

CHAPTER 33

ENVIRONMENT AND FOREST

The emergence of environmental issues at the top of the global agenda in the context of climate change concerns underline the need for collective endeavour for protection of environment. This warrants informed and voluntary participation of all sections of the people in the movement for conservation and protection of environment. In India, the Ministry of Environment & Forests under the Central Government is the nodal agency for implementation of policies and programmes relating to conservation of the country's natural resources including lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals and prevention and abatement of pollution. This Ministry also serves as the nodal agency in the country for the United Nations Environment Programme (UNEP), South Asia Co-operative Environment Programme (SACEP), International Centre for Integrated Mountain Development (ICIMOD) and for the follow-up of the United Nations Conference on Environment and Development (UNCED). The National Environment Policy (NEP) 2006 is the first comprehensive policy document formulated at national level for realizing the overarching goal of sustainable development in the country. It is the outcome of extensive consultations with experts, governments, industry associations, academic and research institutions, civil society, NGOs and the public. The NEP outlines the significance of a number of new and continuing initiatives for enhancing environmental conservation which requires coordinated action of diverse actors and stakeholders at all levels.

Survey of Flora:

The Botanical Survey of India (BSI) is the apex research organization under the Ministry of Environment and Forests, Government of India for carrying out taxonomic and floristic studies on wild plant resources of the country. It was established on 13th February, 1890 with the basic objective to explore the plant resources of the country and to identify the plants species with economic virtues. After independence the department was reorganized in 1954 by Government of India as a part of scientific development of the country. The objectives of BSI include (1) exploration, inventorying and documentation of phytodiversity in general and protected areas, hotspots and fragile ecosystems in particular; publication of National, State and District Floras; (2) identification of threatened/red list species and species rich areas needing conservation; ex-situ conservation of critically threatened species in botanical gardens; (3) survey and documentation of traditional knowledge (ethno-botany) associated with plants; (4) develop a National database of Indian plants, including herbarium and live specimens, botanical paintings/illustrations, etc. The Zoological Survey of India (ZSI) a premier institute under the Ministry of Environment and Forests, has been undertaking exploration and research leading to the advancement of knowledge on the exceptionally rich faunal diversity of this country since its inception in 1916, with its Headquarters at Kolkata and sixteen regional centres located in different parts of the country. In recent years, ZSI has reoriented its plan to work by grouping the survey and studies under six major programmes as follows: (i) Study of the fauna of states (ii) Fauna of conservation areas (iii) Fauna of important ecosystems (iv) Status survey of endangered species (v) Fauna of India and (vi) Ecological Studies & Environmental Impact Assessments (EIA). ZSI is recognized as the repository of Zoological specimens by MoEF under Biological Diversity Act, 2002. Its' Andaman and Nicobar Regional Centre have been recognized as lead institute under UNESCO.

Forest Resources and Survey:

The Forest Survey of India (FSI) is located at Dehradun and its four zonal offices are located at Shimla, Kolkata, Nagpur and Bangalore. FSI is a national level organization for forest resource assessment of the country under the Ministry of Environment and Forests, Government of India. The main objectives of FSI include (1) assess the forest cover of the country through Remote Sensing technology, analyze the changes and prepare State of Forest Report biennially; (2) conduct inventory in forests and nonforest areas at national level and develop database on wood volume and also estimate tree cover; (3) function as a nodal agency for collection, compilation, storage and dissemination of spatial database on forest resources; (4) conduct training of forestry personnel in application of technologies related to resources survey, remote sensing, GIS, etc. Andaman & Nicobar Islands Forest and Plantation Development Corporation Limited (ANIFPDCL) is a Government of India Public Sector Undertaking, created in 1977 with the broad objectives of development and managing forestry plantations on the Islands. This Corporation has three main activities namely (i) Forestry Project, (ii) Red Oil Palm (ROP) and (iii) Katchal Rubber Project (KRP) in operation. So far eleven cycles of forest cover assessment have been completed since 1987. Over the year with the advancement of technologies

of image processing and data quality of remote sensing, the methodology of forest cover assessment has improved to provide more accurate data products for better operational management and planning. More than 80 % forest area of the country was inventoried by 2000. A new inventory design was adopted by FSI since 2002 to generate national level estimates of growing stock both for forest and Tree Outside Forest (TOF) resources on a two year cycle on the basis of selected sampled districts. This estimate is further improved in the subsequent cycle with the increase in the numbers of sampled districts.

Forest cover: India's forest cover in 2007 is 21.02% of the geographical area. 2.54% is very dense forest, 9.71% is moderately dense forest, and the rest 8.77% is open forest; including 0.46 million hectare mangroves. Excluding the area (18.31 million hectare) above tree line, the forest cover of the country comes of 22.26%. The North-East region of the country comprising States, namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland & Tripura is about 8% of the geographic area of the country, but accounts for nearly one fourth of its forest cover. There are sixteen forest type groups sub divided into two hundred types.

Mangroves cover: Mangroves comprise salt-tolerant, evergreen, broad leaved trees having aerial roots like pneumatophores or stilt roots and viviparous germinated seedlings found mainly in tropical and subtropical inter-tidal regions of the world. Mangroves in India cover 4,639 km² showing a net increase of 58 km² over the previous assessment figures. West Bengal has nearly half of the country's mangroves.

Tree cover: India's tree cover (comprising sub hectare tree patches outside forest cover) has been estimated as 92,769 km² constituting 2.82% of geographical area of the country. Excluding the area above tree line, it comes to 2.99%.

Environmental Conservation:

The National Environment Policy, 2006 recognizes that mangroves and coral reefs are an important coastal environmental resource. They provide habitats for marine species; protection from extreme weather events; and a resource base for sustainable tourism. The major efforts made on environmental Conservation are as under:

Mangroves: As per the State of Forest Report 2009, published by Forest Survey of India, the mangrove cover in the country is 0.14% of the country's total geographical area. Mangroves play an important role in coastal ecology and protecting the coastal areas from the impact of tidal waves but the extent of protection is variable & is a function of several factors. In case of Mangroves, the Government of India is assisting the Coastal State Governments/Union Territories in rehabilitation of degraded Mangrove Areas and enhance Mangrove cover by re-plantation in the open mud flats. The project entitled "Mangroves for Future (MFF) is a strategy for promoting investment in Coastal Ecosystem Conservation" is being coordinated by World Conservation Union (IUCN) covering, initially, six Tsunami affected countries (including India) in South & South East Asia & Western Indian Ocean.

Coral Reefs: The four major coral reefs areas identified for intensive conservation and management are (1) Gulf of Mannar, (2) Gulf of Kachchh, (3) Lakshadweep, and (4) Andaman and Nicobar Islands. The emphasis is on preventive aspects through monitoring and surveillance as the restoration work is both costly and time consuming. The Government of India is assisting to the State Forest Departments of all the four identified coral reefs areas in the country for activities like monitoring, surveillance, education & awareness. The Indian reef area is estimated to be 2,375 km². For encouraging targeted research on both hard and soft corals in the country, a National Coral Reef Research Centre at Port Blair has been established.

Biosphere Reserves: Biosphere Reserves are areas of terrestrial and coastal ecosystems which are internationally recognized within the framework of UNESCO's Man and Biosphere (MAB) programme initiated in 1986. These Reserves are required to meet a minimal set of criteria and adhere to a minimal set of conditions before being admitted to the World Network of Biosphere Reserves designated by UNESCO. The world's major ecosystem types and landscapes are represented in this network, which is devoted to conserving biological diversity, promoting research and monitoring as well as seeking to provide models of sustainable development. These Reserves are rich in biological and cultural diversity and encompass unique features of exceptionally pristine nature. The goal is to facilitate conservation of representative landscapes and their immense biological diversity and cultural heritage, etc. India has been divided into ten Bio-geographic Zones and these zones together consist of twenty five Bio-geographic provinces. The aim is to designate one representative site as Biosphere Reserve in each Bio-geographic province for long term conservation.

Biodiversity Conservation:

Biodiversity is the variability among living organisms and ecological complexes of which they are part, including diversity within and between species and ecosystems. Biodiversity has direct consumptive value in food, agriculture, medicine and in industry. In pursuance to the Convention on Biological Diversity (CBD), India had enacted the Biological Diversity Act in 2002 following a widespread consultative process over a period of eight years. The Biological Rules were notified thereafter in 2004. The Act gives effect to the provisions of the CBD. It also addresses access to biological resources and associated traditional knowledge to ensure equitable sharing of benefits arising out of their use to the country and its people. The Act is to be implemented through a three-tiered institutional structure: National Biodiversity Authority (NBA), State Biodiversity Boards (SBBs) and Biodiversity Management Committees (BMCs). Taxonomy is the science which helps in exploration, identification and description of living organisms. A sound taxonomic base is a pre-requisite for environmental assessment, ecological research, effective conservation, management and sustainable use of biological resources. So far in India, around 90000 species of animals and 47000 species of plants have been identified and described but a large number of animals and plants are yet to be explored, identified and described. The Ministry of Environment and Forests has set up an All India Coordinated Project on Taxonomy. The Project has organized specialist groups drawn from Universities, Botanical and Zoological Surveys of India to take up taxonomic work on animal viruses, bacteria and archaea, algae, fungi, lichens, bryophytes, pteridophytes, gymnosperms, palms, grasses, bamboos, orchids, helminthes and nematodes, Microlepidoptera and Mollusca. Several new records of wild flora and fauna have been made. Several new species have also been discovered. The Botanic Garden of India Republic (BGIR) was set up in April 2002 as part of the Botanical Survey of India. The scheme was identified as a "Green Channel" project under the National Jai Vigyan Science & Technology Mission of the Ministry of Science & Technology. The botanic garden was, inter alia, established with the goals: ex situ conservation and propagation of rare and indigenous plants, to serve as a 'centre of excellence' for research and training, and to build public awareness through environmental education.

Forest Conservation:

The Forest Division of the Ministry of Environment and Forest has six Regional Offices located at Bangalore, Bhopal, Bhubaneswar, Lucknow, Shillong and Chandigarh with its Headquarter in the Ministry at New Delhi. The primary function of the Regional Offices is to monitor and evaluate the ongoing forestry projects and schemes with specific emphasis on conservation of forests and follow up action on the implementation of conditions and safeguards laid down by the Ministry while granting clearance to development projects under Forest (Conservation) Act, 1980 and Environment (Protection) Act, 1986. The Forest (Conservation) Act, 1980 deals with grant of forestry clearances for diversion of forest lands for non-forestry purposes in respect of development projects like power, roads, railways, irrigation, mining, schools, defence, drinking water, resettlement & rehabilitation of people etc. This Act is regulatory in nature, not prohibitory. The State/UT Government before diverting / de-reserving forest land for non-forest purposes requires prior approval of Central Government under section-2 of the Forest (Conservation) Act 1980. This Centrally Sponsored Intensification of Forest Management Scheme aims at strengthening forest protection machinery of the State/UT Governments and providing support for area-specific forest management interventions. The major components of the scheme include (1) Forest Fire control and Management, (2) Strengthening of Infrastructure, (3) Survey, Demarcation and Working Plan preparation, (4) Protection and Conservation of Sacred Groves, (5) Conservation and Restoration of Unique Vegetation & Ecosystems, (6) Control and Eradication of Forest Invasive Species and (7) Preparedness for Meeting Challenges of Bamboo Flowering and Improving Management of Bamboo Forest.

Wildlife Conservation:

Realizing the huge task of conserving India's wildlife resources, the National Wildlife Action Plan (2002-2016) was adopted, emphasizing the need for peoples' participation and support for wildlife conservation. Wildlife Wing in the Ministry of Environment and Forest is apex body for wildlife conservation. The Wildlife Wing has two Divisions, namely, Project Elephant Division and Wildlife Division. In addition, three autonomous bodies, National Tiger Conservation Authority (NTCA), Central Zoo Authority (CZA) and Wildlife Institute of India (WII) have been constituted for tiger conservation, zoo management, research and training in wildlife respectively. With the amendment to the Wildlife (Protection) Act, 1972 in 2006, a Wildlife Crime Control Bureau has been established to combat wildlife

related crimes. The Wildlife Crime Control Bureau has five Regional Offices located at Delhi, Mumbai, Kolkata, Chennai and Jabalpur and three Sub-regional offices at Amritsar, Guwahati and Cochin. The main programmes/schemes handled by the Wildlife Division are: (1) Integrated Development of Wildlife Habitats (IDWH), recovery programmes for critically endangered species and (3) Consultancies for Special Tasks.

Central Zoo Authority: Zoos in India are regulated as per the provisions of the Wild Life (Protection) Act, 1972 and are guided by the National Zoo Policy, 1998. The Central Zoo Authority was established by the Government of India in the year 1992 through an amendment in the Wild Life (Protection) (1991 amendment) Act, 1972. The main objective was to enforce minimum standards and norms for upkeep and health care of animals in India zoos and restrain mushrooming of unplanned and ill conceived zoos. Recognition of Zoo Rules, 1992 was revised and notified on 11.11.2009.

Project Tiger: The Project Tiger was launched in April, 1973 with the objective “to ensure maintenance of a viable population of Tigers in India for scientific, economic, aesthetic, cultural and ecological values, and to preserve for all times, areas of biological importance as a national heritage for the benefit, education and enjoyment of the people.” For effectively control illegal trade in wildlife, a multidisciplinary Tiger and Other Endangered Species Crime Control Bureau (Wildlife Crime Control Bureau) has been constituted with effect from 6.6.2007. Seventeen Tiger States, namely, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Orissa, Rajasthan, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal have an area of 32049.8 km² as core or critical tiger habitat under section 38 V of the Wildlife (Protection) Act, 1972, as amended in 2006. Amendment of this Act empowers constitution of the National Tiger Conservation Authority and the Tiger and Other Endangered Species Crime Control Bureau.

Project Elephant: Project Elephant was launched in 1991-92 with objectives (1) to protect elephants, their habitat & corridors, (2) to address issues of man- animal conflict, and (3) welfare of domesticated elephants. Financial and technical support is being provided to major elephant bearing States in the country. The Project is being mainly implemented in 13 States, namely, Andhra Pradesh, Arunachal Pradesh, Assam, Jharkhand, Karnataka, Kerala, Meghalaya, Nagaland, Orissa, Tamil Nadu, Uttarakhand, Uttar Pradesh and West Bengal. Small support is also being given to Tripura, Maharashtra and Chhattisgarh. With the notification of Uttar Pradesh Elephant reserve in the year 2009, the total number of Elephant Reserves (ERs) in the country has become 27, whereas, the permission for 5 more has been accorded by the Ministry of Environment and Forest. The area under Elephant Reserves is about 69582 km².

Environmental Impact Assessment:

The rapid industrial development in the country has increased manifold, the chances of adversely affecting the environment unless timely, adequate, corrective and protective mitigative measures are taken to minimize or neutralize those adverse impacts on environment. The Ministry of Environment and Forests has used Environment Impact Assessment Notification 2006 as a tool to regulate rapid industrial development of the country for minimizing the adverse impact on environment and reversing the trends. In the re-engineered Environment Impact Assessment (EIA) Notification of September 2006, projects were categorized into category ‘A’ and category ‘B’ depending on their threshold capacity and likely pollution potential and were appraised for prior environmental clearance at the Central and the State level respectively.

Abatement of Pollution:

The concern for environmental quality has become the top most issue in the present scenario of rising population increasing urbanization, industrial and vehicular pollution as well as pollution of water courses due to discharge of effluents without conforming to the environmental norms and standards. Realising this trend of pollution in various environmental media like air, water, soil, etc., Ministry of Environment and Forest adopted Policy for Abatement of Pollution in 1992, which provides multi-pronged strategies in the form of regulations, legislation, agreements, fiscal incentives and other measures to prevent and abate pollution. To give effect to various measures and policies for pollution control, various steps have been initiated which, include stringent regulations, development of environmental standards & periodical revision therein, control of vehicular pollution, control of air & water pollution, etc. The Government was adopted the National Environment Policy (NEP- 2006) which seeks to extend the coverage, and fill in gaps that still exists, in light of present knowledge and accumulated experience. The activities taken for Abatement of Pollution are as under:

Air Pollution: The air pollution and the resultant air quality can be attributed to emissions from transportation, i.e. road, rail and airways, industrial and domestic activities. The air quality has been, therefore, an issue of social concern in the backdrop of various developmental activities. The norms for ambient air quality have been revisited and various industry specific emissions standards are evolved afresh or revisited and notified from time to time. For control of air pollution, with a view to initiate policy measures and to prepare ambient air quality management plans, three hundred sixty five ambient air quality monitoring stations are operational covering one hundred forty one cities/towns in twenty six States and five Union Territories. Presently, only the criteria pollutants namely; sulphur dioxide (SO₂), nitrogen dioxides (NO₂) and fine particulate matter (PM₁₀) are monitored by the Pollution Control Boards, Pollution Control Committees, Universities and Research Institutes. Installation of automatic air quality monitoring stations is undertaken for twenty nine cities for continuous monitoring. Out of which the continuous monitoring has been introduced in thirteen cities namely; Agra, Kanpur, Varanasi, Lucknow, Mumbai, Bangalore, Howrah, Durgapur, Haldia, Kolkata, Pune, Solapur and Hyderabad, so far apart from Delhi. Recently, twenty three manual monitoring stations have been also added in the network. The Ministry of Petroleum and Natural Gas, Government of India has enunciated an Auto Fuel Policy which aims to comprehensively and holistically address the issues of vehicular emissions, vehicular technologies and auto fuel quality in a cost-efficient manner while ensuring the security of fuel supply. The Government has also published Gazette Notification vide G.S.R. 84(E) on 9th February 2009 for introducing Bharat Stage IV and III norms, as applicable, for new vehicles in selected cities. The Policy objectives include ensuring sustainable, safe, affordable and uninterrupted supply of auto fuels; optimum utilization of infrastructure for import of crude and crude products, etc. The Policy provides for a road map for reduction in vehicular emission norms for new vehicles as well as for reduction of pollution from in-use vehicles. It also sets standards for quality of fuel and other kits.

Noise Pollution: Noise levels have been a matter of concern due to various activities, religious functions, festivals, marriages, processions and related celebrations. The main sources of noise pollution include industrial activities, use of public address system, construction activities, use of generator sets, pressure horns, fire crackers etc. Keeping in view the increasing trend in noise levels, Ministry has issued various regulations from time to time to control noise pollution. To control community noise, Noise Pollution (Regulation and Control) Rules, 2000 were notified in February, 2000. The Charter on Corporate Responsibility for Environmental Protection (CREP) was adopted in March, 2003 for seventeen categories of polluting industries and it is a road map for progressive improvement in environmental management.

Comprehensive Environmental Pollution Index (CEPI): The Ministry of Environment & Forests has adopted a Comprehensive CEPI system of environmental assessment of the eighty eight Industrial Clusters, evolved by the Central Pollution Control Board in collaboration with the IIT, Delhi. The main features of CEPI are: (1) CEPI may be used as a tool in synthesizing the available information on environmental status of areas by using quantitative criteria and its ability to reduce complex information into smaller and more easily retained information; (2) CEPI could help in determining the effectiveness and comparing alternative plans and policies and assists environmental decision-makers in initiating appropriate measures in grading polluted industrial clusters; (3) An increasing value of CEPI indicates severe adverse environmental decision-makers in initiating appropriate measures in grading polluted industrial clusters; (4) An increasing value of CEPI indicates severe adverse effects on environment as well as an indication of a large proportion of population experiencing health hazards; etc.

Common Effluent Treatment Plants (CETP): The main objective of the CETPs is to reduce the treatment cost to be borne by an individual member unit to a minimum while protecting the water environment to a maximum. Wastewater treatment and water conservation are the prime objectives of the CETP. A Centrally Sponsored Scheme has been undertaken by the Government for enabling the small scale industries (SSI) to set up new and upgrade the existing Common Effluent Treatment Plants (CETP) to cover all the States in the country.

Fly Ash Utilization: Fly ash consists of inorganic matter present in the coal that has been fused during coal combustion. The fast increasing demand of power coupled with its dependence on coal for at least 2/3rd of its energy requirement is generating large volume of fly ash. Generation of about forty million tonnes fly ash during 1994 increased to about one hundred million tonne/year by 2001 and one hundred and thirty million tonne in 2007. The Fly Ash Notification, 1999 (revised in 2003) was issued by Ministry of Environment & Forests to regulate the disposal of fly ash and ensure its proper utilization.

Development & Promotion of Clean Technology: “Adoption of cleaner technologies and cleaner production strategies is considered to provide a balance between Development & Environment through economic benefits by way of increased resource efficiency, innovation and reduced cost for environmental management”. A Scheme on Development and Promotion of Clean Technologies was initiated in 1994 with the objectives: (1) development & Promotion of Cleaner Technologies, (2) development of Tools and Techniques for Pollution Prevention, and (3) formulation of Sustainable Development Strategies.

Central Pollution Control Board (CPCB): The CPCB performs functions as laid down under the Water (Prevention & Control of Pollution) Act, 1974, and The Air (Prevention and Control of Pollution) Act, 1981. It is responsible for planning and executing comprehensive nationwide programmes for the prevention and control of water and air pollution, for advising the Central Government on matters concerning prevention and control of water and air pollution and for coordinating activities of State Pollution Control Boards /Pollution Control Committees besides providing technical assistance & guidance to them.

National Air Quality Monitoring Programme (NAMP): The CPCB conducts ambient air quality monitoring under the nation-wide NAMP comprising of three hundred sixty five stations covering one hundred forty one cities / towns in twenty six States and five Union Territories. Under NAMP, four criteria air pollutants, namely, Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM / PM10) have been taken up for monitoring at all the locations.

Hazardous Waste Management: Hazardous waste, bulk of which is generated by the industries, can cause environmental pollution and adverse health effects if not handled and managed properly. Various actions have been taken to manage hazardous wastes in the country, which include establishing a regulatory and institutional framework, preparation of technical guidelines, development of individual & common facilities for recycle/recovery/reuse, treatment and disposal of hazardous wastes, etc. To regulate management of hazardous waste generated within the country as well as export/import of such wastes, the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008 have been notified. Recycling of e-waste and the requirement of registration for e-waste recyclers has been included under these Rules. An inter-ministerial coordination committee has been constituted to co-ordinate at the field level for effective implementation of the HW Rules.

Chemical Safety: The Manufacture, Storage and Import of Hazardous Chemical (MSIHC) Rules, 1989 and the Chemical Accident (Emergency Planning, Preparedness and Response) Rules, 1996 are the main instruments for ensuring chemical safety in the country. There are one thousand eight hundred forty one MAH units in the country. The Ministry of Environment and Forest continues to take follow-up steps for improving implementation of the Manufacture, Storage and Import of Hazardous Chemical (MSIHC) Rules 1989 and the Chemical Accident (Emergency Planning, Preparedness and Response) Rules, 1996. A “GIS based Emergency Planning and Response System” for chemical accidents in Major Accident Hazard (MAH) units has been developed.

Management of Plastic Wastes: Plastics are used world over. These are littered around and if not collected systematically may find their way into the drainage system resulting in choking of drains, creating unhygienic environment and causing health problems. The Ministry has notified the Recycled Plastics Manufacture and Usage Rules, 1999 under the Environment (Protection) Act, 1986 and amended them in 2003 for regulating and managing plastic carry bags and containers. Training programmes are being conducted for various stakeholders on Management of Plastic Wastes.

Bio-Medical Waste Management: The Ministry of Environment and Forest has notified the Bio-Medical Waste (Management & Handling) Rules, 1998 (BMW Rules) under the provisions of Environment (Protection) Act, 1986 for proper management and handling of Bio-Medical Waste (BMW) generated in the country.

Conservation of Water Bodies:

The annual estimated precipitation, including snowfall, in India is 4000 billion cubic metres (bcm). The resources potential of the country in the form of annual natural run off in the rivers is about 1869 bcm, considering both surface and ground water as one system. However, owing mainly to uneven distribution of precipitation in time and space, the

total water resources available for utilization, including ground water, is only about 1122 bcm. All the major river basins are not perennial. Only four of the thirteen major basin posses areas of high rainfall, i.e. Brahmaputra, Ganga, Mahandi and Brahamani having annual average discharge of a minimum of 0.47 million cubic meter per Km², and they are perennial. Six basins (Krishna, Indus, Godavari, Narmada, Tapi and Subarnarekha) occupy the area of medium rainfall and have annual average discharge of a minimum of 0.26 million cubic meter per Km², and the remaining four (Cauvery, Mahi, Sabarmati and Pennar) occupy the area of low rainfall and have annual average discharge between of 0.06 and 0.24 million cubic meter per Km². The some important programme and activities for Conservation of Water Bodies are as under:

National River Conservation Plan (NRCP): The National River Conservation Directorate (NRCD), functioning under the Ministry of Environment and Forests is engaged in implementing the River Action Plans under the NRCP by providing financial assistance to the State Governments. The objective of NRCP is to improve the water quality of the rivers through the implementation of pollution abatement works. So far a total of 38 rivers have been covered under the programme.

National Water Quality Monitoring Programme (NWMP): The CPCB established a network of water quality monitoring stations across the country; the water quality monitoring network is being operated under a three-tier programme viz. Global Environmental Monitoring System (GEMS), Monitoring of Indian National Aquatic Resources System (MINARS), and Yamuna Action Plan (YAP). Presently the network comprises of 1245 stations spread over the country. The water quality monitoring data obtained from various monitoring stations between years 1995 to 2008 indicated that organic and bacterial contamination continue to be critical in water bodies, particularly biochemical oxygen demand (BOD) was observed to be very high at some locations on major rivers / canals. Since the natural water bodies have got to be used for various competing as well as conflicting demands, therefore a concept of “designated best use” (DBU) has been developed. According to this concept, out of several uses a water body is put to, the use which demands highest quality of water, and accordingly the water body is designated. Primary water quality criteria for different uses are as follows.

Designated- Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	<ul style="list-style-type: none"> • Total Coliforms Organism MPN/100ml shall be 50 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 6mg/1 or more • 4. Biochemical Oxygen Demand 5 days 200C 2mg/1 or less
Outdoor bathing (Organised)	B	<ul style="list-style-type: none"> • Total Coliforms Organism MPN/100ml shall be 500 or less • pH between 6.5 and 8.5 • Dissolved Oxygen 5 mg/1 or more • Biochemical Oxygen Demand 5 days200C 3mg/1 or less
Drinking water source after conventional treatment and disinfection	C	<ul style="list-style-type: none"> • Total Coliforms Organism MPN/100ml shall be 5000 or less • pH between 6 and 9 • Dissolved Oxygen 4 mg/1 or more • Biochemical Oxygen Demand 5 days 200C 3mg/1 or less
Propagation of wild life and Fisheries	D	<ul style="list-style-type: none"> • pH between 6.5 to 8.5 • Dissolved Oxygen 4 mg/1 or more • Free Ammonia (as N) 1.2 mg/1 or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	<ul style="list-style-type: none"> • pH between 6.5 to 8.5 • Electrical Conductivity at 250 C micro mhos/cm Max.2250 • Sodium absorption Ratio Max.26 • Boron Max 2 mg/1

Ganga Action Plan (GAP): The GAP initiated in 1985 is the first River Action Plan. Besides other pollution abatement works, a sewage treatment capacity of 869 million litres per day (mld.) was created under Phase-I. This phase was declared completed in March 2000. GAP Phase-II was taken up which included, Ganga and its four tributaries i.e. Damodar, Gomti, Mahananda and Yamuna. Works under Ganga Action Plan Phase-II covers sixty towns along the main stem of river Ganga. The Central Government has given Ganga the status of a 'National River' and has constituted a 'National Ganga River Basin Authority' (NGRBA) on February 20, 2009. The NGRBA has been set up as an empowered planning, financing, monitoring and coordinating authority for the conservation of Ganga River with a holistic approach under the Environment (Protection) Act, 1986.

Yamuna Action Plan (YAP): Under Yamuna Action Plan Phase-I, assisted by the Japan Bank for International Cooperation (JBIC), a total of 753 mld. sewage treatment capacity was created and this Phase was declared completed in March, 2003. The YAP Phase-II is for abatement of pollution of river Yamuna in Delhi, Uttar Pradesh (eight towns) and Haryana (six towns). The other projects for abatement of river pollution are Gomti Action Plan (GoAP), Damodar Action Plan (DAP), Mahananda Action Plan (MAP), etc.

National Lake Conservation Plan (NLCP): The National River Conservation Directorate (NRCD) is engaged in implementing the Lake Action Plans under the NRCP by providing financial assistance to the State Governments. The scheme of NLCP was initiated with the approval of conservation and management plans of three lakes namely, Powai (Maharashtra), Ooty and Kodaikanal (Tamil Nadu). The objective of the Scheme is to restore and conserve the polluted lakes in urban and semi urban areas of the country degraded due to waste water discharge into the lake.

Regeneration and Eco-development:

In order to promote afforestation, tree planting, ecological restoration and ecodevelopment activities in the country, the National Afforestation and Eco-Development Board (NAEB) was set up in August 1992. Special attention is also being given by NAEB to the regeneration of degraded forest areas and lands adjoining forest areas, national parks, sanctuaries and other protected areas as well as the ecologically fragile areas like the Western Himalayas, Aravallis, Western Ghats etc. The objectives of the NAEB include (1) evolve mechanisms for ecological restoration of degraded forest areas and adjoining lands through systematic planning and implementation, in a cost effective manner; (2) restore through natural regeneration or appropriate intervention the forest cover in the country for ecological security and to meet the fuelwood, fodder and other needs of the rural communities; etc. The National Afforestation Programme (NAP) continues to be the flagship programme of NAEB, in so much as it provides support, both in physical and capacity building terms, to the Forest Development Agencies (FDAs) which in turn are the main organ to move forward institutionalization of Joint Forest Management. The objectives of the scheme include (1) protection and conservation of natural resources through active involvement of the people; (2) checking land degradation, deforestation and loss of biodiversity; (3) ecological restoration and environmental conservation and eco-development; etc.

Education and Awareness under Environment and Forest:

Awareness of people about emerging environmental issues and the interconnections between the life styles and environment is an essential prerequisite for participation of all sections of people for conservation and protection of environment. Population increase, rapid urbanization and industrialisation, increasing needs of energy etc., have impacted the availability of natural resources besides denting the quality of environment. These call for public awareness and participation for bringing about an attitudinal change and finally restricting further damage to the environment. Environment education and awareness thus assumes critical importance. The 'Environmental Education, Awareness and Training' launched in 1983-84, is a flagship scheme of the Ministry for enhancing the understanding of people at all levels about the relationship between human beings and the environment and to develop capabilities/skills to improve and protect the environment. The other Programmes relating to education and awareness are National Green Corps Programme (NGCP), National Environment Awareness Campaign (NEAC), and Global Learning & Observations to Benefit the Environment (GLOBE).

The source of forest data is regular survey and the periodicity of such data is biennial. The concept and definition of the various terms used in chapter are as under:

Forest Cover: All lands, more than one hectare in area, with a tree canopy density of more than 10 percent irrespective of ownership and legal status. Such land may not necessarily be recorded forest area. It also includes orchards, bamboo and palm.

Dense Forest: Lands with forest cover having tree canopy density of 40% and above.

Very Dense Forest: Lands with forest cover having tree canopy density of 70% and above.

Moderately Dense Forest: Lands with forest cover having tree canopy density between 40% and of 70%.above.

Open Forest: Lands with forest cover having tree canopy density between 10% and of 40%.above.

Scrub: Degraded forest lands having tree canopy density less than 10%.

Mangrove: Salt tolerant evergreen forest ecosystem found mainly in tropical and sub-tropical coastal and/or inter-tidal regions.

Forest Areas: Geographical areas recorded as forest in Government records.

Reserved Forest: An area so continued under the provisions of Indian Forest Act or other State Forest Act, having full degree of protection. In reserved forest, all activities are prohibited.

Protected Forest: An area notified under the provisions of Indian Forest Act or other State Forest Act, having limited degree of protection. In protected forest, all activities are permitted unless prohibited.

Un-classed Forest: An area recorded as forest but not included in reserved or protected forest category. Ownership status of such forest varies from State to State. Un-classed forest occurs mostly in Madhya Pradesh., Assam, Bihar, and Maharashtra and consist largely of inaccessible forest or unoccupied waste.

Highlights :

- The actual forest cover increased from 653898 km² in 2001 to 690899 km² in 2009. The area under dense forest increased from 395169 km² to 402522 km² and area under open forest increased from 258729 km² to 288377 km², whereas, the areas under mangroves increased from 4482 km² to 4581 km² and area under scrub increased from 47318 km² to 41525 km² during the same period.
- The recorded area under forest increased from 768436 km² in 2001 to 769512 km² in 2009. The area under reserved forest increased from 423311 km² to 430582 km² and area under protected forest decreased from 217245 km² to 206219 km², whereas, the areas under unclassified forest increased from 127811 km² to 132711 km² during the same period.
- The tree cover area increased from 81471 km² in 2001 to 92769 km² in 2007, whereas mangrove cover area increased from 4482 km² to 4639 km² during the same period.
- There were 95 national parks with area as 38024 km², whereas, there were 500 wildlife sanctuaries with area as 155980 km² in 2006.
- There were 1226784 numbers of taxonomic species in the world, out of which, 7.45% were Indian species in 2007.
- The estimated population of tigers was between 1165 to 1657 in 2007-08, whereas, the estimated population of elephants was between 27669 to 27719 in 2007.

- The global average temperature increased from 14.2886 °C in 2000 to 14.4552 °C in 2009, whereas, atmospheric concentration of carbon dioxide increased from 368.77 parts per million to 386.27 parts per million during the same period.
- The production of ozone depleting substance (ODS) in the country increased from 52093 MT in 2000 to 58340 MT in 2008, whereas, its consumption increased from 20743 MT to 25303 MT during the same period.
- The maximum SO₂ of 28 µg/m³ (microgram per cubic meter) was realized in Jharkhand, whereas, the maximum NO₂ of 73 µg/m³ was realized in West Bengal and the maximum RSPM of 267 µg/m³ was realized in Haryana in Industrial Areas under National Ambient Air Quality Monitoring Programme in 2008.
- The maximum SO₂ of 27 µg/m³ (microgram per cubic meter) was realized in Uttarakhand, whereas, the maximum NO₂ of 66 µg/m³ was realized in West Bengal and the maximum RSPM of 209 µg/m³ was realized in Delhi in Residential Areas under National Ambient Air Quality Monitoring Programme in 2008.
- The revenue from forest increased from ₹ 15.24 billion in 2000-01 to ₹ 23.10 billion in 2005-06, whereas, expenditure on forest increased from ₹ 33.87 billion to 36.10 billion during the same period.
- The afforested area was 19990 km² and expenditure on afforestation was ₹ 2.5 billion in 2005-06.

This chapter contains the following tables:

Table 33.1: presents the year-wise forest cover estimates through satellite and sensor since 1987 and State-wise break-up thereof for 2009.

Table 33.2: presents the year-wise forest cover categorized by geographical area, actual forest cover, very dense forest, moderately dense forest, open forest mangrove, scrub and non-forest since 2001 and State-wise break-up thereof for 2009.

Table 33.3: presents the year-wise recorded forest area of the country categorized by total forest area, reserved forest, protected forest and un-classified forest since 2001 and State-wise break-up thereof for 2009.

Table 33.4(A): presents the State-wise estimates of wasteland in India categorized by forest degraded area and non-forest degraded area for 2000.

Table 33.4(B): presents the category-wise and State-wise wasteland in India for 2000.

Table 33.5: presents the year-wise estimation of tree and mangrove cover since 2001 and state-wise break-up thereof for 2007.

Table 33.6: presents the State-wise number and area of national parks and wildlife sanctuaries in 2006.

Table 33.7: presents the estimated number of species by various taxonomic groups categorized by world species and Indian species in 2007.

Table 33.8: presents the State-wise forest occupancy and population estimate of tigers as per the refined methodology in 2007-08.

Table 33.9: presents the State-wise estimated population of wild elephants in 2002 and 2007.

Table 33.10: presents the production of various forest produce since 2002-03 and State-wise break-up thereof for 2005-06.

Table 33.11: presents the year-wise global average temperature, atmospheric concentration of carbon dioxide and emission from fossil burning since 2000.

Table 33.12(A): presents the year-wise and State-wise air quality in industrial areas under National Ambient Air Quality Monitoring Programme categorized by SO₂, NO₂ and RSPM since 2001.

Table 33.12(B): presents the year-wise and State-wise air quality in residential areas under National Ambient Air Quality Monitoring Programme categorized by SO₂, NO₂ and RSPM since 2001.

Table 33.13: presents the year-wise and parameter-wise water quality of Ganga, Yamuna, Narmada, Godawari, Krishna, Kaveri, Mahanadi and Brahmaputra since 2001.

Table 33.14: presents the year-wise production of various ozone depleting substance (ODS) in India since 2001.

Table 33.15: presents the year-wise consumption of various ozone depleting substance (ODS) in India since 2001.

Table 33.16: presents the year-wise export/import of various ozone depleting substance (ODS) in India since 2001.

Table 33.17: presents the average gaseous composition of dry air in the troposphere.

Table 33.18: presents the various mass emission standards for petrol driven vehicles, namely two-wheelers, three-wheelers, four-wheelers, and diesel vehicle since 2000.

Table 33.19: presents the year-wise revenue and expenditure from/on since 2000-01 and State-wise break-up thereof for 2005-06.

Table 33.20: presents the plan-wise progress area afforested and afforestation expenditure since first Plan.