of North Eastern Region (M/o DoNER), the Central Ministries/Departments spent ₹44,909.36 crore out of total earmarked fund of ₹53,293.86 crore since 1998–99 till the end of the Tenth Plan (2002–07). During the Eleventh Plan, the expenditure incurred by the Central Ministries in the NEER was ₹59,072.95 crore (March 2010–11). By the end of the Plan, it is likely to be ₹75,000 crore. This is against total earmarked outlay of ₹87,502.97 crore for the Plan.

11.100. The utilisation of the 10 per cent mandatory earmarked funds by the Central Ministries has gone up from 80.8 per cent till the Tenth Plan to 89.7 per cent in the first four years of the Eleventh Plan. An amount of ₹19,364.03 crore had accrued to the NLCPR till 2010–11; out of this, an amount of ₹9,595.11 crore has also been released to the States under the NLCPR scheme of M/o DoNER for specific projects in the States of NEER.

11.101. The total Plan expenditure by the Centre and the States of NE, including NEC, had been approximately ₹1,23,756 crore during the four years of the Eleventh Plan (March 2011) through various windows of funding (including Central assistance

provided to the States under their plan, NLCPR and NEC, CSS, and so on). However, this does not include the investments made by the public sector undertakings. (Please refer to Table 11.17.)

**TABLE 11.17**

**Total Plan Expenditure by the Centre and States of NE, Including NEC**

| Source of Fund Flow  | ₹ Crore            |
|----------------------|--------------------|
| 1 State Plan         | 57,258.84          |
| 2 Central Ministries | 59,072.95          |
| 3 M/o DONER, NEC     | 7,424.71           |
| <b>Total</b>         | <b>1,23,756.50</b> |

11.102. This is likely to go up to ₹1.50 lakh crore by the end of the Plan.

### Major Developments in the Field of Infrastructure

11.103. During the latter part of the Ninth Plan, action for identification of infrastructure deficit in the key areas and funding arrangement for the major infrastructure resulted in prioritisation of projects of connectivity (Road, Rail, Air), development of power, investment in Human Resource Development, expansion of Skill Development, and so on. Survey and investigation, forest and environment clearance, detailed project report (DPR) preparation, land acquisition of many projects were initiated and impletion of some of the major projects started on ground during the Tenth Plan. This has accelerated in the Eleventh Plan. Some of the major projects under implementation are:

#### Roads

1. East–West Corridor (670 km in Assam) by National Highways Authority of India (NHAI) stated in 2005–06,
2. Special Accelerated Road Development Programme for the North-Eastern Region (SARDP-NE) connecting State Capitals, District Headquarters and strategic border roads by 2/4 lane roads (approved in 2005–06)—to be implemented in Phase-A and Phase-B—10,141 km (NH 4,798 km and State Road 343 km),

including important bridges like Dhola–Sadia over Brahmaputra.

3. Trans-Arunachal Highway with district connectivity (added subsequently in the SARDP programme)—total length 2,319 km.

#### Railways

1. Broad Gauge (BG) line conversion—connecting Guwahati–Dibrugarh–Tinsukia, Rangia–Murkongselek Bridge (rail-cum-road) across Brahmaputra at Bogibeel
2. Alternative BG line—New Jalpaiguri–Guwahati via Jogighopa–Goalpara–Dudhnoi (commissioned)
3. Third alternative BG route from New Moinaguri to Jogighopa
4. BG route from Lumding–Silchar and Kumarghat–Agartala–Samboom
5. New lines: Agartala–Akhura, Tetelia–Byrnihat–Shillong, Harmuti–Itanagar, Silchar–Jiribam–Imphal (Tupul).

#### Airways

11.104. Major works under implementation for up-gradation of airports are:

- Guwahati (works in progress to be continued during the Twelfth Plan), Dibrugarh, Silchar, Agartala, Shillong, Imphal and Dimapur;
- New airports at Itanagar, Ceithu (Kohima), Pakyong (Gangtok);
- Up-gradation of smaller airports and Advanced Landing Grounds (ALGs) in Arunachal Pradesh.

#### Power

1. Major Hydro project—Lower Subansiri (2,000 MW), Pare, Kameng, Dibang.
2. Thermal Power Palatana gas-based (726 MW), Bongaigaon (750 MW) coal-based.
3. There is also number of identified projects for transmission lines for evacuation/connecting to the grid.

11.105. Apart from the above projects under the Central sector, Telecom connectivity also improved considerably. States' role in the development of the priority areas in their respective States was very encouraging during the Eleventh Plan period.

### Growth in SDP

11.106. Larger Plan investments and focus on infrastructure development has helped growth in this region. It is encouraging to note that there has been substantial improvement in the growth rate in the NE States, particularly in the Eleventh Plan. The growth rate of 5.3 per cent in the Ninth Plan improved to 6.2 per cent in the Tenth Plan, though less than the National Average of 7.8 per cent. The average GSDP growth of these States during Eleventh Plan improved to 9.95 per cent against 7.4 per cent at the national level. Average growth of NE States exceeded the National average in the Eleventh Plan. If the exceptional growth of Sikkim is excluded, the average of seven States was 8.1 per cent. This improvement in the growth is due to concerted efforts of the Centre and the State. The following table indicates growth achievements from the Eighth Plan to the Eleventh Plan.

11.107. The major contributors of growth in the Eleventh Plan in Assam have been Agriculture

and Allied and the Services sectors. The growth of Industry sector has picked up momentum in the fourth and fifth year. The good performance in the areas like Transport and Communication, Banking and Insurance, Trade and Commerce, Hotel and Restaurant, Real estate and Business Services has been able to generate employment both in the public and private sector. In the State of Meghalaya, Industry sector performance was remarkable. However, this improvement was primarily due to commissioning of two units of the Myntdu Leshka Hydel Project (MLHEP) under the State sector. The Services sector has also done quite well. Tripura has done well in agriculture, followed by Services. Manipur also had very good growth in agriculture. But, Industry and Service sectors were below par.

11.108. Mizoram achieved a remarkable growth of 11 per cent. This is a huge improvement over the Tenth Plan growth of 5.7 per cent. The major contributors in the growth have been Agriculture & Allied sector, Business Services and Construction.

**TABLE 11.18**  
**Growth Rate in SDP in the NE States**

| Sl. No.              | State\UT          | Eighth Plan Achievement | Ninth Plan Achievement  | Tenth Plan Achievement | (in percentage)         |                         |
|----------------------|-------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|
|                      |                   |                         |                         |                        | Eleventh Plan           |                         |
|                      |                   |                         |                         |                        | Target                  | Achievement             |
| 1                    | Arunachal Pradesh | 5.1                     | 4.4                     | 6.5                    | 6.4                     | 9.4                     |
| 2                    | Assam             | 2.8                     | 2.1                     | 5.3                    | 6.5                     | 6.9                     |
| 3                    | Manipur           | 4.6                     | 6.4                     | 5.7                    | 5.9                     | 6.5                     |
| 4                    | Meghalaya         | 3.8                     | 6.2                     | 6.4                    | 7.3                     | 8.1                     |
| 5                    | Mizoram           | —                       | —                       | 5.7                    | 7.1                     | 11.0                    |
| 6                    | Nagaland          | 8.9                     | 2.6                     | 5.9                    | 9.3                     | 6.2                     |
| 7                    | Sikkim            | 5.3                     | 8.3                     | 7.8                    | 6.7                     | 22.8                    |
| 8                    | Tripura           | 6.6                     | 7.4                     | 6.4                    | 6.9                     | 8.7                     |
| <b>Average NE</b>    |                   | <b>5.3<sup>a</sup></b>  | <b>5.34<sup>a</sup></b> | <b>6.2</b>             | <b>7.01<sup>b</sup></b> | <b>9.95<sup>c</sup></b> |
| <b>All-India GDP</b> |                   | <b>7.5<sup>d</sup></b>  | <b>5.5</b>              | <b>7.8</b>             | <b>9.0</b>              | <b>7.9</b>              |

Sources: a. Eighth and Ninth Plan figures from Eleventh Plan Document.

b. Tenth Plan achievement from 1999–2000 series (CSO).

c. Eleventh Plan achievement 2004–05 series (CSO).

Notes: <sup>a</sup> Seven NE States' average for Eighth and Ninth Plan.

<sup>b</sup> Only indicative (arithmetic) average as there is no separate growth target for the NE region.

<sup>c</sup> It is on the higher side as Sikkim's growth (22.8 per cent) is an outlier.

<sup>d</sup> Average of three years (1994–95, 1995–96 and 1996–97).



State's Flagship Programme of New Land Use Policy (NLUP) appears to have started making some impact.

11.109. Among the North-Eastern States, Nagaland could not achieve the targeted growth of 9.3 per cent. The achievement was 6.2 per cent. However, this is an improvement over the Tenth Plan growth of 5.9 per cent. Compared to the Tenth plan, agriculture performance was subdued.

11.110. The impressive growth of Sikkim is attributed to commissioning of power projects during the Eleventh Plan period. The Agriculture Sector, particularly floriculture and horticulture has also performed relatively well during the Plan period. In Arunachal Pradesh, higher growth in the Industry sector can be attributed to construction activity. In the Service sector, there had been increase in the activities of banking and insurance, trade and commerce.

### Development Concerns

11.111. The States of NE has been suggesting expeditious completion of most of the incomplete ongoing Central projects works listed above. The States have emphasised on the flexibility of CSS, specifically under schemes like PMGSY for coverage of villages below 250 population and modification in the length of bridges, under SSA to accommodate hostel facilities and reconsider distance norm in view of sparse habitations and improving the Telecom connectivity. General concern in the region has been that many of the projects are under implementation for a long time. While projects are also being reviewed at the apex level, this progress is still slow. It is important to note that during the Eleventh Plan, there has been a general feeling of improvement in the security scenario. Area-specific problems have been also addressed through negotiations/peace talks. For the first time, the much-awaited elections of the hill district councils could be held in Manipur. Economic activities generated in the region have created a positive environment, especially in the minds of the young.

11.112. Some of the other important issues needing attention of the Centre are erosion due to

flood and rehabilitation of affected people, disadvantaged groups/areas (District Councils, Tribe-specific Autonomous Councils, Tea-tribe Inhabited Areas, Minority Areas), early operationalisation of road connectivity with Myanmar, special package for the eastern Nagaland, items of intervention as per Indo-Bangladesh Joint Communiqué (flight between Agartala and Dhaka, access to sea through Chittagong Port, Agartala–Dhaka–Kolkata direct bus service, access to Ashuganj Inland Port, construction of bridge over river Feni, connecting Sabroom–Chittagong), Kaladan Multi-modal Transit Transport Project linking Mizoram and Myanmar up to Sittwe port.

### Problem of Low Financial Resources

11.113. The States of the region have a weak financial base and also limited scope to raise additional resources. Although expenditure control measures and initiatives in fiscal reforms did yield some marginal improvement in the fiscal management, the impact of growing expenditure due to revision in the salaries of the State Government employees has gone much beyond the means and has affected the availability of resources for Plan programmes. While Planning Commission has supplemented the resource requirement by providing SCA, particularly during the last two years of the Eleventh Plan, this continues to be an area of concern.

### Investment Opportunities

11.114. Despite having large investment opportunities in sectors like hydropower, infrastructure and natural gas, health care, textile and handicrafts, tourism, horticulture and agro-based industries, minerals, and so on, the NE States are yet to witness any major investments in these sectors by private investors. Special fiscal package under North East Industrial Policy (NEIP) has so far failed to trigger major investment flow in the region in the manner as it was conceived. NEIP did lead to some investment in industrial units in and around Guwahati in tea, coal, plastics, cement, cosmetics, metallurgy, and so on, but could not attract investors in other parts of the region. According to an assessment based on the financial investment intentions by private/public sector enterprises during the Eleventh Plan

period, 336 units expressed intention for investment in the North-East involving ₹38,892 crore (approximately). However, this does not necessarily reflect the actual flow of investment during the period. Majority of them were in Assam (133 units), Sikkim (70 units), Meghalaya (62 units). Number of units in the rest of the States was less than 10. It may be mentioned that the indicative investment flow is inclusive of Gas Cracker Project (Bharat Petroleum Corporation Limited [BPCL]) in Assam, expansion of Guwahati and Digboi Refinery of Indian Oil Corporation (IOC), who have the largest share. The share of investment (based on letter of Intent) in the NE was, however, only 0.58 per cent of the total intended investment at the national level.

#### **Financial Institutions and Credit Availability**

11.115. Availability of credit is one of the critical weaknesses in the development of economic activities in the NE. Various indicators for NE show that despite improvement in the banking facilities in last five years, the level of financial outreach is low. The main impediment for banking and financial development are topography of the region, sparse population settlements, infrastructural bottlenecks, smaller size of the market, lack of entrepreneurship, law and order conditions in some parts of the NE, land tenure system, especially in hilly areas, and so on. The penetration of banking in the NE, particularly in the rural areas, has been very low. The Credit-Deposit (CD) ratio of the NE as a whole as also the individual States is far below the national average.

11.116. According to the available information, CD ratio in the NE in March 2011 was 33.8 per cent (as per sanction) and 36.3 per cent as per utilisation. At the all-India level, the CD ratio as per sanction and utilisation is 75.6 per cent.

#### **Critical Areas for Intervention in the Twelfth Plan**

11.117. From the performance analysis of the States, suggestions made by the States of NE in the regional consultation, discussions in the Planning Commission and in the NEC meeting, it emerges

that continued emphasis on the development of physical and social infrastructure must continue so that the region can become strong, confident and capable of engaging with external market. Following are some of the areas requiring special attention during the Twelfth Plan:

#### **Roads**

1. East-West Corridor (670 KM in Assam) by NHAI.
2. All stretches of SARDP-NE connecting State Capitals/District Headquarters, (including National Highway-39 and National Highway-53 in Manipur, NH-31A in Sikkim).
3. Strategic border roads,
4. Trans-Arunachal Highway along with identified district connectivity.
5. Roads connecting Kaladan Multi-modal Transit Transport Project,
6. Important bridges include Dhola-Sadia over Brahmaputra and all other crucial bridges on the major road projects.
7. Four-lane highway from Tizit in the north to Dimapur via Tuli-Jalukie-Khelma (proposed by the State Government for survey in investigation and DPR preparation, and so on).

#### **Railway**

1. Broad Gauge (line conversion)—connecting Guwahati-Dibrugarh-Tinsukia, Rangia-Murkongselek Bridge (rail-cum-road) across Brahmaputra at Bogibeel.
2. BG route from New Moinaguri to Jogighopa.
3. BG route from Lumding-Silchar and Kumarghat-Agartala-Samboom.
4. New lines: Agartala-Akhura, Tetelia-Byrnihat-Shillong, Harmuti-Itanagar, Silchar-Jiribam-Imphal (Tupul).

#### **Airways**

11.118. Major works for upgradation of airports are:

- Guwahati, Dibrugarh, Silchar, Agartala, Shillong, Imphal and Dimapur; and
- New airports at Itanagar, Ceithu (Kohima), Pakyong (Gangtok). In addition, there are smaller airports, ALGs to be upgraded in Arunachal Pradesh.

*Inland Water Transport (IWT)*

11.119. IWT development in the Brahmaputra and Barak National Waterway.

*Power*

1. Long-term health of power sector seriously undermined (losses ₹70,000 crore per year). However, aggregate technical and commercial (AT&C) losses are slowly coming down. State Governments must push distribution reform.
2. Hydropower development seriously hindered by forest and environment clearance procedures. Need to look at special dispensation for these States, especially Arunachal Pradesh.
3. A time-bound plan to operationalise development and evacuation of hydropower from NER required. Road connectivity an issue for expeditious project completion.
4. Given limited connectivity of NER with other parts of the country (through Siliguri corridor), access through Bangladesh needs to be explored.
5. Electricity tariffs not being revised to reflect rising costs. Regulators are being held back from allowing justified tariff increases.

*Agriculture/Horticulture/Allied Sector*

1. The growth has to be more rapid and inclusive; the focus has to be on better performance in agriculture, irrigation, drinking water health services, better education in the rural and remote areas, rural connectivity, improved delivery system and governance. Farm-based economic activities—Horticulture, Animal Husbandry, Fisheries, Poultry, and so on, have to be the prime drivers.
2. Post-harvest management and marketing infrastructure required to be attended to by dovetailing of programmes/schemes between Central Ministries and the State Governments for filling up gaps in infrastructure.
3. There has to be continued emphasis on creation of employment opportunities. During the Eleventh Plan, there is a general feeling of improvement in the security and law and order scenario. Efforts have to continue to further improve the scenario. The initiatives so far have created some momentum of development as may be seen from the above analysis. This has

to continue with all possible support from the Centre.

*Encouraging Private Investment*

11.120. The impact so far under the Industrial Policy for the North-East has not been impressive. There are many reasons including the issue of connectivity, power and pocket specific disturbance in the region. However, there is also a demand for a review of the incentive package under the policy which may be looked into during the Twelfth plan for creating enabling environment for investors and rational use of local resources. In this context, Department of Industrial Policy and Promotion initiated some action. Meetings between Industry associations and banks would be of helpful in understanding the associated problems related to industries for suitable incorporation in the modified policy.

*Water Management/Flood Moderation*

11.121. The issue of creation of the North East Water Resource Authority for flood moderation is pending for a long time. Erosion particularly in the Brahmaputra Valley and Barak Valley is a major concern expressed by the State of Assam in various forums. It has to be recognised as a national issue. There is no scheme to take care of the impact of large-scale erosion which is a recurring feature in the State. This needs to be attended to with all seriousness.

*Education/Skill Development/Health*

1. Focus on quality of education. Investment in teachers' training and evaluation. Use distance education infrastructure for quick completion in the North-East.
2. Social, gender and regional gaps in education need special attention. Special emphasis on capacity building and skill development with focus on curriculum is needed. State-specific approach for creation of opportunities for employment generation may be taken up. Reforms in vocational education to ensure employability in the changing market would help.
3. Development and operationalisation of PPP models in school and higher education and focus on increase in seats in medical colleges, nursing

colleges and other licensed health professionals require special attention.

4. Improvement in the quality of NRHM services, rationalisation in the manpower requirement and involvement of PRIs/communities in improving health services is important. Special focus required for development of infrastructure and availability of doctors, paramedics and nurses. Role of PPP in secondary and tertiary health care required to be encouraged.

#### Look East

1. Focus on strong relationship with Bangladesh to ensure effective connectivity by different transport modes. Access to Chittagong port, declaring Ashuganj (Bangladesh) as port of call, Kolkata–Agartala–Dhaka bus service.
2. Connecting the NE by road to south-east (SE) Asia through Tri-lateral Highway–Moreh (Manipur)–Mandalay/Bagan (Myanmar)–Mae Sot/Chiang Mai (Thailand).
3. Focus on development of all Land Customs Stations (LCS) for strengthening border trade and business communication.
4. Expeditious implementation of multi-modal transport using Kaladan River as alternate connectivity to the North-East.

#### Asset Management

11.122. Maintenance of assets, especially roads, is an important aspect and needs a separate financial arrangement. Even maintenance of roads developed under PMGSY is likely to be a major problem.

#### Need for Continued Support

11.123. NER witnessed encouraging growth during last two Plan periods. This is primarily due to the investments in the major projects by the Centre and the developmental programmes taken up by the States. As already discussed above, the major connectivity projects are yet to be completed and the NEIP incentive package has not been able to attract investment. Completion of all the major projects is likely to take more time (10–15 years). Success of Look East policy will also depend on the cooperation

from the neighbouring countries. There are still some remote areas deprived of development opportunities. Requirement of these areas will need to be addressed by special plan investments.

11.124. The indicative Gross Budgetary Support for the Twelfth Five Year Plan for the Ministry of development of North-Eastern Region (NER) is ₹955 crore excluding NEC, NLCPR, BTC and Central assistance for State plan.

#### NOTES

1. C. Purfield, 'Mind the Gap: Is Economic Growth in India Leaving the Poor States Behind?' IMF Working Paper No. WP/06/103, Washington, DC, 2006.
2. K. Kochar, U. Kumar, R. Rajan, and A. Subramanian. 'India's Patterns of Development: What Happened, What Follows', NBER Working Paper No. 12023, National Bureau of Economic Research, Cambridge, MA, 2006.
3. T. Besley, R. Burgess and B. Esteve-Volart, 'Operationalizing Pro-poor Growth: India Case Study', Department of Economics, London School of Economics, 2005.
4. MS Ahluwalia, 'Prospects and Policy Challenges in the Twelfth Plan', *Economic and Political Weekly of India*–XLVI, no. 21 (21 May 2011).
5. This Gini coefficient was calculated assuming that all individuals within each state have income equal to per capita GSDP. It ignores inequality arising out of unequal distribution within each state.
6. At this point, we do not have state-level data on capital and other relevant variables to estimate the growth equation to take this analysis forward.
7. Provisional Census Data, 2011.
8. S. Mehrotra and A. Gandhi 'India's Human Development in the 2000s: Towards Social Inclusion', *Economic and Political Weekly* XLVIL, no. 14 (7 April 2012).
9. B. Debroy and L. Bhandari, 'District Level Deprivation in the New Millennium', RGICS and Indicus Analytics, 2003.
10. Data used are estimates for 2001.
11. India Development Foundation, 'Poverty Mapping in India Using the Small Area Estimation Method', 2010.
12. Hans P. Binswanger-Mkhize, Jacomina P. de Regt and Stephen Spector, *Scaling Up Local & Community Driven Development (LCDD): A Real World Guide to Its Theory and Practice* (The World Bank, 2009).
13. The issues concerning PESA and FRA are discussed at length in the Chapter 24.
14. Sub-district is the category used in the census that helps us overcome the ambiguities created by varying categories of block, taluka, tehsil, mandal, and so on, used by different States.

## ANNEXURE II.1(a)

## Comparative Growth Rates of Selected Low-Income States (Latest CSO Data)

| Eighth Plan             | Ninth Plan              | Tenth Plan              | Eleventh Plan           |
|-------------------------|-------------------------|-------------------------|-------------------------|
| Bihar<br>(3.9)          | Bihar<br>(3.7)          | Bihar<br>(6.9)          | Bihar<br>(11.1)         |
| Odisha<br>(2.3)         | Uttar Pradesh<br>(2.5)  | Uttar Pradesh<br>(5.8)  | Uttar Pradesh<br>(6.9)  |
| Uttar Pradesh<br>(5.0)  | Odisha<br>(5.1)         | Madhya Pradesh<br>(5.0) | Madhya Pradesh<br>(9.4) |
| Madhya Pradesh<br>(6.6) | Madhya Pradesh<br>(4.5) | Jharkhand<br>(5.0)      | Jharkhand<br>(9.3)      |
| Rajasthan<br>(8.0)      | Rajasthan<br>(5.3)      | Odisha<br>(9.2)         | Rajasthan<br>(7.2)      |
| <b>5.16*</b>            | <b>4.22*</b>            | <b>6.38*</b>            | <b>8.78*</b>            |

*Note:* \*Average GDP Growth Rates of Bottom Five Per Capita Income States Amongst General Category States.

**ANNEXURE II.1(b)**  
**Growth Rates in SDP in Different States (Latest CSO Data)**

| Sl. No. | States/UTs                     | (% per annum)          |                         |                       |                          |
|---------|--------------------------------|------------------------|-------------------------|-----------------------|--------------------------|
|         |                                | Eighth Plan<br>1992-97 | Ninth Plan<br>1997-2002 | Tenth Plan<br>2002-07 | Eleventh Plan<br>2007-12 |
| 1       | Andhra Pradesh                 | 5.4                    | 5.5                     | 8.2                   | 8.3                      |
| 2       | Bihar                          | 3.9                    | 3.7                     | 6.9                   | 11.1                     |
| 3       | Chhattisgarh                   | NA                     | NA                      | 8.8                   | 8.4                      |
| 4       | Goa                            | 9.0                    | 5.7                     | 8.5                   | 9.0                      |
| 5       | Gujarat                        | 12.9                   | 2.8                     | 11.0                  | 9.6                      |
| 6       | Haryana                        | 5.2                    | 6.1                     | 9.0                   | 9.1                      |
| 7       | Jharkhand                      | NA                     | NA                      | 5.0                   | 9.3                      |
| 8       | Karnataka                      | 6.2                    | 5.8                     | 7.7                   | 7.6                      |
| 9       | Kerala                         | 6.5                    | 5.2                     | 8.3                   | 8.0                      |
| 10      | Madhya Pradesh                 | 6.6                    | 4.5                     | 5.0                   | 9.4                      |
| 11      | Maharashtra                    | 8.9                    | 4.1                     | 10.1                  | 8.6                      |
| 12      | Odisha                         | 2.3                    | 5.1                     | 9.2                   | 8.2                      |
| 13      | Punjab                         | 4.8                    | 4.0                     | 6.0                   | 6.7                      |
| 14      | Rajasthan                      | 8.0                    | 5.3                     | 7.1                   | 7.2                      |
| 15      | Tamil Nadu                     | 7.0                    | 4.7                     | 9.7                   | 7.7                      |
| 16      | Uttar Pradesh                  | 5.0                    | 2.5                     | 5.8                   | 6.9                      |
| 17      | West Bengal                    | 6.3                    | 6.5                     | 6.2                   | 6.9                      |
|         | <b>Special Category States</b> |                        |                         |                       |                          |
| 18      | Arunachal Pradesh              | 5.0                    | 6.6                     | 6.2                   | 9.4                      |
| 19      | Assam                          | 2.8                    | 1.8                     | 5.0                   | 6.9                      |
| 20      | Himachal Pradesh               | 6.5                    | 6.3                     | 7.6                   | 8.1                      |
| 21      | Jammu & Kashmir                | 5.0                    | 4.2                     | 5.5                   | 6.0                      |
| 22      | Manipur                        | 3.7                    | 4.7                     | 5.7                   | 6.5                      |
| 23      | Meghalaya                      | 4.0                    | 7.2                     | 6.7                   | 8.1                      |
| 24      | Mizoram                        | NA                     | 5.7                     | 5.9                   | 11.0                     |
| 25      | Nagaland                       | 7.2                    | 6.5                     | 7.4                   | 6.2                      |
| 26      | Sikkim                         | 4.6                    | 6.6                     | 7.7                   | 22.8                     |
| 27      | Tripura                        | 6.7                    | 9.4                     | 6.9                   | 8.7                      |
| 28      | Uttarakhand                    | NA                     | NA                      | 11.7                  | 13.7                     |

*Source:* Central Statistical Office (CSO); Averages over growth rates of different base years.

**ANNEXURE II.1(c)****Convergence of GDP Growth Rates in Successive Plans (Latest CSO Data)**

|   | Eighth Plan | Ninth Plan | Tenth Plan | Eleventh Plan |
|---|-------------|------------|------------|---------------|
| Average GDP Growth of Top Five Per Capita Income States Amongst General Category States                                       | 8.16        | 4.92       | 8.38       | 8.80          |
| Ratio of Average Growth of Bottom Five Per Capita Income States to that of All India  | 0.69        | 0.77       | 0.82       | 1.11          |
| Ratio of Average GDP Growth of Bottom Five Per Capita Income States to that the Average GDP Growth of General Category States | 0.79        | 0.88       | 0.82       | 1.05          |
| Ratio of Average Growth of Bottom Five Per Capita Income States to that of Top Five Per Capita Income General Category States | 0.63        | 0.86       | 0.76       | 0.998         |

Source: Planning Commission.

**ANNEXURE II.1(d)****Disparity in PCI (Per Capita NSDP) at 2004–05 Prices (Latest CSO Data)**

| Year    | State with Lowest PCI | PCI (₹) | State with Highest PCI | PCI (₹) | Ratio of Lowest to Highest PCI (%) | Coefficient of Variation in PCI (%) |
|---------|-----------------------|---------|------------------------|---------|------------------------------------|-------------------------------------|
| 2004–05 | Bihar                 | 7,914   | Haryana                | 37,972  | 21                                 | 36                                  |
| 2005–06 | Bihar                 | 7,749   | Maharashtra            | 40,671  | 19                                 | 39                                  |
| 2006–07 | Bihar                 | 8,900   | Maharashtra            | 45,582  | 20                                 | 40                                  |
| 2007–08 | Bihar                 | 9,233   | Maharashtra            | 50,138  | 18                                 | 40                                  |
| 2008–09 | Bihar                 | 10,241  | Maharashtra            | 50,183  | 20                                 | 40                                  |
| 2009–10 | Bihar                 | 10,773  | Maharashtra            | 54,166  | 20                                 | 41                                  |
| 2010–11 | Bihar                 | 12,102  | Maharashtra            | 59,735  | 20                                 | 41                                  |
| 2011–12 | Bihar                 | 13,971  | Maharashtra            | 64,951  | 22                                 | 42                                  |

Source: Directorate of Economics and Statistics of Respective State Governments.

**ANNEXURE II.1(e)**

**Convergence of GDP Growth Rates during Successive Plans (Latest CSO Data)**

