

# 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 ₹2000 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 1500 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 1500 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 38000 million litres per day (MLD), against which treatment capacity of only 12000 MLD exists at present.

Sewage treatment capacity of about 4418 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 19000 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

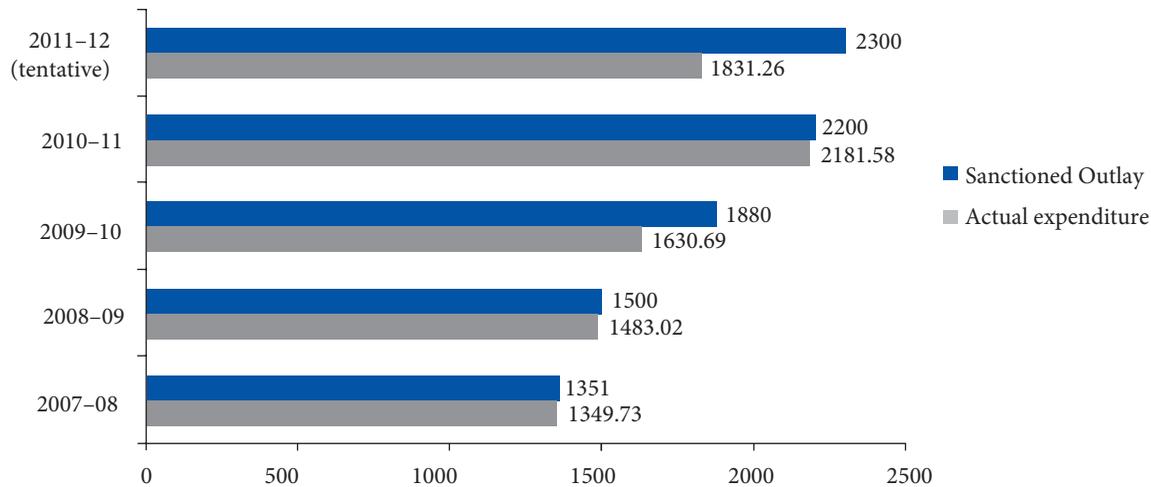


FIGURE 7.1: Sanctioned Outlay vs Actual Expenditure in the Eleventh Plan (₹ Crore)

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 ₹10000 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 ₹2300 crore, against which likely expenditure is tentatively placed at ₹1831.26 crore.

7.19. Thus, a total outlay of ₹9231.00 crore has been allocated to MoEF in the Eleventh Plan as budgeted expenditure (BE), against which its likely expenditure is ₹8476.28 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).

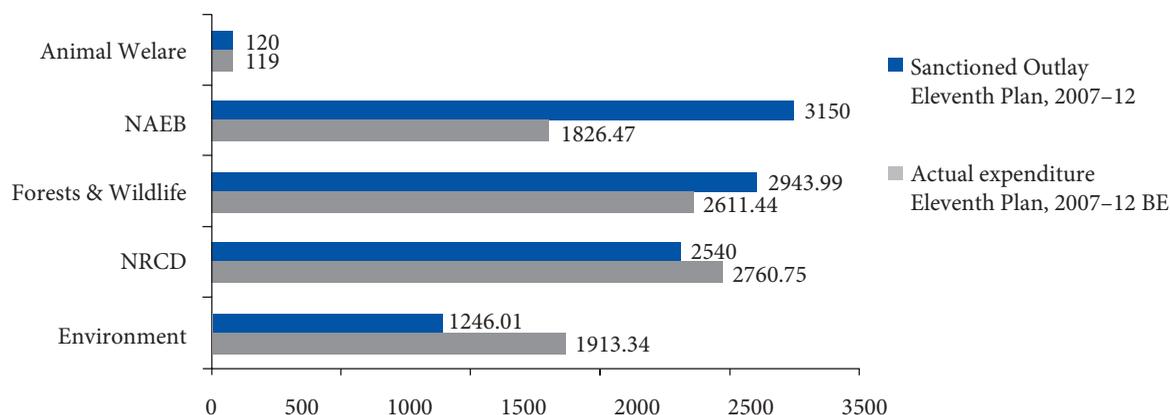


FIGURE 7.2: Sector-wise Allocations/Expenditure during the Eleventh Plan (₹ Crore)

### 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, 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

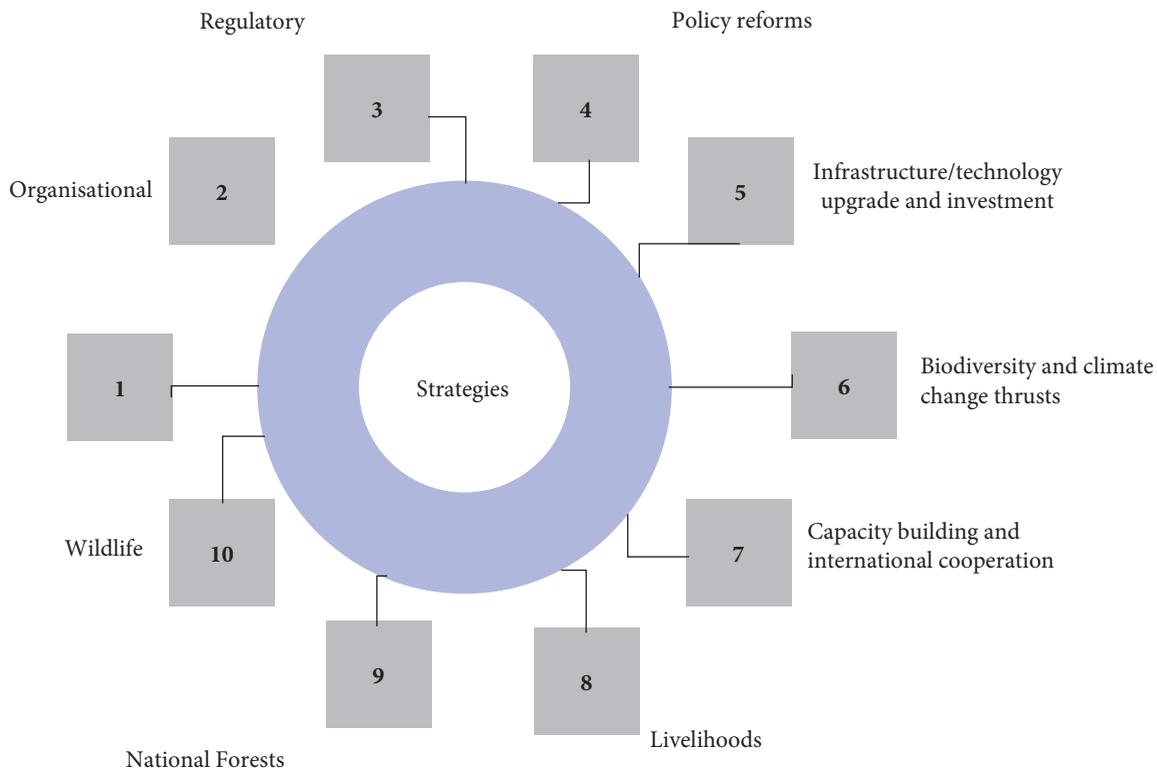


FIGURE 7.3: Strategies for the Twelfth Plan

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 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.

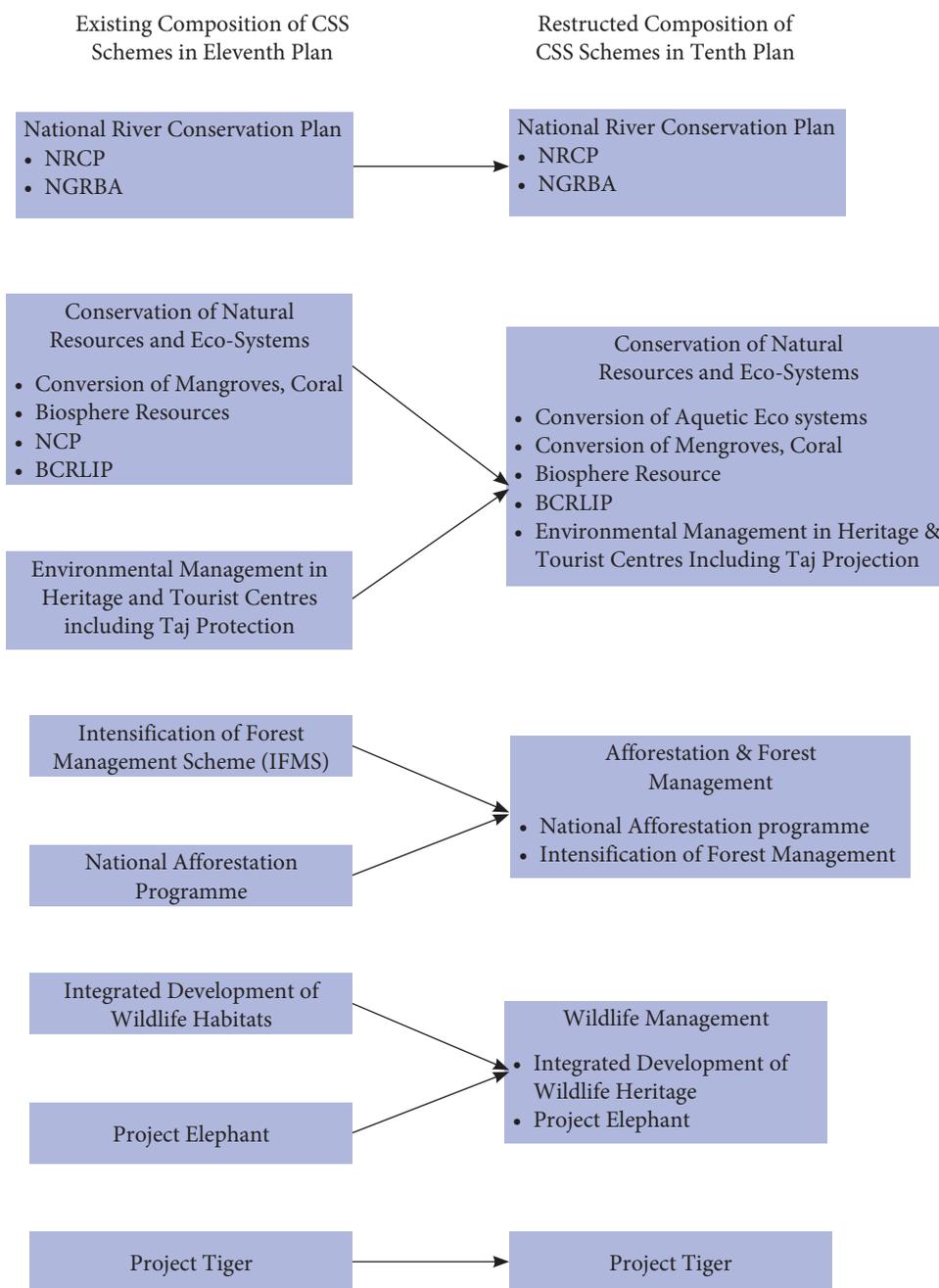


FIGURE 7.4: Rationalisation of Schemes from the Eleventh to the Twelfth Five Year Plan

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 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 ₹2948562 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, ₹1474281 has been distributed to VSS members among 37 families at the rate of ₹39845 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 ₹1474281, an amount of ₹1275946 has been spent towards Raising of 35 ha. Eucalyptus plantation and post-harvest operations while the balance amount ₹198335 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 ₹46000 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 ₹17899 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 49678 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**

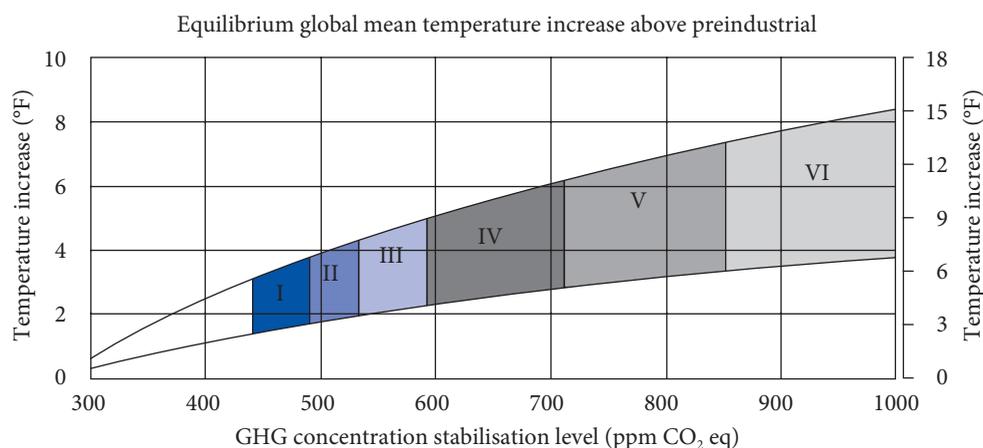
Category	CO <sub>2</sub> Concentration (ppm)	CO <sub>2</sub> eq. Concentration (ppm)	Global Mean Temperature Increase Above Pre-industrial Levels (Deg C)	Peaking Year for CO <sub>2</sub> Emissions	Change in Global Emissions in 2050 (per cent of 2000 Emissions)
I	350–400	445–490	2.0–2.4	2000–2015	–85 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	855–1130	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 1727.71 million tonnes of CO<sub>2</sub> equivalents (or 1904.73 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 14064, 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 ₹230000 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 20000 MW by the end of the Thirteenth Five Year Plan in 2022. The total financial outlay during Phase 1 is estimated as ₹4337 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 19000 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 ₹3400 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 ₹1000 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 1120 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 ₹46000 crore is projected under this mission for coverage of 10 mha over the

next ten years. An outlay of ₹12500 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.