Section - IX

FORESTS AND ENVIRONMENT

CHAPTER 9

FORESTS AND ENVIRONMENT

9.1 Sustainability is not an option but imperative. For a better world to live in; we need good air, pure water, nutritious food, healthy environment and greenery around us. Without sustainability environmental deterioration and economic decline will be feeding on each other leading to poverty, pollution, poor health, political upheaval and unrest. The environment is not to be seen as a stand-alone concern. It cuts across all sectors of development. The rapid increase in greenhouse gases in the atmosphere, land degradation, increasing floods and droughts, advancing deserts and deteriorating conditions of fragile ecosystems, deforestation, loss of biodiversity and environmental pollution have become subjects of serious global concern. The overall impact of these phenomena is likely to result in depletion of ozone layer, change of climate, rise in sea-level, loss of natural resources, reduction in their productivity ultimately leading to an ecological crisis affecting livelihood options for development and overall deterioration in quality of life. Development based on utilization of natural resources, pressure of population and their growing demands and poverty of the people took a heavy toll of our environmental assets. While natural assets have shrunk, demands have grown resulting in overdrawals being unsustainable. We have to improve our economic growth rate, provide basic minimum life support services to a large section of our population and deal with the problems of poverty and unemployment. At the same time, we have to pay attention to conserving our natural resources and also improving the status of our environment. We need to tackle the environmental degradation in a holistic manner in order to ensure both economic and environmental Sustainability. This is a most challenging task for the country and in particular for our planners and policy-makers today.

FORESTS

9.2 Forests play an important role in environmental and economic sustainability. They provide numerous goods and services, and maintain life-support systems essential for life on earth. Some of these life support systems of major economic and environmental importance are:

(i) supply of timber, fuel wood, fodder, and a wide range of non-wood products;

(ii) natural habitat for bio-diversity and repository of genetic wealth;

(iii) provision of recreation and opportunity for eco-tourism;

(iv) playing an integral part of the watershed to regulate the water regime, conserve soil, and control floods; and

(v) carbon sequestration and carbon sink.

Despite significant resource flows and national concern, the potential of forests to reduce poverty, realise economic growth, and their contri-bution to the local and global environment has not been fully realised. A combination of market and institutional failures has led to forests failing to contribute as significantly to rural incomes and poverty alleviation and economic growth as would be possible under good economic and technical management.

9.3 Forests are consistently and seriously undervalued in economic and social terms. For example, the contribution of the forestry sector to gross domestic product (GDP) was only 1 per cent in 1996-97 (measured at constant prices of 1980-81). A latest estimate of gross value of goods and services provided by forestry sector puts its contribution to GDP at 2.37 per cent. Though it is extremely difficult to quantify, the economic value of the eco-system services of the forests is vast. It is

also generally agreed that much of the land-use decision that presently drives forest change takes relatively little account of these values. The challenge for policy makers is, therefore, to bring these values into the markets, cross-sectoral decisions, macro-economic policy making, and into the development of economy in general.

9.4 The country's forest resource is under tremendous pressure. Intensified shifting cultivation, indiscriminate removal of timber, fuel wood, fodders and other forest produce, forest fire and encroachment has led to forest degradation and deforestation. Forests meet nearly 40 per cent of the country's energy needs and 30 per cent of the fodder needs. It is estimated that about 270 mt of fuel wood, 280 mt of fodder, over 12 million m^3 (cubic meter) of timber and countless non-wood forest products (NWFPs) are removed from forests annually. The future management must, therefore, take into account this compelling need for meeting the requirements of the community.

9.5 Participatory arrangements have existed in Indian forestry for several years, in the form of forest labour cooperatives, resin tappers associations, NWFP collector's cooperative societies and other associations. With the advent of social forestry, participation was fostered through various arrangements in different states. The efforts were institutionalised with the introduction of Joint Forest Management (JFM) and the notification to this effect was issued by the Ministry of Environment and Forests in June 1990. The February 21 2000 guidelines have further strengthened the efforts in this direction. So far, 27 states have issued orders enabling the setting up of a mechanism for public participation in the management of forests, and 62,890 JFM Committees covering an area of 14.25 million hectares (m ha) of forest land have been established. The viability of JFM will, however, depend on villagers' willingness to participate and partnership arrangements, particularly with regard to the benefit sharing. The role of Panchayati Raj Institutions (PRIs) and voluntary agencies in the management of forests needs to be formalised in view of the 73rd Amendment to the Constitution.

9.6 India's biological diversity is reflected in the heterogeneity of its forest cover. It is one of the 12 'mega-diversity' countries of the world. India is also at the meeting zone of three major bio-geographic realms, namely the Indo-Malayan (the richest in the world), the Eurasian and Afro-tropical. India also has the two richest bio-diversity areas, one in the northeast and other in the Western Ghats. The biological diversity is being conserved through a network of biosphere reserves, national parks and sanctuaries. However, the challenges for conservation emanate from population pressures, adverse impacts of industrialisation and intensifying threats from illegal trade.

OVERVIEW AND ACHIEVEMENTS OF PREVIOUS PLANS

9.7 Forestry is a subject in the Concurrent List of the Indian Constitution. The Ministry of Environment and Forests is the nodal agency for planning, promotion, co-ordination and overseeing the implementation of various forestry programmes in the country. State Governments implement various forest development programmes under State Plans. The major achievements and programmes undertaken during the previous Plan periods are:

Forest Cover

9.8 The Forest Survey of India (FSI), using remote sensing technology, assesses the forest cover of the country biennially. The results of past assessments since 1987 show that the extent of forest cover in the country has stabilised though a large area still remains degraded.

Table 9.1
Forest cover estimates from 1987 to 1999

Assessment Year	Forest cover (sq km)	%of geographic area
1987	6,40,819	19.49
1989	6,38,804	19.43
1991	6,39,364	19.45
1993	6,39,386	19.45
1995	6,38,879	19.43
1997	6,33,397	19.27
1999	6,37,293	19.39

9.9 The latest assessment on forest cover (FSI 1999) indicates that 11.48 per cent of the total geographical area is dense forest (over 40 per cent crown density) and 7.76 per cent is the open forest (10-40per cent crown density).

- Dense forest 37.73 m ha 11.48%
- Open forest 25.51 m ha 7.76 %
- Mangroves 0.49 m ha 0.15%

9.10 The net increase in forest cover is 3,896 sq km over the previous assessment of 1997. The dense forest has increased by 10,098 sq km and mangrove by 44 sq km, whereas open forest has decreased by 6,246 sq km during this period.

Forest Research and Education

9.11 In order to strengthen the system of forestry research in India, the Indian Council of Forestry Research and Education (ICFRE), an autonomous umbrella organisation, was established in 1986 in Dehra Dun. ICFRE has the mandate to undertake, aid, promote and coordinate forestry research and its application; function as a clearing house for research results and information; and disseminate technology. It works through its network of ten institutes and centres. There are a number of research facilities outside the ICFRE network under the auspices of different agencies such as the Kerala Forest Research Institute (Peechi), the Indian Plywood Industries Research and Training Institute (Bangalore), and forestry faculties of the State Agriculture Universities. In addition, State Forest Departments have research divisions to address their practical problems. An increasing number of private companies and non-government organisations (NGOs) are funding their own research in areas such as tree breeding, medicinal plants and NWFPs.

9.12 A comprehensive national forestry research plan has been developed by ICFRE after working out due priorities. Regional research priorities were worked out in consultation with stakeholders by holding seminars/workshops in different States followed by a national workshop for deciding projects and resource allotment, Research Advisory Committees have been constituted on which all the State Forest Departments have been duly represented.

9.13 ICFRE is imparting forestry education and developing forestry curricula at various levels to accelerate the pace of research and to provide expertise in different fields of forestry research. Universities providing forestry education are being given grants-in-aid for strengthening their infrastructure and technical capabilities. Opportunities are also being provided for furthering the academic advancement of foresters/scientists/academicians in the field of forestry.

People's Participation

9.14 The steady depletion of forest resources and increasing deforestation led to the realisation that the active and willing participation of the communities is necessary for the success of any forest regeneration programme. It was also realised that village communities would have little incentive to participate unless they benefit directly and have sufficient authority. Therefore a new strategy – JFM – was adopted to protect and regenerate degraded forests.

9.15 Participatory forest management as an effective means of protecting and regenerating degraded forests has been gaining ground in India. In 1990, the Government of India issued guidelines to State Governments on the procedure for involving village communities and voluntary agencies in the management, planning and implementation of programmes for the protection and development of degraded forests, provision of fuel wood, fodder, NWFP and timber to people living in and around forests. In response, 27 states issued orders enabling mechanisms for public participation in the management of degraded forests. One of the important elements of the Participatory Forest Management System relates to the use of indigenous capacity and local knowledge about different aspects of conservation, development and use of forests. Rural people, particularly women and the tribal community, have an intimate knowledge of species, their growth characteristics, utility, medicinal value, etc. They are also well informed about the species that need to be planted in a given locality to satisfy specific requirements of fuel, fodder, timber, and other non-wood forest products. This knowledge is utilised under the JFM for the benefit of the community.

9.16 The JFM programme has led to several positive outcomes. The major ones are: (i) change in the attitude and relationships of local communities and forest officials towards each other and the forests; (ii) improvement in the condition of forests; (iii) reduction in encroachments; (iv) increase in the income of local people; and (v) involvement of NGOs.

Private Forestry Initiatives

9.17 The private sector comprising individuals/ farmers, cooperatives, and industry has a large role to play in the management of forests. Though the responsibility for conservation and expansion of forest area lies mainly with the Government, rural people have been practising tree planting in their farms, homesteads and village woodlots to meet household requirements of fuel, fodder, poles, timber and medicinal plants. After the emphasis given to social forestry by the National Commission on Agriculture in 1976, plantations were raised in wastelands, degraded forests, private forests, private marginal lands and agricultural farms. Currently, the area of private tree planting (under agro-forestry, farm forestry in block and line plantations) covers over 6 m ha. Other non-forest sources of wood are rubber, coconut, cashew, and mango plantations. Non-forest private sources contribute 30 to 90 per cent of the total wood supply in different states. Non-forest sources together provide about 50 per cent of the total wood supply in the country and probably an equal or larger share of NWFPs. There are also a large number of small private nurseries meeting the local demand of seedlings. Apart from its contribution to wood supply, the private sector has also demonstrated its ability to enhance the productivity of forests. In addition, the private sector is dominant in the areas of wood harvesting and processing. However, these private initiatives require more support from the Government.

Forest Plantations

9.18 India's achievement in increasing the area under forest plantations has been impressive. Till 1997-98, the total area of tree plantations, under different schemes, was 28.38 m ha. Of this, some 3.54 m ha were raised before 1980, 13.51 m ha. during the 1980s and the rest during the 1990s. The current rate of tree plantation is about 1.2 m ha per annum. Concern has been expressed over the low productivity of plantations due to several factors such as inadequacies in site selection and site-species matching, poor planting stock, lack of proper maintenance and protection, financial and capacity constraints, etc.

External Assistance

9.19 External assistance in the forestry sector remained a major source of funding during the last two decades, and 15 externally aided forestry projects have been completed in 14 States as on 31 March 1998. Approximately 2.57 m ha have been covered under afforestation and 1,679 million seedlings distributed through these projects at a cost of Rs.1,700 crore. However, there has been inadequate investment in the management of natural forests. The thrust of external assistance is now on implementing projects geared towards overall development of the forest sector. The main donors of forestry projects were the World Bank, Japan Bank for International Cooperation (JBIC), Department for International Development of the United Kingdom, Swedish International Development Authority (SIDA), European Economic Community (EEC), UNDP, etc.

9.20 Between 1981-82 and 1991-92, the share of donor assistance in total Plan outlay was around 30 per cent. The provision for external assistance has shown an upward trend since 1994-95. The combined outlay for these projects was Rs. 230 crore during 1994-95 and has gone up to Rs. 830 crore during 1998-99. Sixteen new projects with an outlay of Rs. 13,160 crore have been proposed to various donor agencies.

State Plans

9.21 The outlays under the forestry and wildlife sector in State Plans are around 1 per cent. It includes the externally aided projects. It was envisaged that the external aid would come as an

additional amount, but the domestic budgetary support was consequently reduced. Some States are faced with the problem of maintenance of assets and liabilities created, after the completion of externally aided projects. The Coimbatore Charter on Environment and Forests held in 2001 resolved that State Governments should earmark at least 2 per cent of the total outlay for afforestation purposes. The approved outlay for the Ninth Plan and Annual Plans in the forestry and wildlife sector is given in the Annexure.

Forestry and Agenda 21

9.22 Agenda 21 recognises the need for specific actions to combat deforestation. Chapter 11 of the document identifies four programme areas for action:

- Sustaining the multiple roles and functions of all types of forests, forest lands and woodlands.
- Enhancing protection, sustainable management and conservation of all forests, and greening of degraded areas through forest rehabilitation, afforestation, reforestation and another rehabilitative measures.
- Promoting efficient utilisation and assessment to recover the full value of the goods and services provided by forests, forest lands and woodlands.
- Establishing and/or strengthening capaci-ties for planting, assessment and systematic observation of forests and related programmes, projects and activi-ties, commercial trade and processes.

9.23 The priorities of Agenda-21 are well embedded in the National Forest Policy, 1988 and have also found reflection in successive Five-Year Plans.

STRATEGY FOR THE TENTH PLAN

9.24 The National Forest Policy stipulates that one-third geographic area of the country should be brought under forest/tree cover. The imperative has been echoed in the Approach Paper to the Tenth Five-Year Plan, which states that country will bring 25 per cent area under forest/tree cover by the end of the Tenth Plan period and 33 per cent by the end of the Eleventh Plan period. The Approach Paper also outlines the main concerns in the forestry sector. These include lack of awareness about the multiple roles and benefits of forests, especially its role in drought proofing and prevention of soil and water run-off; no linkage between management and livelihood security of the people; low level of technology; and inadequate research and extension. Other problems were: weak planning capability; wastage in harvesting and processing; market imperfections; over-emphasis on Government involvement and control; low level of people's participation and NGO involvement; lack of private sector participation; lack of inter-sectoral co-ordination; and weakness and conflicting roles of forest administration.

9.25 An effective strategy must consider all activities, current and potential, that can influence forests and related social, economic, and environmental outcomes. Growth alone cannot combat poverty effectively. More focused interventions are required that address issues relating to opportunity, empowerment, and livelihood security of the poor people who depend on forests in different ways. A broader livelihood approach, covering productive capacity, institutional and legal structures, market access and tenure, must be adopted that puts forests into the broader context of rural development. The focus should be on improving governance (especially correcting major distortions in incentives and markets that are reducing the value of the forest resource), and the development of efficient markets and encouraging competitive private sector participation in the sector. More focused interventions are required for maintaining natural forests for eco-system protection and sustaining the global and local forest values.

9.26 The following strategies are proposed in order to address the concerns of forestry sector and to achieve the objectives of sustainable forest management:

- The role of forests to maintain the hydrological balance is complementary. Successful models

of watershed development have helped conserve soil and moisture, improve ground water recharge and the water regime and mitigated the adverse impacts of drought. The watershed approach should be universally adopted for the maintenance and development of forests.

- Due to the increase in human and cattle population, the existing forest resource is under intensive pressure to meet the demands for various forest produce, i.e. food, fodder, fuel, fertiliser, timber, bamboo, medicinal plant, etc. About 41 per cent of the forest area is degraded due to over exploitation of forest produce. However, no strategy to conserve the forest eco-system would be successful unless the basic needs of the society are met. The future management strategy must, therefore, take into account this compelling need of the community to meet their requirements.
- Equity, efficiency and empowerment are the key instruments to achieving sustainable forest development. The effort of JFM in regeneration of degraded forests has been very successful and it requires to be given an increased thrust during the Tenth Plan. However, its strengths and weaknesses need to be identified and corrected.
- Out of the total 5.87 lakh villages in the country, 1.70 lakh have forests as land-use. The forest areas near population centres/villages have degraded faster due to over-exploitation and the forest resource has become impoverished. It has adversely affected the livelihood security and employment opportunity of people dependent on forests. Therefore, a special programme needs to be drawn up for development of such villages and to provide alternative source of income.
- At present, the country is dependent on bulk import of round timber and other produce for large forest industries such as paper and pulp. This must be reversed and the Government should encourage the meeting of these bulk requirements from community land, degraded forests or private farmlands. Steps to do this would imply removal of Government subsidies, regulation of tariff on imports and other policy modifications that affect local producers.
- Agro-forestry should be encouraged by promoting technology, extension and training, credit support, marketing infrastructure, etc and providing a policy environment, which assures the farmers of a remunerative price. The constraints in felling, transport and marketing of forest produce from private holdings in different States should be removed and a common guideline may be framed.
- Though the country has surplus food grain reserves, the tribals are faced with the problems of starvation and malnutrition. Greening programmes under the 'food for work' scheme should be extensively implemented to ensure productive employment and food security.
- The fragile eco-systems such as coastal areas, hills and mountains, wet lands, deserts, shifting cultivation areas need to be protected in order to sustain the livelihood of a large number of people, apart from the ecological benefits they bring.
- Forests can play a major role in the mitigation of greenhouse gas emission and to adapt to climate variability and long-term climate change. Afforestation is an efficient way of sequestering atmospheric carbon. Conserving and managing existing natural forests and forest soils, which are very large stores of carbon, will significantly reduce greenhouse gas emissions. This might provide new market avenues for forest protection and management.
- There is a growing demand for medicinal plants as crude drugs, food supplements, pharmaceuticals, cosmetic and perfumery products in the national and global market. International trade of medicinal plants is over $ 70 billion a year. Medicinal plants being natural, non-narcotic, without side effects and easily available, can ensure affordable health care, employment generation, besides boosting exports and conserving bio-diversity.

- The extensive bamboo flowering warrants the formulation of emergency plans for harvesting and processing of bamboos and its utilisation to produce new generation products like mat board, mat wood veneer board, mat roofing sheets, laminates etc. These new bamboo products are in great demand in the domestic and export market.
- It has been established worldwide that Bio-diesel offers unique solution to problems arising out of fossil fuel starvation and its environmental impact. There is a vast potential for production of bio-diesel from Jatropha curcas and Pongamia pinnata as they occur in plenty in forests and wastelands naturally. Their plantation is cost-effective, conveniently replicable and implementable over vast area of country's wastelands. Bio-diesel is a suitable alternate fuel meeting stringent specification required for implementation of Euro-III and Euro-IV norms. Promotion of bio-diesel will also encourage enhancement of livelihood opportunities and income generation for rural masses.
- Forest product research is another important area calling for attention. Value addition through primary and secondary processing, reduction in wastage and recycling, and new product development will fetch more value and provide productive employment opportunities.

ACTION FOR THE TENTH PLAN

Natural Forests

9.27 The following initiatives are required for the development of forest area:

- Good forest areas must be brought under scientific management to enhance, productivity, density and health. There has been inadequate investment in the management of good forests in last two decades. Forestry projects should lay emphasis on management and rejuvenation of natural forests.
- It has been estimated that out of the open forest of 25.51m ha, about 15.5 m ha have natural root-stock, which may regenerate with the help of proper protection and replenishment of gaps and about 9.5 m ha are partially degraded with depleted natural root-stock. Another 6 m ha are estimated to be totally degraded or treeless. Altogether 31 m ha degraded areas require suitable treatment through plantations of fuel wood, fodder and timber species.
- There are 1.70 lakh villages in the country that have forests as land use. It is proposed to cover all 1.70 lakh forest fringe villages under JFM through the Forest Development Agencies (FDA). It has also been proposed to merge all afforestation programmes of National Afforestation and Eco-development Board (NAEB) into a single scheme called 'National Afforestation Programme'. The programme would be operated through FDAs and it has the components of natural regeneration, management intervention, pasture development, bamboo development, etc. The salient features of the proposed structure are:
  - Micro-planning exercise would be the core element of the strategy.
  - Watershed approach will be universalised in all afforestation programme.
  - Decision-making at the community level in respect of choice of species.
  - Entry point activities to mobilise the community participation.
- The fragile eco-systems such as coastal areas (mangroves and coral reefs), hills and mountains, wetlands, shifting cultivation areas, biodiversity hot spots, etc. should be properly managed in order to safeguard the livelihood of millions of people.

NTFP and Medicinal Plants Development

9.28 The following initiatives are necessary for the development of NTFP including bamboo and medicinal plants:

- In situ conservation of medicinal plants is to be done in the protected areas such as sanctuary, national park, biosphere reserve, etc.

Natural forests rich in medicinal plants should be identified and managed for sustainable supply of crude drugs.

- Bamboo bearing areas should be brought under scientific management. Areas likely to flower gregariously during the Tenth Plan should be harvested after the formulation of emergency working plans. Bamboo products like bamboo laminates, bamboo mat board, bamboo mat-roofing sheets, etc should substitute wood.
- Non timber forest produce (NTFP) will be properly regenerated, harvested, processed and marketed for improving the economy of forest-dwellers.

Forest Protection

9.29 The growing stock of the forest resource of the country as estimated by Forest Survey of India is about 470 million cub m. with an average of 74.42 cub. m. per ha. The forests of north-east region are hotspots of bio-diversity. To safeguard these precious forests and their value, it is necessary to have more rigorous protection measures. The national master plan for integrated forest protection should be drawn. It should include all components of protection and sustainable management of forests such as, forest fire control measures, working plan preparation, survey and demarcation, infrastructure development, etc. During the Tenth Plan, it is proposed to give a thrust to this aspect of forest development.

Forest-Based Industries

9.30 The following initiatives are required for the efficiency of forest
based industries :

- Wood-based industries are not efficient due to technological obsolescence, inappropriate machinery and its maintenance, unskilled manpower and poor quality of products. Such industries have to be modernised in order to be economically viable. Initiatives for the modernisation of technology, reduction and recycling of waste, and regulations regarding the use of seasoned and treated material, promotion of standards and codes for wood products, etc. will be encouraged.
- The use of fuel wood in open hearths is inefficient because it leads to considerable heat loss and causes health hazards. Improved stoves and modified methods of cooking can reduce fuel wood needs and improve hygiene.
- With the relaxation of trade barriers and liberalised imports, customs duty on logs and wood chips was substantially reduced from over 100 per cent to 5 per cent and 10 per cent respectively. Though, on the one hand, the liberalised import reduced the demand on our natural forests, it also acted as a deterrent to the growth of indigenous production and forest based industries.

Forest Plantations

9.31 The following initiatives are required for improving the productivity of forest plantations:

- The plantation strategy should be based on creating new forest resources that help reduce pressure on natural forests and preferably reverse the negative impact of deforestation while meeting the increasing demand. India can benefit from the experience of other countries, which have developed policies and incentives to promote private sector participation in accelerating the pace of afforestation.
- At present, the performance of forest plantations in terms of survival, growth and yield is poor. The mean annual increment (MAI) of forest plantations varies form about 2 m^3/ha/year for valuable timber species to about 5-8 m^3/ha/year for eucalyptus and other fast-growing species. This is far below the MAI of over 10 m^3 and about 50 m^3/ha/year for good quality plantations in different countries.
- The productivity and success of plantations can be improved by appropriate site selection, site-species matching, planting of elite clones, proper maintenance and protection, timely

tending, thinning, irrigation, application of manures and pesticides, etc.

- Reduction in harvesting and post-harvesting losses should be achieved by adopting improved technologies.

Joint Forest Management

9.32 The following measures should be adopted for an effective JFM:

- Suitable forest patches are entrusted to well-defined user groups with a transparent memorandum of understanding (MoU) on roles and responsibilities of JFM Committees and the Forest Department.
- Security of tenures as well as access to benefits from the resource must be assured to the beneficiary.
- Silviculture prescriptions followed for the management of JFM forests must be sustainable. Stakeholders have a voice in decision-making.
- Legal back up to JFM Committees.
- Appropriate institutional and financial mechanisms.
- Linking Village Protection Committees with industries for the sale of JFM produce.
- Detailed projects to be prepared for assistance under Rural Infrastructure Development Fund (RIDF) of the National Bank of Agriculture and Rural Development (NABARD) for JFM areas.
- 'Food for work' schemes to be launched to ensure food accessibility and employment generation for JFM members

Agro-Forestry Development

9.33 The following measures are required for promotion of agro-forestry:

- Commercial agro-forestry should be practised in areas where irrigation is available. The preferred species should be *acacia nilotica, bamboo species, casurina equisetifolia, eucalyptus species, populus deltoides* and *prosopis cineraria* depending upon agro-climatic and edaphic conditions.
- High-tech modern nurseries to be established on a catchment area basis provide quality planting material.
- Suitable agro-forestry models to be adopted for rain-fed areas that will complement agriculture and provide fuelwood, fodder and timber for basic needs.
- Elite clones (higher yielding and disease resistant) of important agro-forestry species to be developed for different edaphic and climatic conditions. The private sector to be encouraged to take up R&D activities and promote new agro-forestry products.
- Agro-forestry product research, new product development, new designs and quality standards to be evolved.
- Market information system to be developed to inform farmers about the major buyers, market trends, etc.
- All restrictions on felling of trees, logging, transport and marketing of forest produce to be removed.
- Agro-forestry boards and marketing federations to be promoted to streamline marketing and trade.

Greening India Programme

9.34 Out of the 328.27 m ha total geographical area of the country, around 300 m ha is the available productive land. The actual forest cover is 63.73 m ha of which only 37.73 m ha has good forests. About 20 m ha is covered under tree plantations (agro-forestry, farm forestry, social forestry and other plantations). Thus, in order to bring one-third area under forest/tree cover, (100-37.73-20=42.27) 43 m ha of area should be covered under the greening programme over 10 years. The detail programme should be as follows:

- 15 m ha of degraded forest land to be covered under JFM.

- 10 m ha of irrigated area to be brought under commercial agro-forestry.
- 18 m ha of rain-fed area to be brought under subsistence agro-forestry.

9.35 Significant efforts are required for greening India to address the food security and environmental challenges. The country is facing the problem of surplus food production on one hand and unemployment, poverty and food deficiency on the other. The implementation of Greening Progra-mme through "food for work" scheme will ensure meeting the basic needs of people, environmental protection, food accessibility and productive employment generation to 10 crore people (mainly tribals, dalits, backwards, other backward classes , landless and women).

Forestry Research, Education and Training

9.36 Continuous and sustainable development of forestry would depend on research inputs in crucial areas, solving problems and expanding knowledge. The scope of forestry research covers not only biological and technological aspects (forestry, forest products, conservation, wildlife), but also a wide spectrum of economic, environmental, sociological and policy research.

Indian Council of Forestry Research and Education (ICFRE)

9.37 The ICFRE should promote research in the following areas:

- Identification of elite clones of agro-forestry species and their mass propa-gation.
- Market information in respect of important forest products.
- Policy research on JFM, bamboo and medicinal plant development.
- Forest product research for value addition, new products and standards.
- Increasing forestry contribution in meeting human needs and welfare.

9.38 Other initiatives should be in the areas of forestry education and extension for dissemination of research results.

Indian Plywood Industries Research and Institute (IPIRTI)

9.39 IPIRTI should aim at optimising the utilisation of plantation and other fast growing wood resources by developing appropriate processing techniques. It should help in the development of wood substitutes from other natural renewable fibres including agro-residues and bamboo. These programmes shall ensure sustained availability of wood and wood products by utilising plantation timbers, bamboo and other agro-residues.

Indian Institute of Forest Management (IIFM)

9.40 The IIFM should enhance its capability and contribution to the process of policy formulation in the area of natural resource management. Some of the new initiatives in the Tenth Plan are: establish-ment of a National Forest Data Centre; establish-ment of a Centre for Continuing Education in Natural Resource Management; establishment of a policy cell for undertaking policy research to provide inputs to policy making; and the establishment of a Centre for Excellence in Medicinal Plants and NTFP. The Institute should also undertake major initiatives in the areas of training and research to build up the capacity of Government agencies and civil society for more effective management of natural resources.

Forestry Training

9.41 The Indira Gandhi National Forest Aca-demy is imparting induction training to Indian Forest Service probationers and in-service training to serving officers. The Academy has also started professional skills upgradation training for the officers promoted to Indian Forest Service from the State Forest Service. The Directorate of Forestry Education is responsible for imparting basic training in forestry to State Forest Service officers and induction training of range forest officers promoted as assistant conservator of forests in the State

Forest Service cadres. During the Tenth Plan, the Directorate should undertake induction/regular training courses for State Forest Service officers and range forest officers including trainers for training courses. It should also organise seminars and workshops besides conducting special courses on various forestry themes. Training and professional skill development of subordinate cadres should be given priority.

Forest Survey of India

9.42 The Forest Survey of India should improve on the State of Forest Reports providing a more detailed assessment of forest cover and forest resources in the country and monitor changes in these. It should also train forest officials to develop specialised skills in the application of remote sensing and geographical information system (GIS), inventory and data processing techniques in forestry.

THE PATH AHEAD

9.43 The demands being made on India's forests today are more than ever before. Managing forests to provide for the environmental, social and economic well-being of India's rapidly expanding population, while conserving forest resources for further generations, has become the most challenging job in the coming years. The challenge has increased because of the multiplicity of stakeholders who influence forest policy formulation and institutional arrangements and decisions affecting the management of forests.

9.44 The roadmap for the future development of the forestry sector includes the following:

- Increase in forest and tree cover to 25 per cent by 2007 and 33 per cent by 2012.
- Universalisation of JFM to cover all 1.70 lakh villages situated inside or on fringe of forests to provide livelihood security and employment generation.
- Priority to agro-forestry, conservation and development of medicinal plants.
- Promotion of shelter belt plantations to reduce the adverse impact of natural calamities.
- Research and technology development to improve productivity and production of new products along with focus on value-addition, improved marketing, export and productive employment generation.

WILDLIFE

9.45 The ecosystems that India has been endowed with not only harbour rich bio-diversity, including plant and animal forms and their produce that is critical for human sustenance, but also form the cradle of our rivers and aquifers which assure our water and food security. Water, wilderness and wildlife are irrevocably inter-linked. With mounting agricultural, industrial and demographic pressures, wilderness areas, which are the richest repositories of wildlife and bio-diversity have either shrunk or disappeared. Their existence is crucial for the long-term survival of bio-diversity and the ecosystems supporting them. The increased frequency and intensity of natural disasters, the declining fertility of our soils and the accelerated degradation of our fresh water resources have imposed a crippling financial burden on the nation. This underscores the need to realign development priorities to take into account ecological imperatives, including the protection of wild species, which sustain and enhance natural habitats, even as they depend on such areas for their survival.

ACHIEVEMENTS OF PREVIOUS PLANS

9.46 India has 88 National Parks and 490 sanctuaries, covering an area of 1.56 lakh sq km. Scientific management plans have been prepared for over 200 National Parks and sanctuaries. Eco-development support to protected area management has not only helped improve the socio-economic condition of the local communities in several cases, but has also made them sensitive to the needs of conservation.

9.47 Project Tiger was initiated in 1973 and so far 27 tiger reserves have been created. Nine

elephant reserves have been constituted under the Project Elephant initiated in 1991. These projects have not only benefited the main species but have led to the amelioration of eco-systems and this is reflected in re-vitalisation of aquifers and security to the range of floral and faunal diversity. The estimated population of cardinal species is:

Tiger	: over 3,500
Elephant	: over 27,000
Asiatic Lion	: over 300
Rhinoceros	: over 1,700

9.48 Capacity building programmes have been intensified, enhancing the diversity and coverage of the training programmes undertaken by Wildlife Institute of India (WII). Action has been initiated to improve the wildlife management training to the frontline staff in the states. WII and several other institutions have been assisted to undertake research relating to conservation and management. Both radio telemetry and satellite tracking have been used to monitor the ranging patterns of selected species such as, bar-headed goose and Olive Ridley sea turtle.

STRATEGY FOR THE TENTH PLAN

9.49 The national development agenda must recognise the necessity of protecting the long-term ecological security. Assigning conservation a high priority both at the Central and State levels should be the objective of all development programmes. Local communities traditionally depend on natural bio-mass and they must, therefore, have the first lien on such resources. However, such benefits must be subject to the assumption of a basic respon-sibility to protect and conserve these resources by suitably modifying unsustainable activities.

9.50 The following initiatives are necessary for the ecological security of our natural heritage:

- **Strengthening and enhancing the Protected Area network:** There is a network of 578 Protected Areas in the country, spread over 1.56 lakh sq km. Out of ten identified bio-geographical zones, some are still deficient in Protected Area coverage. Protected area network should cover all bio-geographical zones of the country.
- **Effective management of Protected Areas:** Each Protected Area should be covered under a management plan, based on sound scientific and ecological data. Management plans should seek to involve local communities and make them aware of Protected Area objectives, including the control of fires, prevention of overgrazing, encroachment and poaching.
- **Conservation of wild and endangered species and their habitat:** The isolation of animal species due to fragmentation of habitats reduces relict populations to unviable levels, leading to local extinction where in situ conservation efforts are unlikely to succeed. Therefore, ex situ captive breeding and rehabilitation measures should be taken up in such cases.
- **Restoration of degraded habitats outside Protected Areas:** The restoration and management of degraded habitats outside Protected Areas is a vital objective, both to provide sufficient habitat for spatial movement of spillover species outside Protected Areas, and to provide biological resources needed by the local communities to reduce their dependency on Protected Area resources. This is also critical to the linking of Protected Areas with effective wildlife corridors to provide for genetic continuity and prevention of insular wild animal populations.
- **Control of poaching and illegal trade in wild animals and plant species:** Poaching and illegal trade in wild animals and plants are serious threats to wildlife conservation. India, as a signatory to Convention on International Trade in Endangered Species (CITES), is obliged to take all necessary steps to implement the provisions of the treaty and ban international trade in Appendix-I species of plants and animals and regulate trade in Appendix-II and III species.

ACTION FOR THE TENTH PLAN

Development of National Parks and Sanctuaries

9.51 Development of National Parks and Sanctuaries is an umbrella scheme encompassing components of protection, habitat improvement, settlement of rights, eco-development, infrastructure development, capacity building including research and training, eco-tourism, education and awareness etc. Priority will be given to the development of high diversity and high value areas.

9.52 A critical review of the scheme in the initial phase of Ninth Plan period revealed that financial assistance to different Protected Areas was being released on the basis of Annual Action Plans submitted by the concerned States rather than on the basis of scientifically prepared long-term management plans. This deficiency has been substantially removed by ensuring a holistic strategy for habitat improvement under the newly prepared Protected Area management plans. This process will be further strengthened in the Tenth Plan period. Wildlife research, monitoring and training component of the scheme has not received due emphasis. This needs to be corrected.

Project Tiger and Project Elephant

9.53 At present, there are 27 tiger reserves covering an area of 0.38 lakh sq km in 17 States. There is a need to emphasise on anti-poaching camps, mobile squads, capacity building of frontline staff in intelligence gathering, detection and successful prosecution of cases and providing necessary infrastructure to them.

9.54 At present, about one lakh sq km area is covered under Project Elephant, out of which approx. 0.28 lakh sq km is inside Protected Areas. There has been considerable increase in human-elephant conflict and crop raiding by elephants. The main thrust in the Tenth Plan would be on protecting existing elephant habitat from further degradation and fragmentation, identifying and protecting corridors, mitigation of human-animal conflict, efficient management of domesticated elephants and arranging for training and skill development of manpower for proper management of elephants.

Wildlife Institute of India (WII)

9.55 The Institute has to rise to the challenges of wildlife conservation in the country in a situation of conflicting demands on natural resources from various sections of the society. Endangered species need to be preserved while the population of other animals should be sustainably managed. The Institute should generate data and information on maintaining a sustainable population of each animal for their scientific management. The idea of sustainable cultivation of musk-deer and extraction of musk, crocodile products, etc. need to be explored and the process be standardised. Research initiatives in the field of sustainable use of wildlife products are needed. The Institute should cover not only wildlife research and training but also the socio-economic aspects of wildlife conservation.

Central Zoo Authority

9.56 The Authority has been given the responsibility of providing technical and financial assistance to zoos to enable them to attain the stipulated standards under the Zoo Recognition Rules 1992. The main emphasis in the Tenth Plan will be on developing better avenues for capacity building of zoo staff, better housing, upkeep and health care of zoo animals along with rescued animals and strengthening of facilities in the existing veterinary institutes.

THE PATH AHEAD

9.57 Rural development has, all along, failed to take into account the strong linkages between conservation of forest and wilderness areas and the sustainable welfare of people dependent on them. This has led to the degradation of both community and private resource base, resulting in widespread impoverishment of the people. Only the coordinated and balanced strategies for forest and wildlife management and rural development can help reverse these adverse trends. Eco-develop-ment activities should be further strengthened to reduce pressure on forests. Local stakeholder-based participation of the people in both planning and

implementation of programmes, aided by enhanced per capita inputs would be essential. Wherever relevant, local community knowledge, skills and practices should be integrated into conservation strategy, planning and management. The awareness among people, parliamentarians, legislators, judges, planners, technocrats and bureaucrats of the strong linkage between a healthy eco-system and the country's water and food security is important to win their support.

9.58 The wildlife management strategy should take into account the problems of increased crop raiding by wild animals, increasing human-wildlife conflict, increasing poaching of wild animals, grazing and encroachments in protected areas. The large number of monkeys in urban settlements, unsustainable population of some herbivores such as, nilgai, wild boer, etc are serious problem. Therefore, an integrated and comprehensive view is needed for meeting the needs of conservation and sustainable use of resources.

ENVIRONMENT

9.59 The growing population, high degree of mechanisation and steep rise in energy use has led to activities that directly or indirectly affect the sustainability of the environment. There has been a reduction in forest cover (hence reduction of sink for the carbon dioxide and soil degradation), contamination of surface and ground water and pollution of the air with Suspended Particulate Matter (SPM), Respiratory Particulate Matter (RPM), hydrocarbons and acid gases, all of which are causing health problems. There is dumping of poisonous waste on grounds. Most of the country's water resources are polluted due to discharge of untreated/partially treated wastes from industry, domestic sewage and fertiliser/pesticide runoff from agricultural fields.

ISSUES AND MEASURES TAKEN DURING PREVIOUS PLANS

Air Pollution

9.60 The main source of air pollution is combustion of solid fuels (coal, lignite, wood etc.) and liquid fuels (from petroleum source). The need for more electricity has led to a steep rise in power generation through coal as India has limited reserves of natural gas. Increased economic activities and urbanisation have increased vehicular traffic using diesel and petrol, both of which add to NOx and SOx emission in cities. Heavy vehicles, which mainly use diesel as fuel, emit large quantities of RPM. Shortage of electric power has also led to the increased use of diesel generator sets in the commercial, household and agriculture sectors.

9.61 Air pollution is a potential health risk and has led to an increase in respiratory diseases in cities. Central Pollution Control Board (CPCB) has established a national air quality monitoring network covering 290 stations spread over 90 cities and towns. While the level of acid gases are much below the prescribed standard, the high level of SPM in many locations (69 locations out of 170) is a matter of concern. The measures taken in the past Plans to deal with this are -

- Setting up of ambient air quality standard for short term (24 hours) and annual for industrial, residential, rural and other areas with respect to various pollutants like SO_2, NO_2, RPM, Pb and CO.
- Monitoring of air quality is done with regard to SO_2, NO_2 and SPM and in selected stations, ammonia, hydro-sulphide, RPM and poly-cyclic aromatic hydro-carbons are also monitored.
- To reduce vehicular pollution, emission standards for petrol and diesel driven vehicles were introduced in 1990 and further modified in 1996. Further restrictions were introduced in April 2000. The fitting of catalytic converters in petrol-driven vehicles has been made compulsory in the four metro cities. Specifications of diesel and gasoline have been further revised to reduce sulphur, aromatics and lead content. Lead in gasoline had been phased out since 2000.
- Guidelines have been laid down for setting up of industries. A project for a district-wise zoning atlas has been taken up that would guide suitable location of industry.

- Twenty-four critically polluted areas have been identified across the country and an action plan has been devised for the control of pollution in these areas.
- Submission of environment statement by polluting units has been made mandatory since 1992.
- Environment impact assessment has been made mandatory for 29 categories of projects since 1994 and public hearings have been prescribed since 1997.
- In Delhi, the plying of buses using diesel has been stopped from 2002.

Water Pollution

9.62 The major rivers of the country suffer from reduction in flow while entering the plains and passing through cities (because of water being drawn for irrigation and drinking water supply in cities). At the same time, they receive polluted discharge, the main pollutants being fertilisers and insecticides, untreated municipal sewage and industrial effluents.

9.63 CPCB has been monitoring water quality, BOD (Biological Oxygen Demand), total coliform and faecal coliform at 507 locations with concerned State Pollution Control Boards. Water quality monitoring results obtained during 1998 indicates that organic and bacterial contamination continues to be critical sources of pollution in Indian aquatic resources. The number of observations having high coliform density has increased in 1998 against 1997.

9.64 CPCB has also carried out limited water quality monitoring of wells in different States and has found dissolved oxygen and total coliform levels far beyond the permissible limits in many cases. The Central Water Commission's (CWC) studies on chemical composition of ground water in a few areas have revealed a high concentration of nitrates, potassium and even phosphates in many cases, while they are virtually absent or have low concentration in other places. This points to the improper use of chemicals, fertilisers and poor water management. In areas where intensive industrial activity, there is high concentration of heavy/toxic metals in different proportions in ground water. Even with strong legislative provisions, 851 defaulting industries were functioning along the rivers and lakes in 1997.

The major initiatives taken so far are:

- Enacting the Water Prevention and Control of Pollution Act, 1974 which empowers State Pollution Control Boards to lay down and maintain location and source specific standards for discharge of waste water with provisions for penalty etc.
- Enacting the Water Cess Act, 1977 empowering the State pollution control boards to levy a cess on local authorities supplying water to consumers with provision of incentives for conservation, reuse, lower discharge etc.
- Enacting the Environment Protection Act, 1986, an umbrella act that empowers Central Government to intervene directly to protect environment.
- Enacting the National Water Pollution Act, 1987 to provide top priority to drinking water and proper management of water resources.
- Environmental Impact Assessment, 1994 has been made mandatory for 30 categories of developmental activities involving investment of more than Rs. 50 crore
- National River Conservation Plan (NRCP) was launched in1995 to clean stretches of major rivers of the country.
- National Lake Conservation Plan (NLCP) was taken up since 1997 to clean and restore major lakes of the country

Solid Waste

Municipal solid waste

9.65 The 2001 Census estimates the urban population at 27.8 per cent of the total population. It is expected to grow at 4 per cent per annum and would account for 40 per cent of the total population

in the next ten years. Due to lack of infrastructure, the proper collection, transportation, treatment and disposal of solid waste by most municipalities has become a subject of concern. As per an estimate, the present annual generation of solid waste in Indian cities has increased from 6 million tonnes (mt) in 1947 to 48 mt in 1997 and is expected to increase to 300 mt by 2047. Though it is difficult to give an exact estimate of the per capita rate of generation of solid waste because of the large variations both in quality and quantity, on an average it ranges between 400 and 500 g/capita/day.

9.66 Most surveys have found the organic component of the waste to be around 40 per cent. The share of recycled waste has increased over the years mainly due to the increased content of plastic. While the per capita waste generation in India is low as compared to western countries, the volume generated is enormous given the size of the population. Due to lack of awareness and absence of legislation, till recently medical wastes were also deposited and mixed with municipal waste collection. The Director General of Health Services estimates that 54,404 mt of medical wastes are generated in the country every year (based on a generation figure of 250 g/capita/day).

9.67 The average waste collection in Indian cities is 72 per cent and only 70 per cent of cities have adequate waste transport facilities. There is a lot of littering at collection centres and also during transportation. Unscientific disposal practices leaves waste unattended at the disposal site and this attracts birds, animals and micro-organisms which create a health hazard. Plastic contents of the waste are picked up by rag pickers for recycling. This recycling is carried out in small factories with no adequate technology, leading to the emission of toxic fumes.

9.68 The various initiatives taken to tackle this are:

- **A National Waste Management Council (NWMC**) was constituted in 1990 to suggest disposal of the municipal solid waste
- **The Recycled Plastic Use Rules, 1998** were issued based on the recommendations of the Plastic Management Task Board. This rule bans the use of recycled plastic for food items and also specifies standards for manufacturing recycled plastic bags.
- National Environmental Engineering and Research Institute (NEERI) has prepared a manual on solid waste mana-gement which highlights various critical issues relating to the task.
- Central Public Health Environmental Engineering Organisation (CPHEEO) has prepared a policy paper on promoting the integrated provision of water, sanitation, solid waste management and drainage utilities in India.
- **Master Plan for Municipal Solid Waste**: The Ministry of Environment and Forests has organised an interaction meet in 1995 with municipal authorities to evolve a strategy for municipal solid waste.
- **The National Programme on Energy Recov-ery from Urban Wastes** scheme has been launched by the Ministry of Non-conventional Energy Sources with many physical and financial incentives for energy recovery from wastes.
- **Two high powered committees were set up on Urban Waste, one in 1975 and again one in 1995. They made several recommendations** like segregation, door-to-door collection, proper handling and transportation, waste composting and treatment and use of appropriate technologies for waste treatment and disposal.
- **The Bio-medical Waste Management and Handling Rules, 1998,** has been formulated to take care of infectious bio-medical waste which can spread various diseases and create health problems.
- **The Municipal Solid Waste Management and Handling Rules, 2000,** has been intro-duced to bring in an element of urgency in the

waste management efforts by urban local bodies. Under the rules, municipalities would be required to submit annual reports on waste management in their areas to the CPCB.

Industrial and Hazardous Waste

9.69 Hazardous waste includes sludge contaminated with heavy metals, wastes from paints, dyes and organic chemical units and highly acidic and alkaline wastes. The relatively more industrialised states like Gujarat, Maharashtra, Tamil Nadu and Andhra Pradesh face problems relating to toxic and hazardous waste. The major hazardous waste generating industries are petroleum and petrochemicals, pharmaceuticals, pesticides, paint and dyes, fertilisers, inorganic chemicals and general engineering industries etc. The presence of toxic chemicals in solid/liquid effluents from industries and other activities leads to ground water contamination. Direct contact with and exposure to hazardous waste can also lead to diseases or chemical poisoning.

9.70 At present, around 7.2 mt of hazardous waste are generated in the country, out of which, according to one estimate, 1.4 mt are recyclable, 0.1 mt to be incinerated and 5.2 mt to be disposed on land. The hazardous waste of 5.3 mt would require about Rs. 1,600 crore a year for treatment and disposal at an estimated rate of Rs. 3,000/ tonne. In addition, land required for disposal will be around 1 $km^{2,}$ taking a depth of 4 m and density of disposal as 1.2 tonnes/m^3.

9.71 The Water Act (1974) and Air Act (1981) were not sufficient to regulate the disposal of hazardous waste and this called for the formulation of the hazardous waste Management and handling rules, 1989. Since then, efforts to make an inventory of hazardous waste were initiated.

9.72 The initiatives taken in this direction are:

- Estimate of the hazardous waste inventory in various States and identification of disposal sites based on environment impact assessment.
- CPCB has prepared a ready reckoner to provide information on the source of the hazardous waste, their characteristics and the method for recycling and disposal.
- Training programmes have been organised to deal with hazardous waste management.
- Import of hazardous waste containing toxic metals like beryllium, selenium, chromium, thallium, pesticides etc. have been restricted on the recommendations of an Expert Committee.
- Export and import of waste containing cyanide, mercury and arsenic have been prohibited since December 1996.
- The import of waste oil and metals such as brass, zinc and lead for processing to recover resources is fully regulated by the Ministry of Environment and Forests.
- The failure to implement existing legislation to check environmental damage by industrial units led to a public interest litigation being filed. This resulted in orders for the closure/shifting of industrial units producing hazardous chemicals from Delhi, closure of 200 tanneries in Tamil Nadu and 35 foundries in Bengal.
- An Australian-aided Project (worth Australian $8.4 million) was taken up in 1996 for the management of hazardous waste generated from industries located in the Medak, Hyderabad and Ranga Reddy districts.
- The Karnataka Government is implementing a German Technical Cooperation Project relating to hazardous waste management at an estimated cost of DM 3 million for the creation of a hazardous waste disposal facility and DM 3 million for technical cooperation.

Bio-diversity

9.73 The sustainable use of bio-diversity is fundamental to ecologically sustainable development. India is one of the 12 mega diversity countries of the world. However, during the past few decades, industrialisation has put a strain on the eco-system, altering and even destroying it. The loss of bio-

diversity stems from destruction of the habitat, extension of agriculture, filling up of wetlands, conversion of rich bio-diversity sites for human settlement and industrial development, destruction of coastal areas and uncontrolled commercial exploitation. The following steps have been taken to conserve bio-diversity:

- Establishment of a protected area network of 88 national parks and 490 wild life sanctuaries.
- A programme of eco-development involving local communities is being implemented.
- Another programme of biosphere reserve is under implementation.
- A specific programme for the conservation of wetlands, mangroves and coral reefs is also being implemented.
- Six internationally significant wetlands of India have been declared as Ramsar sites under the Ramsar Convention.
- A centrally sponsored programme of National Lake Conservation was launched in 1993
- The Wild Life Protection Act (1972) is being revised.
- Under the World Heritage Convention, five natural sites have been declared as World Heritage Sites.
- Project Tiger, initiated in 1973, has created 27 tiger reserve that led to the doubling of the tiger population.
- Project Elephant, initiated in 1991-92, assists states in ensuring the long-term survival of elephants in their natural habitats.
- The National Committee on the Conservation and Management of Mangroves and Coral Reefs, set up in September 1998, has recommended the establishment of an Indian coral reef monitoring network. The preparation of these plans is under way. Financial assistance from United Nations Development Programme (UNDP) and Global Environment Facility (GEF) has been availed for strengthening the Gulf of Mannar Biosphere Reserves and a project relating to the Andamans Coral Reefs.

ONGOING SCHEMES OF THE NINTH PLAN

9.74 While regulation is the main method of controlling pollution, need has been felt for increasing awareness among the people regarding the effects of pollution and the protection available. This effort would also continue in the Tenth Plan. In addition, the Centre's involvement in meeting part of the capital requirement for effluent treatment facilities in a few cases has been found to be essential. For example, cash-strapped municipal bodies in various cities are not able to collect, transport and treat solid waste as well as operate sewage treatment plants. Similarly, because of limited resources, small and medium industries (SMEs) are unable to set up proper facilities for treating toxic effluents. The major schemes of the sector are:

9.75 Central Pollution Control Board (CPCB): It is the apex body to coordinate the activities of all state pollution boards (SPCBs), the latter setup to regulate the Pollution Control Acts and Rules framed. The major works for which budgetary support is required are setting up number of stations for monitoring air and water quality, carrying out certain studies, R&D activities and support to State Pollution Control Boards.

9.76 Industrial Pollution Abatement Through Preventive Strategies: This Scheme lays emphasis on preventive aspects of pollution abatement and promotion of technological inputs to reduce industrial pollution. The preventive strategy for abatement of industrial pollution includes Environmental Audit, Waste Minimisation, Cleaner Production and Environmental Management Systems. Environmental Audits provide for a structured mechanism to analyse, evaluate and assess effects on environ-ment due to activities and products of an enterprise. Waste Minimisation Circles are to be set up in cluster of small scale industries with a view to encourage them to adopt cleaner production practices.

Hazardous Substance Management

9.77 Various programmes have been taken up in the Eighth and Ninth Plans to enhance safety in

handling and management of hazardous substance and these will continue in Tenth Plan. These include preparation of a comprehensive chemical profile, facility for treatment and disposal of hazardous wastes in States and capacity building in ports/ custom laboratories. During the Ninth Plan, an expenditure of Rs. 14 crore was incurred on these activities.

India-Canada Environment Facility

9.78 This is an ongoing project funded by the CIDA which supports environmentally sustainable development projects for land, water and energy resources. Of the 21 ongoing India-Canada Environment Facility (ICEF) projects, two have been completed and the rest are under various stages of implementation.

National River Conservation Plan

9.79 Under this scheme, polluted stretches of major rivers have been identified for sewage collection and treatment. At present, 153 towns have been considered under the National River Conservation Plan (NRCP), out of which 74 towns are located on Ganga, 21 on Yamuna, 12 on the Damodar, six on the Godavari, nine on the Cauvery, four each on the Tungabhadra and Sutlej, three each on the Subarnarekha, Betwa, Wainganga, Brahmini, Chambal and Gomti, two on the Krishna and one each on the Sabarmati, Khan, Kshipra, Narmada and Mahanandi. This project was started with 100 per cent funding by the Centre. However, given resource constraints, states have to share 30 per cent of the cost during the Tenth Plan.

9.80 The scheme plans to tackle river pollution by setting up additional sewage treatment plants where there is a shortage, diverting raw sewage flowing in open drains to these plants, construction of low cost sanitation facilities to prevent open defecation on river banks, setting up crematoria (electric or improved wood based) etc.

9.81 The works under NRCP, including that of Ganga Phase-I, are expected to cost Rs. 3,780 crore. Till January 2002, Rs. 1,295 crore has been spent on the scheme. About 45 per cent of the cleaning of the Ganga has been completed. However, overall progress is poor because of delays in land acquisition and slow pace of work by municipal corporations.

National Lake Conservation Plan

9.82 The National Lake Conservation Plan was initiated in 1994 for cleaning important urban lakes with high levels of silting and pollution. Initially, ten lakes were identified for coverage – Ooty, Kodaikanal, Powai, Dal, Sukhna, Sagar, Nainital, Udaipur, Rabindra Sagar and Hussain Sagar. However, work has started on only one lake and project reports for three lakes namely Ooty, Powai and Kodaikanal have been prepared and approved till date. The progress regarding other lakes is extremely slow because of delays in the finalisation of detailed project (DPRs), tender procedures and award of contract. The progress of work on Dal Lake has been hampered by the delay in approval of the DPR by the State Government.

Grant For Common Effluent Treatment Plants

9.83 This is a ongoing scheme initiated in 1991 under which the Centre and States together provide 50 per cent grant for setting up of common effluent treatment plants for a cluster of small-scale industry (SSI) units. While the Centre and the States provide 25 per cent each of the cost of the plant, the SSI units contribute 20 per cent of the cost while financial institutions will provide the balance 30 per cent as a loan. The target of spending Rs. 21 crore during the Ninth Plan has been met.

Other Ongoing Schemes

9.84 A few other ongoing schemes are:

- Botanical and Zoological Survey of India.
- G.B. Pant Institute of Himalayas and Development.
- Biosphere Reserves - the scheme has been continuing since 1986 as a centrally sponsored scheme, which facilitates the conservation of

major bio-geographic zones. Fifty-two new research projects were sponsored during the Ninth Plan, involving an expenditure of Rs. 18 crore.

- Conservation and management of mangroves, which involved an expenditure of Rs. 14 crore during the Ninth Plan.
- Conservation and management of wetlands. The scheme attempts management and conservation of wetlands through catchment area treatment, water management, bio-diversity conservation and community participation. A sum of Rs. 15 crore has been spent during the Ninth Plan.

NEW INITIATIVES FOR TENTH PLAN

9.85 While the emphasis in the Tenth Plan would be on completing the ongoing schemes, the introduction of a few new programmes/schemes has been felt necessary. These are:

- The scope of the Common Effluent Treatment Plants scheme will be enhanced to cover assistance for modernisation and capacity expansion of existing plants.
- **Scheme with International Cooperation**: More number of new schemes would be taken up during the Tenth Plan under eco-restoration, watershed management, water and energy sectors, bio-diversity, climate change, ozone layer protection, land degradation etc. with the financial and technical help from India Canada Environment Facility (ICEF), Global Environment Facility (GEF), Indo-German Technical Cooperation etc. which are having schemes since Ninth Plan.
- **Schemes under the Clean Development Mechanism (CDM)**: Direct measurement of temperature as well as other visible effect like rise in sea level has confirmed that a change in climate is taking place which is going beyond the normal limit of change and can be put under the category of *effectively* irreversible over the many human life times. The cause for this change is increase in six green house gases (GHGs) in atmosphere and mainly over the last fifty years of the increased economic activities that have multiplied the consumption of fossil fuels many times. Most of the nations of the world (including India) have *ratified* the United Nations Framework Convention on Climate Change (UNFCCC), which aims to bring the GHGs level in atmosphere *back to the pre industrial era.* A *legal instrument* as *Kyoto Protocol* has been devised under which the developing countries would make commitments for reduction of 5% or more by 2012 of the their GHGs emission at 1990 level. This puts a cut of 20% from the present level of emission of the developing countries. The Kyoto Protocol has not been put into force as requisite number of ratification has not been made yet. Clean development mechanism (CDM), an offshoot, of the Protocol, however, has been put into force since November 2001 under Marrakech agreement. Under the CDM, developed countries having commitment of GHG reduction can get *credit* by investing in developing countries in schemes that would reduce GHGs emission like affore-station, renewable energy sources, efficient conversion and utilisation of energy sources etc. Presently, Netherlands has shown interest in CDM projects in India. With Kyoto Protocol coming into force, more countries will like to take up CDM projects in the country.
- Six projects mainly of non-conventional energy sources having been selected for funding from Netherlands under the CDM.
- The State Of Environment Scheme: The central aim of the scheme is assessment of physical parameters, sensitisation of development planners and introduction of corrective measures in mainstreaming environmental concerns. State of Environment Report would be prepared for States/Union Territories.

9.86 An international quality Botanical garden is to be established in NOIDA, near Delhi, to conserve the endangered/ threatened plants of the country. Under the scheme of Assistance to Botanical gardens for ex-situ conservation of rare endemic plants' it is proposed to grant initial support

to identified organisations in areas where botanical gardens do not exists. These organisations would be given suitable land free of cost and must agree to maintain them for three years after setting up the botanical gardens.

- The thrust areas of the Zoological Survey of India during the Tenth Plan should include: exploration survey of state fauna (district wise), studies on selected eco systems of the Indian region, survey of conservation areas including tiger reserves, taxonomic studies of faunal components, status survey of endangered species, chromosome mapping and DNA fingerprinting.
- It is proposed to cover 30 identified mangrove and four coral reef areas for intensive conservation and management. Conservation and Management of Mangroves and Wetlands is an ongoing scheme and shall be strengthened in Tenth Plan by conservation and management through catchment area treatment, water management and bio-diversity conservation and community participation.
- Several initiatives were taken in the Coimbatore charter on Environment and forest in 2001 and resolutions adopted by the National River Conservation Authority (NRCA) in the tenth meeting for improving the sustainability of river and lake cleaning programmes.
- All major pollutted rivers are targetted to be cleared by 2007. The focus would be given on cleaning of the river Ganga and its tributaries.
- A decentralised approach to sewage interception, diversion and treatment will be adopted as this would not only minimise the capital cost but also the operation and maintenance (O&M) work.
- Demonstration models are to be developed for total treatment and disposal of sewage in small colonies or housing societies.
- Root zone treatment/constructing wetland technologies would be promoted singly and in combination with other conventional methods. These are cost effective, low on O&M costs and are resource generating. This would also help in improving flows in rivers during dry seasons.
- The non-point sources of pollution would be addressed more aggressively through the local municipal bodies.
- Treated sewage would be utilised for irrigation after disinfection wherever feasible.
- A more effective river front development approach would be adopted where extensive plantation of trees, shrubs or perennial grasses/ reeds along both banks would be taken up. Planting of *Nirmali* is to be encouraged.
- Apart from the pollution control boards, universities and colleges would also be involved in monitoring the water quality in rivers and lakes.
- Projects would be approved only when there is a firm commitment on meeting O&M costs on the part of local bodies/State Governments.
- Institutional arrangements at the State level would be strengthened for effective and timely implementation of the programme.
- Assessment of minimum flow requirements in different rivers would be made and efforts would be made to ensure minimum flow regimes in critical stretches of all rivers.
- A legislation for a River Regulation Zone on the lines of Coastal Regulation Zone would be attempted.

THE PATH AHEAD

9.87 The major instrument with the State to check environmental degradation is undoubtedly regulation. The country has adopted almost all environmental protection Acts and rules enforced in developed countries. But environmental degradation continues despite the existence of a long-standing policy, and legal-cum-institutional framework for environmental protection. The need for reducing the gap bet-ween principle and practice, cannot be over-empha-sised.

9.88 The environmental clearance of projects by SPCB takes sometiones a long time. There is a need for standardi-sation of procedure and setting of time frames.

9.89 For control of industrial pollution, limits on effluent discharge have been laid down. An economic instrument can also be introduced to force the industry to move towards zero discharge. Industry would pay higher penalty if its effluent discharge contains a higher level of pollutants.

Air pollution

9.90 The monitoring network needs to monitor more pollutants like RPM_{10}, $RPM_{2.5}$, O_3, Pb, CO and hydro-carbons such as benzene and PAHs and should cover all class I cities after class I in the first phase.

9.91 Vehicular pollution control requires action on many fronts: fuel specifications to match engine technology, more checks on maintenance levels, curbing fuel adulteration, phasing out of two-stroke engines, greater promotion for the use of compressed natural gas (CNG)/liquefied petroleum gas (LPG)/battery operated vehicles

9.92 There is also a need to prevent burning of biomass, garbage or any other material, except approved fuel, in cities and towns to minimise secondary sources of air pollution. Aerosol has a significant effect on local weather.

Water pollution

9.93 The major bottleneck in the management of fresh water resources is the current complex institutional set up. As many as eight agencies are involved in collecting data and this results in duplication of effort.

9.94 A proper legal framework for regulating withdrawals of ground water is not in place. Though efforts have been made to check overexploitation of ground water through licensing, credit or electricity restrictions, these are directed only at the creation of wells. In any case, the licenses do not monitor or regulate the quantum of water extracted.

9.95 Most of the sewage treatment plants have not been commissioned for lack of electricity and manpower to run the machines. While municipalities should try to sell bio-sludge to farmers and also supply bio-gas as domestic or industrial fuel, the receipts from these are not expected to be enough to meet the total running cost of the plant. In the event, municipalities have to bear a part of cost through raised sewage tax lest the investments made go to waste.

Solid Waste

9.96 The major reason for the poor solid waste management in cities is due to organisational inefficiency and lack of financial discipline within municipal bodies. Besides, there are policy gaps that need to be addressed. These relate to steps that would desist people from throwing garbage on the road. There is also need to stress segregation of garbage into non-biodegradable and biodegradables, etc. Segregation is the major step for viable utilisation of waste energy and recovery of recyclable materials. As transportation adds to the cost of handling of wastes, there is need to encourage decentralised waste management and set up decentralised sewage treatment plants. There is also need to use proper technology for digestors that would maximise recovery of biogas and would meet most of the running cost of the sewage treatment plants.

Climate Change

9.97 The problem of "Climate Change" is becoming a growing concern of the world community. Under Kyoto Protocol, developed countries would have to take *definite* commitment for reducing emission of GHGs during the first phase of the five years 2008-12. Developing countries are not required to take any commitment during this phase, however, under the Protocol all countries have to reduce emission of GHGs by making mitigation efforts like improving efficiency of energy conversion and utilisation, afforestation, stabilising population growth, limiting methane emissions through proper waste management and phasing out subsidies on power utilistion.

PLAN OUTLAY

9.98 An outlay of Rs 5945 crore has been fixed for Ministry of Environment & Forests in the Tenth Plan. The schemewise breakup of the Tenth Plan is given in the Appendix.

Annexure 9.1

Annual Plan Approved Outlay for Forestry and Wildlife Sector from 1997-2002

(Rs. crore)

States	Ninth Plan Outlay	1997-98	1998-99	1999-2000	2000-01	2001-02
Andhra Pradesh	179.13	64.81	98.00	110.58	88.74	92.11
Arunachal P	67.61	17.28	110.84	16.63	10.63	15.20
Assam	190.00	29.68	33.53	33.53	37.50	35.89
Bihar	269.45	20.15	20.00	12.00	6.88	2.35
Goa	17.00	2.21	2.20	2.40	3.05	
Gujarat	803.00	150.40	174.00	200.00	227.00	188.00
Haryana	218.70	35.26	50.04	40. 30	29.60	32.30
H P	365.00	55.50	80.33	87.11	72.47	72.76
J & K	497.00	40.27	56.16	48.60	45.76	51.03
Karnataka	350.00	14.12	94.75	134.35	118.67	157.00
Kerala	141.00	27.00	44.00	69.00	75.00	42.00
Madhya Pradesh	447.09	129.74	121.07	142.89	50.57	60.55
Maharashtra	489.60	100.08	95.91	131.66	46.73	41.28
Manipur	41.40	5.35	4.50	4.60	2.20	3.67
Meghalaya	100.50	7.50	8.00	8.00	10.00	8.50
Mizoram	40.56	6.20	6.82	5.20	5.20	5.20
Nagaland	51.00	5.22	3.64	3.64	3.45	5.03
Orissa	122.75	20.30	23.56	29.77	36.22	25.56
Punjab	243.70	8.06	53.83	68.66	96.41	115.05
Rajasthan	549.85	94.21	118.68	164.35	62.96	53.13
Sikkim	40.00	4.25	4.85	5.50	5.85	
Tamil Nadu	600.00	94.67	125.28	121.18	137.71	151.63
Tripura	27.33	4.46	3.96	3.41	8.07	10.49
Uttar Pradesh	650.00	108.40	130.40	132.01	162.03	101.93
West Bengal	171.80	35.95	45.11	44.09	21.83	39.89
Chattisgarh						37.94
Jharkhand						81.75
Uttaranchal						105.73
Union Territories						
A&N Islands	61.00	8.00	9.72	11.00	11.00	11.90
Chandigarh	5.00	0.80	2.11	3.31	6.88	6.88
Dadra &N H	14.80	2.60	2.29	2.11	2.02	2.02
Daman & Diu	2.23	0.37	0.38	0.24	0.29	1.98
Delhi	35.00	3.02	5.00	10.00	7.00	
Lakshadweep	0.00	0.00	0.36	0.23	0.23	0.25
Pondicherry	559.00	1.08	1.08	1.08	1.08	1.18