9

Environment and Climate Change

9.1 ENVIRONMENT

9.1.1. Protection of the environment has to be a central part of any sustainable inclusive growth strategy. This aspect of development is especially important in the Eleventh Plan when consciousness of the dangers of environmental degradation has increased greatly. Population growth, urbanization, and anthropogenic development employing energy-intensive technologies have resulted in injecting a heavy load of pollutants into the environment. More recently, the issue assumed special importance because of the accumulation of evidence of global warming and the associated climate change that it is likely to bring.

9.1.2. An important feature of any environmental strategy is that environmental objectives require action in several areas, which typically lie in the purview of different ministries. The Ministry of Environment and Forests (MoEF) has the important role of monitoring the development process and its environmental impact in a perspective of sustainable development and to devise suitable regulatory structures to achieve the desired results. While this role is crucial, environmental objectives can only be achieved if environmental concerns are internalized in policymaking in a large number of sectors. This would require sharing of responsibility at all levels of government and across sectors with respect to monitoring of pollution, enforcement of regulations, and development of programmes for mitigation and abatement. Regulatory enforcement must also be combined with incentives, including market and fiscal mechanisms to encourage both industry and people in their day-to-day working lives to act in a manner responsive to environmental concerns. Sustainable use of natural resources also requires community participation with a responsible role assigned to the communities for conservation.

9.1.3. In this chapter, we outline the main issues in the traditional area of environment and also consider the new challenges posed by climate change.

Overview

9.1.4. The Tenth Plan was a period of extensive review of environmental processes and law. The first National Environment Policy was put into place in May 2006. Also, the re-engineering of the environmental clearance process and Environmental Impact Assessment (EIA) Notification and review of the Coastal Regulation Zone Notification were undertaken to improve the quality of environmental governance. The Eleventh Plan must build on this experience by integrating environment considerations into policymaking in all sectors of the economy—infrastructure, transport, water supply, sanitation, industry, agriculture, and anti-poverty programmes. It also calls for strengthening the oversight and regulatory framework for environment management so that development decisions do not impinge adversely on sustainability.

9.1.5. Some initiatives needed to integrate environmental concerns into planning and developmental activities across all the sectors are given below:

- Environment is a residual Central subject. Since regulation and enforcement in this area cannot be handled by the Central Government alone and the responsibility of maintaining the environment rests at all levels of government, we need to consider

whether environment can be made a concurrent subject in the constitution. This will help the State Governments and the local authorities to enact and notify their own enforcement laws and rules to ensure compliance of relevant environmental norms.

- There is a case for setting up an independent, statutory body on sustainable development with the specific responsibility of guiding government policies and programmes for making them more socially and environmentally sustainable, and to monitor and evaluate their outcomes. This body should comprise eminent environmental experts and citizens with a long and publicly known record in environmental research or action. It should have adequate powers to address environment concerns and not be a purely advisory body.
- The State Pollution Control Boards should be restructured into statutory Environment Protection Authorities with the mandate of developing regulations, standards and upgraded facilities for enforcing compliance.
- At the district level, the scheme of Paryavaran Vahinis, or committees of concerned citizens, should be revived to serve as environmental watchdogs and undertake selective first hand monitoring of the environmental situation in the districts.
- For improving the quality and transparency of the environmental clearance process, prior informed consent of the local self governments of the respective area, as specifically provided in PESA, may be introduced for proposals requiring environmental clearance. Public hearing should also be made mandatory for the activities specified in the EIA notification.

Environmental Impact Assessment (EIA)

9.1.6. EIA is an important management tool for integrating environmental concerns in the development process and for improved decision making. The MoEF in 1994 issued the first EIA Notification prescribing mandatory environmental clearance for 32 categories of developmental activities. The process involved consideration of environmental consequences before starting projects and included procedures like EIA study, public hearing in certain cases, and consideration of the outcome by expert groups before issuing of final clearance by MoEF. This process takes time, often causing long delays in commencement of projects. MoEF organized a re-engineering of the process and a fresh notification was issued in September 2006. The specific modifications made in the EIA notification are summarized in Table 9.1.1.

TABLE 9.1.1
Changes in Environment Clearance Notification, 2006

Step	Pre 2006 Notification position	As per 2006 Notification
Activities requiring clearance	32 activities including infrastructure in respect of petroleum and chemicals, exploration, hazardous industries, large tourism projects, thermal power plants, construction and industrial estates.	39 activities in eight categories including mining/ exploration/power generation, primary processing, material processing, material production, manufacturing/ fabrication, service sector, infrastructure, and construction.
Process	Clearance based on recommendation of Expert Committees set up by the Ministry.	Clearance by designated EIA authorities at the Central or State level based on prescribed dimensions of the projects in the Notification. At the Central and State level, Expert Appraisal Committees provide recommendations for decision-making.
Categories of projects	No categories defined as MoEF was the sole authority for granting clearance.	Two categories prescribed namely, (i) to be dealt at the Central level and (ii) delegated to the State EIA Authority for clearance.
Processing time excl. EIA/EMP	180 days.	Cat. A: 120 days. Cat. B: 30 days.
Public Consultation	Requirement of public hearing at the discretion of government.	Public hearing prescribed for all Category A and some of the Category B projects (defined as B1).

Source: Environment Clearance Notifications, 1994 and 2006.

9.1.7. The new process came into effect on 14 September 2006. As State level authorities and committees are in the process of being set up, the impact of the new process is yet to be seen.

AFFORESTATION

9.1.8. Forests play a critical role in environment protection in two ways. They help to absorb carbon dioxide in the atmosphere thus mitigating the build up of GHGs. They also help to cope with water stress by trapping water that would otherwise run off and this is especially so when forests exist in upper ends of catchments. Unfortunately, both benefits are eroded by deforestation largely as a result of human pressure to exploit forest resources. While some exploitation of forests may be appropriate, the sustainability of forest resources is determined by the quantum of withdrawals.

9.1.9. The existing information on forest/tree cover based on the satellite data of 2002 indicates a green cover of 23.68%. There has been a net improvement of 0.65% between 2000 and 2002. Presuming that the same growth rate continues till 2007, the Tenth Plan target of 25% may have been achieved by 2007. This will be variable in the data of 2008, to be used for the *State of Forest Report* (*SFR*) 2009.

9.1.10. The present extent of forest lands in the country is 77.47 million ha. However, not all the forest lands are under the tree canopy and trees grow outside forests also. *SFR* 2003 of Forest Survey of India indicates a tree cover of over 67.83 million ha, that is, 20.64% of the land area. This extent aggregates the blocks of more than 1 ha area under tree cover. Outside this, nearly 10 m ha area has been assessed as under tree cover in smaller than 1 ha patches outside forests. This brings the total green cover up to 77.83 million ha or 23.68% of the total area. Out of this, dense forests have declined from 416809 sq km in 2001 to 390564 sq km, that is, a fall of 6%. Though over the last few years the extent of forest cover has stabilized, the low extent of good forests is a matter of concern.

9.1.11. Severe pressure for meeting growing livelihood, industrial, and development needs have been some of the critical contributing factors. A demand–supply gap of almost 64 million cubic meters has been projected for timber in 2006. The shortage is being met through import since 1985 amounting to nearly Rs 9000 crore (2003–04). Against a sustainable availability of fuel wood of only 17 million tonnes from the forests, the annual fuel wood requirement has been estimated to be above 200 million tonnes. With development of technologies for use of even smaller sizes of wood for structural uses, small wood is also not available for fuel. India may have sufficient food to eat but it does not have sufficient fuel wood to cook it. Forests also meet about one-third of fodder requirement. The total production of Non Timber Forest Produce (NTFP) has been assessed as worth about Rs 4188 crore annually (Institute of Economic Growth, 2002). Ever increasing herbal markets are only to put further pressures.

9.1.12. While the gaps are huge, potential for improvement of productivity exists. The status of green cover is an indicator of status of productivity of forests. The following strategies have been evolving in the sector for improving the status of green cover.

Participatory Forest Management or Joint Forest Management (JFM)

9.1.13. Initiated with the circular of the MoEF on 1 June 1990 on people's involvement in forest conservation and management, the JFM regime has evolved gradually and at present 106479 such committees (22 million participants) are functioning in 28 States covering 22.02 million ha of forests. This participatory regime is seen as a potential strength of forest management for the forest fringes. The challenge now is to effectively empower the local communities with appropriate rights and responsibilities, and ensure that substantial benefits from forest conservation accrue to them.

9.1.14. A similar approach has been attempted in wildlife management also. In Project Tiger, India, Eco-development Project was implemented during 1995–2005 under Global Environment Facility (GEF) with focus on village eco-development through optimum use of local resources and involvement of local people in conservation of protected areas. Integration of this approach to protected area management through shared decision-making and full integration of conservation and livelihoods across the landscape are yet to be realized. Also, the recognition of a large range and diversity of community traditions or new initiatives towards conservation is very weak.

Social Forestry

9.1.15. The First Five Year Plan, as far back as 1951, indicated the scope for establishment of village plantations. Subsequently, a series of externally aided social forestry projects during the 1980s and allocation of 25% of District Rural Development Agency funds under National Rural Employment Programme, Rural Landless Employment Guarantee Programme, and so on, for social afforestation provided impetus to social forestry. This provision was not pursued since the Eighth Plan. Regeneration of forests and growing of trees being a long-term activity, did not receive due focus in the rural development programmes. Even the Watershed Management Programme aims more at equitable sharing and caring of watershed benefits, and afforestation remains a latent component. The cost norms of these programmes are not able to support substantial afforestation activities requiring strong wage contribution.

Agro and Farm Forestry

9.1.16. The social forestry programmes also include extension and promotion of agro and farm forestry in the farm sector. The farmers of the States like Punjab, Haryana, Himachal Pradesh, Uttar Pradesh, Karnataka, and Tamil Nadu have adopted agro forestry. However, the forward linkages with the user industry and facilitation by the State agencies have not existed. Thus, the sector suffers from problems of unorganized markets driven by middlemen, depriving the farmers of optimum prices for their produce. Conservative exim regulations, cutting and transit controls act as disincentives for diversification into the species which face controls but are economically important.

Strategy for the Eleventh Plan

9.1.17. The monitorable target of the Eleventh Five Year Plan is to increase the forest cover by 5% of the total geographical area. This would require an additional cover of about 16 million ha. Out of this, 5 million ha could be brought under the tree cover within the recorded forest area while the rest would be added through agro forestry and social forestry. However, the policy target is to have 33% forest and tree cover ultimately which will require additional coverage of about 10–11 million ha. This will have to be done mainly outside the recorded forest area.

9.1.18. The target of 33% forest and tree cover reflects the tree component without accounting for other vibrant non-tree natural biomes like grasslands. The amendment of the target of the 1952 policy, of one-third area under *forests,* to *forest/tree cover* resulted in a shift of focus from ecological habitats to tree cover. Further recognition of biodiversity characteristics and ecological services rendered by habitats like grasslands, natural desert ecosystems, alpine, and riparian habitats suggests that several biomes, even if devoid of tree component, can be recognized as 'green cover' and accounted so. Recognizing these facts, the following strategic principles will be adopted for dealing with the green cover.

9.1.19. The policy objective of 33% tree/forest cover should be revisited for its definition on ecological considerations. The green cover should include the existing natural ecosystems within which the tree cover constitutes a sub-set.

9.1.20. Enabling environment for social and participatory regimes should be the aim of Central efforts, as is being done through the JFM mode under the National Afforestation Programme.

9.1.21. Implementation of the Central programmes has met with difficulties on fund flow management at the State level. It is advisable to undertake activities in project mode with earmarked funding, as is done in the externally aided projects.

Improving Air Quality

9.1.22. The Air (Prevention and Control of Pollution) Act, 1981 is the main legislation for regulating air quality, through the Pollution Control Boards (PCBs) in the States. The Central Pollution Control Board (CPCB) has identified 2301 medium and large scale polluting industrial units under 17 highly polluting categories. The requisite pollution control devices are reported to have been provided in 1927 units, while 235 have been closed and the 139 are still defaulting. CPCB also monitors ambient air quality at 308 stations covering 115 cities/towns in 28 States and four UTs in the country to: (i) determine the status and trend in ambient air quality on significant parameters like benzene and polyaromatic hydrocarbons (PAH); (ii) assess health hazard and the damage to materials; (iii) develop preventive and corrective measures; and (iv) understand the natural cleansing process. Presently, the criteria pollutants monitored by Central/ State PCBs and associate agencies include sulphur dioxide (SO_2), NOx, and Respirable Suspended Particulate Matter (RSPM). Other parameters for toxic trace matters PAH are also monitored for select cities.

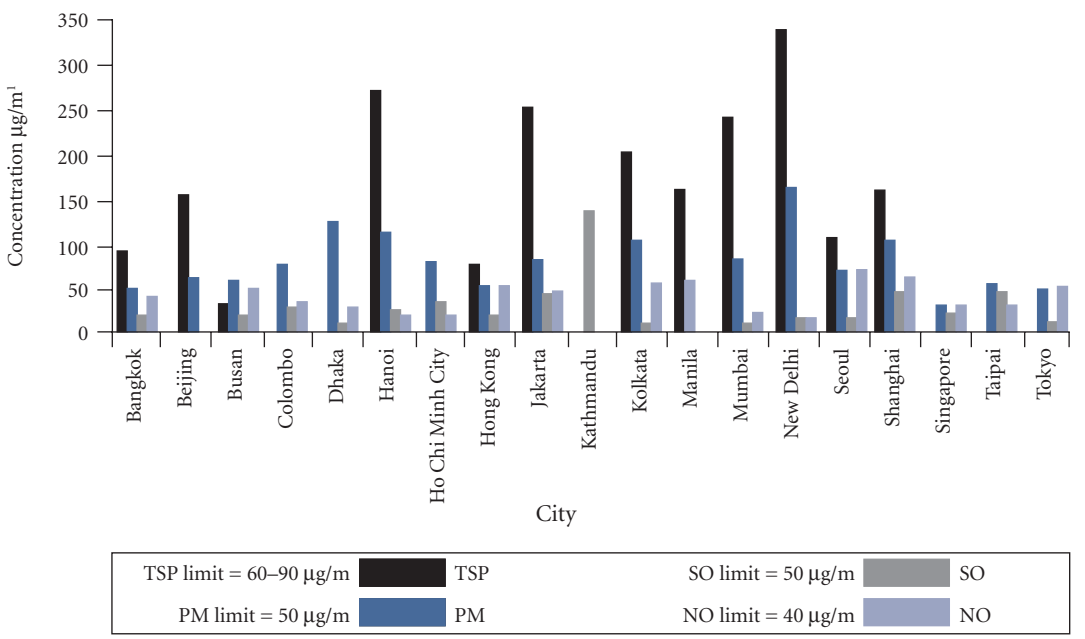
9.1.23. A programme for real time air quality monitoring for cities with population of more than 1 million was started during the Tenth Plan. The automatic air quality monitoring systems are operational in Jodhpur, Patna, Pune, and Sholapur while those in Kanpur, Varanasi, Jharia, and Kolkata will be functional soon. As many as 76 cities/towns are found to exceed acceptable limits of these parameters mainly due to vehicular and industrial pollution measured in terms of ambient air quality in residential, industrial and sensitive areas for SO_2, oxides of nitrogen, Suspended Particulate Matter, RSPM, ammonia, and carbon monoxide.

9.1.24. Figure 9.1.1 displays the average air quality levels of select Asian cities between 2000 and 2004. The chart shows that New Delhi, Mumbai, and Kolkata have failed to meet the WHO standards as far as Total Suspended Particulate Matter and RSPM are concerned. Beijing and Shanghai, though better than Indian cities, also could not meet the WHO standards in this respect. The other Asian cities which failed to meet the required standards were Jakarta, Katmandu, Seoul, Dhaka, and Colombo. As far as SO_2, and NO_2 are concerned, New Delhi and Mumbai were much better than the prescribed WHO standards whereas several Asian cities exceeded the safe limits.

9.1.25. Action Plans for improvement of air quality have been drawn for 16 identified cities on the advice of the Supreme Court. Based on the basic format prepared by CPCB for this purpose, the State PCBs have been asked to evolve such plans for their respective areas.

9.1.26. During the Eleventh Plan period, all Central programmes on outdoor pollution should be reorganized under a National Air Quality Plan, which will cover (i) City based Clean Air Action Plans (CAAPs) and (ii) Pollution Control and Prevention in Industrial Areas programmes. The ongoing national programme for monitoring air quality will be taken forward for achieving real time data. This would help in creating early warning systems and thus enforcing the Plan target of conforming air and water quality to WHO standards.

9.1.27. The entire Air Quality Monitoring network should be expanded from the current 308 stations to 1000 stations. Real time monitoring of PM2.5 (Particulate Matter 2.5 micron), ozone, VOCs (Volatile Organic Compounds), PAH, secondary pollutants—sulphates and nitrates—will be organized in about 15 cities per year, to cover the 76 cities which currently exceed the four specified levels of air pollution. Source monitoring of VOC, BTX (benzene, toluene, and xylene), and toxic heavy metals will be initiated to develop control measures.



Source: CAI-Asia (2006c).

FIGURE 9.1.1: Urban Air Quality in Select Asian Cities, 2000–04

9.1.28. Vehicular pollution is a major source of air pollution in our cities and control of vehicular pollution should have high priority in planning for a clean urban environment. Some of the initiatives needed to control vehicular emissions are listed in Box 9.1.1.

9.1.29. More generally, effective urban transport planning, with appropriate initiatives for the development of public transport is particularly important. CAAP should therefore be integrated with the National Urban Transport Policy and the JNNURM to ensure optimal development of public transport including both bus and rail based mass rapid transit systems. CAAP should also be the basis of all Central and State funding with appropriate provision of penalties for non-compliance.

9.1.30. The monitorable target in air quality should be to achieve WHO standards of air quality in all major cities by 2011–12.

Box 9.1.1
Strategy to Control Vehicular Emissions

- There should be uniform fuel quality and emission standards across India. The road map proposed in the government's Auto Fuel Policy must be accelerated and tightened to cover all cities and to implement Euro IV standards.
- The use of diesel in private vehicles must be discouraged. The present distortions in pricing under which diesel is much cheaper than petrol, encourages the growth of diesel vehicles leading to cheap and toxic motorization.
- All Central funding for the transport sector must be linked to the implementation of car restraint measures including parking charges designed to recover the full cost of using parking space (linked to the real estate and construction costs) and rationalization of road and other transportation related taxes (such as passenger tax, sales tax, and so on) to reduce the tax burden on public transport and increase it for the personal motorized transport.
- The government should impose higher annual taxes on personal transport, which should be used to create a dedicated fund for public transport.

TABLE 9.1.2
Notified Standards for Water Quality

Designated-Best-Use	Class of water	Criteria
Drinking water source without conventional treatment but after disinfection	A	1. Total Coliform—Most Probable No. (MPN)/100ml < 50 2. pH – 6.5–8.5 3. DO > 6mg/litre 4. BOD (5 days 20°C) – < 2mg/litre
Outdoor bathing (Organized)	B	1. Total Coliform (MPN)/100ml – < 500 2. pH – 6.5–8.5 3. DO – > 5mg/l 4. BOD – (5 days 20°C) – < 3mg/l
Drinking water source after conventional treatment and disinfection	C	1. Total Coliform (MPN)/100ml – < 5000 2. pH – 6.5 – 9.0 3. DO > 4mg/litre 4. BOD – (5 days 20°C) – < 3mg/l
Propagation of wildlife and fisheries	D	1. pH – 6.5–8.5 2. DO – > 4mg/litre 3. Free Ammonia (as N) – < 1.2 mg/l
Irrigation, industrial cooling, controlled waste disposal	E	1. pH – 6.5–8.5 2. Electrical Conductivity—(25°C) micro mhos/cm < 2250 3. Sodium Absorption Ratio Max. 26 4. Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

Source: CPCB.

Water Quality

Monitoring Water Pollution

9.1.31. The Water (Prevention and Control of Pollution) Act, 1974 regulates water quality through the State PCBs. The CPCB, under MoEF, has established a nationwide network for water quality monitoring comprising 1019 stations in 27 States and six UTs. The monitoring is done on a monthly or quarterly basis for surface water and on a half-yearly basis for groundwater. The monitoring network covers 200 rivers, 60 lakes, five tanks, three ponds, three creeks, 13 canals, 17 drains, and 321 wells. Water samples are analysed for 28 parameters including physical parameters, nutrients, major ions, and organic and bacteriological parameters.

National River Conservation Plan (NRCP)

9.1.32. The different standards of water quality required for drinking, bathing, and irrigation are given in Table 9.1.2.

9.1.33. Out of the various parameters monitored, Biochemical Oxygen Demand (BOD) and Coliforms are critical. Maintenance of certain level of flow that could ensure a minimum assimilative capacity in water bodies remains a matter of concern, especially in the light of increasing consumptive demands of various sectors such as household, industry, and agriculture. Based on monitoring done during the last 10 years, 14% of riverine length is highly polluted (BOD more than 6 mg/litre) and 19% moderately polluted (BOD—3 to 6 mg/litre). A total of 86 polluted stretches have been identified and action plans for improving the water quality in them are being prepared.

9.1.34. As small-scale industries do not have adequate resources, space or skilled manpower to treat their wastewater, a scheme of Common Effluent Treatment Plants (CETPs) was initiated in June 1990. The CETPs are partially funded by the GoI. Eighty-eight CETPs covering more than 10000 polluting industries have been set up during the Tenth Plan. However, the performance of these units has been generally unsatisfactory largely due to improper operation and maintenance. This calls for strengthening of enforcement. Charters on Corporate Responsibility on Environmental Protection in respect of 17 categories of highly polluting industries have also been formulated in collaboration with the concerned industries.

9.1.35. It is necessary to consider rivers holistically to evolve plans to restore their ecological health and improve the water quality to bathing standards. Cities and towns located on the banks have been found to be gross polluters and these have been taken up for planning and implementing schemes to ensure that only treated wastewater is discharged into the rivers.

9.1.36. Untreated sewage dumped into our rivers is a major cause of river pollution. The total sewage generation in the country is about 33000 MLD (million litres per day). Against this, the total average treatment capacity is only 6190 MLD and 40% of that capacity is in Delhi. This underlines the urgent need to expand the sewage treatment capacity in the country.

9.1.37. The NRCP has covered 160 towns along 34 polluted river stretches in 20 States and has created 2055 MLD of sewage treatment plant (STP) capacity till now, which is approximately 38% of the approved capacity of 5435 MLD to be set up under the Plan. The average capacity utilization of existing STP capacity is reported to be about 72% against the desirable capacity utilization of 100%. Under-utilization of capacity is due to factors like irregular power supply, absence of connections between domestic sewage drains and STPs, failure of States to provide for maintenance costs of STPs, and so on.

9.1.38. Under the Ganga Action Plan (GAP) Phase-I, sewage treatment capacity of 869 MLD was set up covering 25 Class-I towns in Uttar Pradesh, Bihar, and West Bengal. This amounted to 35% of the total sewage treatment capacity needed. As a result of the implementation of GAP I, the length of the polluted stretch of the river was reduced from 740 km to 437 km (Kannauj to Varanasi). Phase-II (1993) covered Ganga's tributaries (Yamuna, Damodar, and Gomti) in 96 towns in seven States. It is estimated that another 20% of the pollution load of Ganga would be covered on completion of the on-going works under NRCP. However, there will still be a gap of nearly 45% of the pollution load to be addressed in the future.

9.1.39. Other major river cleaning projects cover Gomti river in Uttar Pradesh; Yamuna River in Delhi; Musi River in Hyderabad and Pamba River in Kerala. The 22 km stretch of the Yamuna in Delhi between Wazirabad and Okhla, is critically polluted. A sewage treatment

capacity of 2960 MLD was required to handle the entire discharge load in Delhi. However, the STP capacity created is about 2500 MLD only, leaving a gap of about 460 MLD. More importantly, the existing STPs are able to treat only about 1600 MLD (about 64% capacity utilization) due to dilapidated condition of trunk sewers.

9.1.40. The impact reported by MoEF reveals that BOD is within the prescribed standards (BOD less than 3 mg/l and Dissolved Oxygen [DO] more than 6 mg/l for Bathing Quality) at most major cities along the Ganges. However, as shown in Table 9.1.3 below, the stretch from Kannauj to Allahabad has not yet achieved bathing quality standard. As shown in Table 9.1.4, the stretch of Yamuna river between Delhi and Etawah in Uttar Pradesh is not even of bathing standard.

9.1.41. The rivers Narmada, Mahanadi, Brahmini, Baitarni, Subarnrekha, Beas, and Chambal maintain DO levels of 4.0 mg/l or above throughout the year. In the Ganga, Yamuna, Krishna, Sabarmati, Tapi, Sutlej however, the DO level goes as low as 0.3 mg/l.

TABLE 9.1.3
Water Quality Data for River Ganga
(Summer Average, March–June)

Station/Location	1986		2006	
	DO (mg/l)	BOD (mg/l)	DO (mg/l)	BOD (mg/l)
Rishikesh	8.10	1.70	8.30	1.00
Haridwar D/S	8.10	1.80	8.10	1.30
Garhmukteshwar	7.80	2.20	7.70	2.10
Kannauj U/S	7.20	5.50	7.35	1.11
Kannauj D/S	na	na	6.45	4.20
Kanpur U/S	7.20	7.20	6.20	6.80
Kanpur D/S	6.70	8.60	3.90	6.80
Allahabad U/S	6.40	11.40	7.10	4.90
Allahabad D/S	6.60	15.50	8.50	3.20
Varanasi U/S	5.60	10.10	8.70	2.10
Varanasi D/S	5.90	10.60	8.65	2.25
Patna U/S	8.40	2.00	7.40	2.05
Patna D/S	8.10	2.20	8.10	2.30
Rajmahal	7.80	1.80	7.20	1.95
Palta			6.96	2.58
Uluberia			6.46	2.64

Source: CPCB.

TABLE 9.1.4
Water Quality Data for River Yamuna
(Summer Average, March–June)

Station/Location	1986		2006	
	DO (mg/l)	BOD (mg/l)	DO (mg/l)	BOD (mg/l)
Tajewala	11.70	1.20	11.20	1.50
Kalanaur	10.40	1.05	7.30	2.50
Sonepat	9.75	3.00	8.40	2.50
Palla	13.95	6.00	8.00	4.80
Nizamuddin Bridge	0.30	25.00	0.00	31.30
Agra Canal	0.35	26.50	0.00	28.30
Majhawali	0.50	22.00	3.05	26.00
Mathura	8.10	4.00	5.40	15.30
Mathura D/S	8.50	2.50	5.77	15.00
Agra U/S	10.65	4.50	8.40	15.00
Agra D/S	1.65	9.00	8.17	14.80
Batteshwar	13.90	11.00	9.68	14.00
Etawah	11.16	7.00	16.90	15.50
Udi	9.71	2.00	13.30	3.00
Auraiya Juhika	8.14	5.00	8.40	1.80

Source: CPCB.

Strategy for the Eleventh Plan

9.1.42. The country's first river action programme—GAP—completes over 20 years and the NRCP completes 10 years in 2007. The experience of the first 20 years needs to be used to design an effective and affordable river cleaning programme for the future.

- A basic objective must be to maintain minimum flows, which are threatened by withdrawal of water to meet the needs of agriculture and industry, and to ensure treatment of sewage and effluents.
- As urban sewage load is the dominant factor causing river pollution, integration of the NRCP and National Lake Conservation Plan (NLCP) with the urban development programmes and agencies is essential. It should be ensured that by 2011–12 no untreated sewage is drained into the rivers.
- For receiving assistance under the NRCP/NLCP, ULBs should be fully involved in developing the programme along with specific statutory responsibility for operating and maintaining the treatment facilities created.
- The City Development Plans should incorporate environmental management services as the number one priority in JNNURM and Urban Infrastructure

Development Scheme for Small and Medium Towns (UIDSSMT). Mechanisms are needed to ensure that the urban areas covered under these programmes provide for full treatment of the sewage generated.

- For the plan period, the River Conservation Programme should aim at completing the projects in hand and new projects should be considered only in towns which are not covered under JNNURM and UIDSSMT.
- The NRCP should encourage installations on command area basis to facilitate investment in the treatment of maximum quantity of sewage and reuse in the vicinity. In other words, decentralized systems of wastewater treatment need to be encouraged as against centralized, large, end-of-pipe treatment units.
- The wastewater management strategy needs to emphasize the use of state-of-the-art Geographical Information System (GIS)-based decision support systems.
- Water efficiency in flushes and gadgets should be planned in order to reduce wastewater generation. Recycling/reuse of treated sewage in cities should be promoted. Resident groups should be sensitized towards water conservation, recycling, and reuse.

National Lake Conservation Plan (NLCP)

9.1.43. The NLCP was approved as a 100% Centrally funded scheme during the Ninth Plan with the objective of restoring the polluted and degraded lakes of the country. To begin with, NLCP proposed to cover urban lakes of tourist importance. The scope of work has been expanded during the Tenth Plan to include rural water bodies also. Under the programme, conservation of 46 lakes in 13 States has been taken up through 31 projects. So far, projects for 10 lakes have been completed and 10 more are likely to be completed. Improvement in the quality of water in the lakes in the completed projects is more marked than in the river conservation projects. The scheme now provides assistance to States on a 70:30 sharing basis and till date the estimated approved cost is about Rs 565 crore.

9.1.44. The activities covered under NLCP include interception and treatment of pollution loads entering the lake, lake cleaning interventions such as desilting, de-weeding, bioremediation, catchment area treatment, lake front eco-development like bunding, fencing, shore line development, and creation of facilities for public recreation and entertainment.

Dal Lake Conservation Project (DLCP)

9.1.45. The DLCP was approved by the government at a cost of Rs 298.76 crore in September 2005. As an exception, this project is being implemented entirely by the Central Government. The expected date of completion of the project is March 2010. The works envisaged include interception and diversion of pollutants entering the lake, setting up of six STPs, desilting, de-weeding, removal of encroachments in the project area, and so on. The GoI has released Rs 70 crore for the project till 2006–07. Utilizing this, three out of six STPs have been made operational. The remaining three STPs are expected to be commissioned by December 2007. The progress of implementation is, however, slow due to delay in relocation of families who need to be shifted from the project area of the lake.

9.1.46. While the lakes conservation plan focuses on pollution abatement in lakes, the larger objective of conservation of lakes is the maintenance of the aquatic ecosystems. Keeping this in view, wetlands will be integrated with NLCP and the programme's objectives will cover conservation of life forms apart from mitigating pollution and augmenting catchments.

Water Pollution

9.1.47. Effluent standards, environmental laboratories, and government analysts have been notified under the Environment (Protection) Act. There is a need for much stronger monitoring and enforcement for expanded coverage by both the Central and State Pollution Control Boards. Greater awareness and involvement of local (affected) communities and local governments in compliance and monitoring is critically important. While compliance will cover treatment and recycling of used water, monitoring should include the extent and quality of the treated water, and water quality of the water bodies providing or receiving the water in treated or untreated form.

9.1.48. The Joint Parliamentary Committee on pesticide residues in and safety standards for soft drinks, fruit juice, and other beverages has suggested notifying quality standards for drinking water. These quality standards should be made mandatory.

Waste Management

9.1.49. Municipal Solid Waste (Management and Handling) Rules, 2000 stipulated that these were to be complied by December 2003. Under these rules, all local

bodies were expected to undertake segregation of waste and its collection, storage, transportation, processing, and disposal. While the Ministry of Urban Development reported that Jodhpur in Rajasthan, Sirsa in Haryana, and Namakkal in Tamil Nadu have been making good efforts towards compliance, no other city/town in the country has taken the required steps. Some local bodies are reported to have taken initiatives to set up waste processing and disposal facilities. These local bodies are generating about 1.2 lakh tonnes of municipal solid waste every day and treatment is not a priority in their plans.

Urban Solid Waste Management

9.1.50. Management of industrial and municipal waste is a serious challenge because of its magnitude and the resources required. The JNNURM covers programmes for urban waste disposal. The scheme of Balanced Use of Fertilizer under the Ministry of Agriculture strengthens the soil-testing programme in the country and encourages efficient fertilizer use and composting of urban biodegradable waste. The Ministry of New and Renewable Energy (MNRE, previously MNES) has formulated a National Programme on Energy Recovery from urban and industrial waste. These programmes need convergence and exploitation of synergies.

Strategy for the Eleventh Plan

9.1.51. Collection, treatment and disposal of solid waste are the responsibility of the ULBs. These bodies must be made specifically accountable in this respect. The Supreme Court directions for municipal solid waste collection and management which require segregation, sanitary landfills, and other safe options of treatment should be part of a Master Plan. The following measures also need to be taken.

- Processes for waste minimization and segregation should be promoted and pursued. The existing regulations have to be revisited to see the changes needed and the investments required.
- The role of CPCB and MoEF must be clarified. They should be charged with enforcing the rules through the ULBs and not rest satisfied solely from being the key standard setting and pollution monitoring agency.
- Assistance for projects for treatment and disposal of hazardous and biomedical waste should be provided as incentive for compliance.
- Avoidance of waste going to the landfill should be the priority for all ULBs.
- For smaller and medium towns and cities, regional/shared landfills/waste processing infrastructure should be considered. For larger cities, the problem of availability of land should be addressed.
- Programmes like JNNURM and UIDSSMT need to link assistance to the progress in solid waste management. During the Plan period, all Class I cities should have sanitary landfills in place.

9.1.52. The PCBs are responsible for enforcing Management of Hazardous Waste and Biomedical Wastes (Management and Handling) Rules. It is assessed that about 4.4 million tonnes of hazardous waste are generated annually by over 13000 units. At the instance of the Supreme Court, an inventory of dumpsites is being carried out. MoEF provides assistance for installing Transport, Storage, and Disposal Facilities (TSDF) for management of hazardous waste generating industrial clusters. So far, six such systems have been supported in PPP mode. The average capacity of these units is 1–1.2 lakh tonnes per annum. Biomedical waste is generally disposed of by incinerators or conventional methods. At least 17 units, mostly incinerators, were set up by industry associations. Some health care facilities have installed their own biomedical waste treatment facilities and others are availing the services of Common Bio-medical Waste Treatment Facilities (CBWTF). There were 157 CBWTFs, including eight under installation, in the country as on March 2007.

9.1.53. During Eleventh Plan period, an institutional mechanism would be required to be put in place to ensure that issues related to handling of industrial, hazardous and bio-medical wastes are also dealt under JNNURM and UIDSSMT. Funding through these two umbrella schemes should be made conditional upon appropriate measures being taken in respect of these issues. In places not covered under JNNURM and UIDSSMT, an effective mechanism should be put into place to ensure strict monitoring and compliance by the concerned local authorities. A framework for management of e-waste also needs to be put into place.

Biodiversity

9.1.54. Habitat conversion or land use changes, land degradation, and pollution result in the decline of ecological goods and services needed for human welfare. The Biological Diversity Act, 2002 and Rules, 2004 provide for constitution of State Boards (SBBs) and Management Committees (BMCs) for conservation, documentation and sustainable utilization of biodiversity and for building up capacities of these bodies. Chronicling in the form of

People's Biodiversity Registers will be the only way we can identify changes happening due to climate change. There is a need to develop appropriate methodology and models for conducting such an exercise. Documentation of traditional knowledge should also include adaptation of such knowledge in line with the present needs of conservation.

Biosphere Reserves

9.1.55. This programme was started in 1986 with UNESCO (Management and Biosphere) support for integrating social, cultural, and ecological values of ecologically rich landscapes. The primary focus was on monitoring and designing conservation strategies. With a Tenth Plan outlay of Rs 35 crore, the programme has not been able to deliver an effective outcome for the existing biosphere reserves. There is a need to reinforce the information and strategic back up for the management of protected areas in the core of biosphere reserves.

9.1.56. Keeping in view the facts that village eco-development and participatory management of habitats are part of protected areas management schemes, the primary objectives of this programme will be research, documentation, and monitoring of the dynamics of human ecosystem interface. The programme should focus on cross-sectoral linkages between biochemical resources and human livelihood.

Mountain Ecosystems

9.1.57. The MoEF has established an autonomous institute, the G.B. Pant Institute of Himalayan Environment and Development (GBPIHED), with the overall mandate of dealing with issues relating to the environment of the Indian Himalayan Region. The results of project studies of the Institute also have implications on issues such as climate change and land degradation. However, the output falls far too short of what is needed to be done for the Himalayan ecosystems.

9.1.58. During the Eleventh Plan period, GBPIHED should reorient its activities to evolve as a resource centre for the Himalayan States and GoI for advice on sustainable development of the Indian Himalayan Region. The focus of research should include socio-economic development of the mountain habitations. An Indian Alpine Initiative should also be started for tracking the dynamics of alpine biomes in the context of climate change.

Coastal Zone Management

9.1.59. The earlier Coastal Regulation Zone notification prescribed regulation of activities based on uniform principles of vulnerability of coastal areas against human activity. Coastal areas are currently classified in four categories (CZ 1 to 4) with different principles for development activities. Category 1 includes ecologically sensitive areas, category 4 includes islands, and categories 2 and 3 permit construction activities based on vulnerability. The Swaminathan Committee prescribed that the local circumstances and vulnerabilities should be the basis of coastal zone management and regulations. For this purpose, use of scientific, social, and local information should be made in environmental management plans for coastal areas. Conservation of life forms (and their habitats such as nesting/spawning sites) and integration of their environments with human well-being should be essential components of such plans. Participation of civil society and fishing/coastal communities in the State level coastal zone management committees should be ensured for conservation and sustainable harvests.

Botanical Survey of India (BSI) and Zoological Survey of India (ZSI)

9.1.60. The Botanical and Zoological Survey of India are today facing major challenges in view of the new regime on genetic resources, provisions of the Biochemical Diversity Act, and fast evolving knowledge and information environment. Use of recent trends in organizing information and modern skills in exploration and documentation will be given priority. These institutions will develop into prime repositories of information on plants and animals, and as referral institutes. Collaboration and linkages with other institutions as part of a network will be encouraged.

Environmental Awareness and Education

9.1.61. The Environment Education in School System project initiated in 1999 strengthens environment education in the formal school curriculum through infusion of appropriate education material. Introduction of environmental concepts in Business/Management Education is another focus area. A committee comprising representatives from management institutions, AICTE, UGC, industry, and MoEF is working on this.

9.1.62. During the Eleventh Plan, the programme of Environmental Education, Training, and Extension may be continued with further linkages with the publicity and awareness mechanisms of State forest departments.

This may include a manual on public participation in all activities of MoEF. Public transport like railways, buses, and even airways can be extensively used for environmental awareness through well designed awareness material. Information generated by student activities on local environmental issues may be integrated with the database under the National Environmental Monitoring Programme (NEMP). Capacity building, such as training of trainers, should also be focused on.

9.1.63. The National Museum of Natural History (NMNH), New Delhi, and three regional museums at Mysore, Bhubaneshwar, and Bhopal will be made more effective in natural history education and awareness with the introduction of the state-of-the-art education and interpretation methods. The MoEF has contemplated setting up of a new regional museum at Sawai Madhopur with focus on the life forms of the region, the details of which are being worked out.

National Environmental Monitoring Programme (NEMP)

9.1.64. The Steering Committee on Environment and Forests for the Eleventh Plan has suggested a unified NEMP for ecology, environmental chemistry, public health, and socio-environmental studies. This programme would track the status and change in the socially relevant biophysical parameters and their social impacts, wherever possible. NEMP may have sub-programmes on forest cover and ecosystem services, apart from air and water pollution. The programme may have linkages with educational, scientific, and social organizations working in the relevant fields. Accordingly, the existing programme for Environment Information System (ENVIS) will be reshaped to provide information in interactive formats for effective use. Real time sharing of data on environmental parameters collected under NEMP will be implemented. A special portal could also be organized for environmental data from school and college student projects.

Environmental Research And Development

9.1.65. The MoEF supports nine Centres of Excellence in research which need to be strengthened.

9.1.66. During the Eleventh Plan period, environmental policies and programmes will need strong research backup. The identified research priorities will be met by a combination of open, competitive research grant programmes, and dedicated support to special organizations and centres of excellence.

- An 'Environmental Research Grants' programme should focus on the relevant areas such as clean technologies, preventive strategies, hazardous substances management, and so on. There should be special programmes on Ecosystem Health, Pollution and Health, Ecological Footprint, NTFP regeneration ecology, Invasive species, Fire Ecology, and Forest-Watershed Services.
- Documentation of traditional and community knowledge should be a special area of research.
- Special mechanisms may be set up for co-ordination and management of research amongst agencies like Indian Council of Forestry Research and Education (ICFRE), ICAR, CSIR, DBT, DST, and UGC, as well as multilateral and bilateral donors and private foundations.
- The All India Coordinated Project on Taxonomy (AICOPTAX) needs strengthening in order to bring more taxa of lower organisms and issues like molecular taxonomy.

Taxonomy Capacity Building

9.1.67. The implementation of the Biological Diversity Act, 2002 and Rules, 2004 and National Environmental Policy, 2006 calls for an adequate number of trained taxonomists. Existing programmes on botanical gardens and taxonomic capacity building assume immense significance in this respect. MoEF provided assistance to 72 botanical gardens during the Tenth Plan and under an AICOPTAX, 11 coordinating centres and two centres for training have been supported at various institutions.

9.1.68. AICOPTAX should be augmented for capacity building (including human resources) in Taxonomy. The ZSI and BSI will be the key institutions to organize taxonomic capacity building programmes and train young Indian taxonomists for forest, wildlife and management.

Conservation of Natural Resources and Ecosystems

9.1.69. Inland aquatic systems (excluding paddy fields) cover 5.3% of the country's land area but harbour 15% and 20% of India's floral and faunal diversities, respectively. There are wide gaps in knowledge relating to hydrological parameters, ecosystem processes, and aquatic life forms in these systems. Information on the physico-chemical aspects of water quality in rivers and lakes has become available largely because of the support from the National River Conservation Directorate (NRCD) and the CPCB, but that on aspects such as area, depth, hydrology, and

ecosystem processes (functions) is practically non-existent. The existing programmes on conservation accordingly need a revamp.

9.1.70. The Scheme on Conservation and Management of Mangroves, Coral Reefs, and Wetlands has been too small to make an impact on the conservation of these ecosystems. Mangroves and coral reefs are mainly found on government lands. Development of appropriate institutions to motivate people to cooperate in the conservation efforts of these systems will be a priority area. More protected areas are needed for the conservation of coral reefs. Restoration and plantation programmes for mangroves are necessary to make these eco-systems function as effective barriers against invasion of land by sea. The existing programmes on wetlands, mangroves, and coral reefs will be extended to mountains, grasslands, and alpine ecosystems.

9.1.71. Initiatives on conservation need to be more effectively integrated with development and poverty reduction. The principles of Community Reserves under the Wild Life (Protection) Act may be useful in such efforts. Long-term plans for conservation of such habitats will be important. Wetlands will be part of NLCP and the objectives will cover conservation of life forms apart from mitigating pollution and augmenting catchments.

- An information system will be set up for islands, coral reefs, mangroves, and wetlands by developing a consolidated and easily accessible database of all recorded species.
- Support activities will include participatory research for inventory and valuation of freshwater ecosystems, measures to tackle serious threats to them and ensure conservation, as also the livelihood security of dependent communities.
- With regard to linkage between biodiversity and climate change, it should be recognized that biodiversity is an important tool to find solutions for tackling the impact of climate change on rural populations that depend on biomass for their livelihood.
- There is a need to recognize the potential of biodiversity to provide solutions for adaptation in the form of traditional crop varieties and donors for creating GMOs.
- National agro biodiversity hotspot mapping and identification of important agro biodiversity landscapes will be undertaken for conservation with the participation of farmers and pastoralist groups. Regions with high concentration of genetic diversity on major and important crops may be declared as 'gene sanctuaries' for conservation and enrichment of diversity, involving communities through diversity based income generation and incentives.
- The regulatory mechanism for trials and adoption of GMOs will be required to be based on scientific, socio-economic, and EIA in the long as well as short term. The process of a regulatory regime, therefore, should be consultative and transparent, based on the prescribed scientific, logical, and progressive norms, taking into account factors of human health and environmental health.
- Awareness generation will be important for ensuring effective outreach of the prescribed process for promotion of appropriately and adequately tested GMOs, mechanisms for enforcement of procedures, and processes for safeguarding ecological and health safety will be established.

Other Programmes

9.1.72. Several ongoing programmes of NoEF on specific subjects will continue to be pursued during the Eleventh Plan period. This includes the Environment Planning and Coordination project for Madhya Pradesh and Nagaland, Environmental authorities and tribunals, the Taj Protection Mission, National Natural Resource Management systems, IT, Adaptation and Capacity Building on Climate Change, and so on. Such programmes, with specific mandate derived from the Supreme Court or externally aided projects, will continue till their logical conclusion.

9.2 CLIMATE CHANGE

9.2.1. Global Climate Change due to rising levels of GHGs in the atmosphere is one of the most serious environmental concerns of our time. The Intergovernmental Panel on Climate Change (IPCC), established in 1988 by the World Meteorological Organization and the United Nations Environment Programme, has worked extensively on evaluating past trends and the future prospects of climate change. The synthesis report of the Fourth Assessment Report (AR4) of the Panel was released in November 2007.

9.2.2. The IPCC reports present a grim picture. It is estimated that the Earth's surface temperature has risen by 0.6±0.2°C over the twentieth century. In the last 50 years, the rise has been 0.13 ± 0.07°C per decade and the recent years have been the warmest since 1860, the year from which regular instrumental records are available. The Panel has concluded that the fact of global warming is unequivocal and there is enough evidence to indicate

that this is due to anthropogenic reasons. Although some of these conclusions have been disputed, the assessment of the IPCC represents a broad and growing consensus in the scientific community worldwide. The current level of atmospheric CO_2 is estimated as 379 parts per million (ppm) compared with the pre-industrial level of only 280 ppm. The annual growth rate of CO_2 concentration has been greater in the last 10 years (1.9 ppm/yr) compared to the last 40 years (1.4 ppm/yr). Halocarbons (chloro-flouro-carbons etc.) in the atmosphere, however, are observed to be decreasing due to their phase out under the Montreal Protocol.

9.2.3. Since warming depends upon the total stock of GHG in the atmosphere, continued emissions beyond the earth's absorptive capacity necessarily imply a rise in temperature. If emissions continue to increase as at present, a warming of about 0.2°C per decade is projected by IPCC. If emissions are stabilized at the 2000 level, the warming could be about 0.1°C per decade. The Special Report on Emission Scenarios projects that surface air temperatures could rise by between 1.1 and 6.4°C over the twenty-first century. In most cases, the temperature rise may be 2–4°C. The sea level rise is projected to be 18 to 59 cm.

Impact and Implications of Climate Change

9.2.4. Climate changes noted in the IPCC Assessment reports include recession of glaciers, thawing of permafrost, lengthening of mid- to high-latitude growing seasons, pole-ward and altitudinal shifts of plant and animal ranges, decline in some plant and animal populations, early flowering of trees, and changes in insect populations and egg-laying in birds. Associations between changes in regional temperatures and the observed changes in physical and biological systems have been documented in many aquatic, terrestrial, and marine environments.

- The water cycle is totally dependent on the temperature regime. Increasing global temperature and resultant faster retreat of most glaciers is expected to affect the snow fed perennial water regimes. Accordingly, the vegetation status of catchments, magnitude and frequency of floods, precipitation, runoff and groundwater recharge may all be affected. These changes may substantially affect hydropower generation, and may also require an increase in irrigation due to higher crop evaporative demand.
- Through the twentieth century, the average rate of global sea level rise has been 1.7 ± 0.5 mm/yr. The maximum rise since 1992 has been observed in the Western Pacific and the Eastern Indian Ocean. This trend could result in loss of land due to inundation, erosion, floods, and salt-water intrusion, adversely affecting coastal agriculture, tourism, fisheries and aquaculture, human settlements, and health.
- Changing environmental attributes are sure to affect the species spectrum and the profile and composition of forests is also likely to change. The degree to which terrestrial ecosystems will continue to be net sinks for carbon is uncertain. In arid or semi-arid areas, productivity is expected to decrease. Trends of drying up of wetlands and degradation of ecosystems have been observed.
- Estimated crop yield responses to climate change vary widely, depending upon species, cultivation practices and soil properties; pests, and pathogens; the direct effects of carbon dioxide (CO_2) on plants; and interactions between CO_2, air temperature, water stress, mineral nutrition, air quality, and adaptive responses. Even though increased CO_2 concentration can stimulate crop growth and yield, this benefit may not always overcome the adverse effects of excessive heat and drought. The AR4 projects a decline in global rice production by 3.8% by the end of the twenty first century.
- Changes in the severity and frequency of extreme heat and cold, and of floods and droughts, coupled with local air pollution and aero allergens may result in changes in infectious disease occurrence, in local food production and also cause under nutrition, leading to impaired child development. There will also be health consequences of population displacement and economic disruption. For India, the risks of malaria and heat stress related mortality have been projected by IPCC. Increase in flooding and droughts are associated with increased risk of drowning, diarrhoeal and respiratory diseases, and hunger and malnutrition. Adaptive options like health-oriented management of the environment (including air and water quality, food safety, urban and housing design, and surface water management), and appropriate medical interventions are normally related to income levels. Therefore, the poor are more vulnerable. Human settlements are also expected to be affected by changes in resource productivity or market demand for goods and services causing structural and functional adaptations leading to migration, which in turn would result in changes in living conditions.

9.2.5. Global warming will affect us seriously. For South Asia, warming has been projected to be above the global mean and in South East Asia, equal to the global mean. The impact projections for India indicate a rise of 0.68°C in the twentieth century with an increasing trend in the annual mean temperature. Precipitation is likely to increase and extreme rainfall and other climatic events may occur more frequently. Extreme rains in the South West monsoon and fewer rainy days along the East Coast have been projected. An increase in temperatures of 0.5°C to 1.5°C could produce a decline of between 2.5% in wheat and maize production in India.

9.2.6. Existing research based on formal modeling suggests that a scenario of warming between 2–3°C would lead to a permanent loss of up to 3% in the global output. In countries with predominantly agrarian economies, the projected increase in temperature and reduction in precipitation could, in the absence of adaptive responses such as increased irrigation, related agricultural research and related infrastructural interventions, dampen economic growth by reducing agricultural productivity. These impacts can be moderated by efforts at adaptation but these are expected to be costly and will impose a burden on both producers and consumers. Climate change would therefore result in lower incomes of the vulnerable populations and increase in the absolute number of people at risk of hunger unless these outcomes can be countered through the development of cost effective technologies.

Responses to Climate Change

9.2.7. The serious consequences of climate change, including especially the consequences for India, lead naturally to the question of what should be our response. Two types of responses need to be considered. The first relates to adaptation, i.e., measures that have to be taken given the very high likelihood that climate change will occur and will have adverse effects. The second relates to mitigation, i.e., steps to be taken that might reduce the extent of climate change.

9.2.8. Recognizing the importance of climate change issues, the Prime Minister established a Council on Climate Change under his chairmanship in June 2007 to co-ordinate national action for assessment, adaptation, and mitigation of climate change. Earlier, the government had set up an expert committee to study the impact of climate change. One of the important decisions taken by the Prime Minister's Council is that a National Action Plan will be prepared compiling action taken by India for addressing the challenge of climate change and the action that needs to be taken in the future.

Adaptation

9.2.9. Since a substantial adverse change in climate appears unavoidable even with the optimal mitigation response, the process of adaptation to climate change must have priority. The most important adaptation measure is development itself. A stronger economy is more able to adapt both in terms of the cost of adaptation and technological capability. Achieving rapid economic growth as targeted in the Eleventh Plan is therefore a key element in adaptation. As mentioned earlier, the Prime Minister's Council on Climate Change has decided that a National Action Plan on Climate Change compiling action taken by India for addressing the challenge of climate change and the action that it proposes to take, should be prepared as India's National Report on Climate Change. The Action Plan will deal with key vulnerabilities of India to Climate Change and, in particular, the impact on water resources, forests, coastal areas, agriculture, and health. An action plan for adaptation to climate change would require (i) action in the area of agricultural research to evolve varieties that can cope with likely climate changes, (ii) action to cope with likely increases in water stress, (iii) action to be able to cope with a greater frequency in natural disasters. The institutional network created at the time of preparation of India's initial National Communication to United Nations Framework Convention on Climate Change (UNFCCC) exists and is currently engaged in the preparation of information on India's second National Communication.

9.2.10. In the changing temperature and water regimes, improvement of productivity potential and water use efficiency of agricultural crops, specifically in regimes of water shortage and extreme variations of temperature, will be priority areas of research.

9.2.11. The adaptation response needs to be incorporated in the relevant programmes, including those relating to watershed management, coastal zone planning and regulation, forestry management, agricultural technologies and practices, and health.

9.2.12. Work on the potential impact, forecasting systems and adaptations in response to Climate Change will be the key concerns for future development. For projections and early warning systems, understanding of the

processes which could show discernible changes well before the actual impact starts is essential.

Mitigation

9.2.13. Recognizing the need for international co-operation in devising an effective mitigation strategy, in 1992, the international community established the UNFCCC which established the principle of 'common but differentiated responsibility' between the industrialized countries (Annex 1 countries) and the developing countries (non-Annex 1 countries), taking account of the respective capacities. The Annex 1 countries were required to bring down their GHG emissions to 1990 levels by 2000. In 1997, the Kyoto Protocol under the UNFCCC was adopted, which set legally binding targets for GHG reduction by individual industrialized countries totaling 5.2% below their aggregate 1990 emissions during the 'first commitment period', 2008–12. Under the provisions of the Kyoto Protocol, non Annex I Parties (India is in this category) are not obliged to reduce emissions of GHG. So far, 176 countries, including India (and the regional economic organization EEC), have ratified the Protocol. The US and some other countries have not ratified the Protocol till now. Most of the industrialized countries thus far have not achieved significant progress in reducing their GHG emissions in the manner required in the first commitment period.

9.2.14. An optimum approach to mitigation from a global perspective is only possible if all countries cooperate to facilitate collective action. This is because mitigation actions are characterized by the classic problem of externality—the benefits of the action of any one country do not accrue only to the country itself but to the entire global community, while the costs of mitigation are fully internalized. Without co-operative action, all countries taken together will do less mitigation than is collectively optimum. The challenge lies in determining a basis for collective action which is fair, provides equitable entitlement to the global environment space with burden sharing in a manner which recognizes the very different levels of development and also the very different degrees of historical responsibility for causing the problem in the first place. Such differenciation among the countries of the world has been accepted by the UNFCCC and the Kyoto Protocol. This must be effectively operationalized to create an environment of trust and co-operation.

9.2.15. The first commitment period of the Kyoto Protocol is 2008–2012 and as per the provisions of the Kyoto Protocol and discussion at the 13th Conference of Parties at Bali in December 2007, Bali Action Plan was commenced which intends to enable the full, effective, and sustained implementation of the Convention through long-term co-operative action, now, upto and beyond 2012. As part of the Bali Action Plan, a process has also been initiated to determine the GHG reduction commitments of industrialized countries (Annex 1 countries) under the Kyoto Protocol, beyond 2012. The precise nature of the outcomes of this process would be determined in a two year negotiating time table ending in 2009.

9.2.16. There is no doubt that the accumulation of GHG, which is the cause of global warming, has occurred overwhelmingly due to the emissions of industrial countries and it is therefore entirely appropriate that the burden of mitigation must fall on them. It is for this reason that the first commitment period in the Kyoto Protocol entailed commitment for reduction only by the industrialized countries.

9.2.17. With a share of just 4% of global emissions, any amount of mitigation by India will not affect climate change. A substantial commitment to reduce emissions by the major industrialized countries will be required. Nevertheless, as contribution to the global emissions reduction effort, the Eleventh Plan would focus on efforts to ensure that the emissions intensity of India's GHG continues to decline. The correct approach in mitigation is to define the obligations of different parties on the basis of common but differentiated responsibility and differences in respective capabilities. India's view on burden sharing is based on this approach. Our National Environmental Policy of 2006 requires 'equal per capita entitlements of global environmental resources to all countries'. At the meeting of the G 8 +5 in Heiligendamm in July 2007, Prime Minister Manmohan Singh indicated that we are determined to see that India's per capita emissions never exceed the per capita emissions of the industrialized countries. This formulation focuses on per capita emissions rather than total emissions as the relevant variable, and also provides industrial countries with an incentive to reduce their level of emissions as quickly as possible.

9.2.18. While optimal mitigation strategies will no doubt evolve in time from the ongoing international negotiations, India is already taking a number of initiatives in clean energy including renewable energy and action to increase energy efficiency and conservation.

One of the objectives of the Eleventh Plan is to reduce the energy intensity per unit of GHG by 20% from the period 2007–08 to 2016–17. We will also initiate action to increase our access to cleaner and renewable energy by fully exploiting existing resources (e.g., hydropower and wind power) developing nuclear power, and also supporting research in newer areas such as biofuels from agro-waste, solar energy, etc.

9.2.19. The CDM is a flexible arrangement under the Kyoto Protocol which enables industrialized countries to meet their emission reduction obligations by encouraging adoption of sustainable and environmentally friendly technologies in developing countries. India's CDM potential is a significant component of the global CDM market. Till 14 February 2008, out of a total of 871 projects accorded Host Country Approval, 314 projects in India have been registered by the CDM Executive Board, so far the highest in any country. However, in terms of the corresponding Certified Emission Reduction (CERs), India is second to China.

Allocations in the Eleventh Plan

9.2.20. The total projected GBS in the Eleventh Plan for the MoEF is Rs 8842 crore (at 2006–07 price) and Rs 10000 crore (at current price).

9.3 DISASTER MANAGEMENT

Overview

9.3.1. Many regions in India are highly vulnerable to natural and other disasters on account of geological conditions. About 60% of the landmass is susceptible to earthquakes and over 8% is prone to floods. Of the nearly 7500 kilometers long coastline, approximately 5700 kilometers is prone to cyclones. 68% area is susceptible to drought. All this entails huge economic losses and causes developmental setbacks. Disasters are no longer limited to natural catastrophes. Man-made emergencies often cause bigger disasters in terms of fatalities and economic losses. With urbanization and concentration of population in metropolitan cities, more and more people are becoming vulnerable to locational disasters. So, the development process needs to be sensitive towards disaster prevention, preparedness and mitigation. Disaster management has therefore emerged as a high priority for the country. Going beyond the historical focus on relief and rehabilitation after the event, there is a need to look ahead and plan for disaster preparedness and mitigation in order to ensure that periodic shocks to our development efforts are minimized.

9.3.2. Disaster risk reduction has not been highlighted in the policies and programmes of various plan schemes. The country's commitment to mainstreaming disaster risk reduction into the process of development planning at all levels so as to achieve sustainable development is yet to be carried forward across sectors through actionable programmes for achieving the desired result.

Tenth Five Year Plan Strategy and Approach

9.3.3. The Tenth Five Year Plan (2002–07), prepared in the backdrop of the Orissa super cyclone, Gujarat earthquake, and end of the International Decade of Natural Disaster Reduction, recognized disaster management as a development issue for the first time. The Plan devoted a separate chapter to disaster management and made a number of important prescriptions to mainstream disaster risk reduction into the process of development.

9.3.4. The Tenth Plan prescriptions on disaster management can broadly be divided into three categories:

(i) Policy guidelines at the macro level that would inform and guide the preparation and implementation of development plans across sectors;
(ii) Operational guidelines for integrating disaster management practices into development plans and programmes, and
(iii) Specific developmental schemes for prevention and mitigation of disasters.

9.3.5. At the macro level, the Plan emphasized that 'while hazards, both natural or otherwise, are inevitable, the disasters that follow need not be so and the society can be prepared to cope with them effectively whenever they occur' and called for a 'multi-pronged strategy for total risk management, comprising prevention, preparedness, response and recovery, on the one hand, and for initiating development efforts aimed towards risk reduction and mitigation, on the other'. It stated that only then could we look forward to 'sustainable development'.

9.3.6. At the operational level, the Plan made a number of very important suggestions, as given below:

- Streamlining institutional arrangements for disaster response by an integrated approach involving civilian and military resources; setting up a modern, permanent national command centre or operations room with redundant communications and data links to all State capitals; establishing a quick response team particularly

for search and rescue operations; developing standard operating system for dealing with humanitarian and relief assistance from non-government sources; and formulating a unified legislation for dealing with all types of disasters.

- Building disaster prevention and preparedness in development planning by introducing a rigorous process of vulnerability analysis and risk assessment, maintaining comprehensive database and resource inventories at all levels, developing state-of-the-art infrastructure for mitigation planning, and establishing a Disaster Knowledge Network for the use of disaster managers, decision makers, community, and so on.
- Developing a nation-wide culture of prevention by introducing disaster management in the school curriculum, including relevant aspects of disaster management in professional courses, enhancing the capacity of disaster managers by better training facilities and creating a massive awareness at all levels.
- Encouraging community level initiatives for disaster preparedness by involving people at the grass roots, particularly those who are more vulnerable, for better preparedness and response.
- Developing appropriate zonal regulations, design standards, building codes, and performance specifications for safe construction.
- Inclusion of disaster mitigation analysis in all development schemes in vulnerable areas through which the feasibility of a project is assessed with respect to vulnerability of the area.
- Building disaster mitigation components into all development projects financed under the Plan.

9.3.7. The Tenth Plan felt that planned expenditure on disaster mitigation and prevention measures was required in addition to a Calamity Relief Fund. The Plan, however, stopped short of recommending any specific plan scheme for prevention, mitigation or preparedness for disasters nor did it allocate any amount for such scheme, except making a general recommendation that '*Creation of faculties in disaster management in all 28 states is proposed to be taken up in the Tenth Plan in addition to community mobilization, human resource development, establishment of Control Rooms and forging international cooperation in disaster management. There is also an urgent need for strengthening the disaster management pedagogy by creating disaster management faculties in universities, rural development institutes and other organizations of premier research.*'

Implementation of Schemes in the Tenth Plan

9.3.8. A Central Sector Plan Scheme, the National Disaster Mitigation Programme (NDMP), has been implemented since 1993–94. The scheme mainly provided for training and capacity building of government functionaries and other stakeholders to manage disasters in an effective manner. This scheme was transferred from the Ministry of Agriculture to the Ministry of Home Affairs in June 2002. The allocation for this scheme was raised from Rs 6.30 crore in the Eighth Plan to Rs 16.32 crore in the Ninth Plan and to Rs 30.77 crore in Tenth Plan. The annual allocations under various components of the scheme during the Tenth Five Year Plan are in Table 9.3.1.

9.3.9. Out of the eight components of the above scheme, only two components namely 'Grants-in-Aid' and 'Professional Services' were developmental in nature, while the remaining components were on revenue expenses. The major activities under the grants-in-aid include the setting up of the National Centre for Disaster Management at the Indian Institute of Public Administration, now upgraded as a statutory organization

TABLE 9.3.1
National Disaster Mitigation Programme—Year-wise Allocation of Funds in the Tenth Five Year Plan

(Rs in lakh)

S. No.	Head	2002–03	2003–04	2004–05	2005–06	2006–07	Total
1.	Grants-in-aid	262.00	349.00	474.00	505.00	600.00	2190.00
2.	Professional Services	20.00	29.00	54.00	110.00	150.00	363.00
3.	Machinery & Equipments	2.00	20.00	30.00	15.00	10.00	77.00
4.	Foreign Travel	80.00	30.00	25.00	40.00	50.00	225.00
5.	Contribution	20.00	20.00	20.00	17.00	20.00	97.00
6.	Office Expenses	2.50	3.00	2.00	2.00	2.00	11.50
7.	Advertisement & Publicity	20.00	10.00	25.00	1.00	1.00	57.00
8.	Other Charges	0.50	26.00	10.00	10.00	10.00	56.50
	Total	**407.00**	**487.00**	**640.00**	**700.00**	**843.00**	**3077.00**

Source: Disaster Management Division (MHA).

known as National Institute of Disaster Management (NIDM), creation of 29 disaster management faculties/ Centres in 28 States, research and consultancy services, and documentation of major disaster events. The faculties did not have sufficient back-up from the States with the result that only limited activities are undertaken by the Centres. Even meagre allocations provided by the Central Government as grants-in-aid were not fully utilized in many of the States. The allocation of Rs 21.90 crore to the training institutes during the Tenth Five Year Plan was mainly used on NIDM which incurred an expenditure of Rs 11.56 crore. Nearly 71000 persons have been imparted training under the programme (Table 9.3.1).

9.3.10. The National Cyclone Risk Mitigation Project is another Plan Scheme proposed to be implemented with World Bank assistance. The project is presently at the stage of preparation of Detailed Project Report. It covers all 13 cyclone prone coastal States and UTs. Investments are to be made in upgradation of cyclone forecasting, tracking and warning systems, construction work of cyclone shelters, road linkages, plantation, retro-fittings of vital lifeline installations, strengthening of national and regional training institutions, setting up a techno-legal regime for cyclone mitigation and for strong management and monitoring system. As regards upgradation of cyclone forecasting, tracking and warning systems, this activity is proposed to be taken up either as part of the project or independently by the IMD.

9.3.11. The Ministry of Home Affairs is also implementing Phase II of a Community based Disaster Risk Mitigation (DRM) Programme in 169 multi hazard districts in 17 States/UTs with the support of UNDP under a multi-donor programme at a total estimated cost of Rs 153 crore (US$ 34 million). Under this programme, disaster management plans are being prepared from village to district; village volunteers are being trained in first-aid, search and rescue, evacuation and relief and shelter management; disaster management teams are being constituted at the district and sub-district levels and mock drills are being conducted at all levels. This 100% externally funded programme is, however, outside the framework of the Plan and is being implemented on the non-Plan side. It is the largest community based DRM programme in the world. Phase I of the programme was implemented in the three States of Gujarat, Orissa, and Bihar during 2002–06 and has been rated well in a recent evaluation conducted by a team of consultants. While the general feedback on Phase II of the programme is good, there is a definite need to increase the scope to cover other deficient areas too, in order to draw the full benefit from this.

Institutional and Other Initiatives in the Tenth Plan

9.3.12. The following significant initiatives on disaster management were taken during the Tenth Five Year Plan period:

- The Disaster Management Act, 2005 has been enacted for establishing requisite institutional mechanisms for drawing up and monitoring the implementation of disaster management plans, ensuring measures by various wings of the government for prevention and mitigating the effects of disasters, and for undertaking a holistic, co-ordinated, and prompt response to any disaster situation.
- The National Disaster Management Authority (NDMA), under the Chairmanship of the Prime Minister, has been set up in terms of the Act. NDMA is an apex body responsible for laying down of policies, plans and guidelines on disaster management so as to ensure timely and effective response to disasters. The Authority has prepared a Draft National Policy on Disaster Management and has taken up preparation of guidelines on prevention, mitigation, response, and recovery in regard to various types of disasters such as earthquake, flood, landslides, industrial disaster, and so on. The guidelines on management of earthquake, chemical disasters, and chemical (industrial) disasters have been finalized and circulated.
- The State Governments are in the process of setting up State and district Disaster Management Authorities. The provisions of the Act relevant to the States/UTs have been brought into force w.e.f. 1 August 2007. While Arunachal Pradesh, Goa, Gujarat, Himachal Pradesh, Kerala, Mizoram, Puducherry, Punjab, and Uttar Pradesh are reported to have constituted SDMAs as per the Act, the other States/UTs are in the process of constituting the same.
- An eight battalion-strong National Disaster Response Force has been set up comprising of 144 specialized response teams on various types of disasters of which 72 teams are for nuclear, biological, and chemical (NBC) disasters.
- The Civil Defence set-up in the country is proposed to be revamped to strengthen local efforts for disaster preparedness and effective response. Similarly, the Fire Services are also proposed to be strengthened/

modernized to convert them into a multi-hazard response force.

- The National Institute of Disaster Management has been set up for training, capacity building, research, and documentation on various natural and manmade disasters. A comprehensive Human Resource Plan for Disaster Management has also been developed.
- Disaster Management has been included in the curriculum of middle and secondary school education. The subject has also been included in the post-induction and in-service training of civil and police officers. Modules have also been identified to include disaster management aspects in the course curriculum for engineering, architecture, and medical degrees.
- A committee of experts has finalized the Model building by-laws for town and country planning legislations, land use zonation, and development control legislations. The municipalities and city development authorities all over the country have been advised to make necessary changes in their respective by-laws and regulations in accordance with the model laws.
- The Bureau of Indian Standards has issued building codes for construction of different types of buildings in different seismic zones in the country. The National Building Code has also been revised, taking into consideration the natural hazards and risks of various regions of the country.
- The National Programme for Capacity Building of Engineers in Earthquake Risk Management to train 10000 engineers and 10000 architects on safe construction techniques and architectural practices is under implementation.
- A Web-enabled centralized inventory of resources has been developed to minimize response time in emergencies. Over 110000 records from 600 districts have been uploaded.
- Safe construction practices and dos and don'ts for various hazards are being disseminated for creating public awareness.

Eleventh Plan

Vision and Strategy

9.3.13. The Tenth Plan has set into motion the process of shift in focus from response-centric disaster management covering rescue, relief, rehabilitation, and reconstruction to laying greater emphasis on the other elements of disaster management cycle—prevention, mitigation, and preparedness—as a means to avert or soften the impact of future emergencies. The Eleventh Plan aims at consolidating the process by giving impetus to projects and programmes that develop and nurture the culture of safety and the integration of disaster prevention and mitigation into the development process. The guidance and direction to achieve this paradigm shift will need to flow from NDMA, and in the true spirit of the Disaster Management Act, to all stakeholders including State Governments and UTs, right up to the PRIs. Communities at large will need to be mobilized to achieve this common objective as they are the first responders. Even the best of isolated efforts will not bear fruit unless they are part of an overall, well- considered approach, and responsibilities of all stakeholders are clearly spelt out and accountability and sustainability factored in.

9.3.14. Projects and programmes undertaken may be such that they address the felt national needs and with well acknowledged prioritization. With scarce resources, it will be imperative to put in place suitable mechanisms which will facilitate systematic project and programme appraisal. Support will have to be lent to programmes and projects that will lead to sustainable development, with assurance of disaster risk reduction built in. The question of vulnerability will also have to be considered, not only in the physical sense but in a comprehensive sense; vulnerability could also be social, ecological, organizational, educational, attitudinal, political, cultural, and economical.

9.3.15. For an objective screening and scrutiny of development projects in a speedy manner, it is essential that professionalism in project formulation is insisted upon. Well-considered and well-drafted, need-based project proposals with in-built disaster prevention and mitigation features, as brought out above, should usually sail through the decision making process. These projects would need to be based on sufficient studies, reliable assumptions, and have regard for the latest advances in science and technology.

9.3.16. To ensure thoroughness in project formulation, all the expected requirements need to be clearly articulated and the project appraisal procedure kept simple and straightforward. One set of standard guidelines may not be adequate in addressing all the complex set of issues and there is clearly a need to evolve a multi-pronged approach to address a host of interlinked issues.

9.3.17. For the assessment of impact of any major development scheme in a given zone of hazard, it is imperative that the proposal takes in its stride what all could go wrong (damage scenarios) and shows how the project design is fashioned to counter that likely damage scenario. Conceptualization of damage scenarios will require quality scientific studies in a multi-disciplinary environment, and generation of new data, besides filling data gaps.

9.3.18. The SoI needs to be entrusted with the responsibility of generating large-scale maps which will form the basis for disaster management studies. They will also need to generate a Digital Elevation Map (DEM) of high resolution (1/2m interval along vertical) for the purpose of 3D terrain modelling. There will be a need to carry out prioritization of the areas on which the SoI will carry out the 1:10000 mapping for the whole country and map all towns and cities on 1:2000 scales. Coastal zones and flood prone areas of the country will need to get priority in the preparation of DEM. NDMA, in consultation with National Informatics Centre (NIC), National Spatial Data Infrastructure, National Remote Sensing Agency, and DoS is actively promoting the use of GIS in all institutions concerned with disaster management. Priority will have to be given to highly vulnerable areas for generating the database for mapping as well as hazard vulnerability and risk assessment related to disasters like cyclone, flood earthquake, chemical and industrial, etc.

9.3.19. Data-sharing among the various data generators is an even more important aspect and needs to be addressed. All such schemes getting Plan funds will be treated as national asset and data would be made available without any pre-condition for use for disaster management authorities and others.

9.3.20. The national emergency communication network, involving the contemporary space and terrestrial-based technologies, in a highly synergistic configuration and with considerable redundancy, needs to be developed and deployed countrywide. With almost a 100% reliability, this network must ensure real-time dissemination of warnings and information direct to the affected community and local authorities.

9.3.21. Research on all aspects of disaster mitigation which has the potential to save lives and property needs to be encouraged. NDMA could provide the necessary policy direction to Science related ministries and departments both at the Central and State levels to foster, promote, and sustain research and development work through need-based disaster mitigation and management projects.

9.3.22. A well sensitized and prepared community forms one of the most important links in the process of better management of disasters. For that reason, 'Extended Disaster Risk Mitigation Project' has been identified for being taken up for preparation of a Project Report during the Plan. This will be supplemented by activities under various other national/State level mitigation projects. As far as Community Based Disaster Management is concerned, a degree of convergence is required to be brought into community mobilization, participation, awareness, and capacity building aspects of all concerned social sector schemes like women and child development, rural development, drinking water, sanitation, and so on. The concerned ministries may consider inclusion of disaster management content into their plans and make provision of funds in their respective schemes.

9.3.23. It is essential that while clearing plans for State Governments, there is an integrated approach, particularly for creation of adequate capacity for relief and rescue operations.

9.3.24. There is need for evolution of a broad classification of anticipated projects that would come up for clearance by the Planning Commission. One possible classification could be:

- Projects specifically designed in response to the NDMA Strategy, Guidelines and Action Plan, and
- Development projects with built-in environmental preservation and disaster mitigation features in tune with the philosophy of mainstreaming mitigation measures into development projects.

9.3.25. Assistance is needed for State level mitigation projects, especially drafting of State, district, and panchayat level disaster management plans and in continuous sustenance, modernization, and upgradation of disaster management capacity.

9.3.26. In view of the focus on disaster mitigation of projects, institution building, aimed at training a new breed of disaster managers, and establishment of centres/ institutes fully equipped to carry out specialized investigations and

post-disaster studies, would need to be encouraged. The training and skills of the 72 teams for NBC disasters in the eight battalions of the National Disaster Response Force have to be improved and sharpened.

9.3.27. Out of the eight battalions of the National Disaster Response Force already sanctioned by the government, two Battalions already have the basic infrastructure. While the existing infrastructure has to be upgraded for these two Battalions, completely new infrastructure has to be created for the remaining six Battalions.

Mainstreaming Disaster Management into Development Planning

9.3.28. Mainstreaming disaster management into the development planning process essentially means looking critically at each activity that is being planned, not only from the perspective of reducing the disaster vulnerability of that activity, but also from the perspective of minimizing that activity's potential contribution to the hazard. Every development plan of a ministry/department should incorporate elements of impact assessment, risk reduction, and the 'do no harm' approach. Examples of this approach are urban planning and zoning, upgradation of building codes and their effective enforcement, adoption of disaster resilient housing designs and construction of school and hospitals, flood proofing, response preparedness planning, insurance, establishment of early warning systems for various types of disasters, generating community awareness, creating technical competence and promoting research among engineers, architects, health experts, and scientists.

9.3.29. State governments need to give priority in their plans for schemes regarding hazard identification and risk assessment once they have prepared the project paper, completed preliminary work, and drawn up the details of the scheme. Hazard identification and risk assessment across the country must be bound by uniformly followed procedures, fine-tuned to local conditions. In the absence of such procedures, any sporadic activity based on some ad hoc procedure carries the potential of doing more harm than good. It will be essential that while clearing plans of State Governments, there is an integrated approach particularly for creation of adequate capacity for relief and rescue operations, for example, for funding projects for construction of school buildings. Some school buildings need to be identified which will be used as relief centres and buildings designed so that they withstand the impact of disasters and also have adequate capacity to provide space as relief centres. Such schools should be equipped with essential services which become important at the time of a disaster.

9.3.30. State governments will need to make comprehensive Management Action Plans for achieving long-term results in a phased manner. To make these plans more meaningful, workshops and training programmes are to be organized at local/regional/national levels for capacity building and awareness generation/community participation.

9.3.31. Outside the framework of Plan schemes, many innovative measures can be adopted to encourage disaster risk reduction measures by the corporate sector, non-government organizations, and individuals. Fiscal measures like rebates on income and property tax for retrofitting unsafe buildings, compulsory risk insurance for bank loan on all types of properties, and so on, shall definitely help to mobilize resources for safe construction and retrofitting of existing constructions in all disaster prone areas. Similarly, many innovative measures may be taken for promoting public–private–community partnership for disaster risk reduction.

Principles for Project Appraisal from the Disaster Management Perspective

9.3.32. To assist the Planning Commission in appraisal of projects, broad and generic guidelines which are not disaster or theme specific have to be adopted. Conceptualization of hazard scenarios and associated vulnerability and risk assessments in a given situation will necessarily have to depend on available maps, Master Plans and building and land use regulations, National Building Code of India, and the various safety Standards and Codes of the Bureau of Indian Standards. The guidelines will have to cover the following aspects:

- The location of the project is to be carefully considered, especially if this is in a multi-hazard prone area/district recognized by the NDMA. Multi-hazard prone districts are reported in the latest National Building Code of India of the Bureau of Indian Standards. The listing has been revised by the Building Materials Technology Promotion Council of India, currently under the consideration of NDMA.
- The project/scheme should be based on a detailed hazard and risk assessment; wherever required, environmental clearance will also be taken. The risk assessment will usually involve the following factors:

- Assessment of degree of hazard, based on high resolution single/multiple hazard maps interpreted in the light of all available historic records, publications, site-specific information, and studies. For all major projects/schemes, where such maps are presently unavailable, the project/scheme should be supported by adequate site-specific seismo-tectonic, geological, geo-physical, and geotechnical studies and analyses. Data gaps, assumptions made, and their implications should be brought out. Where high resolution multi-hazard maps are not available, multi-hazard assessment is to be made by coalescing the information on single hazards.
- All such site specific risk assessment studies should be referenced to a national high resolution geospatial database so as to facilitate temporal analysis of future assessment impact studies in the area and also enable integration of all other assessment studies carried out in the vicinity. Through such a process it will be possible to evolve a national database of assessment studies which, in turn, will facilitate refinement of National Hazard and Vulnerability Mapping.
- Assessment of vulnerability against a hazard of a given magnitude should be carried out. The vulnerability of an individual or a group of individuals or of any element or an infrastructure like a flyover or a bridge, for a hazard of a given magnitude, will vary from 0 to 1 depending on the degree of mitigation built into the design. For example, an earthquake of magnitude 7 on the Richter scale may render very unsafe school children in a poorly built school (vulnerability = 1) whereas the residents of an earthquake-resistant neighbouring house for the same magnitude of earthquake, may be safe (vulnerability = 0). This distinction is essential because existence of hazard does not automatically mean vulnerability, and vulnerability does not necessarily have to be 1. The question of vulnerability has to be considered not only in a physical sense but in a comprehensive sense. Vulnerability could be physical, social, ecological, organizational, educational, attitudinal, political, cultural, or economical. Vulnerability assessment may also take note of medical care and casualty management that would be possible in the vicinity in case of natural or man-made disaster.
- Assessment of risk against a given hazard will be a function of hazard and vulnerability.
- Identification of elements at risk like population, properties, economic activities, public services, is to be brought out. By overlaying the infrastructure map of an area on the corresponding hazard map of the same scale, elements at risk can be identified.
- Particularly while carrying out hazard identification and risk assessment for industrial estates, issues like release scenario, consequences in terms of heat generation over pressure and toxicities, identification of hazardous chemicals, processes and operations, identification of important receptors, both environmental and physical, classification of units which have potential for creating an off site emergency, and so on, need to be addressed.

- The reliability of hazard, vulnerability, and risk assessments will depend upon the quality of maps and other investigational data and various uncertainties involved due to inadequacy of data and other factors. It is therefore important that all major stages of project/scheme development, namely, planning, site investigations and designs, are subject to a process of rigorous peer review and accordingly certified.

9.3.33. Where projects specifically identified and designed for disaster management are to be appraised, the following factors would need to be considered:

- The proposed project or scheme (i) is to be need based and demand driven; (ii) must fall within the high priority bracket, linked with the development plan of the area; (iii) should have well stipulated goals, clearly identified stakeholders and beneficiaries; (iv) should be fully backed with analyses of risks and quantified benefits in terms of disaster safety; and (v) should clearly reflect implications of not taking up the project in terms of disaster related risks, environmental protection, and economic development.
- Projects/schemes which yield multiplier effect for the greatest good of the largest number will deserve priority. For example, a well drafted practical disaster emergency plan for a school or disaster management plan for a district can inspire other schools and districts to yield the snow-balling (multiplier) effect. Similarly, development of a knowledge based, multi-media disaster mitigation product when translated in different vernacular languages may at once multiply benefits.
- Project merit rating should also depend on the following factors:
  - Breaking new ground in terms of scientific, technological or management innovation, including peoples' participation. For instance, development

of an innovative early warning system against a particular type of disaster using simple, readily monitored indicators.
  - Delivering 'Best Practices' for others to emulate and getting inspired by them. For example, best practices of engineered constructions in a given earthquake-affected hilly area.
  - Choice of appropriate technology. For example, partially prefabricated construction technology will be more appropriate than the cast-in-place construction technology in a post-disaster reconstruction programme in a given situation.
  - Employment generation. For example, a judicious man-machine mix in the construction of flood prevention works may help generate employment in an area without unduly compromising on efficiency of work.
  - Sustainable capacity building. It is the key to empowering a village, district, State, or a region so that each one of them can, as far as possible, manage their own affairs in the event of a disaster. For example, water sampling and testing capacity at local level when post-disaster situations threaten epidemics.
  - Pro-active engagement of communities and spreading the culture of safety in communities and other levels. Disaster education and community leadership development, public awareness development, gender mainstreaming, special focus on the needs of women and children, vocational training of unemployed youth, and concern for physically challenged persons will add weight to the project/scheme.
- Since disasters know no district or State boundaries, projects of interest to two or more districts or States may score over those yielding localized benefits. By the same logic, national level mission-mode projects/ schemes should get preference over others.

Financial Provisions for Disaster Management

9.3.34. It is important that a portion of the Plan funds is earmarked for efforts that directly or indirectly help in disaster management. Ideally, each project should provide adequately for the disaster mitigation and management expenditure that is identified by the appraisal process described in the previous section as being necessary. In addition, Central and State Governments may, depending upon their own hazard assessments, earmark a suitable and adequate amount for disaster mitigation schemes that are implemented over a definite time period.

9.3.35. The projects to be taken up should include:

- All schemes for generating basic input data for hazard and vulnerability impact analysis.
- Stand-alone disaster management projects such as mitigation projects, awareness programmes, capacity building projects, community based disaster management projects, upgrading early warning systems, failsafe disaster management communication network, micro-zoning, and so on.
- Mainstreaming disaster reduction into already approved projects in sectors of education, housing, infrastructure, urban development, and the like. For example, projects already under implementation such as the SSA, which caters to the construction of school buildings, could be reviewed. The design of the school building under the programme could include hazard resistant features, at least in multi-hazard prone (earthquake, cyclone, flood), high-risk areas so that these are safe. Similarly, existing infrastructure like bridges and roads will need to be strengthened and upgraded to mitigate disaster at a subsequent stage.

Schemes/Programmes Identified/Proposed to be taken up in the Eleventh Five Year Plan

9.3.36. National level initiatives/projects for disaster management, identified and recommended by the Working Group on Disaster Management and the NDMA for being taken up during the Eleventh Five Year Plan are indicated at Annexure 9.3. However, details of these projects/ schemes will have to be worked out through preparation of project reports. Thereafter, such schemes as are approved for implementation during the Eleventh Five Year Plan will have to be accommodated within the sectoral allocations of the ministries concerned.

9.3.37. Apart from the projects/schemes mentioned above, a number of ongoing and proposed schemes of various ministries and departments of the GoI have a direct or indirect bearing on disaster management as these add to preparedness for responding to disasters or constitute the efforts towards recovery from the impact of disasters. Similarly, many developmental projects/schemes take care of the vulnerability to different kinds of disasters and provide for mitigation of their effects.

ANNEXURE 9.1
Financial Performance in the Tenth Plan

S. No.	Schemes/Programmes	Financial Performance Tenth Plan (Rs in crore)			
		Outlay	BE	RE	Actual Exp.
	Environment				
1	Central Pollution Control Board (CPCB)	100.00	147.90	138.90	140.06
2	Industrial Pollution Abatement through Preventive Strategies	5.00	4.60	4.48	1.48
3	Common Effluent Treatment Plants (CETP)	25.00	20.27	20.25	20.10
4	Environmental Management in Heritage Pilgrimage and Tourism Centres, including Taj Protection	170.00	59.02	25.03	25.00
5	Establishment of Environment Protection Authorities and Environment Commission and Tribunal	15.00	18.80	18.22	13.83
6	Assistance for Abatement of Pollution and Environment Policy and Law	19.67	21.00	24.69	25.00
7	Environmental Health	10.00	2.00	0.05	1.03
8	Clean Technologies	25.00	12.50	9.19	5.18
9	Environmental Impact Assessment (EIA)	13.00	11.80	11.07	12.35
10	Industrial Pollution Prevention Project (EAP)	10.00	10.00	13.54	13.55
11	Hazardous Substances Management	70.00	37.00	32.91	30.71
12	Botanical Survey of India (BSI)	85.00	61.50	49.54	47.89
13	Zoological Survey of India (ZSI)	45.00	49.37	50.87	45.51
14	G.B. Pant Institute of Himalayan Environment and Development	35.00	34.00	36.96	37.00
15	Biosphere Reserves	35.00	37.20	37.87	36.62
16	Conservation and Management of Mangroves, Coral Reefs, and Wetlands	54.00	55.00	57.55	57.11
17	Assistance of Botanical Gardens	15.00	9.50	7.25	6.96
18	Biodiversity Conservation	12.00	15.00	17.00	15.51
19	Taxonomy Capacity Building Project	10.00	8.50	8.34	8.96
20	Institute of Biodiversity	16.00	1.00	0.00	0.00
21	Research and Development	24.00	20.07	20.83	20.78
22	Environment Education, Training, and Awareness	125.00	143.00	125.25	118.16
23	National Museum of Natural History (NMNH)	40.00	31.50	28.56	26.71
24	Centres of Excellence	45.00	38.00	36.56	33.28
25	Environmental Information System (ENVIS)	14.00	17.50	20.03	19.55
26	National Natural Resource Management System (NNRMS)	7.00	23.50	22.50	22.74
27	Environment Management Capacity Building Project (EMCB) (EAP)	48.98	80.00	48.29	46.14
28	Indo-Canada Environment Facility (ICEF) (EAP)	35.00	0.05	0.04	0.00
29	GoI-UNDP-CCF Programme (EAP)	3.00	13.00	9.50	9.06
30	Global Environment Facility (EAP)	0.05	0.01	0.01	0.00
31	International Co-operation Activities	8.00	9.20	9.92	10.13
32	Canada Assisted Centre for Excellence in Environmental Science, Technology, and Policy (EAP)	1.00	0.11	0.02	0.00
33	Indo-German Technical Co-operation Project (EAP)	6.00	0.50	0.01	0.00
34	State of Environment Project	6.00	6.15	7.26	6.26

(Annexure 9.1 contd.)

(Annexure 9.1 contd.)

S. No.	Schemes/Programmes	Financial Performance Tenth Plan (Rs in crore)			
		Outlay	BE	RE	Actual Exp.
35	Information Technology (IT)	25.00	46.73	29.96	29.69
36	Adaptation and Capacity Building Project on Climate Change (ACPCC)	30.00	21.83	28.05	26.99
37	Strengthening of Plan Coordination	0.30	0.06	0.01	0.00
38	Civil Construction Unit (CCU)	12.00	8.98	9.71	8.75
NEW SCHEMES					
39	EPCO-Madhya Pradesh and Strengthening Natural Resource Management and Farmers Livelihood in Nagaland (EAP)		1.59	0.94	0.90
40	Strengthening of Environment Information Centre		0.10	0.00	0.00
41	National Coastal Management Programme		0.10	0.00	0.00
42	Capacity building EIA and Revised Environmental Clearance Process		0.10	0.00	0.00
43	Promotion of Bilateral Cooperation		0.00	0.00	0.00
Total Environment		**1200.00**	**1078.04**	**961.16**	**919.99**
NRCD					
44	NRCD	33.00	27.00	27.00	24.35
45	NRCP	1342.00	1199.96	1207.27	1134.89
46	NRCP (EAP)	75.00	337.00	185.76	218.91
47	NLCP	220.00	250.00	202.37	164.62
Total NRCD		**1670.00**	**1813.96**	**1622.40**	**1542.77**
FORESTRY & WILDLIFE					
48	Indian Council for Forestry Research and Education (ICFRE)	210.00	226.86	228.57	227.95
49	Grant-In-Aid to Indian Plywood Industries Research and Institute (IPIRTI)	10.00	12.10	14.20	14.15
50	Indian Institute of Forest Management (IIFM)	20.00	21.00	22.77	23.46
51	Training to IFS Officers	6.00	6.75	6.25	5.94
52	Indira Gandhi National Forest Academy (IGNFA)	30.00	27.25	26.68	23.61
53	Directorate of Forestry Education (DFE)	10.00	11.73	12.69	15.06
54	Gregarious flowering of Muli (*Melocanna baccifera*) Bamboos		60.00	43.00	42.82
55	Forest Survey of India (FSI)	35.00	29.50	26.97	27.15
56	Integrated Forest Protection Scheme	445.00	279.84	224.47	208.01
57	Strengthening of Forestry Divisions	34.00	31.50	32.94	33.79
58	Afforestation through PRIs (NCMP—related scheme)	0.00	0.10	0.10	0.00
59	Strengthening of Wildlife Divisions and outside Protected Areas	10.00	15.00	14.51	11.23
60	Development of National Parks and Sanctuaries	350.00	230.50	240.11	234.65
61	Wildlife Institute of India (WII)	50.00	45.00	49.47	46.07
62	National Zoological Parks (NZP)		2.50	4.80	4.37
63	Project Tiger	150.00	149.00	160.96	160.44

(Annexure 9.1 contd.)

(Annexure 9.1 contd.)

S. No.	Schemes/Programmes	Financial Performance Tenth Plan (Rs in crore)			
		Outlay	BE	RE	Actual Exp.
64	Biodiversity Conservation and Rural Livelihood Improvement Project (EAP)		4.00	3.33	2.03
65	Eco-development around Protected Areas (EAP)	45.00	80.25	58.05	56.59
66	Project Elephant	60.00	67.25	66.00	63.83
67	Central Zoo Authority (CZA)	75.00	76.00	83.85	86.38
68	Protection of Wildlife outside Protected Areas	60.00	10.11	0.01	0.00
Total Forests & Wildlife		**1600.00**	**1386.24**	**1319.73**	**1287.53**
69	**Animal Welfare**	**175.00**	**70.50**	**81.02**	**75.22**
	NAEB				
70	National Afforestation and Eco-development Board (NAEB)	80.00	106.00	86.19	71.60
71	National Afforestation Project (NAP)	1115.00	1224.10	1164.42	1179.07
72	National Action Programme to Combat Desertification	30.00	3.00	0.02	0.00
73	Eco-development Forces	75.00	42.00	41.04	42.96
Total NAEB		**1300.00**	**1375.10**	**1291.67**	**1293.63**
Grand Total		**5945.00**	**5723.84**	**5275.98**	**5119.14**

Source: Ministry of Environment and Forest (MOEF).

ANNEXURE 9.2
Physical Performance of Important Plan Schemes of the Tenth Plan

S. No.	Schemes/Programmes	Physical Performance	
		Targets	Achievements
1	Central Pollution Control Board (CPCB)	National Ambient Air Quality Monitoring Program (NAMP)	Ambient air quality monitoring at 321 locations; water quality monitoring at 1019 locations.
2	Environmental Management in Heritage Pilgrimage and Tourism Centres Including Taj Protection		Moratorium due to court case.
3	Clean Technologies	Life Cycle Assessment (LCA) studies and demonstration projects	Ten projects on Clean Technologies for food preservation, arsenic removal, bio-remediation of lakes, recycling of marble slurry, development of natural dyes; adhesives from forest waste; development of bamboo composites; utilization of anode muds and chips; air pollution control package for medium-scale lime kilns and development of eco-friendly welding machines.
4	Hazardous Substances Management	Management of chemical emergencies and hazardous substances	6 TSDFs set up.
5	Environment Education, Training and Awareness	Assistance to 100000 eco-clubs and 10000 organizations	33778 eco-clubs created (total 91378); 9784 organizations.
6	National River Conservation Plan (NRCP)	Projects for 34 polluted river stretches in 160 towns for treating 5435 MLD sewage.	308 projects completed; creating treatment capacity for 2055 MLD sewage.
7	National Lake Conservation Plan	Conservation of 35 lakes, 28 projects	Approved works in 42 new lakes; projects for 10 lakes completed.
8	Indian Council for Forestry Research and Education (ICFRE)	Co-ordinating research, education in institutes/universities	414 research projects initiated; 23 universities supported.
9	Integrated Forest Protection Scheme	Assistance to States and UTs for identified activities	Assistance for fire protection (196819 km) and forest boundary (219418 nos) consolidation.
10	Development of National Parks and Sanctuaries	Assistance to States and UTs for national parks and sanctuaries (total 606)	Assistance to 342 national parks and sanctuaries being provided.
11	Project Tiger	Funding support to 28 Tiger Reserves	Funding support to 28 Tiger Reserves covered in the area of 37761 sq km.
12	Project Elephant	Assistance to 15 States for elephant conservation.	Funds released for 25 Elephant Reserves in 15 States.
13	Central Zoo Authority (CZA)	Assistance for management of zoos	293 zoos evaluated; 42 supported.
14	Animal Welfare	Animal Welfare Board and construction of National Institute of Animal Welfare.	Animal Welfare Board and National Institute of Animal Welfare functioning.
15	National Afforestation and Eco-development Board (NAEB)	Evaluation of projects and assistance to NGOs for afforestation.	650 projects evaluated.
16	National Afforestation Project (NAP)	Afforestation project-based assistance to JFMCs.	729 projects involving 6.45 lakh ha in 29 States taken up.
17	Eco-development Forces	Support to 4 Eco Task Force battalions	4 Eco Task Force battalions supported.

Source: MOEF.

ANNEXURE 9.3
Projects/Schemes Identified by the Working Group/ NDMA for being taken up by NDMA/MHA for Implementation during the Eleventh Plan

S. No.	Name of the Project/Programme/Scheme	Objective
1	National Cyclone Risk Mitigation Project (with World Bank Assistance)	For mitigating hazard risks in the country & enhancing capabilities at various levels.
2	National Earthquake Risk Mitigation Project	Strengthening structural & non-structural earthquake mitigation efforting and reducing risk and vulnerability in high risk districts.
3	National Flood Mitigation Project	Multi-objectives including effective preparedness and improved promptness and capability, strengthening community capacity, and reduction in consequences of floods.
4	National Landslide Mitigation Project	Strengthen the structural and non-structural landslide mitigation efforts and reduce the landslide risk and vulnerability in the hilly districts prone to landslides and mudflows.
5	Expanded Disaster Risk Mitigation Project	Strengthen the structural and non-structural disaster preparedness and mitigation efforts to reduce the risk and vulnerability in the disaster-prone districts with community participation.
6	National Disaster Communication Network (NDCN)	Dedicated communication & IT support for pro-active disaster support functions including for early warning & forecasting.
7	Information, Education, and Communication (IEC) Programme	Disaster risk and vulnerability reduction, disaster preparedness, structural and non-structural mitigation efforts and disaster response by developing ICT materials, print and electronic media products, campaigns, exhibitions, etc.
8	Micro-zonation of Major Cities	To carry out micro-zonation of High Risk Cities in Seismic Zones IV and V to prepare strategies to reduce earthquake risk and vulnerability in the high risk districts.
9	Project Preparation Facility/Research Programme Studies	Take up mitigation projects for disaster risk reduction and also undertake special studies and research programmes.
10	Vulnerability Assessment Schemes	Gujarat has undertaken vulnerability analysis of different parts of the State to different forms of disasters. Such an analysis is urgently required to be carried out by other States too.
11	International Co-operation	India needs to adopt a proactive approach for providing necessary support to the neighbouring countries through multilateral co-operation and involvement of regional organizations.
12	Infrastructure of 8 NDRF Battalions	Completely new infrastructure has to be built for 6 battalions @ Rs 80 crore per bn and existing infrastructure has to be upgraded for the 2 battalions @ Rs 25 crore per bn.
13	Upgradation of NIDM and other Institutes	The institute requires space and equipments for state-of-the-art emergency operations centre, disaster mitigation workshop, mock drill exercise, library, GIS laboratory, etc.

ANNEXURE 9.4
Tenth Plan Outlay and Actual Expenditure in Environment and Forest Sectors (States and UTs)

(Rs lakh)

S. No.	State/ UT	State Plan Outlay	Forestry & Wildlife			Ecology & Environment		
			Projected Outlay	Agreed Outlay	Actual Expenditure	Projected Outlay	Agreed Outlay	Actual Expenditure
1	Andhra Pradesh	4661400	123779	113262.86	80076.85	620	203.72	316.29
2	Arunachal Pradesh	388832	7700	9529.87	8403.42	42	208.91	38.46
3	Assam	831522	7736	11235	9076.1	65	79	29.45
4	Bihar	2100000	4514	7953.92	6267.25	0	0	0
5	Chhattisgarh	1100000	32718	39180	46844.04	783	679.5	370.13
6	Goa	320000	2500	2908.95	2880.93	300	795.45	799.33
7	Gujarat	4000700	93634	75445.7	66076.37	2766	2196	1010.44
8	Haryana	1028500	12733	32125	30612.03	283	407	277.46
9	Himachal Pradesh	1030000	42377	36748.49	36344.2	50	27	82.59
10	Jammu & Kashmir	1450000	36358	23794.13	23096.74	3619	465.42	288.4987
11	Jharkhand	1463274	46277	49802	46875.73	0	0	0
12	Karnataka	4355822	73396	51408.83	46677.84	1285	5535	2417.584
13	Kerala	2400000	17500	22789	21348.75		0	0
14	Madhya Pradesh	2618993	35275	64458.82	81330.29	5112	9663.63	8388.896
15	Maharastra	6663200	68279	10997.81	10729	1200	627.71	500
16	Manipur	280400	1744	3704.66	3560.81	495	1714	556.75
17	Meghalaya	300900	5250	6596	6093.89	275	300	174.34
18	Mizoram	230001	2846	4285	4515.88	19	20	11.04
19	Nagaland	222765	2250	2535	2828.24	100	178	272
20	Orissa	1900000	69446	22899.95	6083.94	2030	2482.29	2561.305
21	Punjab	1865700	28075	40800.6	30500.46	572	203.1	26.08
22	Rajasthan	2731800	115320	52592.87	31584.73	464	100.95	35.8972
23	Sikkim	165574	3500	3564.2	3510.45	500	160	125.97
24	Tamilnadu	4000000	134810	63561.93	64601.18	11305	1578.16	486.2261
25	Tripura	450000	4835	4273.65	4113.03	446	209	243.3531
26	Uttar Pradesh	5970800	120800	49784	48642.5	235525	24979	2628.58
27	Uttaranchal	763000	20693	56223.18	62063.17	5902	2900	1505
28	West Bengal	2864100	16443	12908.12	6823.73	1688	1259.99	2487.03
Total (States)		**56157283**	**1130788**	**875369.54**	**791561.55**	**275446**	**56972.83**	**25643.7**
UTs								
29	Andaman & Nicobar	248300	7243	6369	6097.71	0	40	32.88
30	Chandigarh	100000	1733	2455	1916	270	323	188.13
31	Dadra & Nagar Haveli	30400	1200	1657	1733.87	0	0	0
32	Daman & Diu	24500	278	200	173.38	0	5	13.1
33	Delhi	2300000	2600	2300	14791.16	4800	2705	998.6
34	Lakshadweep	43700	92.3	91.7	46	400.3	163.3	102.52
35	Pondicherry	190649	500	859	819.54	176	244	257.13
Total (UTs)		**2937549**	**13646.3**	**13931.7**	**25577.66**	**5646.3**	**3480.3**	**1592.38**
Total (States/UTs)		**59094832**	**1144434.3**	**889301.24**	**817139.21**	**281092.3**	**60453.13**	**27236.08**
Percentage to Total		100	1.94	1.50	1.38	0.48	0.10	0.05

Source: Planning Commission.

ANNEXURE 9.5

State-wise and Scheme-wise Releases of Central Funds to Ongoing CSS under MoEF during the Tenth Plan

(Rs crore)

Name of the State/Scheme	CETPs	Indus. Polln. Prevention	Taj Protection	Biosphere Reserve	Mangroves, Coral Reefs & Wetlands	NRCP	NLCP	Tiger Project	India Eco-development Project	Project Elephant	IFPS	Dev. of National Parks & Sanctuaries	NAP	Gregarious Flowering	Total 2002–07
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Andhra Pradesh	0.30	3.24			1.20	115.85	0.80	1.74		2.78	6.94	4.91	53.18		190.94
Arunachal Pradesh				1.13	0.00			5.49		3.05	10.34	5.91	14.18	0.75	40.84
Assam				0.89	2.88			3.15		4.95	11.67	8.24	33.07	3.25	68.10
Bihar						0.66		2.36		3.93	3.80	0.35	12.98		24.09
Chhattisgarh		1.58						2.65		0.64	12.08	13.53	44.55		75.03
Goa					1.20	8.56					0.99	0.93	0.64		12.33
Gujarat	4.28	1.01			8.40	42.54			13.67		9.46	9.71	48.80		137.87
Haryana						16.78				0.50	5.11	1.73	40.99		65.12
Himachal Pradesh					1.41						3.70	11.52	38.89		55.53
Jammu & Kashmir					2.26		70.00				3.78	5.89	31.01		112.94
Jharkhand								5.77	4.48		8.08	3.86	46.15		68.33
Karnataka		4.38		2.73	3.07	31.48	22.93	16.07	10.42	7.65	4.55	28.05	101.62		232.95
Kerala				3.64	2.18	0.75	4.30	5.61	2.35	8.07	7.51	12.73	25.09		72.23
Madhya Pradesh		1.21		3.78	0.30	39.90	4.58	41.47	8.56		11.93	21.82	71.08		204.63
Maharashtra	15.24				57.93	66.73	5.50	17.46		0.25	3.03	9.07	61.93		237.14
Manipur					0.86						6.78	4.31	26.99	5.44	44.39
Meghalaya				1.34						2.67	2.30	3.16	13.45	1.71	24.62
Mizoram					0.25			4.66		0.05	17.94	11.40	62.47	13.33	110.10
Nagaland										2.20	12.81	2.01	35.64	6.32	58.98
Orissa				2.53	6.53	28.99	1.21	5.92		5.85	4.27	13.07	67.54		135.91
Punjab					1.88	88.40					1.01	0.03	10.17		101.49
Rajasthan		0.37			2.04	0.44	15.00	9.86	8.64		2.70	12.28	27.69		79.02
Sikkim				2.64		1.79					6.82	5.75	27.80		44.80
Tamil Nadu	0.11			1.81	6.86	480.30	0.73	4.85		5.38	8.14	8.37	76.53		593.08
Tripura							0.50	0.50		0.36	10.40	4.28	21.26	11.32	48.61

(Annexure 9.5 contd.)

(Annexure 9.5 contd.)

(Rs crore)

Name of the State/Scheme	CETPs	Indus. Polln. Prevention	Taj Protection	Biosphere Reserve	Mangroves, Coral Reefs & Wetlands	NRCP	NLCP	Tiger Project	India Eco-development Project	Project Elephant	IFPS	Dev. of National Parks & Sanctuaries	NAP	Gregarious Flowering	Total 2002–07
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Uttar Pradesh			0.24		1.00	121.07	1.49	7.37		0.18	5.61	12.25	89.01		238.22
Uttaranchal				3.50	0.42	20.02	31.94	9.12		6.10	13.37	4.28	44.41		133.
West Bengal				3.52	7.53	135.56	5.11	9.10	4.14	6.97	8.45	14.26	27.79		222.42
Total States	19.93	11.79	0.24	27.50	108.21	1199.82	164.09	153.16	52.26	61.58	203.58	233.70	1154.91	42.12	3432.88
Union Terrotories															
Andaman & Nicobar				2.50	0.83							2.11			5.45
Chandigarh				0.95								0.14			1.09
Dadra & Nagar											0.52	0.70			1.22
Delhi						121.25						0.20			121.45
Lakshadweep					0.30										0.30
Total UTs				3.45	1.13	121.25					0.52	3.15			129.50
Total States/UTs	19.93	11.79	0.24	30.95	109.34	1321.07	164.09	153.16	52.26	61.58	204.10	236.84	1154.91	42.12	3562.38

Source: MOEF.