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GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT AND FORESTS

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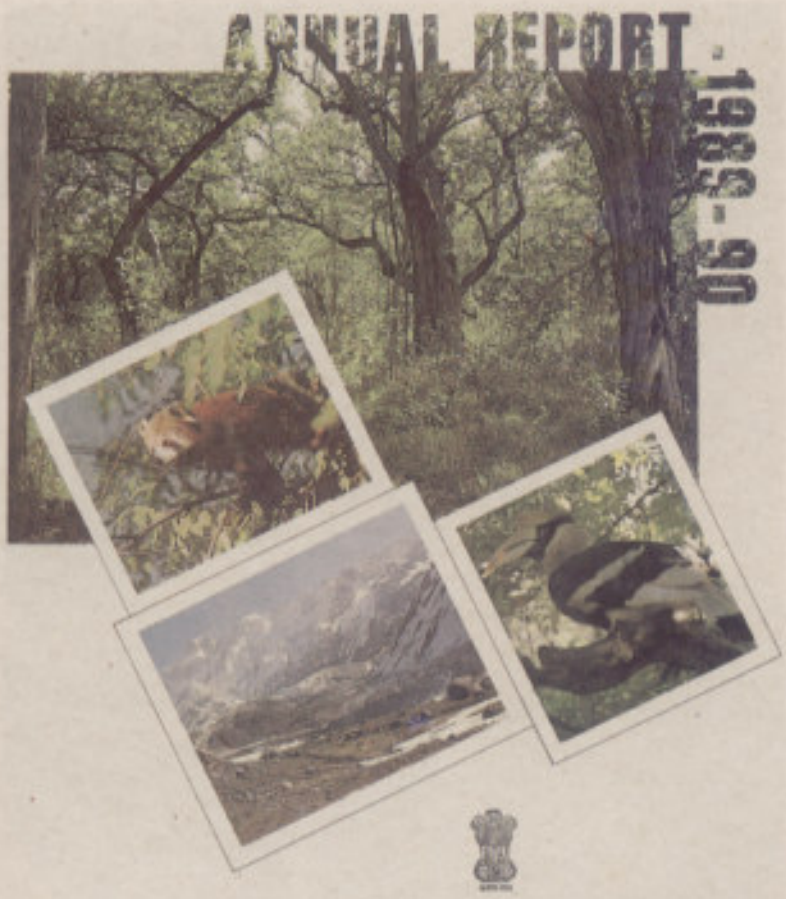

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DEPARTMENT OF ENVIRONMENT, FORESTS & WILDLIFE

CONTENTS

1. INTRODUCTION

1.1 ROLE AND ORGANISATION

The Ministry of Environment and Forests serves as the focal point in the administrative structure of the Central Government for planning, promotion, and co-ordination of environmental and forestry programmes. The Ministry's main activities include conservation and survey of flora, fauna, forests and wildlife, prevention and control of pollution, afforestation and re-generation of degraded areas and protection of environment. These tasks are being fulfilled through environmental impact assessment, eco-regeneration, assistance to organisations implementing environmental and forestry programmes, promotion of environmental and forestry research, extension, education and training to augment the requisite manpower, collection, collation, storage and dissemination of environmental information, and creation of environmental awareness at national level.

1.1.1 Allocation of Business

Items of work allocated to the Ministry of Environment and Forests are as follows:

- Environment and ecology, including environment in coastal waters, mangroves and coral reefs, but excluding marine environment on the high seas;
- Botanical Survey of India and Botanical Gardens;
- Zoological Survey of India;
- National Museum of Natural History;
- The Water (Prevention and Control of Pollution) Act, 1974;
- The Water (Prevention and Control of Pollution) Cess Act, 1977;
- The Air (Prevention and Control of Pollution) Act, 1981;
- The Environment (Protection) Act, 1986;
- Biosphere Reserve Programme;
- National Forest Policy and forestry development in the country including social forestry;
- Forest Policy and all matters relating to forests and forest administration in so far as the Andaman and Nicobar Islands are concerned;
- Indian Forest Service;
- Wildlife preservation and protection of wild birds and animals;
- Fundamental research including co-ordination thereof and higher education in forestry;
- Padmaja Naidu Himalayan Zoological Park;
- National Land Use and Wastelands Development Council;
- National Wastelands Development Board and National Mission on Wastelands Development;
- Central Ganga Authority; and
- Prevention of Cruelty to Animals.

1.1.2 Organisation

The organisational structure of the Ministry showing various Divisions and Agencies is given in Annexure I.

1.2 AN OVERVIEW OF ACTIVITIES DURING THE YEAR

1.2.1 Survey of Natural Resources

Flora

- Intensive floral surveys in certain priority areas of Andaman and Nicobar Islands, Jammu & Kashmir, Mizoram, Sikkim, Pondicherry, South Western Ghats and Nanda Devi Biosphere Reserve were taken up by the Botanical Survey of India (BSI) and about 28 per cent survey and exploration work has been completed in these areas.
- Volume III of the Red Data Book of Indian Plants containing more than 200 rare and endangered species has been published.
- Flora of India 'Fascicle 20' and State Flora of Tamil Nadu, Volume 3 have been published.
- First phase of the All India Co-ordinated Project on 'Ethnobiology' has been completed and the second phase covering several tribal areas of the country is being initiated.
- On the occasion of the Centenary Celebration of BSI, a Conservatory for succulent plants and a garden for medicinal plants called 'Charaka Udyan' were established.

Fauna

- A total of 78 faunal surveys covering various eco-systems have been conducted in 70 districts of several States of the country by the Zoological Survey of India (ZSI).
- Faunal resources of West Bengal, Lakshadweep Rushikulya estuary and the river Ganga have been compiled.
- Hydrobiological studies of Rushikulya estuary and limnological studies of Kabar lake have been completed.
- National Zoological collections have been enriched by addition of 1,03,084 identified specimens pertaining to 3,860 species.

— Status Survey of Endangered Species in North-Eastern India has revealed restricted distribution of three non-human primates viz., Hoolock Gibbon, Pigtailed Macaque and Stumptailed Macaque.

— In addition to its regular publications, ZSI published a volume each on the Fauna of Andaman & Nicobar Islands and Sunderbans Mangroves.

Forest Survey

— The Forest Survey of India completed the second assessment of forest cover in the country. The survey assessed a total of 64.01 million ha. as against the first assessment of 64.20 million ha. which means a loss of 0.19 million ha. of forest cover during the last four years.

Wildlife Survey

— A survey on the status of the Sarus Crane has revealed the declining trend of Sarus population in the country due to disappearance of wetlands.

1.2.2 Conservation of Natural Resources

Forest Conservation

— The high powered Committee was constituted to examine various facets of forest conservation, implementation aspects of the National Forest Policy, 1988 and the Forest (Conservation) Act, 1980.

— The Advisory Committee constituted under Section 3 of the Forest (Conservation) Act, 1980, has been reconstituted in accordance with the amended Forest (Conservation) Rules.

— Diversion of forest land for non-forest purposes during 1989 has been 20,365 ha. Detailed guidelines for submission of proposals for diversion of forest land for non-forest purpose have been issued. Out of the 3,907 proposals received under the Forest (Conservation) Act, 1980, 1,891 proposals were approved.

— Regional Offices of the Ministry have been conferred with powers to process proposals for diversion of forest land for non-forest use up to 1 ha.

— In order to reduce pressure on forests for fuelwood, townships of more than 5,000 population in the vicinity of forests were identified for supplying them LPG.

— The Modern Forest Fire Control Project for devising, testing, and demonstrating principles and techniques of prevention, detection and suppression of forest fire continued during the year. Eight more States have been identified for extension of the project during the Eighth Five Year Plan.

Wildlife Conservation

— The main thrust of conservation continued to be on strengthening the protected areas comprising 399 Sanctuaries and 69 National Parks including 18 Tiger Reserves.

— A Committee was constituted to frame tourism management plans for 12 Wildlife Reserves where the problem is particularly acute.

— Eighteen Tiger Reserves have so far been established in 13 states covering over 28,017 Sq. km. forest area of the country. During the year the 18th Tiger Reserve has been created at Valmikinagar in the West Champaran District of Bihar.

— The Ministry has approved the setting up of Field Research, Veterinary Centres and Nature Interpretation Centres in each Tiger Reserve to give a boost to research activities and to provide educational and scientific information.

— An eco-development programme in buffer area of Ranthambhore Tiger Reserve was launched to solve the problem of the people living in and around the tiger reserve.

— The All India Tiger Census 1989 has estimated a total number of 4,200 tigers in the country, indicating an increase of about 200 tigers against 1984 census.

— Captive breeding programmes for highly endangered species like Musk deer and Pheasants were continued.

— The National Zoological Park, New Delhi, continued the conservation of rare and endangered species of wild animals like Thamin Deer, Swamp Deer, and Sloth Bear through successful breeding.

Biosphere Reserves

— Out of the 14 potential sites identified for setting up Biosphere Reserves in India, 7 Biosphere Reserves have been set up, so far. These are: Nilgiri, Nanda Devi, Nokrek, Great Nicobar, Manas, Gulf of Mannar and Sunderbans.

— Actions Plans for survey, protection, eco-restoration, education and awareness have been sanctioned for all the existing Biosphere Reserves except Manas.

— Project documents in respect of 4 Biosphere Reserves namely Uttarakhand, Thar Desert, North Andaman Island and Khaziranga have been referred to the respective State Governments for concurrence.

Wetlands, Mangroves and Coral Reefs

— The National Management Committee has identified 16 wetlands for conservation and for the preparation of Management Action Plans.

— Action Plans for 5 more wetlands viz., Wullar (J&K), Chilka (Orissa), Bhoj (MP), Pichola-Fateshsagar (Rajasthan), and Renuka (HP) were approved during the year.

— The National Mangrove Committee approved Action Plans for four out of the 15 identified mangrove areas. These are Bhitarkanika and Mahanadi Delta (Orissa), Coondapur (Karnataka) and Achra-Ratnagiri (Maharashtra).

— Steps have been initiated for conservation of coral reefs in the areas of Lakshdweep, Andaman & Nicobar Islands, Gulf of Mannar and Gulf of Kutch.

National Conservation Strategy

— The Core Committee constituted for formulation of National Conservation Strategy prepared an outline of the same which has been circulated to over 700 organisations in the country including State Governments, Universities, NGOs, etc., for comments/suggestions. A sub-group of the Committee also undertook the preparation of a draft Environment Policy Statement.

1.2.3 Environmental Impact Assessment

— The existing guidelines on ports and harbours, river valley projects, thermal power projects, mining projects, industries and development of beaches are being revised and updated. In addition, guidelines for rail/road/highway projects, airports project, communication projects and new towns have been finalised and published.

— Out of the 341 development projects appraised during the year for environmental clearance, 143 projects were cleared and 105 were rejected. Additional information has been sought for the remaining projects.

— The Tehri Dam Project proposed across Bhagirathi river near the Tehri Township in Tehri-Garhwal areas is still under consideration on the basis of plans furnished in December, 1989.

— The Ministry has set up an Environment Cell to keep track of the environmental action plans for the Narmada Sagar Project.

— Studies regarding environmental management in Neyveli Lignite Mine and the Model Environmental Management plan for an open-cast iron ore mine have been completed.

— In order to provide a uniformity of approach in coastal management and protection, the Ministry has initiated modalities for policy decision and direction under the Environment (Protection) Act, 1986.

— Island Development Authority continued to issue the guidelines for environmentally sound development of Andaman, Nicobar and Lakshdweep Islands. A Working Group set up to look into the environmental aspects of various developmental projects of Diu and Chauch Islands, has made specific recommendations to ensure environmentally sound development of these Islands.

— Two afforestation schemes—one involving 2,500 ha. of mined areas, and the other involving 2,690 ha. of area on both the sides of the Shivalik Hills have been prepared for the Doon Valley.

— One policy level seminar and workshops covering environmental impact assessment in five major sectors like water resources development projects, ports and harbours and industrial siting and land use planning were organised under the Indo-Dutch Programme.

— An Indo-US Workshop on Environmental Management Planning for Singrauli Coal Fields was also organised.

1.2.4 Control of Pollution

Control of Water and Air Pollution

— The Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 continued to be implemented through the Central and the State Pollution Control Boards.

— The States of Manipur, Mizoram and Sikkim have constituted State Pollution Control Boards in their respective States. With this, all States except the States of Nagaland and Arunachal Pradesh have constituted their State Pollution Control Boards.

— Water (Prevention and Control of Pollution) Amendment Act, 1988 has been adopted by the States of Assam, Goa, Meghalaya, Maharashtra, Himachal Pradesh, Sikkim, Tripura, Tamil Nadu, Uttar Pradesh and West Bengal.

— Under the United Nations Global Environmental Monitoring Systems (GEMS) and the Monitoring of the Indian National Aquatic Resources (MINARS) Programme, 90 new Water Quality Monitoring Stations have been set up during the year raising the total number of Monitoring Stations to 400 all over the country.

— Studies on Mahanadi and Mahi River Basins have been completed and those on Narmada, Indus and Tapti have been initiated.

— The Project on waste water recycling undertaken by the Central Pollution Control Board continued at three sites namely Baroda, Nagpur and Gwalior.

— A survey undertaken by the Central Pollution Control Board on Water Supply and Sanitation Status in Class I and Class II cities revealed that about 12,000 MLD of waste water is generated from 15,000 MLD of supplied water to 212 Class I cities and about 1,300 MLD of waste water from 1,600 MLD of supplied water to 241 Class II cities. In case of Class I cities about 2,500 MLD of waste water receives some kind of treatment before final disposal. Whereas, in Class II cities almost entire waste water is disposed of without any treatment.

— Twenty eight new Air Quality Monitoring Stations have been set up thereby raising the total number of Monitoring Stations to 200 spreading over 49 cities throughout the country.

— National and Zonal Task Forces were reconstituted for the implementation of standards in the industries like fertilizer, iron and steel, cement, pulp and paper and thermal power.

— The survey on assessment of vehicular pollution in Metropolitan cities conducted by Central Pollution Control Board has revealed that petrol driven vehicles are the major contributors to total vehicular pollution load in all the Metropolitan cities.

— Under Indo-Dutch Programme on Industrial Counselling for effluent treatment in distilleries, 5 distilleries have been selected for bringing down the BOD load in the spentwash.

— Under an Indo-Swedish collaboration programme, development of new technologies for a cost effective system for protection of environment in large pulp and paper mills has been mooted.

— Several publications on the assessment of vehicular pollution in Metropolitan cities and comprehensive documents on Minimum National Standards for pharmaceutical and aluminium industries have been brought out.

Management of Hazardous Substances

— Responsibilities for identifying major hazards and steps to prevent and limit the consequences of an accident as well as training for safety during operations have been laid on the occupier as per the notified rules on manufacture, storage, and import of hazardous chemicals. State Governments have been instructed to identify hazardous installations and operations and implement the notified rules.

— An on-site and off-site plan model to handle emergencies in case of a major accident at a site have been finalised.

— Eighteen States/Union Territories have been provided partial financial assistance for creating infrastructure for management of hazardous chemicals. A Red-book titled *Central Crisis Group Alert System*, dealing with the management aspects at the time of chemical accidents in the country has been prepared.

— Eighteen categories of hazardous wastes have been regulated. As per stipulated rules, the authorised occupier shall have to take all steps to ensure proper collection, reception, packaging, labelling, transport, storage, treatment, and disposal of hazardous wastes.

— A Genetic Engineering Approval Committee (GEAC) has been set up to examine proposals for licensing the experiments and field trials in Genetic Engineering.

— India joined the International Convention on Transboundary Movement of Hazardous wastes known as 'Basel Convention'.

— Draft guidelines for handling of hazardous wastes in the country have been prepared and circulated to State Pollution Control Boards for comments/suggestions so as to finalise the same.

— A report on Chlorofluorocarbons (CFCs) and technical briefs on 'Asbestos' and 'Titanium-di-oxide' have been prepared.

— The Ministry has constituted a National Waste Management Council with the objective of promoting waste utilisation in the country. The Council will render advice to the Government, industry and other sectors for legislative, regulatory or fiscal measures needed to promote waste minimisation.

1.2.5 Regeneration and Development

Ganga Action Plan

— Out of the 262 schemes sanctioned at a total cost of Rs. 276.57 crores covering the States of Uttar Pradesh, Bihar, West Bengal, 89 schemes have been completed and the rest are in progress.

— A low cost sanitation programme at a cost of Rs. 7.74 crores, jointly financed by the Ganga Project Directorate, Ministry of Social Welfare, HUDCO, and the Government of Uttar Pradesh, is being implemented at Allahabad.

— A scheme for integrated development of Saraswati Ghat and adjoining areas near Sangam, Allahabad has also been taken up at an estimated cost of Rs. 28.18 crores.

— Construction of 32 electric crematoria in 22 towns of Bihar, Uttar Pradesh and West Bengal, at a total cost of Rs. 11.56 crores has been taken up to reduce the demand

for firewood by about 3,000 quintals per year equivalent to the produce of 900 ha. of forests.

— Diverse public participation programmes especially for the youth, students, pilgrims and school children have been organised.

Wastelands Development

— Afforestation activities by the National Wastelands Development Board were completed in a total area of 1.48 million ha. against the targetted area of 1.7 million ha.

— The scheme of Rural Fuelwood Plantations is being implemented in 159 fuelwood deficient districts in 25 States and in the Union Territory of Delhi.

— During the year, 0.23 lakh ha. in the Himalayan region is being covered under soil, water and tree conservation schemes.

— Thirty five new projects were sanctioned with 'grants-in-aid to various agencies'. 30.50 crores seedlings are being raised under the decentralised people's nurseries scheme during the year. Silvipasture schemes to augment the production of good quality grass and fodder continued in collaboration with the National Dairy Development Board.

— Several schemes like plantation of minor forest produce including medicinal plants, seed development, aerial seeding and area oriented fuelwood, fodder projects have been taken up.

— Fourteen social forestry projects are being implemented in 14 States with financial assistance from World Bank, United States Agency for Internationl Development (USAID), Canadian International Development Agency, Swedish International Development Authority, Overseas Development Agency (UK).

— A National Mission on Wastelands Development has been launched to upgrade and strengthen the wastelands development programme. Six mini-missions have been set up to implement various programmes of the National Mission on Wastelands Development. An Empowered Committee has been set up for reviewing and guiding the Mission's activities.

Other Activities for Regeneration

— Eco-Task Forces of Ex-servicemen, deployed in Rajasthan, Jammu and Kashmir and Uttar Pradesh continued their activities on afforestation, pasture development, soil and water conservation and other restorative works.

— Four field development projects demonstrating technologies for restoration of selected degraded areas have been completed.

— Activities on eco-regeneration of Pushkar Lake Valley, Ajmer, ecological improvement of Gopeshwar (UP) Area and integrated environment development around Binsar Sanctuary, Almora (UP), were continued.

— Fifty Eco-development Camps were sanctioned in various parts of the country to undertake short-term ecological and environmental improvement activities with the involvement of school children, voluntary agencies, Non-Governmental Organisations, etc.

1.2.6 Research

Environmental Research

— Under the Environmental Research Programme and the Man and Biosphere Programme, 24 new projects were sanctioned during the year while 23 research projects sanctioned earlier were completed.

— The second phase of the all India Coordinated Project on Ethnobiology has been launched covering tribal areas located in various States.

— A project on studies on sea level rise is being conducted by 9 institutions all over the country at a total cost of Rs. 37.35 lakhs.

— Support to the research under All India Coordinated Research on Conservation of Endangered Plant Species was continued.

— Seventeen new projects under the 'integrated action oriented research demonstration and extension' programme on Eco-development were sanctioned during the year. Out of these, 13 are for the Himalayan Region, 4 for the Western Ghat Region and one for the Eastern Ghat Region. Twenty research projects on Himalayan Region, 8 on Western Ghats and 4 on Eastern Ghats sanctioned earlier were completed.

— An Integrated Action Oriented Research Programme on river Cauveri has been taken up.

— Workshops and meetings were organised to review the on-going research projects under various programmes.

— The Ecological Research and Training Centre at the Indian Institute of Science, Bangalore and the Centre for Mining Environment, Dhanbad, continued their programme under the 'Centres of Excellence' scheme to strengthen research and training in priority areas of environmental sciences and management.

— The G.B. Pant Institute of Himalayan Environment and Development, an autonomous organisation of the Ministry

initiated 10 projects on conservation and sustainable development of natural resources of the Himalayan Region. Four Sub-Centres of the Institute have also been set up at Kumaon (UP), Garhwal (UP), Gangtok (Sikkim), and Chuchuyamlang (Nagaland). The Institute has started the publication of a News letter 'Hima-Paryavaran' both in Hindi and English, disseminating information on the Institute's activities.

Research on Wetlands

— Research on various aspects of wetlands conservation is being promoted through universities and other research institutions. In addition to the 16 on-going research projects, three new projects were sanctioned.

Research on Mangroves

— Research on various aspects of mangrove conservation is being taken up through universities and other research institutions. Two new research projects were sanctioned.

Research on Biosphere Reserves

— Sixteen research projects covering Hydrological studies, Human Ecology, Eco-restoration and long-term monitoring of biological processes were sanctioned under Nilgiri and Nanda Devi Biosphere Reserves. Two research projects sanctioned earlier were completed.

Forestry Research

— The Indian Council of Forestry Education and Research (ICFRE) and Forest Research Institute, Dehradun, undertook research activities on different aspects of forestry namely, silviculture, forest protection, ecology and conservation, social forestry, etc.

— Research work on standardisation of afforestation techniques and demonstration and evaluation of Himalayan Shrubs for their utility for fuel, fodder and soil conservation is being carried out at the Coniferous Research Centre, Shimla.

— The Institute of Forest Genetics and Tree Breeding, Coimbatore, has undertaken research in the field of forest genetics and tree breeding.

— National level research in the field of wood science and technology including physical and chemical properties of forest produce, their uses, processing, etc., continued to be carried out at the Institute of Wood Science and Technology, Bangalore.

— Institute of Deciduous Forests, Jabalpur, continued research activities on the problems of deciduous forests.

Wildlife Research

— The Wildlife Institute of India continued its research activities on various aspects of ecology and management problems of wildlife. Twenty research projects in different parts of the country have been taken up by the Institute.

— The Bombay Natural History Society, Bombay, continued its research projects on the ecology of Keoladeo National Park, Pt. Calimere Sanctuary, Migratory birds, elephants and lesser floricans.

— Under the Indo-US Rupee Fund Programme, two new projects were sanctioned to the Bombay Natural History Society, Bombay.

National Natural Resources Management System (NNRMS)

— Based on the recommendations of the Standing Committee on Bio-resources and environment, 37 projects were identified under the NNRMS Programme, out of which 11 projects have been sanctioned for implementation.

1.2.7 Education and Information

Formal Training

— Fifty IFS Probationers and two foreign trainees are being trained at the Indira Gandhi National Forest Academy, Dehra Dun. A computer cell has been set up in the Academy to train the IFS probationers in the EDP fundamentals.

— Two hundred and forty four officers of the State Forest Services are being trained in the three State Forest Service Colleges located at Dehra Dun (UP), Burnihat (Assam), and Coimbatore (Tamil Nadu). Training to the Range Officers of the State Forest Department continued in the Forest Rangers Colleges at Chandrapur (Maharashtra), Balaghat (MP) and Kurseong (West Bengal).

— A six-week orientation course for 23 IFS officers was arranged at Indira Gandhi National Forest Academy, Dehra Dun.

— A six-month course on social forestry is being conducted for the officers of the State Forest Departments at State Forest Service College, Dehra Dun.

— Twenty one candidates from Jammu and Kashmir participated in two special courses on 'Techniques of Wood Seasoning and Preservation' conducted at Forest Research Institute, Dehra Dun.

— Financial support was provided to the Indian Council of Agricultural Research (ICAR) to continue the undergraduate courses in forestry in 14 State Agricultural Universities and Post-Graduate courses in two universities.

— Twenty-six candidates are being trained under the Post-Graduate Diploma course conducted by the Indian Institute of Forest Management (IIFM), Bhopal. The IIFM also conducted management development programmes, one week refresher courses for IFS officers and an orientation course for IFS probationers.

— The Wildlife Institute of India, Dehra Dun continued its various programmes on wildlife education and training. During the year, seven students completed Post-Graduate course on 'Wildlife Biology' from the Institute.

— Three capsule courses on Wildlife Management were conducted by Wildlife Institute of India to introduce a minimum level of scientific management in National Parks and Sanctuaries.

Environmental Education and Awareness

— "Conserving our Water Resources" continued to be the central theme for National Environmental Awareness Campaign (NEAC), 1989. November 19th to December 18th was observed as the National Environment Month (NEM). More than 300 organisations including NGOs, schools, and colleges, universities, research organisations, professional societies and Government agencies from all over the country participated in the Campaign and organised various programmes such as seminars/workshops, audio-visual shows, rallies, padayatras, folk dances, essay/debate/painting competitions, etc. All possible target groups like students/youth, teachers, women, legislators, voluntary workers, armed forces and the general public were covered by the Campaign.

— The Centre for Environment Education (CEE), Ahmedabad, conducted four 'Regional Resource Persons', Training Workshops to train personnel from State Department of Education and voluntary organisations and initiated the formation of 80 clusters of NGOs and schools all over the country to initiate environmental education programmes and actions.

— The C.P.R. Environment Education Centre, Madras, organised a training programme highlighting various environmental issues, methods of water conservation, pollution treatment, etc., and conducted two exhibitions on conservation of water resources in several parts of the Southern Region.

— The National Museum of Natural History organised a variety of programmes and activities for promoting environmental awareness among the masses.

— During the NEAC, Doordarshan telecast fortnightly programmes on environment and related areas in the National Network. The All India Radio also broadcast several programmes on environment.

— An Indira Gandhi Conservation Monitoring Centre at Worldwide Fund for Nature—India at New Delhi has been provided financial assistance for its building construction. The Centre aims at collecting, analysing, disseminating information/data related to the conservation of species, habitats micro-organisms, etc.

— Two major interpretative programmes at Kanha National Park, MP and at National Zoological Park, New Delhi and the first module of the Children's Environmental Education Television Project have been completed by Centre for Environment Education, Ahmedabad.

— Fourteen people from voluntary organisations and universities were trained in a eight-month course on environmental education including theory and practical on-the-job training by the Centre for Environment Education, Ahmedabad.

— Workshops, intensive training programmes for children and exhibitions were conducted by CPR Environmental Education Centre, Madras. A variety of resource materials for children, teachers and voluntary organisations on different aspects of environment were also published by the Centre.

— Sixty four universities, NGOs, research institutions, and professional bodies were provided financial assistance for organising technical seminars/symposia/workshops on various environmental topics of current interest.

— A new gallery entitled "Cell-the basic unit of life" depicting structural and functional aspects of the cell and a "Bio-science Computer Room" has been set up at the National Museum of Natural History (NMNH).

— The Museum conducted summer programmes for teenagers, nature painting competitions and a Nature Camp for promoting environmental education among children.

— An exhibition entitled "Our Environment—Our Future" was organised by the Ministry as a part of the India International Trade Fair, 1989 at Pragati Maidan in November, 1989, in which Centre for Environment Education, Ahmedabad, National Wastelands Development Board, Ganga Project Directorate and various other agencies participated. The exhibition depicted the rich biological diversity of India, threats to our natural heritage through deforestation, soil erosion, pollution of land, air and water, etc., and was awarded a special commendation medal for excellence by the Trade Fair Authority.

— The Pitambar Pant National Environment Fellowship was awarded to Dr. V.M. Meher-Homji, Honorary Dean, Salim Ali School of Ecology, Pondicherry and to Dr. K.N. Mehrotra, Principal Scientist, Indian Agricultural Research Institute, New Delhi for the years 1988 and 1989 respectively.

— A Chair in Environmental Law entitled Jawaharlal Nehru Professorship set up by the Ministry in 1988 at the Jawaharlal Nehru University, New Delhi started functioning during the year.

— The Ministry approved, in principle, the institution of a Fellowship at Jodhpur University for the study on Desert Ecology. It has also been decided to undertake afforestation work and to set up a Museum/Desert Ecology Interpretation Centre at Khejarli village near Jodhpur, as a tribute to the Bishnoi community whose men and women sacrificed their lives to save trees from being felled in 1730 AD.

Environmental Information

— The Environmental Information System (ENVIS) Network with its Focal Point in the Ministry and 10 other ENVIS Centres on diverse areas of environment continued their activities on collection, collation, storage, retrieval and dissemination of environmental information to all concerned.

— The Focal Point of ENVIS enriched the existing information base by acquiring various documents on environment and related areas for storage, retrieval and dissemination of information.

— More than 3,500 queries on diverse aspects of environment were responded to by the ENVIS Focal Point and ENVIS Centres out of which more than 1,300 queries were responded to by the Focal Point alone.

— The quarterly abstracting Journal namely, "Paryavaran Abstracts", reporting Indian research on environment and related areas, continued to be published by the ENVIS Focal Point.

— Number of computerised data bases were developed/up-dated by the ENVIS Focal Point in order to disseminate the latest information to the users.

— The Focal Point of ENVIS also continued its liaison with other National Information Systems for exchanging environmental information and to avoid duplication of efforts.

— ENVIS Focal Point in the Ministry continued its activities as the National Focal Point (NFP) and as the Regional Service Centre (RSC) for South Asia Sub-region of INFOTERRA of UNEP. As NFP, more than 500 Indian sources engaged in environment related activities were registered for inclusion in ' International INFOTERRA Directory of Environmental Sources' published by UNEP. During the year, the Focal Point as NFP and RSC of INFOTERRA processed 3,219 National and 336 International queries and provided substantive information to the users.

1.2.8 Legislation and Organisation

— Powers under Section-5 of the Environment (Protection) Act, 1986 were delegated by the Central Government to 22 States.

— Action has been initiated against 91 polluting industries, during the year. Directions have been issued in 52 cases out of which 33 units have been instructed for closure and 19 units were given time to set up Effluent Treatment Plants (ETP) within the stipulated period.

— As on 1st December, 1989, the number of cases filed by the Central/State Pollution Control Boards is 3,777 out of which 1,092 have been decided and the rest are pending in various courts.

— Standards for discharge of effluent/emission in respect of Asbestos, Chloro-Alkali, Large Pulp and Paper industries, Integrated Iron and Steel Plants and Reverberatory Furnaces have been notified. Emission standards for Motor Vehicles have also been notified. The Hazardous Wastes (management and handling) Rules have also been notified.

— Rules on manufacture, storage, import, transportation, prohibition and restriction of handling of hazardous substances including hazardous micro-organisms have been notified.

— The rules on transport of hazardous chemicals by road have been notified under the Motor Vehicle Rules, 1989 and will become effective from 1st May, 1990.

— The Air (Prevention and Control of Pollution) (Union Territories) Amendments Rules, 1988 have been notified.

— The Standards for noise pollution have been notified.

— A High Powered Committee was constituted to examine various facets of forest conservation and implementation aspects of the National Forest Policy, 1988 and the Forest (Conservation) Act, 1980. The Amendments made in the guidelines for the diversion of forest lands for non-forest purposes under the Forest (Conservation) Act, 1980 have come into force with effect from 1st January, 1990.

— One hundred and twenty two laboratory staff and 288 field staff were sanctioned to strengthen the State Pollution Control Boards to carry out their programmes.

— An amount of Rs. 71 lakhs has been disbursed to the State Pollution Control Boards for equipment and scientific and technical staff.

— Financial assistance of Rs. 10 lakhs has been provided to the Departments of Environment of 19 States and 5 Union Territories for strengthening their technical set-ups.

— Eight new laboratories have been recognised as environmental laboratories during the year under Section 12 of the Environment (Protection) Act, 1986 raising the total number to 84.

— A proposal for 'Mandatory Public Liability Insurance Cover' for all hazardous chemical industries is under consideration.

1.2.9 International Cooperation

— India has been re-elected as member of the Governing Council of the UNEP.

— The Ministry participated in the meetings of the Intergovernmental Panel on Climate Change (IPCC) jointly set up by United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO).

— The Swedish International Development Authority (SIDA) continued its support to Social Forestry Projects.

— Projects on the establishment of training institutes in Tamil Nadu and Karnataka and evaluation of thermal processes for treatment and disposal of hazardous waste and studies were taken up with Denmark for assistance.

— The Netherlands continued its financial assistance for projects under the Ganga Action Plan and for Pollution Control.

— The Indo-FRG Programme on strengthening capabilities of selected State Pollution Control Boards was continued.

— The FRG assisted integrated project for development of Dhauladhar (HP) has been completed.

— Projects on Forest Fire Control Programmes, assistance to Wildlife Institute of India and Aerial Seeding are being implemented with UNDP assistance under Country Programme (CP—III).

— Under Country Programme—IV (CP-IV) of UNDP, various projects in forestry sector have been formulated with an outlay of US $ 5 million.

— India participated in a number of deliberations in the International Fora on global environmental issues.

1.2.10 New Initiatives

— The Ministry has recently taken several new initiatives to draw nations attention towards the basic precincts of sustainable development and towards providing ecological security for the future generations. The thrust of these initiatives has been on providing a policy framework to realize conservation, a regulatory framework to penalize the polluters an institutional framework to empower citizens and an organisational framework to achieve the goals. The details of these initiaves are given in chapter. 11.

1.2.11 Administration and Budget

— In accordance with the Revised Recruitment Rules for Group 'A' Scientific posts in the Department, 46 vacancies were filled up and 160 Group 'A' Scientific Officers were reviewed and 98 were promoted to the next higher grade under the 'Flexible Complementing Scheme'.

— A special drive to fill up backlog of Scheduled Caste/Scheduled Tribe vacancies for Group 'A', 'B', 'C' and 'D' posts in the Ministry and associated offices was taken up and selections were made for 115 posts.

— As a measure of simplification of procedure, all the forms which are in use in the Ministry were reviewed by the Forms Control Committee.

— The Hindi Salahkar Samiti was reconstituted in August, 1989 and met once and reviewed the progress in the use of Hindi.

— Hindi week was organised during 11th-15th September, 1989 in which various competitions were held and prizes distributed to the winners.

— A Quarterly Journal "Paryavaran" in Hindi continued to be published for encouraging creative writing in Hindi among the Officers and the employees. The prize schemes introduced in 1987 to encourage creative and original writing on topics relating to environment in Hindi continued and during the year, three prizes were awarded to the winners.

— The Civil Construction Unit undertook various construction activities with the total estimated cost of Rs. 35.47 crores.

— The Budget Estimate (Plan) and the Revised Estimate (Plan) of the Ministry during 1989-90 was Rs. 202.00 crores and Rs. 190.04 crores respectively.

2. SURVEY OF NATURAL RESOURCES

2.1 SURVEY OF FLORA

2.1.1 The Botanical Survey of India (BSI) was established in 1890 with the objective of surveying and identifying plant resources of the country. The Survey has its headquarters at Calcutta and 9 Circles located in different phytogeographical regions of the country. The objectives of BSI after its restructuring have been classified into primary and secondary as detailed below:

2.1.2 Primary Objectives

- To survey entire plant resources of the country,
- To undertake and complete taxonomic studies of all the flora of the country,
- To enlist all endangered species to undertake measures for their effective conservation and to collect and maintain germplasm and gene bank of endangered, threatened and vulnerable species,
- To publish volumes of National and State Flora of States/Union Territories,
- To identify, collect and preserve specimens of plants which are economically and otherwise beneficial to human beings and
- To prepare National Data Base on herbarium collections including types, live collections, plant genetic resources, plant distribution and nomenclature.

2.1.3 Secondary Objectives

- To undertake studies on selected critical and fragile ecosystems,
- To undertake assessment of flora relating to environmental impact studies as may be specifically called for,
- To undertake ethnobotanical studies and evaluate plants of economic utility in specified areas and
- To carry out geobotanical studies in specified areas.

2.1.4 The activities of the BSI during the year are as follows:

2.1.4.1 Survey and Taxonomic Studies

Intensive survey work was taken up in priority areas to collect, identify and document the plant resources. The areas surveyed during the year are as follows:

- Andaman and Nicobar Islands;
- North Andaman Biosphere area which includes Saddle Peak, Ariel Bay, Lamia Bay I & II, Kalipur, Kalighat, Kalpong, Table, East, Turtle and Smith Islands, North Nicobar Islands, Kamorta, Munak, Kakkana, Pilpillow and Champion areas. In addition, Little Andaman and Middle Andaman Mangrove vegetations were surveyed,
- Jammu & Kashmir: Jammu, Risai, Trikunta Hills, Anantnag and Rajauri,
- Mizoram: Lungleh, Seling, Thitlang, Chhahtlang, Sepchhip, Rhelkang, Zobok, Sangu, Zhotlang and Nagurthalang,
- Pondicherry: Survey work was conducted in most parts of the Union Territory,
- Sikkim: Dikchhu valley, Paulny plains, Upper Tista valley, Lhonak valley, Chola range, Zemu valley and Sakyong valley,
- South Western Ghats: Sivagiri and Sethur Hills, Pachakoomatachi, Vellimalai, Highway Mountain, Eravikulam, Pooyamkutty, Moozhiar, Goodrical Reserve Forests, Pothigaimalai and Vattapara and
- Uttar Pradesh: A final tour for collection and photography was undertaken in Nanda Devi Biosphere areas.

About 28 per cent survey and exploration work has been completed in the priority areas listed above. More than 5,210 plant specimens collected during these surveys have been processed and preserved for further study. 300 specimens were mounted on herbarium sheets and 950 of them were accessioned. Thirty per cent of the collected plants, seeds and other propagules of rare and threatened species and less known economic plants were collected and introduced in the gardens of BSI.

A critical study and identification of 1,500 species from among the collections made from the States of Manipur, Mizoram, Assam, Nagaland was completed. The publication of the above State Flora is in progress.

2.1.4.2 Rare and Endangered Species

Red Data Book of Indian Plants Vol. 3 comprising of more than 200 rare and endangered species was published. The rare and endangered species were introduced in Botanic Gardens and Orchidaria of BSI for *ex situ* conservation and multiplication.

2.1.4.3 National Flora and State Flora

National Flora

The manuscript of Flora of India: Fascicle 20 comprising of families, Barclayaceae, Nelumbonaceae, Nymphaceae, Rhamnaceae, Sabiaceae, Stachyuraceae, Tetracentraceae, Zygophyliaceae has been sent for publication. While manuscripts of the families viz., Tamaricaceae, Hypericaceae, Sonneratiaceae, Goodeniaceae have been edited for publication in Flora of India, fascicle 21. Florae Indicae Enumeratio Vol. 1 (Monocotyledons) has been published.

Fig 1: *Pandanus leram*—One of the important elements of the flora of Nicobar Islands.

State Flora

State Flora of Tamil Nadu Vol. 3 was published. Work on compilation of the State Flora of Madhya Pradesh Vol. 1, Maharashtra Vol. 1 and West Bengal Vol. 1 has been completed. Although survey work in some priority areas like Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland and Sikkim is still in progress, compilation of these State Flora has also been initiated based on available collections.

2.1.4.4 National Data Base

- Detailed data relating to 850 type specimens available in various Indian herbaria was listed,
- 650 species growing in BSI and other gardens of India were listed,
- Distribution data of 650 species of flowering plants of India was compiled and
- Nomenclature of 710 species of India was updated.

2.1.4.5 Studies on Selected and Fragile Ecosystems

- Identification Manual of Indian Mangroves has been published.

2.1.4.6 Environmental Impact Assessment

Floristic survey and assessment of Tipaimukh Dam site on Assam-Manipur border was completed and the report was submitted.

2.1.4.7 Ethnobotanical Studies

Work on the first phase of the All India Coordinated Project on Ethnobiology, covering studies on Onges of Andaman Islands and certain tribals of Andhra Pradesh has been completed. The second phase of the project covering other tribal areas of the country is being initiated.

2.1.4.8 Geobotanical Studies

Geobotanical studies in Singhbhum (Bihar) and Khetri (Rajasthan) Copper belt areas were taken up in collaboration with the Geological Survey of India. During intensive and sytematic field trips, plant samples were collected alongwith soil samples at different sites for chemical analysis. More than 800 plant and soil samples were analysed for Copper, Nickel, Lead, Cobalt, Zinc, Manganese and Chromium. The behaviour of some plants with respect to mineralisation is noticeable indicating the specificity of certain plant species in the mineralised zones. The project report is being finalised.

2.1.4.9 Other Activities

Apart from maintaining National collection of herbarium specimens, identification services, data on distribution and cultivation of plant species, living and preserved materials for scientific research are supplied to various scientific institutions and individuals.

- The Central National Herbarium (CNH) and all herbaria of Circles of BSI have regularly exchanged specimens with other Indian and foreign herbaria. More than 1,200 specimens were exchanged on loan with University and

Institutional herbaria of India. About 825 specimens were exchanged with herbaria abroad. The type section of CNH was enriched by adding 50 more type specimens and photographs of types.

— Palynology Unit of CNH completed work on pollen morphology of 85 species of Caesalpinaceae, Rubiaceae and Ongraceae. Pollen and Seed morphological studies under Scanning Electron Microscope (SEM) were initiated with the installation of SEM during the year.

— Ecology Unit completed work on Mangroves of the Mahanadi Delta. Work on Floristic survey of coastal areas was initiated.

— Crytogamic Unit completed work on *Microlepia strigosa complex* (Dennstaedtiaceae) and *Luersenia* in India. Work on Pteridophytic flora of N.E. India, Illustrated Lichen Flora of West Bengal and revision of some genera of Polypodiaceae have progressed satisfactorily. Family Hymenochactaceae of India comprising 78 species was completed as part of studies on Indian Polypores. Families Pottiaceae and Rissidentaceae (Bryophytes) progressed as per the target.

— Cytology Unit completed compilation of chromosome number reports from published literature towards the publication of supplementum to the Chromosome Atlas of India. Besides this, Chromosome numbers of 25 flowering plant species were determined.

Fig 2: *Meconopsis nepalensis*—A rare 'Poppy' of the Sikkim Himalayas.

— Economic Botany Unit identified 15 plants of Ethnobotanical importance among the collections made from different tribal areas of West Bengal. Ethnobotanical Data from more than 5,000 herbarium specimens of Rosaceae and Orchidaceae were documented. Data were also compiled on 5 less known economic plants of India.

Fig 3: *Garvia callosa*—A wild species of ornamental value.

Fig 4: *Paphiopedilum spicerianum*—A Lady's slipper orchid of North-Eastern Region.

— Industrial Section of the Indian Museum maintains exhibits of plant products in its galleries. The old materials on display were replaced by new ones and were labelled with updated information.

— The Indian Botanic Garden, Experimental gardens and Orchidaria of BSI have introduced about 650 plants of interesting species apart from maintaining their live collections. Special emphasis was laid on introduction and multiplication of rare and threatened plant species of the country. Vanamahotsava, flower shows, film shows, conducted tours in the gardens and drawing competitions for children were organised to educate the general public. Seed materials and Index Seminum were regularly exchanged with different gardens of India and abroad.

— BSI Scientists participated and presented research papers in different National and International Symposia/ Conferences/Seminars.

2.1.5 Centenary of Botanical Survey of India

The Botanical Survey of India celebrated its Centenary to mark the completion of 100 years of its service to the cause of taxonomy and plant conservation. On this occasion a conservatory for succulent plant and a garden for medicinal plants called 'Charaka Udyan'—both established by the BSI were declared open by the Hon'ble Union Minister of State for Environment and Forests and the Hon. Chief Minister of West Bengal respectively.

2.1.6 Publications

The following publications were brought out during the year:

— Bulletin of the Botanical Survey of India; Vol. 29,
— Flora of Saurashtra; Part III,
— Economic Plants of India; Vol. 1,
— Identification Manual of Indian Mangroves,
— Annual Report of Botanical Survey of India 1987-88,
— BSI newsletter, Vols. 13(2), 14(1),
— Directory of Botanic Gardens,
— Flora of Nallamalais; Vol. 2,
— Red Data Book of Indian Plants; Vol. 3,
— Chromosome Atlas; Vol. 3,
— Flora of Tamil Nadu—Analysis; Vol. 3,
— Florae Indicae Enumeratio; Vol. 1 and
— Flora of Bilaspur District, M.P. Vol. 1.

2.2 SURVEY OF FAUNA

2.2.1 The Zoological Survey of India (ZSI) was established in 1916 with the main objective of carrying out faunistic studies. The Survey with its headquarters at Calcutta has 15 regional/ecological/field stations located in different parts of the country.

2.2.2 The objectives of ZSI after its restructuring in 1987 have been classified into primary and secondary objectives. These include:
— Exploration and survey of faunal resources,

— Taxonomic studies,
— Status survey of endangered species,
— Publication of Fauna of India,
— Maintenance and development of National Zoological collections,
— Maintenance of Museums at Headquarters and Regional Stations and
— Central referral, information, advisory and library services.

2.2.3 The activities of ZSI during the year are as follows:

2.2.3.1 Exploration and Survey of Faunal Resources

A total of 78 surveys were conducted in 70 districts of various States of the country which cover various ecosystems.

— **Himalayan Ecosystem:** Surveys were conducted in the districts of Kulu, Lahaul Spiti, Mandi, Shimla and Sirmour in Himachal Pradesh and Pithoragarh, Nainital, Almora, Uttar Kashi, Tehri, Chamoli and Pauri in Uttar Pradesh.

— **Desert Ecosystems:** Surveys were undertaken in the districts of Ajmer in Rajasthan and Baroda, Bharuch, Bulser, Dangs, Palanpur, Panchmahal, Surat and Valsad in the State of Gujarat.

— **Tropical Rain Forest Ecosystems:** Surveys were undertaken in the States of Meghalaya (Garo, Jaintia and Khasi Hills Districts) and Arunachal Pradesh.

— **Indo Gangetic Plains:** Surveys were undertaken for Ghazipur, Gorakhpur, Lucknow, Muzaffarnagar, Saharanpur and Varanasi.

— **Wetlands:** Two surveys were undertaken at Kabar Lake in Bihar by the Joint Task Force of Freshwater Bilogical Station, Hyderabad and Gangetic Plains Regional Station, Patna.

— **Estuarine Ecosystem:** Surveys were conducted in Hooghly Malta Estuary (W.B.) and Mahanadi Estuary (Orissa).

— **Biosphere Reserves:** Three surveys to Nilgiri Biosphere Reserve and one survey each to Bandipur (Karnataka), Thekkadi (Kerala), Sunderbans Tiger Reserve (W.B.) and Nanda Devi Biosphere Reserve (U.P.) were conducted.

2.2.4 Faunistic Studies

2.2.4.1 Fauna of West Bengal

Studies were continued on the fauna of the State.

Fig 5: White Tiger—An attribute to zoos in India.

Fig 6: Nilgai (Blue Bull)—A widespread herbivour in many Indian Forests.

Manuscripts of 15 papers dealing with Echinodermata; Freshwater Mollusca; Annelida (Oligochaeta and Hirudinea); Insecta (Neuroptera); Lepidoptera (Pieridae, Ctenuchidae, Hypsidae, Hesperidae, Arctidae); Diptera (Simulidae); Arachnida (Scorpions); Freshwater, Estuarine and Marine Pisces and Reptillia, have been finalised. Further studies on other groups are in progress.

2.2.4.2 Fauna of Lakshdweep

After conducting the studies of fauna of Lakshdweep, 18 manuscripts have been finalised which provide general features and the fauna of the area pertaining to various groups viz. Echinodermata, Meiofauna, Annelida (Polychaeta), Sipuncula, Echiura, Crustacea (Stomopoda) and Insecta (Orthoptera, Dermaptera, Dictyoptera, Mantoidea, Coleoptera and Lepidoptera).

Studies on Polychaeta, Stomopoda, Crabs, Birds and Mammals were completed.

2.2.4.3 Studies on Rushikulya Estuary, Orissa

Hydrobiological work has been completed and analysis of data for zooplankton and hydrography was done. Identification of various groups of animals viz., Zooplankton, Polychaeta, Crustacea and fish and prawn larvae has been completed.

2.2.4.4 Fauna of Meghalaya and Tripura

Studies were completed on Annelida (Hirudinaria and Polychaeta), Mollusca, Insects (Odonata, Isoptera, Lepidoptera and Hymenoptera) and Arachnida (Scorpions). Studies were also undertaken for other groups viz., Porifera, Bryozoa, Parasitic Protozoa and Mammalia.

2.2.4.5 Fauna of Uttar Pradesh

As a result of faunistic survey conducted in different districts of U.P. a little over 7,000 specimens have been

collected. A part of the material belonging to insecta (Isoptera and Orthoptera), Acarina (Ixodid Ticks) and Mammalia has been identified. Further studies on other groups are in progress.

2.2.4.6 Limnological Studies of Kabar Lake, Bihar

Kabar Lake, together with a chain of 10 to 12 smaller lakes, locally called 'Chaurs' forms an interesting wetland ecosystem in the eastern plains of the country. A map showing its geographical distribution and topography has been prepared. A report on the socio-economic aspects and strategies for conservation of the Lake has also been prepared. The water samples collected from various sampling stations were scanned and physico-chemical parameters viz., Dissolved Gases, Dissolved Oxygen content (mg DO/l), free CO_2 (mg/1), alkalinity and its forms (Bicarbonates mg HCO_3/1 and Carbonates mg CO_3/l were recorded. In addition, studies on Zooplankton, Phytoplankton, Macro-invertebrates, Pisces, Amphibia, Reptiles and Ornitho-fauna are under progress.

2.2.4.7 Status Survey of Endangered Species

The survey conducted in North-Eastern India has revealed that out of all the non-human primates, three species viz., Hoolock Gibbon *(Hylobates hoolock)*, Pigtailed Macaque *(Macaca nemestrina)* and Stumptailed Macaque *(Macaca artoides)*, reported earlier to be widely distributed in the area, are now restricted to certain pockets only.

2.2.4.8 Faunal Resources of Ganga

Faunal resources of Ganga covering pisces, amphibia, reptilia, aves and mammalia were compiled.

2.2.4.9 Marine Aquarium-cum-Research Centre (MARC)

The setting up of a Marine Aquarium-cum-Research Centre at Digha is in progress. Procurement of equipment and stores and deployment of staff are under way.

2.2.4.10 Development of National Zoological Collections

The National Zoological Collections were enriched by the addition of 1,03,084 identified specimens pertaining to 3,860

Fig 7: Spotted Deer at a water hole.

Fig 8: Grey Pelican—A migratory bird to India.

species. These include 52 type specimens belonging to 21 new species and 13 specimens belonging to 6 species new to National Zoological Collections.

2.2.4.11 Identification and Advisory Services

The Zoological Survey of India continued to render identification and advisory services to various research and teaching institutions in India and abroad and different Central and State Government Departments and individuals. During the year, 887 zoological specimens pertaining to 235 species were identified. In addition, 110 other enquiries of scientific and technical nature requiring information and advice on various zoological and allied problems were also attended to.

2.2.4.12 Other Activities

- One of the Scientists of ZSI participated in the 9th Antarctica Expedition from 22.11.1989 to 9.4.1990.
- Renovation of Small Mammal Gallery of the Indian Museum, Calcutta is in progress.
- A training programme on 'Snails, Flukes and Man' was organised during the year in which trainees from various Indian Institutes, Universities and Zoological Survey of India participated.

2.2.4.13 Publications of Zoological Survey of India

- Fauna of India: 4 Volumes viz., Chalidoidea, Part I and II; Isoptera, Part I; Oligochaeta,
- Fauna of Conservation area: 2 Volumes, one on a General account of the fauna of Andaman and Nicobar Islands, and the other on the Fauna of Sunderbans Mangroves,
- Annual Report of Zoological Survey of India; 1983-84,
- Occasional Papers: Records of Zoological Survey of India Vol. 17, Part 1 and 2,
- Prani Jagat (Hindi), No. 2,
- Fauna of Orissa—Part 1 and 2,
- Records of Zoological Survey of India, Vol. 85, Part 3 and 4 and,
- A volume covering diverse topics such as introduction to basic components, land and soil pollution, wetlands, forests and vegetation, conservation of wildlife habitats, air and noise pollution and related subjects was compiled.

2.3 FOREST SURVEYS

2.3.1 State of Forest Report

The Forest Survey of India completed the second assessment of forest cover in the country by visual interpretation of Landsat satellite imagery pertaining to the period 1985-87. The following estimates of the forest cover in the country have been made:

Table 1

Category	Second Assessment (1985-87)	Previous Assessment (1981-83)
Forests		
1. Dense forest (crown density 40% & above	37.8470 million ha	36.1412 million ha
2. Open forest (crown density 10% to less than 40%)	25.7409 million ha	27.6583 million ha
3. Mangrove forest	0.4255 million ha	0.4046 million ha
Total:	64.0134 million ha	64.2041 million ha

— The second assessment gives the figure of 64.01 million ha. There has been a reduction of 0.19 million ha. of forest cover during the last four years. The annual rate of loss of forest cover works out to 47,500 ha. The annual loss of forest cover upto 1981-82 was 1.3 million ha.

— A digital cartography system was installed and it has started functioning at National Forest Data Management Centre (NFDMC), Forest Survey of India, Dehra Dun. The system is being used for digital processing of remote sensing data.

2.3.2 Forest Statistics

A statistical handbook 'India's forests, 1987' containing statistics pertaining to various aspects of forestry was compiled.

2.4 WILDLIFE SURVEY

2.4.1 The Ecological Society, Pune was entrusted with the survey of the status of the Sarus Crane. The first part of the study is over and according to the report the total Sarus population in the country is estimated as between 12,500 to 13,000 and is declining. The main cause of the decline in the population is the disappearance of wetlands.

2.4.2 The Salim Ali Centre of the Bombay Natural History Society conducted a survey of the endangered Rusty Spotted Cat in the Forests of Gujarat. The report has revealed that the status of this less known cat and other species is very critical due to depletion of forest cover and other related disturbances.

Fig 9: A deciduous forest in Western India.

3. CONSERVATION OF NATURAL RESOURCES

3.1 FOREST CONSERVATION

3.1.1 Revised National Forest Policy

The National Forest Policy formulated in 1952 was revised in 1988-89 after extensive consultation with the States, experts, and all relevant agencies. Protection, conservation and development of forests has been stressed in the revised Forest Policy. The basic objectives of which are:

- Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance;
- Conserving the natural heritage of the country;
- Checking soil erosion and denudation in the catchment areas of rivers, lakes, reservoirs;
- Checking the extension of sand-dunes in the desert areas of Rajasthan and along the coastal tracts;
- Increasing substantially the forest/tree cover in the country through massive afforestation and social forestry programmes;
- Meeting the requirements of fuelwood, fodder, minor forest produce and small timber of the rural and tribal populations;
- Increasing the productivity of forests to meet national needs;
- Encouraging efficient utilisation of forest produce and maximising substitution of wood, and
- Creating a massive people's movement with the involvement of women for achieving the objectives and to minimise pressure on existing forests.

A High Powered Committee consisting of the Members of Parliament and other distinguished persons was constituted to examine various facets of forest conservation; implementation aspects of the National Forest Policy, 1988 and the Forest (Conservation) Act, 1980, and to suggest ways and means of achieving conservation alongwith fulfilling the developmental aspirations of the people, especially those living in and around forests.

3.1.2 The Forest (Conservation) Act, 1980 and it's Implementation

The enactment of the Forest (Conservation) Act, 1980 was primarily based on the truth that the forests are being destroyed very fast in the country, specially in the Himalayas and other hill areas. The continued process of ruthless destruction of forests is not only leading to heavy erosion of soil, erratic rainfall and frequent floods, but also causing acute shortage of fodder, industrial wood, firewood etc. and more significant is the loss of productivity due to degraded and eroded lands.

Prior to the enactment of the Forest (Conservation) Act, 1980, the Central Govt. had issued guidelines to all State Governments/ Union Territories, according to which, besides other points, it was laid down that all proposals involving use of forest land on and above 10 ha. should be referred to the Central Ministry of Agriculture for prior concurrence. Obviously the intention was to have a little check on the indiscriminate felling of trees and loss of forest wealth. Unfortunately, it had no impact. In this perspective, the Forest (Conservation) Act, 1980 was enacted to check indiscriminate deforestation/diversion of forest land for non-forest use.

3.1.2.1 Amendment of the Forest (Conservation) Act, 1980

To check the violation of the provisions of the Forest (Conservation) Act, 1980, the Act has since been amended to make the existing provisions more stringent, which include the following:

- No State Government or other authority may issue orders directing that any forest land or any portion thereof may be assigned by way of lease or otherwise to any private person or to any authority corporation, agency or any other organisation not owned, managed or controlled by Government without prior approval of the Central Government;
- The scope of the existing definition of "non-forest purposes" has been extended to include therein cultivation of tea, coffee, spices, rubber, palms, oil-bearing plants, horticultural crops and medicinal plants. A further paragraph under the "Explanation" has been added to include such operations which are ancillary to forest conservation, development and management as part of forest purposes as this was not mentioned in the original Act; and
- Whoever contravenes or abets the contravention of any of the provisions of Section 2 of the Act shall be punishable with simple imprisonment for a period which may extend to 15 days including public servants who are directly incharge at the time the offence is committed.

3.1.2.2. Advisory Committee

The Advisory Committee, constituted under Section 3 of the Forest (Conservation) Act, 1980, has been reconstituted in accordance with the amended Forest (Conservation) Rules. Three eminent personalities in the field of environment and afforestation have been nominated in the Advisory Committee as Non-official Members.

3.1.2.3 Meeting of the Advisory Committee

A specific provision has been made in the Forest (Conservation) Act, 1980 laying down the periodicity of holding the meeting of the Committee. The Chairman shall call the meeting of the Committee as often as necessary but not less frequently than once in a month.

3.1.2.4 Diversion of Forest Land for Non-Forest Purposes

Prior to the enactment of the Forest (Conservation) Act, 1980, the average rate of diversion of forest land for non-forest purposes used to be in the range of 1.5 lakh ha. per year. But after the enactment of the Act, this rate has come down considerably. Year-wise details of the diversion since the enactment of the Act are given below:

Year	Forest land diverted in hectares
1980	Nil
1981	2,672.04
1982	3,246.54
1983	5,702.01
1984	7,837.59
1985	10,608.07
1986	11,963.11
1987	72,780.05
1988	18,765.35
1989	20,365.05

Detailed guidelines for submission of proposals for diversion of forest lands for non-forest purposes under Forest (Conservation) Act, 1980 were issued by the Ministry during the year.

3.1.2.5 Present Status of the Proposals Received under the Forest (Conservation) Act, 1980

The present status of the 3,907 proposals received under the Forest (Conservation) Act, 1980 till 31st December, 1989 is given below:

— Approved	1,891
— Not approved	534
— Rejected	1,217
— Withdrawn by the States/UTs	106
— Pending for final decision	159

The Central Government has decided that if no information is furnished by the States/UTs within a month from the date of seeking requisite information, the proposals will be rejected for 'non-furnishing of information'.

3.1.3 Regional Offices for Monitoring of Conditions/Safeguards

Six Regional Offices have been established at Bangalore, Bhopal, Bhubaneswar, Lucknow, Shillong and Chandigarh to monitor the implementation of the conditions imposed while conveying approval for diversion of forest land for non-forest use and also to evaluate ongoing forest development projects and schemes.

Regional Offices have been delegated powers to process proposals for diversion of forest land for non-forest use upto 1 ha. The State Governments will submit such proposals to the concerned Regional Offices.

3.1.4 Use of Alternative Source of Fuel

In order to reduce pressure on forests for fuelwood, townships of more than 5,000 population which are in the vicinity of forests have been identified with a view to supplying them with LPG. The list of such townships from the States/UTs of Bihar, Maharashtra, Rajasthan, Arunachal Pradesh, Haryana, Tamil Nadu, Sikkim, Goa, Dadra & Nagar Haveli, Daman & Diu, Tripura, Gujarat, Kerala, Nagaland and Himachal Pradesh have been forwarded to the Ministry of Petroleum and Natural Gas for taking further necessary action. The State Governments have been advised to ensure adequate supply of kerosene oil in these towns and to take preventive action to check unauthorised felling and smuggling of timber from the forest area.

3.1.5 Modern Forest Fire Control Project

The 'Modern Forest Fire Control Project' for devising, testing and demonstrating principles and techniques of prevention, detection and suppression of forest fires was continued during the year.

— Studies carried out to assess the effect of the project on localisation of fires, have indicated that the area burnt in Project area of Maharashtra has been reduced from 15 per cent in the base year 1985 to 1.86 per cent in 1989. During the period the average size of fire has come down from 190 ha. to 18 ha.,

— In the State of Uttar Pradesh, forest area burnt has been reduced from 15,789 ha. in 1984 to 10,798 ha. in 1989, and the average size of fire has been reduced from 45.10 ha. to 21.17 ha. This has been possible because the fires were contained by organising fast initial attack with the help of modern equipment and methodology introduced in the projects, and

— A number of demonstrations were organised in the project area for the officers of other states during this year. Eight more states have been selected for extension of the project during the Eighth Five Year Plan.

3.2 WILDLIFE CONSERVATION

3.2.1 The network of protected areas comprising 399 sanctuaries and 69 National Parks, including 18 Tiger

Reserves demonstrates the country's commitment to conserve wildlife and its critical habitat.

The main thrust of wildlife conservation continues to be on strengthening the management of these protected areas through central assistance, organising intensive training for wildlife managers, sponsoring of status survey and research in the management of endangered species, strict enforcement of the Wildlife (Protection) Act including control of domestic and international trade and traffic in wildlife and assistance for better management of zoos including captive breeding of endangered species.

3.2.2 Indian Board for Wildlife

A Committee was constituted to frame tourism management plans for 12 Wildlife Reserves where the problem is particularly acute. The Committee has submitted its report for five Wildlife Reserves and the report on others is expected shortly.

3.2.3 Enforcement of Wildlife (Protection) Act

The Regional Deputy Directors of Wildlife Preservation at Delhi, Calcutta, Bombay and Madras continued to enforce the Wildlife (Protection) Act and the provisions of Convention on International Trade in Endangered Species (CITES) and Export and Import Policy of India. Several cases of illegal trade were detected and handed over to State Wildlife Wings and the Customs Department for follow-up.

3.2.4 Project Tiger

3.2.4.1 The Centrally Sponsored Plan Scheme 'Project Tiger' was launched on 1st April, 1973 to achieve the following objectives:

- To ensure the maintenance of a viable population of the tigers in India for scientific, economic, aesthetic, cultural and ecological values, and
- To preserve for all times, areas of such biological importance as a national heritage for the benefit, education and enjoyment of the people.

3.2.4.2 To achieve these objectives, 18 Tiger Reserves have so far been established in 13 states covering over 28,017 sq. kms. forest area. The 18th Tiger Reserve at Valmikinagar was created in the West Champaran district of Bihar in January, 1990. The area is contiguous to Royal Chitwan National Park of Nepal and would provide protection to the population of tigers in Northern Bihar. Table 2 gives at a glance the distribution of areas of Tiger Reserves in the country:

Table 2

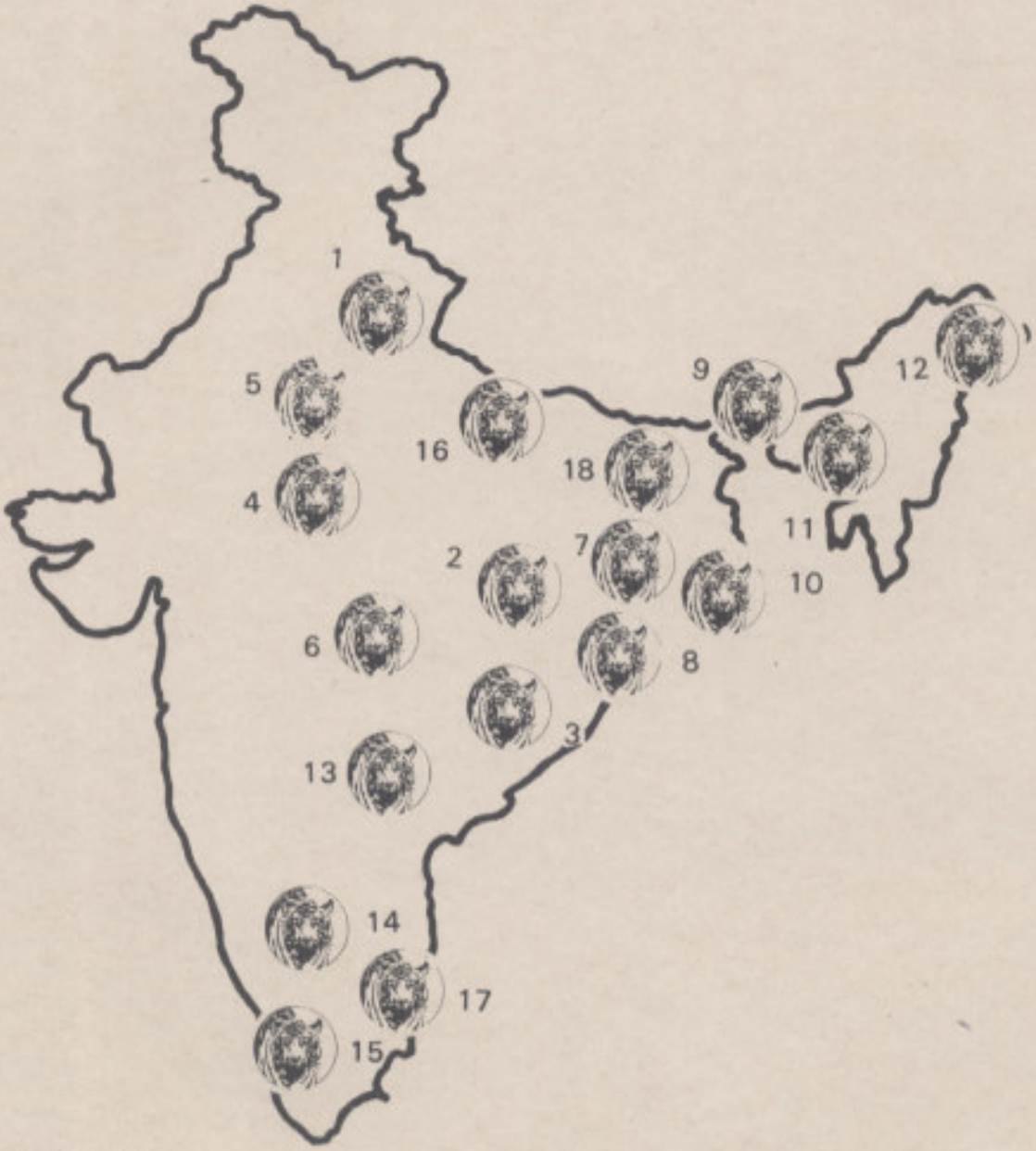
S.No.	Name of the Tiger Reserve	Area (in Sq. kms.)		
		Core	Buffer	Total
1.	Bandipur (Karnataka)	523	343	866
2.	Corbett (Uttar Pradesh)	338	183	521
3.	Kanha (Madhya Pradesh)	940	1,005	1,945
4.	Manas (Assam)	470	2,370	2,840
5.	Melghat (Maharashtra)	448	1,170	1,618
6.	Palamau (Bihar)	213	715	928
7.	Ranthambhore (Rajasthan)	392	433	825
8.	Simlipal (Orissa)	845	1,905	2,750
9.	Sunderbans (West Bengal)	1,330	1,255	2,585
10.	Periyar (Kerala)	501	276	777
11.	Sariska (Rajasthan)	498	302	800
12.	Buxa (West Bengal)	315	444	759
13.	Indravati (Madhya Pradesh)	1,258	1,541	2,799
14.	Nagarjunasagar (Andhra Pradesh)	1,200	2,368	3,568
15.	Namdapha (Arunachal Pradesh)	1,808	177	1,985
16.	Dudhwa (Uttar Pradesh)	648	163	811
17.	Kalakad-Mundanthurai (Tamil Nadu)	571	229	800
18.	Valmiki Tiger Reserve (Bihar)	336	504	840
	Total	12,634	15,383	28,017

3.2.4.3 A Steering Committee functioning under the Chairmanship of the Prime Minister provides guidelines for the management of the Tiger Reserves. The non-official members of the Steering Committee (Project Tiger) and the four scientific institutions nominated by the Steering Committee (Project Tiger) review the Project Tiger biannually.

3.2.4.4 On the recommendations of the Steering Committee, the Department has agreed to provide 100 per cent financial assistance for establishing field research centres as well as veterinary centres in each Tiger Reserve to boost up research activities in these reserves. Besides this, 100 per cent financial assistance shall also be provided for establishing Nature Interpretation Centres in each Tiger Reserve for providing educational and scientific information.

3.2.4.5 The total expenditure during the year for the maintenance and development of the existing 17 Tiger Reserves was about Rs. 7.00 crores, out of which the Central assistance was about Rs. 4.7 crores. Valmiki Tiger Reserve the eighteenth one has been notified only recently.

3.2.4.6 An eco-development programme was launched during the year, in the buffer area of the Ranthambhore Tiger Reserve to solve the problem of the people living in and around the Tiger Reserve. It is proposed to implement similar eco-development programmes in the buffer areas of all the 18 Tiger Reserves. The activities proposed to be undertaken as a part of the eco-development programme aim at increasing the biomass productivity of the buffer areas to ensure their availability of adequate firewood and fodder to



Corbett National Park 1
Kanha National Park 2
Indravati National Park 3
Ranthambore National Park 4
Sariska National Park 5
Melghat Sanctuary 6
Palamau Tiger Reserve 7
North Simlipal National Park 8
Buxa Sanctuary 9
10 Sundarbans National Park
11 Manas Sanctuary
12 Namdapha National Park
13 Nagarjun Sagar Shrishailam Sanctuary
14 Bandipur National Park
15 Periyar National Park
16 Dudhawa National Park
17 Kalakad and Mundanthurai Wildlife Sanctuary
18 Valmiki Tiger Reserve

Fig 10: Project Tiger Field Areas

meet the legitimate requirements of the people who had been adversely affected due to ban on removal of firewood and fodder from the core areas. The programme will also provide veterinary care to domestic cattle of the people and encourage stall-feeding by improving their breed.

3.2.4.7 Other Important Activities during the year are as under:

- Revision of the Management Plan of Palamau Tiger Reserve;
- Organisation of a Short-term Management Course for Field Directors at Ranthambhore Tiger Reserve;
- Organisation of a workshop on Eco-Development Programme for all the field Directors at Sunderbans Tiger Reserve;
- A biannual review of all the Tiger Reserves by the non-official members of the Steering (Project Tiger) Committee;
- Construction of 28 buildings for the field staff living in the remote areas and purchase of 14 jeeps, 53 wireless sets and 1 truck for fire fighting;
- Financial support to the tune of Rs. 34.5 lakhs to State Government of Assam for the purchase of arms, vehicles, boats and wireless sets to equip the field staff to control poaching and encroachment in the Manas Tiger Reserve;
- Ex-gratia payment of Rs. 50,000 per head to the dependents of the three field staff, killed by the poachers inside the Manas Tiger Reserve;
- Preparation of Tourism Plans for all the Tiger Reserves to regulate tourism;
- Arrangement of a field study tour for all the Field Directors to the National Parks of Kenya with the financial assistance provided by WWF-International;
- Financial assistance of Rs. 5.00 lakhs to the State Government of Orissa for relocating four villages from the core area of the Simlipal Tiger Reserve; and

Fig 11: Renuka Wildlife Sanctuary in Himachal Pradesh.

Fig 12: An Elephant herd—Whose habitat now requires rigorous protection.

— The estimated number of tigers in the country according to All India Tiger Census 1989 comes to 4,200 as compared to 4,005 of 1984 Census.

3.2.5 Conservation Programme

— Under the Centrally Sponsored Scheme "Assistance for Development of National Parks", Rs. 167 lakhs have been sanctioned supporting 27 National Parks, including those located in the high altitudes and covered under the "Snow Leopard" Project;

— Central Assistance of Rs. 392 lakhs was made available to 112 sanctuaries for development activities like construction of buildings, creation of infrastructure for protection etc;

— Under the Centrally Sponsored Scheme "Control of Poaching and Illegal Trade in Wildlife", Rs. 20 lakhs have been made available to the State Governments, on a 50 per cent cost sharing basis, for strengthening anti-poaching and enforcement activities outside wildlife protected areas;

— Under the Scheme "Nature, Education and Interpretation" central assistance of Rs. 20 lakhs was made available to 10 states, on a 50 per cent cost sharing basis, for setting up wildlife interpretation centres and for conducting conservation education campaigns; and

— The Scheme "Captive Breeding and Rehabilitation of Endangered Species" provides for central assistance, on a 50 per cent cost sharing basis. Captive breeding programmes for a number of highly endangered species like the Musk deer and pheasants in four states were continued under the scheme.

3.2.6 Indo-U.S. Seminar on Marine Parks

A seminar was organised jointly by the Government of India, Government of Tamil Nadu, the Madurai Kamaraj University and the US National Park Service at Madurai from 8th to 13th January, 1990 under the Indo-US Programme. The main focus of the seminar was on creating awareness among the concerned wildlife managers about the urgency of conserving marine ecosystems and the special features of marine park management.

3.2.7 Zoological Parks

3.2.7.1 National Zoological Park, New Delhi

The National Zoological Park, New Delhi, at present, displays 1,711 animals comprising 70 species of mammals, 97 species of birds and 5 species of reptiles. On an average about 15 to 16 lakh people visit the zoo every year. Construction work of the Nocturnal House is nearing completion and the house will be made operational soon. The construction of Reptile House and renovation of monkey enclosures have been undertaken. Action is being taken to augment water supply and improve drainage in the park.

The zoo continued to ensure conservation of rare and endangered species of wild animals like Thamin deer, Swamp deer and Sloth bear, through successful breeding.

3.2.7.2 Padmaja Naidu Himalayan Zoological Park

This zoological park in Darjeeling, an autonomous organisation of the State Govt. of West Bengal, continued to house and breed a number of endangered and rare species of wildlife. The park also conducts research on the behaviour and breeding biology of the fauna of the East Himalayan Region and provides visitors a rare opportunity to learn about the high altitude fauna and flora.

3.3 BIOSPHERE RESERVES

3.3.1 The Biosphere Reserves are intended to preserve genetic diversity in representative ecosystems and provide for *in-situ* conservation of plants, animals and micro-organisms. They also provide scope for research in the natural ecosystem vis-a-vis man-modified ecosystem.

3.3.2 A core advisory group of experts setup by the Government of India in 1979, identified 14 potential sites for setting up of Biosphere Reserves in India. These are:

Site	*State (s)*
Nilgiri	Tamil Nadu, Karnataka & Kerala
Namdapha	Arunachal Pradesh
Nanda Devi	Uttar Pradesh
Uttarakhand (Valley of Flowers)	Uttar Pradesh
North Islands of Andamans	Andaman & Nicobar
Gulf of Mannar	Tamil Nadu
Kaziranga	Assam
Sunderbans	West Bengal
Thar Desert	Rajasthan
Manas	Assam
Kanha	Madhya Pradesh
Nokrek (Tura Range)	Meghalaya
Little Rann of Kutch	Gujarat
Great Nicobar	Andaman & Nicobar

Fig 13: Lion-tailed Macaque—An endangered species.

Fig 14: Wetland Ecosystem—An attraction for migratory birds.

3.3.3 So far the following seven Biosphere Reserves have been set up:

— Nilgiri (with effect from 1.9.1986);
— Nanda Devi (with effect from 18.1.1988);
— Nokrek (with effect from 18.9.1988);
— Great Nicobar (with effect from 19.1.1989);
— Manas (with effect from 14.3.1989);
— Gulf of Mannar (with effect from 18.2.1989); and
— Sunderbans (with effect from 19.3.1989).

3.3.4 Action Plans have also been sanctioned for all the existing Biosphere Reserves except Manas. These are broadly on survey, protection, eco-restoration, education and awareness. Concurrence of the State Governments of Arunachal Pradesh and Madhya Pradesh have been received in respect of Namdapha and Kanha Biosphere Reserves respectively. Notifications for the country's 8th and 9th Biosphere Reserves (Namdapha & Kanha) are under process.

3.3.5 Project documents in respect of four Biosphe Reserves viz. Uttarakhand, Thar Desert, North Andama Island and Kaziranga have been referred to the respecti State Governments/Administration for concurrence. Dra project report in respect of Little Rann of Kutch has bee received and is under process.

3.3.6 Based on the new biogeographic classificatio developed and published by the Wildlife Institute of Ind in their report on "Planning a Wildlife Protected Are Network in India", a review of sites for setting up Biosphe Reserves is being carried out.

3.4 WETLANDS AND MANGROVES

3.4.1 Wetlands

3.4.1.1 Wetlands are transitional areas between aquat and terrestrial ecosystems where water table is usually at

near the surface of land, covered by shallow water. India is very rich in wetland resources. These wetlands show great ecological diversity due to variable climatic conditions and the changing topography of the country. Many such areas have been decreased due to agriculture, industry and settlement practices. A great number of areas have also been polluted by industrial effluents, sewage, sedimentation and due to ecological degradation in the catchment areas. Since wetland ecosystems play a crucial role in flood control, recharging of aquifers, regulation of water quality, reduction of sediment load, pollution abatement and also because of their aquaculture potentiality and as breeding grounds for waterfowl, etc., steps have been initiated for conservation and management of these wetlands.

3.4.1.2 The National Wetland Management Committee has identified 16 wetlands for conservation and also for the preparation of management action plans. Steering Committees at the State level have been constituted for drawing up action plans and monitoring the progress of work. A nodal research/academic institution has also been identified for each of the selected wetlands.

3.4.1.3 During the year, action plans have been sanctioned for five more wetlands as follows:

— Wular (J&K)
— Chilka (Orissa)
— Bhoj (M.P.)
— Pichola Fathesagar (Rajasthan)
— Renuka (H.P.)

These plans cover activities such as survey and demarcation, weed control, soil conservation, wildlife conservation, control of siltation, creation of public awareness etc.

3.4.1.4 In order to review the work done by various State Governments, a meeting was held at Puri from July 12-13, 1989 in which representatives of State Governments and scientists participated. The meeting reviewed the progress of work done by the various State Governments/Union Territories and also brought out the broad priority areas requiring attention.

3.4.2 Mangroves

3.4.2.1 Mangroves are the salt-tolerant forest ecosystems of tropical and sub-tropical regions bordering the sheltered sea coasts and estuaries. Mangroves occur all along the large

Fig 15: Mangrove Forest—An ecosystem to be protected.

Indian Coast line in sheltered estuaries, tidal creeks, backwaters, salt marshes and mud flats. It is estimated that the total mangrove area in India is 6,740 sq. kms. which is about 7 per cent of the world's mangrove area. The mangroves in India have been subjected to immense biotic pressures and ruthless exploitation.

3.4.2.2 A National Mangrove Committee for conservation and management of mangroves has been constituted to advise the Government on appropriate policies for conservation, research and training. Based on the recommendations of the Committee, 15 mangrove areas viz., Northern Andaman & Nicobar (Andaman & Nicobar Islands), Sunderbans (West Bengal), Bhitarkanika and Mahanadi Delta (Orissa), Coringa, Godavari Delta and Krishna Estuary (Andhra Pradesh), Pichavaram and Point Calimere (Tamil Nadu), Gulf of Kutch (Gujarat) Coondapur (Karnataka), Achra/Ratnagiri (Maharashtra) and Vembanad (Kerala) have been identified. It has now been decided to extend the scheme to the remaining mangrove areas in the country.

3.4.2.3 Steering Committees at State level have been constituted for drawing up action plans and monitoring the progress of work. A nodal research/academic institution has also been identified for each of the selected mangrove area.

3.4.2.4 During the year, action plans have been sanctioned for four mangrove areas as follows:

— Bhitarkanika and Mahanadi Delta (Orissa)
— Coondapur (Karnataka); and
— Achra/Ratnagiri (Maharashtra).

These plans cover activities like survey and demarcation, regeneration, afforestation and protective measures. Mapping of the entire mangrove resources in the country through remote sensing technique has also been taken up.

3.4.2.5 In order to review the work done by various State Governments, a meeting was held at Kakinada from 6-7 July, 1989 with the representatives of State Governments and scientists. The meeting reviewed the progress of work done by various State Governments/Union Territories and also brought out the broad priority areas requiring attention.

3.5 CORAL REEFS

3.5.1 There are several types of coral reefs like atolls, fringing reefs, barrier reefs, etc. These are largely located around Lakshadweep, Andaman & Nicobar Islands, Gulf of Mannar and Gulf of Kutch. Increased industrialisation in coastal areas, pollution, dredging, mining, overexploitation for shells, etc. are responsible for the deterioration of coral reefs in India. In order to conserve these coral reefs from further deterioration a suitable conservation strategy is called for. Steps have been initiated for conservation of coral reefs by selecting the following areas:

— Lakshadweep
— Andaman & Nicobar Islands
— Gulf of Mannar
— Gulf of Kutch

The Action Plan will consist of preparation of Management Action Plan for these areas, carrying out detailed studies on various aspects of conservation and adoption of protective measures to prevent overexploitation.

3.6 NATIONAL CONSERVATION STRATEGY (NCS) AND ENVIRONMENTAL POLICY STATEMENT

3.6.1 The growing degradation of India's natural resources and the demands of a growing economy have necessiated the formulation of National Conservation Strategy to achieve sustainable development.

3.6.2 A committee was constituted by the Ministry to recommend the framework for formulation of a National Conservation Strategy. In addition to this assignment, the Committee has also been working on the preparation of a draft for a National Environmental Policy statement.

3.6.3 The NCS would deal with the key issues such as population (human and livestock), stabilisation, optimal use of land, water and energy, genetic resources, biomass, issues relating to grazing, degradation of forests, catchment areas, ecological fragile ecosystems and coastal areas. Attention is being focussed on conservation, sustainable use of natural resources, sensitization of policy makers, professionals and the public in general and also on evolving an institutional framework to achieve the goals. The NCS would be backed up by regional/State level conservation strategies.

3.6.4 An outline for various components to be incorporated in the NCS document was prepared and circulated for comments/suggestions to 700 organisations in the country including state governments, Central Ministries, Universities, NGOs and various institutes.

3.6.5 A workshop on Energy and Environment was held during August, 4-5, 1989 and a brain storming Seminar on Measurement of Sustainability was held during September 4-6, 1989. The recommendations of these workshops shall be considered while formulating the Strategy.

3.6.6 A study group on Endogenous Management and Conservation Strategy to cover the Socio-cultural aspects was constituted and the report was submitted to the Core Committee on NCS.

3.6.7 A small group on Environment Policy Statement was constituted to address the broad objectives of sustainable development and to stress the building of an environmentally secured 'Conservation Society'. A preliminary draft on the Statement has been prepared.

4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 INTRODUCTION

Over the years, Environmental Impact Assessment (EIA) has emerged as an important tool for integrating the objectives of environmental management with the requirements of economic growth and social development. The purpose of environmental impact assessment is to evaluate the beneficial and adverse effects of a development activity on the environmental system so that it could be integrated with the economic analysis of the project costs and benefits. The Ministry of Environment and Forests has been assigned the responsibility for appraisal of projects with regard to their environmental implications. Based on environmental impact assessment and issues arising therefrom, decisions are taken by the competent authorities in respect of the projects including selection of sites.

4.2 The projects in various sectors, which have so far been brought under the purview of such a procedure, include the following:

— Major irrigation projects (covering 10,000 hectares and above),

— Multipurpose River Valley Projects,

— Hydel Power Projects,

— Thermal Power Projects (using coal, lignite gas and other feed stock) including atomic power stations,

— Mining Projects,

— Industries,

— Ports and Harbours,

— Human Settlements, new towns and cantonments,

— Tourism projects including beach resorts,

— Projects in coastal areas,

— Projects in ecologically fragile areas (e.g. Doon Valley, Andaman & Nicobar and Lakshadweep Islands), and

— Communication Projects.

4.3 Apart from environmental clearance, clearance from forestry angle is also required, if forest land is involved in a project. Under the Forest (Conservation) Act, 1980, diversion of forest land for non-forest use requires prior approval of the Central Government. For such diversion, the Ministry of Environment and Forests considers the proposals on recommendation of the State Forest Departments.

4.4 A multi-disciplinary staff complement in the Ministry is responsible for scrutiny of the projects, site visits wherever required, interaction with the project authorities and consultations with experts on specific issues as needed for analysis of various aspects.

4.5 ENVIRONMENTAL APPRAISAL COMMITTEES (EAC)

To elicit multi-disciplinary inputs for appraisal of projects, the Ministry has constituted Environmental Appraisal Committees for the following sectors:

— River Valley, Multipurpose, Irrigation and Hydel Power Projects;
— Industrial Projects;
— Mining Projecjts; and
— Thermal Power Projects.

For advice on proposals regarding diversion of forest land for nonforestry purposes, which require statutory clearance of the Ministry under the Forest (Conservation) Act, 1980, an Advisory Committee has been set up in the Ministry, as envisaged in the Act.

In addition to the above mentioned Committees, specific groups/committees and task forces are constituted from time to time for appraisal of other major projects referred to the Ministry.

4.6 REGIONAL OFFICES

Depending on the nature of projects, certain safeguards are recommended while according environmental clearance. For monitoring the implementation of these safeguards and to interact with the concerned authorities in different regions including the State Departments of Environment and State Pollution Control Boards, the Ministry has recently set up Environmental Wings in the Regional Offices of the Ministry.

4.7 PROCEDURE FOR ENVIRONMENTAL AND FORESTRY CLEARANCE

4.7.1 The Ministry has developed guidelines and questionnaires/checklists for appraisal of projects in different sectors. The project authorities are required to provide the relevant information as per prescribed questionnaires/checklists along with the feasibility/detailed project reports. After preliminary scrutiny, the project proposals are placed before the Environmental Appraisal Committees in respective areas. Project authorities are invited for discussions with the experts of the Committees and wherever necessary site visits are made for on-the-spot assessment of environmental aspects.

On the basis of such an exercise, the Appraisal Committees make their recommendations for approval or rejection of particular projects. While recommending approval of a project, the Committees also suggest certain safeguards in specific cases.

4.7.2 The recommendations of the Appraisal Committees are then processed for approval or rejection of the projects. If all the particulars containing relevant information and

action plans are available, the Ministry takes a decision for clearance within 3 months of receipt of the proposal. However, if the proposals lack necessary details and essential information, the Ministry asks the project authorities to submit the missing details/action plans within 3 months. On receipt of the requisite information within the prescribed period, the case is considered for a decision. In case the requisite information is not made available within 3 months, the case is straightaway rejected for non-furnishing of information.

4.7.3 Similarly, proposals for diversion of forest land are considered by the Advisory Committee which looks into the essentiality of the requirement, ecology of the forest involved and makes recommendations as to acceptance with suitable safeguards or rejection of such proposals. A decision is usually taken within 6 weeks of the receipt of the proposals, if all the required information is available. In case the proposal lacks details regarding compensatory afforestation, maps or some other essential information, the State Governments and Project Authorities are required to submit the requisite details. If the particulars are not made available within one month of asking, the cases are rejected for non-furnishing of essential information.

4.7.4 To facilitate expeditious decisions, the Ministry has adopted the single window clearance procedure under which, projects involving diversion of forest land as well as approval from environmental angle are processed simultaneously for clearance/rejection, although separate letters are issued in each case.

4.8 REOPENING OF THE CASES REJECTED FOR NON-FURNISHING OF INFORMATION

Cases rejected for non-furnishing of information may be reopened provided the following conditions are satisfied:

- All the required information has been made available;
- Delay in providing the information is satisfactorily explained; and
- There is no change in the proposal in terms of scope, purpose and other important aspects.

4.9 INFORMATION REQUIRED FOR ENVIRONMENTAL APPRAISAL OF PROJECTS

4.9.1 The project authorities are required to furnish the following documents for environmental appraisal of a development project:

- Detailed Project Report (DPR);
- Filled in questionnaire on environmental aspects; and
- Environmental Impact Statement along with Environmental Management Plan.

4.9.2 The detailed project report is necessary to seek information on the technical and financial aspects of the project.

4.9.3 The questionnaire is meant for providing information on specific queries for determining the likely environmental impact of a development project. The Environmental Impact Statement (EIS) is an exercise of self-assessment on the part of the project authorities regarding the likely impact (positive and negative) of their projects. Some of the issues that need to be dealt with while preparing the statement are as follows:

- Impact on soil, water (hydrological regime, ground water and surface water) and air quality;
- Impact on land use, forests, agriculture, fisheries, tourism, recreation etc.;
- Socio-economic impacts including short and long-term impact on population;
- Impact on health;
- Impact on flora and fauna (wildlife) particularly endemic and endangered species; and
- Cost-benefit analysis including the measures for environmental protection.

4.9.4 The Environmental Management Plan (EMP) needs to cover the following aspects:

- Safeguards and control measures proposed to prevent or mitigate the adverse environmental impacts;
- Plans for rehabilitation of project oustees;
- Contingency plans for dealing with accidents/disasters; and
- Monitoring and feed back mechanism on implementation of necessary safeguards (e.g. setting up of Environmental Management Cells).

4.10 GUIDELINES AND QUESTIONNARIES FOR ENVIRONMENTAL CLEARANCE

To help the project proponents for inhouse evaluation of their projects from environmental angle and to elicit specific information on environmental aspects as required for environmental clearance, the Ministry of Environment and Forests has prepared guidelines and questionnaires for the following sectors:

- River Valley Projects;
- Thermal Power Projects;
- Mining Projects;
- Industries;
- Shipping and Harbour Projects; and
- Development of Beaches.

4.10.1 Guidelines for the following sectors have been finalised during the year:

— Rail/Road/Highway Projects;
— Airport Projects;
— Communication Projects; and
— New Towns.

4.10.2 Guidelines for Tourism projects are also in the stages of finalization and shall be available shortly.

4.10.3 Apart from this, the Ministry has also taken up the task of revising and updating the existing guidelines. While the existing guidelines on Ports and Harbours have already been revised, guidelines for the following sectors are being revised:

— River Valley Projects;
— Thermal Power Projects;
— Mining Projects;
— Industries; and
— Development of Beaches.

4.11 STATUS OF APPRAISAL OF DEVELOPMENT PROJECTS

The Status of appraisal of various development projects referred to the Ministry for approval from environmental angle during the year is given in Table 3.

4.11.1 River Valley Projects

4.11.1.1 Tehri Dam Project, U.P.

The Tehri Dam Project proposed across Bhagirathi river near the historical Tehri township in Tehri Garhwal area was initially approved by the Planning Commission in 1972 for an installed capacity of 600 MW. The scheme has undergone a considerable change in its scope. The scheme as envisaged now, will involve construction of a 260.5 m. high rock fill dam, 4 diversion tunnels, irrigation canals and construction of power houses with installed capacities of 2,000 MW at Tehri and 400 MW at Koteshwar respectively. The project is expected to provide irrigation to 2.7 lakh ha. and also help in stabilising the existing irrigation system in 6.04 lakh ha. One component of the scheme, namely, the Koteshwar Dam Project is proposed to be located 22 Km. downstream of Tehri Dam. The total catchment area at the project site is 6,92,125 ha. out of which 2,14,500 ha. (31%) is forest cover and 1,92,445 ha. (28%) is snow bound. So far, treatment is reported to undertake in 31,000 ha. at a cost of Rs. 46.59 lakhs. A provision of 0.093 Mham. dead storage has been made in the design of the dam. The estimated cost for the entire scheme is Rs. 3,008.12 crores. The various construction works are now planned for completion by June, 1996 including the Transmission System. So far, about Rs. 400 crores have been spent. It is proposed to rehabilitate 9,800 families from the rural areas and 3,500 families from urban settlements (as per 1984 estimates).

A Working Group was constituted to study the environmental aspects of the project. The Working Group submitted its interim report in May, 1980 highlighting a number of studies to be undertaken by the project authorities in consultation with Institute of Himalayan Geology, etc. The Working Group also noted that adverse environmental implications of the project are not commensurate with the benefits and, therefore, recommended that a series of small run-of-the river schemes should be seriously considered and the Ganga Management authority be created to oversee the planning, implementation and monitoring of all development projects in the basin. The operational control of the project has been transferred from the U.P. State Irrigation Department to the Tehri Hydro Development Corporation. Plans furnished in December, 1989 have been examined and the report of the Standing Appraisal Committee for River Valley Projects is under consideration.

Table 3

	Projects pending at the beginning of the year	Projects Received	Projects Total	Projects Appraised	Projects Cleared	Projects Rejected	Additional Information sought
	1	2	3	4	5	6	7
River Valley and Hydel Project	9	27	36	36	10	22	4
Thermal	36	25	61	43	28	9	24
Mining	47	42	89	89	7	48	34
Industrial	23	30	53	53	31	6	16
Other Projects	24	96	120	120	67	20	33

4.11.1.2 Narmada Sagar and Sardar Sarovar Project

Both these projects were granted conditional environmental approval in 1987 stipulating that satisfactory environmental action plans will be formulated and implemented *pari passu* with the engineering works, failing which, the construction work will be halted. Two additional sub-groups have been created in the Narmada Control Authority (NCA) to deal with the problems of rehabilitation of the oustees and the environmental issues. An Environmental Cell set up in the Ministry of Environment and Forests is to keep track of the implementation of the action plans. The project authorities are presently formulating the action plans so that the Narmada Control Cell in the Ministry as well as the Environmental Sub-Group of the NCA may monitor the progress of implementation of the plans as soon as they are ready.

4.11.1.3 Ecological Balance in Gangotri Region

With a view to harmonise developmental activities with ecological aspects, a Special Area Development Authority is being planned to be set up for the development of the Gangotri region with the following programmes:

— Preparation of Development Master Plan for the region;
— Development of micro hydel schemes;
— Development of network of road; and
— Regulation of vehicular traffic at Harsil.

4.11.1.4 Monitoring the Progress of Implementation of Stipulated Safeguards

A concerted effort has been made to collect information on the present status of implementation of the safeguards suggested while granting environmental approval to the projects. The regional offices of the Ministry have been entrusted with the task of close monitoring of these safeguards through periodical field checks.

4.11.2 Thermal Power Projects

Twenty-eight projects in the area have been cleared from environmental angle by the Ministry during the year. While giving clearance, conditions of regular monitoring of efficiency of electrostatic precipitators and other pollution control equipment, stack and ambient air quality monitoring, raising of green belts around the power plants etc., have been considered. In addition, project authorities are advised to place emphasis on conservation of water through recycling/reuse, energy conservation, utilisation of fly ash for construction purposes such as in cement, building materials, bricks, blocks, etc.

In certain areas where a large installed capacity of thermal power generation is planned, installation of flue gas desulphurisation is being insisted upon to bring down the levels of emission of SO_2.

4.11.3 Mininig Projects

During the year, 7 projects in this area have been cleared from environmental angle. A case study regarding environmental management in Neyveli Lignite Mine, initiated during 1987-88, was completed and the final report has been received. During the year two more case studies, one on 'iron-ore mine' and the other on 'coal mine' have also been commissioned.

The Model Environmental Management Plan in respect of an opencast iron-ore mine, commissioned in 1987-88, was also completed during the year.

4.11.4 Industrial Projects

A total of 31 industrial projects have been cleared from environmental angle by the Ministry during the year.

4.12 DEVELOPMENT CONTROL IN BOMBAY

After assessing the construction activities of the Defence authorities in Colaba area, Bombay, the Ministry has directed the Defence authorities to prepare a Master Plan for the area taking planning and environmental concerns into consideration.

4.13 OTHER PROGRAMMES

4.13.1 Coastal Area Management

In order to protect the cultural, aesthetic and ecological values in the coastal areas, the Prime Minister had issued a directive, that, no construction activities be undertaken within 500 metres of the High Tide Line. The directive had been adressed to all the Coastal States to ensure that indiscriminate construction activities do not result in serious environmental impacts in these areas. To help the State Governments in the preparation of Environmental Management Plans, the Ministry has initiated three pilot projects in different coastal stretches, namely, Puri-Konark, Digha and Dwarka-Jodia.

In order to provide a statutory backing to the Prime Minister's directive and to provide a uniformity of approach in coastal management and protection, the Ministry has initiated modalities for policy decision for direction under the Environment (Protection) Act, 1986.

4.13.2 Doon Valley

Considering the fragile eco-systems of the Doon Valley and to ensure that developmental activities are consistent with the principles of environmental conservation, several sectoral

projects have been identified and formulated to generate basic data needed for assessing the assimilating capacity of the Doon Valley.

A scheme for afforestation of the Doon Valley mined areas has been prepared. The scheme would cover an area of approximately 2,500 hectares in six years, out of which, 2,000 hectares will be available for plantation. Another scheme has also been prepared for afforestation of approximately 2,690 hectares area on both sides of Shivalik hills during the next 10 years.

4.13.3 Island Development

The Island Development Authority (IDA) under the Chairmanship of the Prime Minister continued to issue guidelines for ensuring that the natural resources of Andaman & Nicobar Islands and Lakshadweep Islands are put to optimal use without creating adverse environmental impacts. Major issues with which the Ministry has been involved include:

— Phasing out of timber extraction from forests in Andaman and Nicobar Islands upto 31st December, 1978;

— Assessment of anti-vector measures for Malaria eradication in Andaman and Nicobar Islands;

— Relaxation of ban on construction activities within 500 meters from high tide line for civil works in the Islands;

— Assessment of population of 'Crown of Thorns-Star Fish' in and around National Park;

— Wandoor and their removal from the water bodies; and

— Monitoring of changes in the sea level rise.

A general survey of the environmental status of Pitti and Amini Islands has been carried out to identify areas for conservation and restoration of degraded areas.

4.13.3.1 A Working Group was set up to look into the environmental aspects of developmental projects for Diu and Chauch Islands. The Group has recommended well regulated tourism, setting up of only non-polluting industries, modernized and improved methods for fishing and horticulture in these islands.

4.13.3.2 A number of projects were assessed for envir nental clearance which included dairy plant, const tion of road, Yatri Niwas, harbour facilities and ceme grinding unit. Some of them were accorded environmental clearance stipulating a number of safeguards for mitigating adverse environmental impacts.

4.14 HUMAN EXPOSURE ASSESSMENT LOCATION (HEAL)

4.14.1 The Human Exposure Assessment Location (HEAL) project is the first international attempt to make an integrated assessment of environmental pollution. The project is being implemented by WHO and UNEP in close cooperation with national agencies and institutions.

The long-term global objectives adopted for the HEAL project are:

— To provide comparable and valid assessment of human exposure to selected environmental pollutants;

— To improve, field tests, harmonize and demonstrate methods for this integrated monitoring and assessment of human exposure to environmental pollutants;

— To promote the assessment of human exposure to pollutants as a basis for development of environmental control strategies for the protection of public health;

— To provide an overview of existing exposure of selected populations to pollutants on a regional and global basis and, if possible, observe trends in this regard, and

— To improve national capabilities for environmental monitoring and human exposure assessment.

4.14.2 The project is being implemented in three phases viz.,
(i) Training phase,
(ii) Pilot monitoring phase, and
(iii) Definite monitoring phase.

In the present study, Pb/Cd, DDT/PCB and NO_2 have been selected.

4.14.3 Chembur and central area of Bombay city have been selected as Indian HEAL sites due to industries and heavy traffic density, respectively. Both the sites have been subdivided into two regions, viz., low polluted area and high polluted area. The institutions associated with the programmes are as follows:

— National Institute of Occupational Health (NIOH), Ahmedabad;

— Maharashtra Pollution Control Board (MPCB), Bombay;

— Air Quality Monitoring and Research Laboratory, KEM Hospital, Bombay; and

— Municipal Corporation, Bombay (BMC).

4.15 WORKSHOPS/TRAINING

Under the Indo-Dutch Programme, a series of 15 workshops and three policy level seminars have been

planned for three years (1989-91). During the year, one policy level seminar and five workshops have been organised. These have been attended by senior level executives of concerned Ministries/organisations both at the Central and State levels. The workshops cover three major sectors as follows:

— Water Resources Development Projects;
— Ports and Harbours; and
— Industrial Siting and Land use Planning.

In addition, a series of workshops on Water Resources Development projects are being organised in collaboration with the Central board of Irrigation and Power (CBIP).

An Indo-US Workshop an "Environmental Management Planning for Singrauli Coal-field" was organised at Singrauli from 29th January to 2nd February, 1990 during which the work on the Indo-US project on "Conceptual Environmental Management Plan for Coal Mines in India" was initiated.

5. CONTROL OF POLLUTION

5.1 CONTROL OF WATER AND AIR POLLUTION

5.1.1 Water (Prevention and Control of Pollution) Act, 1974 and its amendments, the Air (Prevention and Control of Pollution) Act, 1981 and its amendments and the Environment (Protection) Act, 1986 are the major instruments for control of pollution of Water and Air. The Water (Prevention and Control of Pollution) Cess Act, 1977 provides for levy of cess on water consuming industries.

5.1.2 The Water and Air Acts are implemented through the Central Pollution Control Board and the State Pollution Control Boards.

During the year, three more states viz., Manipur, Mizoram, and Sikkim have constituted State Pollution Control Boards in their respective states. With this all states excepting the states of Nagaland and Arunachal Pradesh have constituted their State Pollution Control Boards. Besides, Water (Prevention and Control of Pollution) Amendment Act, 1988 has also been adopted by the states of Assam, Goa, Meghalaya, Maharashtra, Himachal Pradesh, Sikkim, Tripura, Tamil Nadu, Uttar Pradesh and West Bengal. The pollution control activities in the Union Territories are looked after by the Central Pollution Control Board.

5.1.3 The Central Pollution Control Board has set up six zonal offices at Calcutta, Chandigarh, Kanpur, Shillong, Vadodara and Bangalore to facilitate its closer coordination with the State Pollution Control Boards.

5.1.4 National Water Quality Monitoring Programme

Under the United Nations Global Environmental Monitoring Systems (GEMS) and the Monitoring of Indian National Aquatic Resources (MINARS) Programme, 90 new stations have been added during the year raising the total number of water quality monitoring stations to 400 all over the coutnry. The present network comprises of 322 stations under MINARS Programme, 51 stations under GEMS and 27 stations under the Ganga Action Plan (GAP), covering all the 14 major, 7 medium and 11 minor rivers. A water quality status profile map has been prepared for the 14 major rivers of the coutnry which indicates the gap between the desired and the existing water quality.

Apart from 27 manual stations under the Ganga Action Plan, 9 continuous automatic monitoring stations are also being set up.

5.1.5 Coastal Monitoring

The on-going project on coastal monitoring has a network of 173 stations spread all along the coastal waters of the country. Of these 173 stations, 107 are monitored by the State Pollution Control Boards of Gujarat, Maharashtra, Kerala, and Tamil Nadu, in the respective coastal waters. The East Zonal Office of the Central Board, Calcutta is involved in the monitoring of the Orissa and West Bengal coastal waters. The Central Pollution Control Board is co-ordinating the work of these five agencies. The monitoring of the remaining 66 stations through 4 agencies is being co-ordinated by the Department of Ocean Development.

5.1.6 River Basin Studies

The Central Pollution Control Board is conducting studies on major river basins to assess the impact of pollution related activities in these basins. These studies provide necessary information for rational planning of Pollution Control Programme of the rivers. Reports of such studies on Sabarmati, Brahmani-Baitarni and Krishna river basins have been published.

Studies on Mahanadi and Mahi river basins have been completed and reports are under publication. The river basin studies for Cauvery and Godavari are in progress.

During the year, studies on Narmada, Indus and Tapti have been initiated.

5.1.7 Wastewater Recycling

The Central Pollution Control Board has undertaken a project on "Land disposal of industrial and municipal wastewaters as a method of treatment, and study of effect on soil, underground water, agricultural produce" at three sites, viz., Baroda, Nagpur, and Gwalior. The objective of this project on wastewater recycling is to evolve guidelines for disposal of wastewater on land covering quality, quantity and periodicity of application of wastewater, to prevent groundwater pollution, soil damage and health hazards.

The project was initiated at three sites at Baroda, Nagpur and Gwalior. Major activities at these sites are as follows:

5.1.7.1 Baroda

The project at Baroda is executed by the Gujarat Industrial Development Corporation (GIDC) in collaboration with the Central Pollution Control Board. 'Wastewater from common effluent channel is regularly being monitored by GIDC. The ground water qualities in and around the experimental plot are also being monitored to detect any contamination. Crops such as cowpea, moong, wheat, cotton, tobacco are being grown in the experimental fields irrigated with wastewater.

5.1.7.2 Nagpur

The project at Nagpur is being executed by the National Environmental Engineering Research Institute (NEERI). NEERI is growing crops like sugarcane, paddy, wheat, moong, and

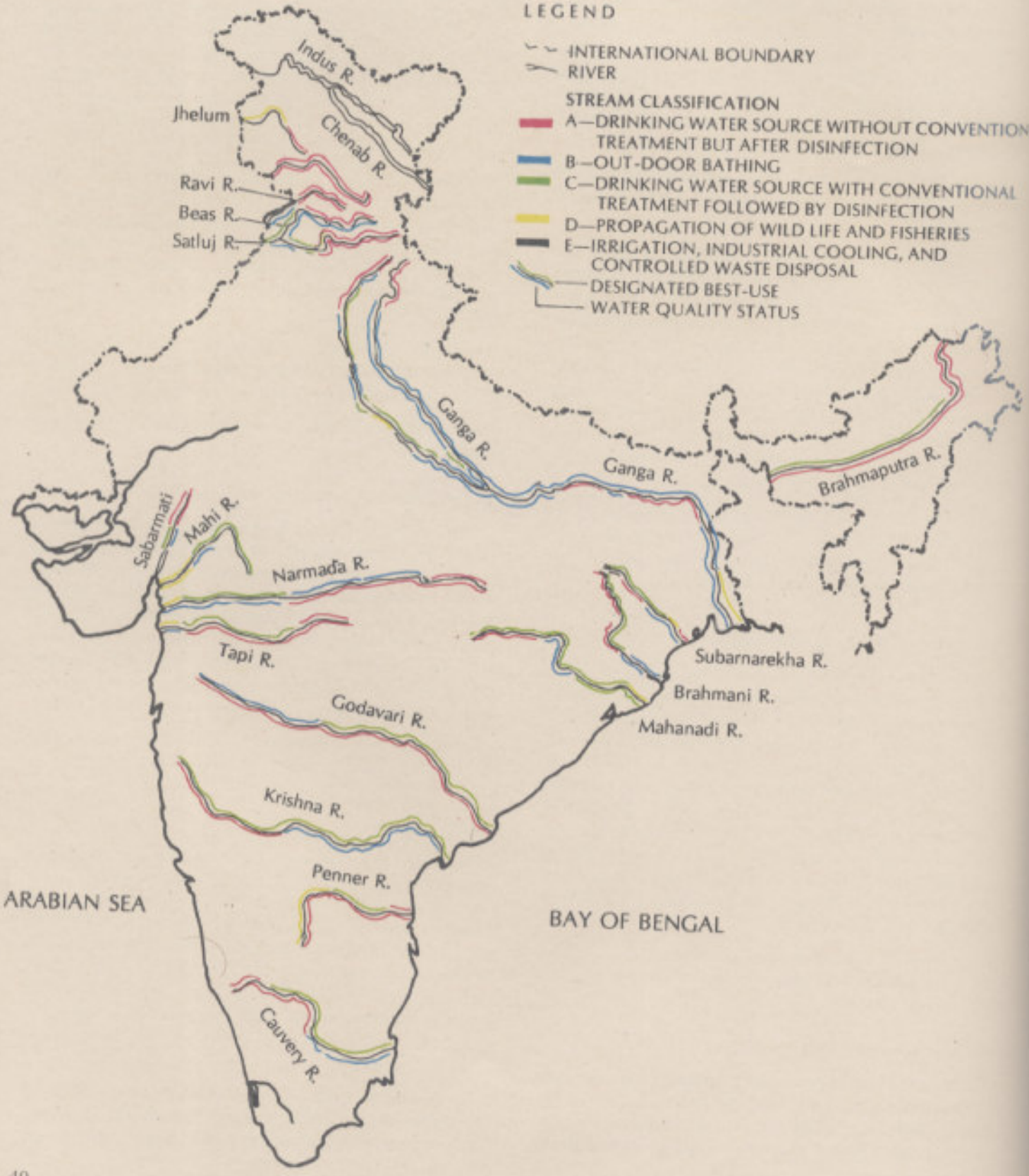


Fig 16: Water Quality Profile of Major Rivers in India

Fig 17: Effluent Treatment in Polifabrics Industry, Harihar, Karnataka.

sunflower on the experimental field, irrigated with wastewaters from sugar mills.

5.1.7.3 Gwalior

The project at Gwalior is executed by the M.P. State Pollution Control Board. The experimental plot is being irrigated with the wastewater of textile mills, on which jawar, moong and maize, in Kharif season and wheat, gram, pea and bausen in rabi season are being cultivated.

5.1.7.4 Colour Removal from Pulp and Paper Mill Effluents

A Research Project

High levels of colour and concomitant COD in pulp and paper wastewaters is due to the presence of lignin, which is not easily bio-degradable. A research project on 'colour removal from the wastewaters of pulp and paper mills' has been sponsored by Central Pollution Control Board since economically feasible technology for removal of colour is not available in the country at present.

5.1.8 Water Supply and Sanitation Status in Class I and Class II Cities

The survey on 'water supply and sanitation status' in Class I and Class II cities conducted by the Central Pollution Control Board has revealed that about 12,000 MLD of wastewater is generated from 15,000 MLD of supplied water to 212 Class I cities. This wastewater is used partly for irrigation and the rest is disposed into rivers or coastal waters. About 1,600 MLD of water is supplied to 241 Class II Cities and about 1,300 MLD of wastewater is generated from these cities. In case of Class I cities, only about 2,500 MLD of wastewater receives some kind of treatment before final disposal whereas in Class II cities, almost entire wastewater is disposed of without any treatment.

5.1.9 Air Quality Monitoring

The National Ambient Air Quality Monitoring (NAAQM) Programme, initiated in 1984 with a total number of 28 monitoring stations covering 7 important cities has been progressively expanded raising the number of monitoring stations to 200, spreading over 49 cities throughout the country. At present 120 stations are in operation. Out of these 200 stations, 30 stations are operated in collaboration with the National Environmental Engineering Research Institute (NEERI) for the analysis of Suspended Particulate Matter (SPM) in the air of 10 metropolitan cities, for trace metals and 5 carcinogenic fractions of Polynuclear Aromatic Hydrocarbon (PAH). The remaining stations are being operated through the respective State Pollution Control Boards. Parameters such as SO_2, NO_2 and SPM are being monitored at these stations regularly.

5.1.10 Enforcement of Standards

Minimal National Standards (MINAS) and air emission standards are evolved by the Central Board for major categories of water and air polluting industries respectively

and they refer to the maximum limit of effluents and emissions that an industry may discharge into any water body or to the atmosphere. The State Pollution Control Boards, while issuing their consent to the industries, can stipulate the same or more stringent standards for effluent and air emission discharges.

National and Zonal Task Forces have been reconstituted for the implementation of standards in the industries like fertilizer, iron and steel, cement, pulp and paper (small) and thermal power. These task forces interact with the concerned industry representatives and State Pollution Control Boards and also take up inspection of pollution control systems installed at source and monitor the progress of implementation of MINAS and emission standards. The status implementation of MINAS and emission standards in respect of some important industries are as follows:

5.1.10.1 Cement Industry

The present status of implementation of standards for 94 cement units in the country is as follows:

Table 4

— Number of units complying with emission standards	58
— Number of units committed to time-bound programme to meet the emission standards by December, 1989	25
— Number of units which have not given any information on time-bound programme	05
— Number of units closed	06

5.1.10.2 Thermal Power Plants

The present status of pollution control in the 68 coal-based thermal power plants is given below:

Table 5

— Number of plants meeting the emission standards	21
— Number of plants which meet the emission standards partially and have provided the time-bound programme for compliance	20
— Number of plants which do not meet emission standards but have taken up implementation programme for the installation of new electrostatic precipitators by replacing existing ones	24
— Number of plants closed	03

5.1.10.3 Small Pulp and Paper

The Present status of water pollution control in small pulp and paper industries is as follows:

Table 6

— Total number of small pulp and paper and board mills in the country	364
— Number of industries having complete effluent treatment plant	80
— Number of industries having partial treatment plant	118
— Number of industries where treatment plants are under construction	34
— Number of industries meeting MINAS/State Board Standards	41
— Number of industries against which legal action has been taken	78
— Number of industries against which legal action is contemplated	97
— The number of industries having complete effluent treatment plant at the end of previous year	73

5.1.10.4 Integrated Iron and Steel Plants

All steel plants have prepared and submitted programmes for revamping/reactivation of existing pollution control systems with time frames.

5.1.10.5 Fertiliser Industry

The pollution control status of total 108 industries is as follows:

Table 7

— Number of units complying with both MINAS & emission standards	44 (15)*
— Number of units complying with MINAS	57
— Number of units complying with Emission Standards	49 (15)*
— Number of units for which no information is available	16
— Number of units closed down	03
— Number of units where control systems are under installation	05

* Does not comply with fluoride emission standard which is under revision.

5.1.10.6 Oil Refineries

The pollution control status of the 12 oil refineries in the country is as follows:

Table 8

— Number of units complying with both MINAS & emission standards	02
— Number of units complying with MINAS in respect of concentration limits	04
in respect of quantum limits	02
— Number of units complying with emission standards	06
— Number of units committed to comply with MINAS and emission stnadards before the end of 1989	03

5.1.11 Assessment of Vehicular Pollution in Metropolitan Cities

A survey conducted by the Central Pollution Control Board to quantify the pollution load generated by vehicles in 12 metropolitan cities of India has revealed that petrol driven vehicles are the majro contributors to total vehicular pollution load in all the metropolitan cities. The quantum of vehicular pollutants emitted is highest at present in Delhi followed by Bombay, Bangalore, Calcutta, and Ahmedabad. Carbonmonoxide, Hydrocarbons and oxides of nitrogen emitted by diesel and petrol driven vehicles in these twelve metropolitan cities consitute about 64 per cent, 22 per cent and 12 per cent of the total pollution load respectively.

Decongestion of Central Business District, provision and strengthening of efficient and fast mass transport system, introduction of scientific traffic management, creation of mass awareness on vehicular pollution and its impact, modification in the design of engines, introduction of battery operated buses in congested areas are some of the measures suggested for reducing the vehicular pollution.

5.1.12 Other Programmes

5.1.12.1 Indo-Dutch Programme on Industrial Counselling for Effluent Treatment in Distilleries

Technical expertise has been sought from the Government of Netherlands for cost-effective treatment technology to follow anaerobic treatment of spent wash in distilleries to bring down the BOD load to 100 mg/l from the present level of 5000 mg/l. Five distilleries have been selected where methane recovery system in the primary anaerobic treatment is in operation.

5.1.12.2 Indo-Swedish Programme on Pollution Control in Large Pulp and Paper Industries

An Indo-Swedish Bilateral Programme has been mooted to develop new technologies for a cost-effective system for protection of environment in large pulp and paper mills. Major environmental problems to be covered include:

— Removal of colour and concomitant COD from the effluents;
— Emission of malodorous gas from ogranic sulphur compounds;
— Large amount of water consumption; and
— High energy consumption.

5.1.12.3 Indo-Dutch Bio-monitoring of the Yamuna River

The Indo-Dutch project on Bio-monitoring of the river Yamuna, including Automatic Waste Quality Monitoring initiated in November, 1988 continued to make progress during this year.

5.1.12.4 Awareness

The Central Board participated in the exhibition on Environment organised by the Ministry in November, 1989 at Pragati Maidan, New Delhi. Information on river water quality monitoring, coastal water quality monitoring, river water quality status, water supply and waste water disposal, industrial water and air pollution effects and their control, environmentally compatible industrial complex, combined effluent treatment plant, vehicular air pollution status in metropolitan cities, etc., was disseminated through models, charts and various other exhibits.

5.1.13 Publications

The Central Pollution Control Board brought out the following publications during the year:

— Assessment of Vehicular Pollution in Metropolitan Cities —Part-II—Delhi: CUPS/18/1988-89;
— Assessment of Vehicular Polluiton in Metropolitan Cities —Part-III—Bombay: CUPS/20/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-IV—Calcutta: CUPS/20/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-V—Bangalore: CUPS/22/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-VI—Madras: CUPS/22/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-VII—Pune: CUPS/24/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-VII—Hyderabad: CUPS/24/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-IX—Kanpur: CUPS/25/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-X—Lucknow: CUPS/25/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-XI—Jaipur: CUPS/27/1/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-XII—Nagpur: CUPS/28/1988-89;
— Assessment of Vehicular Pollution in Metropolitan Cities —Part-XIII—Ahmedabad: CUPS/29/1988-89;
— Status of Water Supply and Wastewater Collection Treatment and Disposal in Class-I Cities: CUPS/30/1988-89;
— Comprehensive Document on Integrated Aluminium Industry (Emission Control) COINDS/23/1988-89;
— Comprehensive Document on Minimal National Standards Pharmaceutical Industry: COINDS/29/1988-89;
— Impact of Auto-Exhaust-EIAS/2;
— CPCB Newsletter; and
— ENVIS Newsletter.

5.2 MANAGEMENT OF HAZARDOUS SUBSTANCES

5.2.1 The Environment (Protection) Act, 1986 places the responsibility on the Ministry for laying down procedures and safeguards for handling of hazardous substances and prevention of accidents. During the year the following actions have been taken in this regard:

— The responsibilities for identifying major hazards, steps to prevent and limit the consequences of an accident and provision of information and training for safety during operations have been laid on the occupier as per the rules notified on the manufacture, storage, and import of hazardous chemicals. While the responsibility of preparation and updation of the on-site emergency plan shall rest with the occupier, offsite emergency plans will be prepared by the local emergency authority or the District Collector based on information provided by the occupier.

— The State Governments have been instructed to identify hazardous installations and operations and implement the notified rules.

— Efforts are being made to create and maintain a data bank on hazardous chemicals and accidents. Various commercial data bases with compatible hardware are also being obtained.

— An on-site and off-site plan model explaining the details or handling emergencies in case of a major accidents at a site has been finalised by an expert group.

— Eighteen States/Union Territories have been provided partial financial assistance for creating infrastructure for management of hazardous chemicals.

— The Ministry has taken over the residue work of the Scientific Commission on Continuing Studies on 'the Effects of Bhopal Gas Leakage on Life System and Environment' from the Cabinet Secretariat. The final compilation of the executive summaries of various completed projects is under progress.

5.2.2 Central Crisis Group

A Red Book titled *Central Crisis Group Alert System,* which deals with the management aspects at the time of a crisis pertaining to a chemical accident in the country has been prepared. It also contains names, addresses, and telephone numbers of experts in various states.

Two meetings of the Central Crisis Group (Chemical Disasters) have been held during the year.

5.2.3 Radioactive Substances

5.2.3.1 The Ministry of Environment and Forests is actively associated with the Department of Atomic Energy and the Atomic Energy Regulatory Board in prescribing procedures and safeguards for nuclear installations. The Ministry is also a member of the Advisory Committee on Project Safety Review and the National Emergency Response Committee for nuclear disasters. Various projects from the Department of Atomic Energy (DAE) and Nuclear Power Corporation (NPC) referred to the Ministry for environmental clearance are also reviewed from time to time.

5.2.3.2 A plan involving the Central Pollution Control Board and the Bhaba Atomic Research Centre (BARC) to participate in the Global Environmental Radiation Monitoring Network (GERMON) being created by the WHO/UNEP, has been finalised and under this plan a total of 28 monitoring stations are proposed to be set up.

5.2.4 Hazardous Micro-organisms

5.2.4.1 The notified rules on hazardous micro-organisms deal with the following two distinct aspects:

— Regulation of gene technology and micro-organisms
— Management of biological disasters

Industries, hospitals and research institutions in both the public and the private sectors and others who would be handling hazardous micro-organisms, exporting or importing, processing or producing genetically engineered organisms or products, have been covered under the rule.

5.2.4.2 Rules to regulate manufacture, transport, import, export, and use and storage of hazardous chemicals, mirco-organisms and genetically engineered cells have been promulgated by the Ministry along with the Department of Bio-Technology in December, 1989. With a view to ensure the implementation of the rules, department level, State level and District level Committees are being set up. Guidelines for laboratories, conducting genetic engineering research have been formulated. A Genetic Engineering Approval Committee (GEAC) has been set up in the Ministry which will examine proposals for licencing the experiments and field trials in Genetic Engineering.

5.2.4.3 An International Centre for Genetic Engineering and Biotechnology is functional at New Delhi with UNIDO assistance. The Ministry is actively involved in reviewing the safety aspects of the various research projects being conducted by the Centre. A safety Committee has been constituted for this purpose.

5.2.5 Hazardous Wastes

5.2.5.1 Eighteen categories of hazardous wastes have been regulated. As per the stipulated rules the authorised occupier shall take all steps to ensure proper collection, reception,

packing, labelling, transport, storage, treatment and disposal of hazardous wastes. Accidents at a waste site need to be reported to the State Pollution Control Board who would also examine the applications for import of hazardous wastes. The exporting country or the exporter shall keep the Ministry of Environment and Forests informed of the proposed transboundary movement of such wastes.

5.2.5.2 Government of India has decided to join the international convention on transboundary movement of hazardous wastes known as the Basel Convention. The Conventionl provides a management approach for dealing with the transboundary movement of hazardous wastes including threshold wastes of hazardous nature. This will go a long way in saving our country from inflow of dangerous waste substances.

5.2.6 Reports on Hazardous Chemicals

A report on chlorofluorocarbons (CFCs) entitled 'CFCs and Indian Scenario' and a technical brief on 'Asbestos' and 'Titanium dioxide', have been prepared during the year.

5.2.7 National Waste Management Council

The Ministry has constituted a National Waste Management Council to promote waste management and to make appropriate recommendations to the Government for any legislative, regulatory or fiscal measures needed to promote waste minimisation. The objectives of the Council are as follows:

— Promotion of collection, collation and publication of information regarding availability of wastes, technologies for waste and markets for recoverable materials.

— Analysis of information for overcoming constraints to commercialisation of available technologies for both waste utilisation and waste minimisation and identification of areas in which new technologies need to be developed.

— Rendering advice to the Government, industry and such other sectors as may seek their advice on the aspects of the waste management and on incentives/disincentives needed to facilitate waste utilisation.

— Recommending research and development schemes for developing new technologies.

— Advise Government on fiscal/regulatory measures to promote waste utilisation.

— Promotion of measures to create awareness among those concerned.

The council will achieve its obejctives through interaction with various Government Departments, industrial associations, NGOs local bodies, etc. It will be the focal body for disseminating information collected through different study projects and to promote publications of documents, journals, exhibitions and interaction between the generators and users of the waste.

6. REGENERATION AND DEVELOPMENT

6.1 GANGA ACTION PLAN

6.1.1 The Central Ganga Authority was constituted in February, 1985 to guide and oversee the implementation of a programme for restoring the quality of the river Ganga. During the year, the Authority, under the Chairmanship of the Prime Minister reviewed the overall progress of the Ganga Action Plan and the Monitoring Committee met three times to monitor the progress of engineering and scientific aspects of Ganga Action Plan. The Steering Committee met several times during the year to review the progress of sanctions and executions of various schemes and utilisation of funds under the Ganga Action Plan. The Ganga Project Directorate (GPD) of the Ministry continued to coordinate the implementation.

6.1.2 The three State Governments of Uttar Pradesh, Bihar and West Bengal have designated an officer in their nodal departments to coordinate the Action Plan Work. In addition, committees comprising of implementing agencies and non-officials have been set up for each of the major towns to oversee the programme.

6.1.3 Schemes Sanctioned

6.1.3.1 A total of 262 schemes necessary for completion of the Plan, have been sanctioned. The State-wise position regarding the schemes sanctioned is as follows:

(Rupees in crores)

State	Schemes Sanctioned No.	Cost
Uttar Pradesh	106	122.29
Bihar	45	35.18
West Bengal	111	119.10
Total	262	276.57

6.1.3.2 Schemes sanctioned under the Ganga Action Plan can be broadly divided into six categories as shown in Table 10.

Fig 18: Ganga Action Plan—Cleaning of Sewer lines.

The physical progress of 262 schemes in various States is shown in Table 11.

Table 11

Physical progress (%)	Uttar Pradesh	Bihar	West Bengal	Total
Schemes under execution				
Preparatory work commenced	8	0	1	9
Less than 0	4	2	7	13
10-50	17	10	28	55
Over 50%	25	19	52	96
Schemes completed	52	14	23	89
Grand Total	106	45	111	262

6.1.3.3 Out of 262 schemes sanctioned, 89 schemes have been completed and 96 schemes are nearing completion. The schemes to be completed include construction and commissioning of intermediate pumping stations, interception of drains/sewers, renovation and construction of sewage treatment plants, electric crematoria, etc. Priority has been given for completion of interception and diversion

Table 10

(Rupees in lakhs)

	Uttar Pradesh		Bihar		West Bengal		Total	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost
Interception and diversion	40	3368.90	17	1573.62	31	5180.94	88	10123.46
Sewage Treatment	13	6129.85	7	870.07	15	4683.72	35	11683.64
Low cost sanitation	14	1000.50	7	550.34	22	647.22	43	2198.06
Electric crematorium	3	130.91	8	330.84	18	693.89	29	1155.64
River front facilities	8	613.26	3	87.52	24	673.50	35	1374.28
Other schemes	28	985.32	3	106.03	1	30.47	32	1121.82
Total	106	12228.74	45	3518.42	111	11909.74	262	27656.90

schemes. It is estimated that 173 MLD of waste water has already been prevented from flowing into the river and when all schemes of interception and diversion are completed about 900 MLD of waste water flowing into the river will be intercepted and diverted.

6.1.3.4 Schemes at Sangam—Allahabad, Uttar Pradesh

A very large low cost sanitation programme at a cost of Rs. 7.74 crores jointly financed by GPD, Ministry of Social Welfare, HUDCO and UP Government, taken up at Allahabad is under implementation. A scheme for integrated development of Saraswati Ghat and adjoining areas near the Sangam has been taken up at an estimated cost of Rs. 28.18 crores. The works covered are public amenities at the main ghat, development of the Nehru Ghat, bathing facilities, jetty line-cum-pathway, repairs to existing ghats, boat club building and adjacent ghats, approach road and lighting, afforestation, land scaping, etc.

6.1.3.5 Other Schemes

Though the bulk of the schemes under the Ganga Action Plan relate to sewerage and sanitation, some additional schemes to supplement these efforts have also been taken up as follows:

— Schemes for plantation in the denuded stretches of Mansa Devi Hills, soil conservation and construction of check dams to reduce silt intrusion into the drains and sewers of Hardwar;

— Conservation and breeding of fresh water turtles at Varanasi/Kukrail with a view to introduce them into selected areas of the River Ganga;

— A scheme for improving safety for river using public at Varanasi, through increased patrolling to prevent dumping of solid wastes, remove floating animal carcasses and dead bodies and control mooring of vessels;

Fig 19: A view of newly constructed Saraswati Ghat, Allahabad— A River Front Development Activity under the Ganga Action Plan

— Construction of 32 electric crematoria in 22 towns in Bihar, UP and West Bengal at a cost of about Rs. 11.56 crores which will reduce the demand for firewood by about 3000 quintals per year equivalent to the produce of 900 hectares of forest; and

— In the Calcutta Metropolitan District, an urban development programme of Rs. 110 crores is being implemented, which will supplement the schemes under the Ganga Action Plan.

6.1.4 Water Quality Monitoring

Two types of monitoring activities have been undertaken for water quality monitoring of the river Ganga.

6.1.4.1 Macro Level Monitoring Programme

The programme involves monitoring through 27 stations spread over the entire fresh water stretch of the Ganga in the States of U.P., Bihar and West Bengal. A total of 42 parameters are being analysed.

6.1.4.2 Micro Level Monitoring Programme

A total of 42 stations are monitored by the U.P. Pollution Control Board, at a frequency of three times a month, for 19 parameters. In order to estimate the quality of Nallah effluents entering the river, corresponding drains at Rishikesh-Hardwar, Kanpur and Allahabad are monitored once a month.

The micro level monitoring data are being stored in the computer to generate a data base. An appropriate coding system has been evolved for effective retrieval. The following programmes have been initiated recently:

— Baseline/trend monitoring
— Impact locations monitoring
— Statistical analysis of collected water quality data
— Automatic river water quality monitoring stations.

6.1.5 Water Quality Modelling

GPD has sponsored IIT Bombay to develop a Water Quality Model named 'STREAM'.

6.1.6 Studies in Minimum Flow in the Ganga

An Inter-disciplinary Group to study and determine the minimum additional flows of water that would be necessary at specific points, like Kanpur, Allahabad, Varanasi, etc. was set up. The study covered aspects of measurement of water abstraction, lift irrigation and ground water tapping and existing water management practices with a view to suggest short- and long-term improvements.

6.1.7 Technology Innovation

Ganga Action Plan is a comprehensive plan comprising control of domestic and industrial pollution of the river, development of the river front, maintenance of the river hygiene, ecology of the basin etc. It is expected to serve as a model for undertaking pollution abatement works in respect of other rivers of the country. Successful implementation of the Action Plan involves the following scientific and technical efforts:

— Survey and identification of pollution loads;
— Treatment technologies;
— Pilot plants for new low cost treatment technologies;
— Low cost sanitation technologies,
— Resources recovery,
— Energy recovery from sewage gas,
— Sewer inspection and *in situ* rehabilitation;
— Flow measurement;
— Water quality modelling;
— Water quality monitoring of the river at macro and micro levels;
— Industrial waste treatment;
— Research projects and studies in the river basin;
— River front development and other facilities;
— Public awareness and education;
— Project monitoring; and
— Manpower development and training.

6.1.8 Pollution Abatement in River Yamuna

As per the survey carried out by the Central Pollution Control Board, 4 stretches of the river Yamuna have been identified as critical ones requiring upgradation of the quality of water. These are (1) Wazirabad-Okhla, (2) Okhla-Vrindavan, (3) Vrindavan-Mathura, and (4) Mathura-Etawah. The sources of pollution in these stretches are due to the discharges of domestic and industrial waste waters from the cities of Delhi, Ghaziabad, Vrindavan, Mathura and Agra.

Action plans for interception, diversion, treatment and disposal of waste waters from identified pollution sources have been formulated. Resources recovery, an important and integral part of the Yamuna Action Plan will be effected in different ways, depending upon the size and locations of the plant.

6.1.9 Public Awareness and Participation

Various organisations such as Nehru Yuvak Kendra, National Service Scheme (NSS), National Cadet Corps (NCC), and others participated in Ganga Sewa Shivirs, comprising of cleaning of ghats, padayatras, exhibitions etc. Such programmes were held during occasions such as Kumbh Mela and Kartik Purnima to involve people in the Ganga

Action Plan. Special attention was given to the participation of school children in analysing water quality in different stretches of the river. Other programmes such as painting competitions, seminars, workshops were also held to increase people's involvement in the Ganga Action Plan.

6.2 WASTELANDS DEVELOPMENT

6.2.1 The National Wastelands Development Board (NWDB) set up in 1985 for the development and reclamation of wastelands in the country through a massive programme of afforestation with people's participation continued its activities with the following objectives:

— to increase tree and other green cover on wastelands;

— to prevent lands from becoming wastelands;

— to develop a people's movement for afforestation; and

— to meet the fuelwood and fodder needs of the people.

NWDB's programmes for afforestation and wastelands development have special emphasis on meeting the needs of fuel wood, fodder and small timber with the involvement of the people.

6.2.2 Afforestation under 20-Point Programme

NWDB is the nodal agency for coordinating and monitoring the afforestation activities under the 20-Point Programme (Point No. 16) being implemented through the States and Union Territories.

The targets and achievements under this programme during the past four years are as follows:

Table 12

Year	Targets (in million ha.)	Achievements (in million ha.)	Percentage achievement
1985-86	1.45	1.51	104.1
1986-87	1.71	1.76	102.9
1987-88	1.79	1.77	98.9
1988-89	2.0	2.1	105.5
1989-90	1.7	1.48 (upto Dec., 89)	—

6.2.3 Plan Schemes

6.2.3.1 Rural Fuelwood Plantation Scheme

The objective of the scheme is to meet the fuelwood, fodder and timber requirements of the people and to conserve soil and moisture in the planted areas. The pattern of Central assistance is 50% in respect of States and 100% to UTs limited to the permissible unit cost. The scheme is being implemented in 159 fuelwood deficient districts in 25 States and the UT of Delhi. During the year an area of 0.65 lakh ha. is being covered involving an expenditure of Rs. 20.00 crores.

6.2.3.2 Soil, Water and Tree Conservation Scheme in the Himalayas (Operation Soilwatch)

The main objective of the scheme is soil/water conservation on catchment/micro-catchment basis by adopting an integrated approach with a view to conserving ecosystems in the Himalayan region. The pattern of Central assistance is 50% grant and 50% loan to the participating States. During the year, 0.23 lakh ha. of area is being covered at an expenditure of Rs. 12 crores.

6.2.3.3 Grants-in-aid to Voluntary Agencies

Under this scheme, grants are given to voluntary agencies for motivating the people to set up nurseries and to undertake plantation work, besides organising awareness campaigns and training camps regarding the benefits of afforestation, etc. During the year, 35 new projects have been sanctioned under this scheme at a total cost of Rs. 83.88 lakhs. Evaluation of 70 completed projects was also undertaken during the year.

6.2.3.4 Decentralised People's Nurseries

Under this scheme, decentralised people's nurseries are being promoted through participation of the people, especially the landless poor, small/marginal farmers, mahila mandals, youth groups, etc. with a view to decentralise the seedling production for the local needs at a cheaper production cost with 100% Central assistance limited to a maximum subsidy of 45 paise per sapling.

This scheme is also being implemented by the National Dairy Development Board through the field functionaries of the milk unions/federations in various States, with an outlay of Rs. 140 lakhs.

During the year, 35.50 crores seedlings are being raised involving an outlay of Rs. 16.00 crores.

6.2.3.5 Silvipasture Scheme

The objectives of the scheme are to augment the production of good quality grass and fodder on Government, institutional, community and marginal/sub-marginal private lands for meeting the fodder needs in the country, encourage stall feeding and to reduce the grazing pressure on the country's limited forest wealth. Although the scheme has been envisaged on 50:50 basis between the States and the Centre, the Central assistance is limited to a maximum of Rs. 1250 per ha.

This scheme which is based on people's participation, involves Gram Panchayats/Gram Sabha in creation, protection and maintenance of grass/fodder farms on community lands, and the target of 12,000 ha. involving an outlay of Rs. 1.5 crores is being achieved.

Fig 20: Nursery Raised by Voluntary Organisation under Decentralised People's Nurseries Scheme.

The scheme is also being implemented by National Dairy Development Board (NDDB) through the Village Milk Cooperatives and Tree Growers Cooperatives under "Operation Flood". The total membership of such cooperatives, so far is 5398.

6.2.3.6 Margin Money Assistance

The objective of the scheme is to encourage flow of institutional funds for socially beneficial afforestation and wastelands development projects by extending Central assistance, so that, it can be brought within the economic viability criteria of NABARD. During the year the funding pattern of the scheme has been revised and a provision of Rs. 100 lakhs has been made for developing an area of about 5000 ha.

6.2.3.7 Plantation of Minor Forest Produce including Medicinal Plants

The scheme with 100% Central assistance envisages plantation of fruit bearing trees, bamboo, cane, tendu, harra, behera, lemon grass and medicinal plants, to benefit the tribals and other backward classes living near the forests. The scheme is being implemented in the States of Andhra Pradesh, Assam, Karnataka, Sikkim, Meghalaya, Nagaland, Orissa, Rajasthan, Tripura, West Bengal, Gujarat, Tamil Nadu, Manipur and Arunachal Pradesh. During the year, plantations are expected to be created on 5000 ha. involving an expenditure of Rs. 250 lakhs.

6.2.3.8 Seed Development

The scheme with 100% Central assistance for developing proper facilities for collection, testing, certification, storage

and distribution of quality seeds, was introduced in the States of Andhra Pradesh, Rajasthan, Gujarat, Karnatka, Haryana and Madhya Pradesh. During the year, the programme has also been taken up in the States of Punjab, Sikkim, Uttar Pradesh and Orissa.

An Expert Group on Seed Development has been set up to make an indepth study of the on-going projects, suggest programmes relating to seed technology and for assessing requirements of funds etc.

6.2.3.9 Aerial Seeding

The objectives of the scheme are to study the effectiveness of aerial seeding techniques of afforestation, regeneration/revegetation of difficult and inaccessible areas like ravines, hill areas, desert areas etc. During the year, an area of 23,000 ha. is being covered under this scheme.

6.2.3.10 Area Oriented Fuelwood and Fodder Projects

This scheme envisages implementation of Area Specific Integrated Wastelands Development Projects, including promotion of fuelwood/fodder produciton, soil/moisture conservation measures and water management. During the year, an area of 2000 ha. is being covered under this project.

6.2.3.11 Integrated Wastelands Development Projects

In view of the restructured approach to develop integrated land-use planning capabilities, a new Central/Centrally Sponsored Scheme "Integrated Wastelands Development Project" with 100% Central assistance has been initiated during the year with the objectives of taking up specific activities for conservation of the ecologically fragile areas, regeneration of degraded forests and technology extension

Fig 21: Raising of Quality Seedlings under Decentrilised People's Nurseries Scheme.

Fig 22: Raising of Fruit Bearing Trees under Plantation of Minor Forest Produce Scheme.

for reclamation of special category of problem lands for fuelwood and fodder production approach on watershed basis for broad based programme for wastelands development.

During the year, 8 districts viz., Almora (UP), Purulia (West Bengal), Sundergarh (Orissa), Dungarpur (Rajasthan), Bellary (Karnataka), Datia (Madhya Pradesh), Madurai (Tamil Nadu) and Nasik (Maharashtra) have been identified for preparation of micro-plans.

6.2.4 Projects

6.2.4.1 Categorisation and Identification of Wastelands

A National Wastelands Identification Project was taken up to make a systematic study of the wastelands in 146 districts of the country. During the year, 75 districts have been identified for undertaking mapping with the help of the National Remote Sensing Agency (NRSA).

6.2.4.2 Computerisatior

Micro-computers have been installed and updated software packages have been provided in 27 States/UTs. During the year, 8 training programmes were ogranised for the field staff of the States/UTs for imparting necessary training regarding collection of data for computerisation.

6.2.4.3 Operational Research Projects

— An amount of Rs. 18.16 lakhs has been provided to the Government of Uttar Pradesh to carry out afforestation in the Mussorie Hills over an area of 80 ha.

— An amount of Rs. 36.76 lakhs has been provided to the Society for Promotion of Wastelands Development (SPWD), for executing a project on "Technology Demonstration and Transfer on Usar Land Reclamation" in 12 districts of Uttar Pradesh covering an area of about 120 ha.

6.2.5 Externally Aided Social Forestry Projects

Fourteen Externally Aided Social Forestry Projects are being implemented in the States of Andhra Pradesh, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal with financial assistance from the World Bank, USAID, CIDA, SIDA, and ODA (UK). Afforestation programme for 5 to 8 years is being undertaken on public and private wastelands covering an area of about 2,068,483 ha. The projects will meet the needs of rural population for fuelwood, fodder, small timber, agricultural implements, tools, etc.

6.2.6 Other Activities

6.2.6.1 Tree Patta Scheme

The Tree Patta Scheme is being implemented by the Department of Rural Development in 8 States viz., Bihar, Maharashtra, Tamil Nadu, Uttar Pradesh, Rajasthan, Gujarat, and Karnataka with the objectives of providing employment, creating assets and providing subsistence requirements of fuelwood, fodder and food to the landless, marginal farmers and weaker sections of society.

6.2.6.2 Tree Grower's Cooperatives

A Pilot Project of Tree Growers' Cooperatives was taken up in 5 States in collaboration with National Dairy Development Board for raising decentralised nurseries and silvipastural farms. Over 600 lakhs seedlings and about 3300 ha. of silvipasture farms have been raised under this project.

6.2.6.3 Institutional Finance

National Bank for Agriculture and Rural Development (NABARD) in consultation with the Board continued to extend lending of funds for forestry projects.

6.2.6.4 Indira Priyadarshini Vrikshamitra Awards

The Indira Priyadarshini Vrikshamitra Awards were instituted in 1986 to recognise the work of people's involvement in wastelands development and afforestation. Ten awards of Rs. 50,000 each are given to individuals, panchayats, schools, voluntary agencies, and districts (2 Awards for each category).

Nominations received for these awards for the year 1989 are under consideration.

6.2.6.5 Training

Specific training and extension programmes to educate and motivate rural people, especially the women to take up afforestation activities are being taken up by the Board in various stages with the involvement of voluntary agencies.

6.2.6.6 Communications

An Advisory Committee has been constituted to advise the Board on all matters of communication and extension work and to lay down general guidelines to consider and approve specific schemes and projects and also for periodical review of progress.

6.2.6.7 Exhibition

During the year, the Board participated in a national level exhibition "Our Environment—Our Future" organised by the Ministry at Prgati Maidan, New Delhi, during November, 1989.

6.2.6.8 Publications

The following publications were brought out during the year:

— Technologies in Wasteland Development;
— Developing Indian Wastelands;
— Reports of the Working Group on Minimum Domestic Requirement of Fuelwood; and
— Report of the Working Group for Wasteland Development Action in the Eighth Five Year Plan.

6.2.7 NATIONAL MISSION ON WASTELANDS DEVELOPMENT

6.2.7.1 In order to upgrade and strengthen the wastelands development programme and to give a concrete shape to the restructured programme of the National Wastelands Development Board, a National Mission on Wastelands Development has been launched in October, 1989. The main reasons for upgrading the wastelands development programme to the status of a Technology Mission are:

— to bring management focus;
— to impart a sense of urgency;
— to make qualitative changes in on-going programmes;
— to integrate financial and institutional resources;
— to accelerate lab-to-land transfers;
— to provide mechanisms for resolution of relevant policy issues; and
— to evolve strategies for meaningful involvement of the people.

6.2.7.2 The main strategy of the Mission focusses on integrated land use planning on watershed basis with village level action plans involving people's participation specially through Panchayats for increasing fuelwood, fodder and timber production, and conservation and natural regeneration of degraded forest areas.

6.2.7.3 The following 6 mini-missions have been set up to implement the various programmes of the National Mission on Wastelands Development:

— Planning and Policy;
— People's Participation;
— Technology Extension;
— Regeneration of Degraded Forests;
— Greening of Public lands; and
— Farm Forestry.

6.2.7.4 An Empowered Committee under the Chairmanship of the Cabinet Secretary has been set up for reviewing and guiding the Mission's activities

6.2.8 Working Group for Wastelands Development

A working Group on 'Wastelands Development' under the Chairmanship of Secretary (E&F) was set up by the Planning Commission, with the following objectives:

— to formulate proposals for the VIII five year plan with clear time schedules;
— to review the performance of various plan schemes;
— to identify specific area oriented schemes based on the classification of wastelands;
— to evolve mechanisms to ensure people's participation in the programme;
— to evolve integrated programmes for the development of wasteland; and
— to suggest an optimum outlay for the development of wastelands in the country.

6.2.8.1 To facilitate the working and deliberations of the Working Group, three Sub Groups (Plan Schemes, People's Participation and Scientific and Technical Inputs) were set up with specific terms of reference. Thereafter the Working Group met and discussed in detail the policy prescriptions and projects needed to make the Wastelands Development Programme more effective. The Working Group made recommendations on increasing people's participation, making use of technologies for wastelands reclamations and on the new approach needed to tackle the problems of land degradation and fuelwood and fodder crisis. Some of the strategies recommended by the Working Group are given below:

— Building land use planning capability, specially at district and village levels, aimed at integrated use/management of wastelands;
— Conservation of selected ecologically fragile areas/watersheds, specially the Upper Himalayan Catchments, the Western Ghats and the Aravallis;
— Regeneration of degraded forest areas;
— Reclamation of special problem lands;
— Grassland and fodder development;
— Production and conservation of fuelwood;
— Promotion of Agro-forestry/Farm forestry; and
— People's participation at all stages and a conscious effort to involve small and marginal farmers and agricultural labourers.

6.3 OTHER ACTIVITIES ON ECO-REGENERATION

The main objectives of the eco-generation schemes are to demonstrate technologies for regeneration of ecologically degraded and fragile areas to undertake integrated environmental improvement projects and to create environmental awareness. These activities are being carried out by organising Eco-Task Forces of ex-servicemen, Field Demonstration Projects and Eco-development Camps.

6.3.1 Eco-Task Forces

Eco-Task Forces of ex-servicemen, a joint venture of the Ministry of Environment and Forests, the Ministry of Defence and the concerned State Government, undertake in ecological restoration work in selected environmentally degraded areas particularly in unapproachable and hostile terrains. The activities include afforestation, pasture development, soil and water conservation and other restorative works. Eco-Task Forces are deployed in Uttar Pradesh, Rajasthan and Jammu & Kashmir.

6.3.1.1 Eco-Task Force, TA-127, Uttar Pradesh

This Task Force is deployed in the Kiarkuli micro-catchment near Mussoorie. The work done during the year is as follows:

— Plantation (Nos.)	1,17,308
— Mined area reclamation (No. of mines)	5
— New area covered (ha)	109

6.3.1.2 Eco-Task Force, TA-128, Rajasthan

The Task Force continued to work on the left bank of the Indira Gandhi Canal, Rajasthan. The main achievements during the year are as follows:

— New plantation (Nos.)	10,48,960
— New area covered (ha)	557
— Development of land for fodder (ha)	45
— Nursery raising (Nos.)	3,09,675

6.3.1.3 Eco-Task Force, TA-129, Jammu & Kashmir

This Task Force was created in 1988 and is engaged in eco-regeneration work in Jammu region near Samba. The main achievements during the year are as follows:

— New Plantation (Nos.)	70,731
— New area covered (ha)	42
— Nursery raised (No. of saplings)	2,00,000
— Soil conservation (ha)	40

6.3.2 Field Demonstration Programmes

This programme is intended to demonstrate technologies for restoration of selected degraded areas and integrated ecological development. During the year, four projects were completed and two new projects were sanctioned as per details below:

— Ecological resotration of Cherrapunjee, Meghalaya (completed).
— Environmental regeneration of Auroville, Tamil Nadu (completed).
— Eco-development in Shivalik foothills, Hoshiarpur, Punjab (completed).
— Ecological Improvement at Tumkur, Karnataka (completed).
— Eco-regeneration and environment improvement of Umri area in Distt. Nanded, Maharashtra.
— Eco-development, afforestation and eco-regeneration of degraded hill slopes, Coimbatore, Tamil Nadu.

Details of the on-going projects are given below:

6.3.2.1 Eco-regeneration of Pushkar Lake Valley, Ajmer

The project is implemented by the Consortium of Indian Scientist for Sustainable Development, New Delhi/Ajmer. About 45,000 plants planted earlier were maintained and protected in critical sandy areas. Eight nurseries have been maintained and about 4 lakh seedlings have been raised for plantation. A seed bank has been set up with the assistance of school children from 6 schools at Vaishalinagar, Rishi Udyan and Madhopura in order to provide varieties of seeds of fruit, flowers, vegetables, fodder and medicinal plants. For augmenting water supply, 5 wells were deepened. In addition 2 new dramas on environmental themes, 2 corresponding Puppet shows and 2 computer games based on environmental activities have been developed for linking environment with education.

6.3.2.2 Ecological Improvement of Gopeshwar Area, Distt. Chamoli (UP)

The project was initiated in 1987 for rehabilitation of 30 sq. km. areas (at 30 patches) in Alaknanda Catchment of the Himalayas. The activities include nursery raising, afforestation, soil conservation, biofencing and protection with stonewall and organisation of eco-development camps. About 36,000 meter long stone wall was constructed in 30 villages with active involvement of local women. Three eco-development camps were organised and 2 nurseries have been estaboished in which 50,000 saplings are being raised. The project is being implemented by Dasholi Gram Swarajya Mandal, Gopeshwar.

6.3.2.3 Integrated Environment Development around Binsar Sanctuary, Almora (UP)

The project was sponsored in 1988 to Paryavaran Jan Jagran Samiti, Binsar, Almora to undertake the following activities:

— Plantation of 2.8 lakh samplings of multiple use in 146 ha of community and Van Panchayat land in 6 Gram Sabhas;
— Establishment of 5 nurseries to grow 2.3 lakh saplings;
— Arrangement for drinking water for 3 villages;
— Development of water resources, construction of water storage tanks and construction of 'Kulhs' (water channels) to cover 30 ha. of land belonging to poor section of society;
— Construction of check dams for preventing soil erosion and improving water management; and
— Creation of environmental awareness.

During the year, the following work has been completed:

Fencing/stone wall protection	57 ha.
Digging of pits (Nos.)	45,000
Plantation (Nos.)	45,000
No. of nurseries set up	2
Laying of water pipes for drinking water (mts.)	2,050
Water storage tanks (Nos.)	2
Construction of irrigation channel (mts.)	950

6.3.3 Eco-development Camps

The aim of this programme is to create awareness and undertake short-term ecological and environmental improvemnt activities with the involvement of school children, college youth and public. Under this programme, voluntary, government and semi-government organisations are provided financial support to organise camps for specific activities such as tree plantation, soil conservation, management of water resources, health care and sanitation, promotion of non-conventional sources of energy and creation of environmental awareness. During the year, 50 camps were sanctioned in various parts of the country.

7. RESEARCH

7.1 ENVIRONMENTAL RESEARCH

7.1.1 Introduction

7.1.1.1 The aim of the programme of environmental research is to generate an information and to provide a scientific basis for development of strategies for environmental protection, conservation and ameleoration.

7.1.1.2 The Man and Biosphere Programme and Environmental Research Programme are the two major programmes in this area. At present there are 130 research projects in operation dealing with monitoring and control of air and water pollution, impact studies covering industrial effluents/emissions, agro-chemicals, engineering projects, conservation of flora and fauna, ethnobiological studies, effects of pollutants, eco-toxicology, and development of systems for pollution monitoring and control and management.

7.1.1.3 During the year, 24 new research projects have been sanctioned-11 projects under the Man and Biosphere Programme and 13 under the Environmental Research Scheme. The list of sanctioned projects is given at Annexure II. Twenty three research projects were completed during the year. The list of completed projects is given at Annexure III.

7.1.2 Coordinated Research Projects

7.1.2.1 Ethnobiology

During the year, the second phase of the All India Coordinated Project on Ethnobiology has been launched. The project envisages studies to understand the inter-relationships and association of tribal communities with the surrounding environment. The areas to be covered include tribal areas located in the plains of Uttar Pradesh, Maharashtra, Goa, Rajasthan, Tamil Nadu, Karnataka, Assam, Sikkim, West Bengal, Gujarat, Haryana and North Eastern States. Besides this, phyto-chemical and pharmacological investigations for promoting tribal medicinal plants will be carried out. The institutions participating in the project are National Botanical Research Institute, Lucknow; Botanical Survey of India; Central Drug Research Institute, Lucknow; St. Xavier's College, Bombay; Regional Research Laboratory, Jammu; and Post-Graduate-cum-Research Centre, Trivandrum.

7.1.2.2 Studies on Sea Level Rise

The Department has constituted an Expert Advisory Committee on Global Environmental Issues to advise the Government on all aspects related to global warming and depletion of ozone layer to help in the promotion and coordination of multi-institutional and multi-disciplinary studies in this area and to assess the research projects in the relevant areas. On the recommendations of the Committee, the Department is financing research studies for the analysis of the existing Indian coast, identification of scientific inputs required for impact assessment studies, estimation of land areas threatened by possible sea level rise and estimation of degree of coastal erosion, impact on ground water, extent of coastal floods due to storm surges, estimation of socio-economic impact along the coast and a status report for policy decisions. The project is being conducted by 9 institutions all over the country at a total cost of Rs. 37.35 lakhs. The results of the project are expected to be available in about two years time.

7.1.2.3 All India Coordinated Research Project on Conservation of Endangered Plant species—Tissues Culture Programme

This programme on tissue culture involves identification and enumeration of endangered medicinal plant species, undertaking studies on gene pool conservation, artificial propagation in natural habitats, development of techniques of mass-multiplication of selected plant species, development of agro-technological packages of practice and domestication and cultivation of threatened plant species. It also includes creation of cryo-preservation centres for preservation of propagules of genetically rich strains.

The following institutions are involved in the programme:

— Department of Botany, University of Delhi, Delhi;
— High Altitude Plant Physiology Research Centre, H.N. Bahuguna Garhwal University, Srinagar, Garhwal;
— Department of Botany, University of Calcutta, Calcutta;
— Department of Botany, North Eastern Hill University, Shillong;
— National Chemical Laboratory, Pune; and
— Central Institute of Medicinal & Aromatic Plants, Lucknow.

The important findings of this project are:

— Micro-propagated plants of *Saussurea lappa, Piccrorhiza kurroa, Delphnium malabaricum* and *Podophyllum hexandrum* have been transplanted and plants of *Valeriana wallichii* and *Nepenthes khasiana* raised through tissue culture have been established under field conditions.

— *In vitro* callus cultures have been obtained for the following plant species:

Coptis teeta	*Saussurea lappa*
S. circaester agrestis	*Nardostacty jatamansi*
Commiphora wightii	*Acontium heterophyllum*

Shoot bud induction, development and their multiplication *in vitro* have been achieved for:

Nymphaea tetragona	*Ruscus hypophyllum*
Asparagus racemosus	*Lillium longiflorum*

L. tiqrinum	*Tylophora indica*
Rauwolfia indica	*R. vomitora*
Saussurea lappa	*Valeriana wallichii*

Protocorm formation, followed by development of young seedlings with shoots and roots was established *in vitro* regenerated plants *Valeriana wallichii* and *Piccrorhiza kurroa* to the field.

7.1.2.4 Integrated Action Oriented Research Demonstration & Extension Programme on Eco-Development

— The programme envisages integrated research and development aimed at finding solutions to the local environmental and ecological problems and is expected to evolve action plans for undertaking eco-development activities in the Himalayas, Western Ghats and Eastern Ghats regions of the country.

— During the year 17 new projects were sanctioned under the programme out of which 13 are for the Himalayan region, 3 for the Western Ghat region and one for Eastern Ghat region. The list of projects sanctioned is given in Annexure-II.

— Twenty research projects of Himalayan region, 8 projects of Western Ghats region and 4 projects of Eastern Ghats region were completed during the year. The list of the completed projects is at Annexure III. Apart from this, 40, 25 and 21 projects are ongoing in the Himalayan, Western Ghats and Eastern Ghats regions respectively.

— The Department has also taken up an Integrated Action Oriented Research Programme on River Kaveri with the following objectives:

  — Physico-chemical and biological monitoring of water quality of the river and its tributaries;

  — Environmental epidemiology covering studies on prevalence of water borne and other environmental diseases along the river stretch;

  — Inventorization of the sources of pollution along the river stretch; and

  — The programme involves 8 universities and 12 colleges along the river and is coordinated by Madras Science Foundation with the participation of Tamil Nadu and Karnataka Pollution Control Boards. During the year analytical methods for water quality parameters have been standardized through two workshops. The scope of the projects and the institutions involved have been given in Annexure IV.

7.1.2.5 Monitoring of the Research Projects

— Sixty one research projects under the Environmental Research and Man & Biosphere Programme were reviewed at three review workshops organised at New Delhi during the year;

— Fifty three research projects under the Integrated Action Oriented Research Demonstration and Extension Programme on Eco-development were reviewed at three workshops at Nainital, Mangalore and Bhubaneshwar during the year; and

– The Monitoring Group on River Kaveri reviewed the projects during its meeting at Madras in September 1989.

7.1.2.6 Integrated Eco-development Action Oriented Research Programme on the Ganga Basin

This programme was initiated with the main objective of obtaining the biological profile together with the physico-chemical characteristics of the River Ganga and consists of 49 studies (projects) ranging from physico-chemical and biological characteristics to environmental awareness.

7.1.2.7 Research Committee for the Ganga Action Plan

The Ganga Project Directorate has set up a Research Committee of 16 members bringing together various scientific organisations and individual experts for the promotion of resarch and technology application. Projects of various nature such as pisciculture, application of treated sewage as irrigant, rehabilitation of fish in places where they are depleted, biomonitoring and bioconservation of certain species have been considered and approved for funding. The Committee has also prepared a compendium on algae and macro fauna identified as the original species related to the Ganga.

7.2 CENTRES OF EXCELLENCE

The Deparement had set up the following 5 Centres of Excellence in the areas of environmental education, ecology and mining with a view to strengthening research and training in priority areas of environmental science and management.

— Centre for Environment Education, Ahmedabad;
— C.P.R. Environmental Education Centre, Madras;
— Ecological Research & Training Centre, Bangalore; and
— Centre for Mining Environment, Dhanbad.

Salim Ali Centre for Ornithology was sanctioned to be set up in collaboration with the Bombay Natural History Society, Bombay.

7.2.1 Centre for Environment Education, Ahmedabad

The Centre was established in 1984 to meet the country's need for creating high quality environment education materials on various environmental themes. Details regarding the activities of the Centre have been given in Chapter 8.

7.2.2 Environmental Education Centre, Madras

C.P.R. Environmental Education Centre was set up by the Department in 1988 with the objectives of increasing consciousness and knowledge about the environment. Details of the activities of the Centre have been given in Chapter 8.

7.2.3 Ecological Research & Training Centre, Indian Institute of Science, Bangalore

The Centre continued its activities on Western Ghats and Nilgiri Biosphere Reserves. The Department has approved a scheme for acquiring additional space for the Centre in view of its extended activities. The programmes of the Centre were reviewed and those for Eighth Plan have been finalised by the Standing Monitoring Committee.

7.2.4 Centre for Ornithology, Bombay

The Salim Ali Centre for Ornithology is being set up by the Department at Bombay Natural History Society, Bombay. The broad functions of the Centre are as follows:

— Conducting research in ornithology including post-graduate research at M.Sc., M.Phil, and Ph.D levels;

— Applied research of direct relevance to ornithology; and

— Creation of a data bank on Indian ornithology.

7.2.5 Centre for Mining Environment, Dhanbad

This Centre, established in March 1987, has started functioning during the year with the appointment of faculty members. Research projects dealing with water quality assessment, air quality status, land damages, biological reclamation, noise pollution and demographic studies have been finalised. The construction of the building for the Centre has also been started during the year.

7.3 GOVIND BALLABH PANT HIMALAYA PARYAVARAN EVAM VIKAS SANSTHAN

G.B. Pant Himalaya Paryavaran Evam Vikas Sansthan (G.B. Pant Institute of Himalayan Environment and Development) has been set up as an autonomous organisation for evolving integrated strategies for conservation and development of the natural resources of the Himalayan region for its sustainable development based on ecological principles. The Sansthan is a focal point for policy planning in the areas of research, development, training, education and awareness.

The Institute has identified its core programmes around land and water resource management, sustainable management of the rural ecosystems, ecological economics, environmental impact analysis and conservation of biological diversity. The following 10 projects have been initiated during the year:

— Restoration ecology of degraded terraces and re-development of agro-ecosystem at Katarmal, Almora;

— Integrated watershed management—A case study in Sikkim;

— A comparative study of selected watersheds in the Western Ghats and the Himalayas;

— Sustainable development of village clusters in Srinagar, Garhwal;

— Sustainable development of villages surrounding Binsar sancturary in Almora district;

— Managing Binsar sanctuary with people's participation;

— Jhum and sustainable development of a cluster of villages in Mokochung district, Nagaland;

— Ringal bamboo and sustainable development of Kapkot region of Almora district;

— Long-term ecological research in the Binsar sanctuary, Almora;

— Environmental impact analysis and restoration of magnesite mining area in Almora district; and

— Ecology and sustainable development of tribals in north-east India.

In addition, three projects have been initiated in collaboration with the Department of Science and Technology.

Apart from the core programmes to be implemented through the Institute's scientific staff, the participatory programmes with the available scientific talent in the existing insitutions as well as NGOs in the Himalayan region are also being prepared. A newsletter Hima-Paryavaran has been started both in Hindi and English to disseminate useful scientific information for the management of natural resources of the Himalayan region as well as to highlight the activities of the Institute.

Four sub-centres of the Institute have been set up at Kumaon (UP), Garhwal (UP), Gangtok (Sikkim) and Chuchuyamlang (Nagaland) during the year.

7.4 RESEARCH ON WETLANDS AND MANGROVES

7.4.1 Wetlands

Research on various aspects of wetland conservation is promoted through universities and other research institutions. During the year three research projects were sanctioned. The list of ongoing research projects is given at Annexure II.

7.4.2 Mangroves

Research on various aspects of mangrove conservation is taken up through universities and other research institutions. The proposals are scrutinised by the National Mangrove Committee. During the year two new projects have been sanctioned. The list of ongoing research projects is given at Annexure II.

7.5 RESEARCH ON BIOSPHERE RESERVES

Research on various aspects of biosphere reserve areas is being promoted through academic and research institutions. The proposals are considered by research committees constituted for each biosphere reserve. The research institutions for studies on various disciplines have also been identified. So far 16 research projects covering hydrological studies, human ecology and eco-restoration and long term monitoring of biological processes have been sanctioned under Nilgiri and Nanda Devi Biosphere Reserve. The list of sanctioned projects is given at Annexure II. The list of completed projects is given at Annexure III.

7.6 FORESTRY RESEARCH

Forestry research has been totally reorganised after an indepth review to achieve the twin goals of conservation of natural forests and the stepping up of the pace of afforestation and wasteland development.

7.6.1 The Indian Council of Forestry Research & Education (ICFRE)

ICFRE has been set up with a view to oversee the activities relating to Forestry Research & Education in the country and coordinating the efforts of all the concerned institutes/organisations. The functions of the council include:

— Preparing the overall research policies of the country, review it periodically, monitor the progress of research schemes and allocate resources.

— Support forestry education programmes in State Agricultural Universities and other Universities.

7.6.2 Forest Research Institute (FRI), Dehra Dun.

The ten Divisions of FRI undertake research activities on different aspects of forestry viz. silviculture, forest protection, ecology and conservation, social forestry, forest management, forest products and minor forest products, genetics, tree propagation, botany and forest operations. Research activities undertaken during the year are as follows:

— Studies for developing nursery techniques for neem, shisham, khair, aonla;

— Growth records of *Acacia caven, A. mangium;*

— Propagation of shrub species e.g. *Woodfordia, Rhur, Adhatoda, Carissa, Barberis,* etc;

— Studies on propagation of 10 medicinal and aromatic plants;

— Studies on oil content in 9 tree species;

— Mutation breeding of *Eucalyptus, Albizzia, Dalbergia sisso;*

— Evaluation of mycorrhizal injection in nursery seedlings of 20 important hardwood tree species;

— Pathological studies in nurseries for the control of rhizobia;

— Systematic studies of some bamboo species of north east;

— Studies of biomass and productivity in degraded slopes in Himalayan region;

— Studies in timber mechanics, wood preservation, seasoning, timber engineering and related fields; and

— Development of logging tools such as pruners and stalkposters.

7.6.3 Coniferous Research Centre, Shimla

This Research Centre is carrying out work on standardisation of afforestation techniques and demonstration and evaluation of Himalayan shrubs for their utility for fuel, fodder and soil conservation at Shimla and Tabo in Spiti valley.

7.6.4 Directorate of Lac Development, Ranchi

Activities of this Directorate relate to demonstration of improved methods of lac cultivation and to supply of quality broad lac to other organisations for extensive lac cultivation.

7.6.5 Institute of Forest Genetics and Tree Breeding, Coimbatore

This institute aims at carrying out national level research in the field of forest genetics and tree breeding. It also deals with regional research needs of the Southern Region. Main activities during the year include:

— Studies on intraspecific differentiation of important

primary and secondary timber species of natural evergreen reserves;

— Provenance trials of *Eucalyptus incrotheca, E. terreticornis, Acacia* and *Albizzia* species;

— Standardisation of techniques for vegetative propagation of *Eucalyptus, Acacia* and *Albizzia* and studies on clonal micro propagation techniques for selected tree species;

— Studies relating to pathological aspects of important species and effect of pathogens;

— Trials of species in degraded lands and studies on important mixed tree cropping; and

— Development of methodology for assessing the impact of field application of research outputs of the institute.

7.6.6 Institute of Arid Zone Forestry Research, Jodhpur & Institute of Rain & Moist Deciduous Forests Research, Jorhat

These two institutes have been set up with a view to carrying out research in problems of forestry in the arid and humid zones in the North Eastern Regions of the country. Both the institutes are primarily engaged in developing infrastructural facilities for carrying out the research work.

7.6.7 Institute of Wood Sciences & Technology, Bangalore

This institute has been set up to carry out national level research in the field of wood science and technology including physical and chemical properties of forest produce, their uses, processing and substitution of wood by alternate materials. Main activities of the institute during the year include:

— Studies on wood properties of plantation grown species of *Albizzia falacataria, Hevea braziliensis, Eucalyptus camaldulens* and *Dalbergia sissoo;*

— Studies on wood seasoning in *Eucalyptus camaldulensis* and *Acacia nilotica;*

— Studies on effect of preservatives in *Eucalyptus camaldulensis;*

— Production of animal feed from wood residue and isolation of wood extractives having biocidal activity;

— Physiological studies on marine wood boring crustacean durability of treated and untreated timber under marine conditions; and

— Efficacy of Copper Chrome Arsenic (CCA) and Copper Chrome Boric (CCB) preservatives.

7.6.8 Institute of Deciduous Forests, Jabalpur

This institute aims at carrying out national level research on the problems of deciduous forests. Main activities of the institute during the year include:

— Large scale mortality of sal and teak tree species;

— Productivity and comparative study on biomass productivity;

— Effect of biotic factors like fire, grazing and shifting cultivation;

— Hydro-geology of plantations;

— studies on soil moisture dynamics;

— Development of nursery techniques of selected species like *A. latifolia A. pendula, Adina cardifolia, Boswellia serrata, Pterocarpus marsupium* and *Sterculia urens;*

— Ethnobotanical studies in tribal areas;

— Studies of the diseases and insect pests of forest tree seeds, nurseries and plantations; and

— Biological control of major diseases.

7.7 WILDLIFE RESEARCH

Research on various aspects of biology, ecology and management problems of wildlife is mainly conducted by the Wildlife Institute of India and the Bombay Natural History Society, the latter with funding from the Indo-US Rupee Fund.

7.7.1 Widlife Institute of India

The Institute has taken up 20 research projects in different parts of the country covering ecological, management and human aspects of wildlife conservation. These include lion and wild ass studies in Saurashtra, elephant, rhino and swamp deer studies in Uttar Pradesh, snow leopard study in Ladakh and problems of scrub live-stock in Mudumalai Sancturary of Tamil Nadu. A study of the impacts of the Narmada Sagar Project on flora and fauna has also been taken up.

The Institute has published manuals on Habitat Evaluation Techniques and Chemical Restraint of Wild Animals and the final and updated report on the Network of Protected Areas during the year.

7.7.2 Bombay Natural History Society

Research projects taken up by the Bombay Natural History Society under the Indo-US Rupee Fund Programme on the ecology of Keoladeo National Park and the Pt. Calimere Sanctuary as well as the ecology of the migratory birds, elephants and lesser floricans were continued during the year. Two new projects viz. Conservation of Birds of Prey, and Ecology of grasslands of Indian plains with particular

reference to their endangered fauna have been sanctioned this year.

7.8 NATIONAL NATURAL RESOURCES MANAGEMENT SYSTEM (NNRMS)

7.8.1 The scheme of NNRMS was initiated to have an accurate inventory of resources such as land, water, forests, minerals, oceans etc. and to utilise this information to achieve maximum national benefit with least damage to ecological system. In order to achieve this objective the Department constituted a Standing Committee on Bio-resources and Environment with the following objectives:

— To examine and identify the key issues in the management (including information systems) of bio-resources and environment;

— To study the national requirements and identify the potential user (s) for remote sensing technology;

— To identify improved methods for management of resources by integrating conventional surveys and remote sensing techniques and generate specific national programmes/projects for achieving the objectives;

— To identify the data sources required for NNRMS especially for the requirement of remote sensing data; and

— To identify research support, training programmes, joint experiments and technology development/transfer required to achieve the objectives.

7.8.2 Based on the recommendations of the committee, 37 projects were identified out of which 11 projects were approved by the Department for implementation. One research project viz. 'Changes in land use because of urban spread and industrialisation in Ahmedabad-Vapi region' was completed during the year. The remaining 10 projects are in progress.

8. EDUCATION AND INFORMATION

8.1 FORMAL TRAINING

8.1.1 Forestry Education and Training

8.1.1.1 In Service Courses:

— The Indira Gandhi National Forest Academy (IGNFA), Dehra Dun, continued its primary task of training Indian Forest Service Probationers. Fifty probationers are undergoing training at present. Two foreign trainees from Bhutan are also being trained. A Board has been set up to monitor the activities of the Academy. A computer cell has also been established in the Academy with the objective of imparting training to IFS probationers in EDP fundamentals, use of standard software packages as also preparation of course material and computerisation of office work. Hardware equipments and associated peripheral accessories are being acquired to strengthen the computer cell.

— The three State Forest Service Colleges located at Dehra Dun (UP), Burnihat (Assam), and Coimbatore (Tamil Nadu) continued to train officers of the State Forest Service (SFS). These colleges run two years courses for the SFS personnel. Out of the 244 trainees being trained, 121 are likely to complete the training during the year. The syllabus of the two year SFS course has been revised to ensure training of the highest standard.

— The Forest Ranger's Colleges at Chandrapur (Maharashtra), Balaghat (Madhya Pradesh) and Kurseong (West Bengal) continued to train Range Officers of the State Forest Departments. Two hundred and twenty trainees are expected to complete their training during the year.

— Consequent upon the decision of the Government to hand over the responsibility of running the Rangers' Courses to the States, the colleges at Chandrapur and Balaghat are being closed w.e.f. 31.3.1990, while the college at Kurseong will be closed w.e.f. 30.6.1991.

8.1.1.2 Orientation Courses

— During the year one Orientation Course of six-week duration was arranged at the Indira Gandhi National Forest Academy and 23 IFS officers were trained.

— A six-month long course on social forestry is being conducted by the SFS College, Dehra Dun, for officers from the State Forest Departments. Four persons from Laos are also participating in this course.

— Two special courses were conducted at FRI, Dehra Dun for graduates and undergraduates from Jammu & Kashmir in 'Techniques of Wood Seasoning and Preservation' in which a total of 21 candidates participated.

— Regular courses on planning, basic logging, harvesting, transportation, use of power chain saws and cableways were arranged for forestry personnel from different States. About 3000 field workers were also trained in use and maintenance of improved logging tools.

8.1.1.3 Forestry Education

The Indian Council of Forestry Research and Education (ICFRE) oversees forestry education in the country. Financial support was provided to the Indian Council of Agricultural Research (ICAR) to continue the undergraduate courses in forestry in 14 State Agricultural Universities, and the post-graduate course in two universities. Guru Ghasidas University, Bilaspur (Madhya Pradesh) was also provided financial assistance during the year to strengthen the B.Sc., Forestry Courses being run by them.

8.1.1.4 Indian Institute of Forest Management, Bhopal

The Institute continued its activities to provide training in management and allied subjects to persons from the Indian Forest Service, State Forest Departments, Forest Development Corporations and Forest related industries with a view to equipping them with the necessary skills for the management of forestry development.

During the year 26 candidates are being trained under the Post Graduate Diploma Course. The Institute also conducted Management Development Programme, one week refresher courses for IFS officers and an orientation course for IFS Probationers.

8.1.2 Wildlife Education and Training

8.1.2.1 The Wildlife Institute of India, Dehra Dun continued its various programmes on wildlife education and training. During the year the first batch of 7 students completed Post-Graduate Course on 'Wildlife Biology' from the Institute. The nine-month post-graduate diploma programme in 'Wildlife Management' was also continued with 18 trainees and a three-month certificate course in wildlife management was completed by 26 Rangers.

8.1.2.2 Three capsule courses in Wildlife Management were conducted by the Institute to introduce a minimum level of scientific management in national parks and sanctuaries.

8.1.2.3 During the year, the Institute organised symposia and workshops on various subjects of topical field interest like elephant management, protected areas and people, wildlife health and disease monitoring, application of system analysis to wildlife studies, etc.

8.2 ENVIRONMENTAL EDUCATION AND AWARENESS

The Department gives priority for promoting environmental education, creation of awareness and dissemination of

information among all age groups of the country's population through training programmes, seminars, workshops, eco-clubs, environmental camps etc.

8.2.2 National Environment Awareness Campaign/National Environment Month—1989

8.2.2.1 Realising the importance of a well informed society, the Department has been conducting nationwide National Environment Awareness Campaign (NEAC) every year since 1986, with the objective of creatiing environmental consciousness at the national level. As a part of this Campaign, November 19 to December 18 of every year is observed as the National Environment Month (NEM).

8.2.2.2 "Conserving our Water Resources" continued to be the central theme for NEAC 1989 also. However, as in previous years, the Campaign addressed a wide range of environmental issues, such as afforestation, eco-regeneration, conservation, rural and urban environment, pollution control, eco-development, etc.

8.2.2.3 More than 300 organisations including NGOs, Schools, Colleges, Universities, Research Organisations, Professional Societies, and Government Agencies, from almost all the States and Union Territories, have been involved in organising various programmes, such as seminars, workshops, training courses, public meetings, eco-camps, rallies, padayatras, jathas, audio-visual shows, films, display of posters, dramas, folk dances, street theatres, essay/debate/painting competitions for school children, preparation and distribution of educational resource materials, etc. All possible target groups like students/youth, teachers, women, tribals, administrators, professionals, legislators, industrial and voluntary workers, armed forces and the general public have been covered by the Campaign.

8.2.2.4 During NEAC-89, the Centre for Environment Education, Ahmedabad, has initiated the formation of 80 clusters of NGOs and schools around the country to initiate and sustain Environmental Education programmes and actions. Four Regional Resource Persons Training Workshops

Fig 23: Cycle Rally participants at Pondicherry during NEAC'89.

Fig 24: Children at a Self-test Quiz in an exhibition 'Man and the Environment' organised under NEAC'89.

have been held to train personnel from State Departments of Education and Voluntary Organisations who, in turn, would train primary school teachers through teacher training workshops in their respective clusters.

8.2.2.5 The C.P.R. Environmental Education Centre, Madras, organised a training programme during NEAC-89 highlighting various environmental issues, methods of water conservation and pollution treatment, etc. In addition, two exhibitions on conservation of water resources were also organised by the Centre in several parts of the Southern Region. Various resource materials and video films have also been prepared by the Centre under this Campaign.

8.2.2.6 During the National Environment Month, i.e., 19th November to 18th December, the National Museum of Natural History, New Delhi, also organised a variety of programmes and activities for promoting environmental awareness among the masses. A quiz and a declamation contest on 'Conserving the Environment' were organised by the Museum for teenagers and the winners of the competitions were taken on a field trip to Bharatpur Bird Sanctuary.

8.2.2.7 During the Campaign, Doordarshan telecast fortnightly programmes on environment and related areas in the National hook-up and a variety of programmes on environment have also been broad-cast by All India Radio.

8.2.2.8 During the year, the Department also considered several proposals on non-formal environmental education and awareness and provided financial assistance to various organisations for the following projects:

— Production of documentary films "Mycorrhiza—The Wonder Root—Fungus Association" and "Anokhi Hartal";
— Setting up of eco-clubs in selected schools in Tamil Nadu, Andhra Pradesh, and Gujarat; and
— Setting up of Indira Gandhi Conservation Monitoring Centre (IGCMC) at the World Wide Fund for Nature-India, at New Delhi, for continuous collection, analysis, interpretation and dissemination of data/information related to the conservation of species, habitats, and micro-organisms, wildlife trade and protected areas.

8.2.3 Centres of Excellence on Environment Education

In order to meet the country's need for creating high quality of environment education material and to spread environmental awareness, the Ministry has set up the following Centres of Excellence in the area of environmental education:

— Centre for Environment Education, Ahmedabad; and
— C.P.R. Environmental Education Centre, Madras.

8.2.3.1 Centre for Environment Education, Ahmedabad

The Centre, established in 1984, continued its activities relating to development of environmental education materials and creation of environmental awareness among the children and the general community. Programmes and activities of the Centre during the year are detailed below:

— Major interpretive programmes at Kanha National Park, Madhya Pradesh, comprising Orientation and Visitor Centres, signage and publication of popular literature and fabrication and installation of interpretive programmes at National Zoological Park, New Delhi have been completed;
— The first module of the children's Environmental Education Television Project including film and puppet segments and resource materials for teachers and students has been completed;

Fig 25: A Puppet show organised during NEAC'89.

— The Centre also participated in the exhibition 'Our Environment—Our Future' organised by the Department by putting up participatory exhibits on Environment Education, portraying the various approaches that may be adopted to increase environmental awareness;

— An eight month course on Environmental Education including theory and practical on-the-job training was organised for 14 people from Voluntary Organisations and Universities;

— Work on the eco-development projects around the protected areas at Ranthambore and Hingolgadh was continued. Four audio-visuals were completed for the Gujarat Energy Development Agency;

— A Workbook on birds in Hindi for children and a booklet 'Ant' in Hindi, English and Gujarati were published by the Centre. A book in Gujarati on wetland birds, the second in the series of field guides is under publication; and

— The Centre continued its weekly publication of 'News and Features' in both Hindi and English.

8.2.3.2 C.P.R. Environmental Education Centre

The C.P.R. Environmental Education Centre (EEC) was set up by the Department in 1988 at Madras with the objective of increasing consciousness and knowledge of the people about the environment as well as the major environmental problems facing the country today. The Centre has been conducting a variety of programmes to achieve this objective. The Centre is also involved in the generation of resource material and eductional packages on environmental conservation.

Various activities undertaken by the Centre during the year are as follows:

— The Centre organised workshops for voluntary organisations of Tamil Nadu in order to train voluntary workers on communication techniques, utilisation of communication methods, design of publicity materials, etc., to convey environmental messages;

— Workshops for teachers from various schools in Madras on "Understanding Animals", various laws relating to wildlife conservation and prevention of cruelty to animals, were also conducted;

— An intensive training programme for children was organised on different environmental themes, like health and hygiene, pollution and the environment, nutrition and balance diet, use and importance of trees, land and water conservation and pollution. A six-week workshop to expose children to the environmental issues and nature was also organised;

— The Centre also organised exhibitions on "Conserving Our Water Resources" and "Man and Environment" in various parts of Southern Region;

— Rural workshops for farmers and women demonstrating tree plantation, desiltation, water filtration and treatment, were organised by the Centre;

— Training programmes on micro-watershed development were also conducted for NGOs and Government officials of Tamil Nadu;

— A variety of resource materials for children, teachers and voluntary organisations on different aspects of environment have been published by the Centre. Video films on environmental themes are also being produced;

— A computerised data base on several environmental issues is being developed for immediate access and retrieval of environmental information; and

— Volunteers from NGOs, Schools, Bharat Scouts and Guides are trained in folk media, such as puppetry, street theatre, folk songs, etc., to convey environmental messages to different target groups.

8.2.4 Support to Seminars/Symposia/Workshops

The Ministry continued its support to the organisation of seminars, symposia, etc., on various technical environmental topics of current interest. During the year 64 universities, non-governmental organisations, research institutions and professional bodies have been provided financial assistance for organising such seminars. These are in addition to the large number of Seminars/ Symposia/Workshops supported under NEAC, 1989.

8.2.5 National Museum of Natural History (NMNH)

The National Museum of Natural History (NMNH), an associated organisation of the Department, has been set up to promote non-formal education among the public in various fields of environment. A brief report of avtivities of the Museum during the year is given below:

8.2.5.1 Gallery on "Cell—the basic unit of life"

A new gallery entitled "Cell—the basic unit of life" depicting structural and functional aspects of the cell, and a "Bio-Science Computer Room" were inaugurated on the occasion of the 'World Environment Day' and the 11th Anniversary of the Museum.

8.2.5.2 Exhibitions

— The Museum participated in the National Agricultural Fair, 1989 at Pragati Maidan, New Delhi by setting up a theme pavilion on "Environment and Agriculture";

Fig 26: An exhibit at the new gallery on "Cell—the basic unit of life" at NMNH.

— The Museum participated in the Science in Villages Exhibition Cum Mela at Gauri Ganj, Sultanpur (MP) in March, 1989;

— The Museum also participated in the Science and Technology Demonstration Campaign organised by the Department of Science and Technology at NSS College, Ottapalam, Kerala in September, 1989; and

— An exhibition on "Our Environment—Our Future" was organised as a part of the India International Trade Fair, 1989 at Pragati Maidan, New Delhi, in November, 1989. The exhibition depicted the rich biological diversity of India, threats to our national heritage through deforestation, soil erosion, habitat loss, pollution of land, air, and water, etc. The exhibition was awarded a special commendation medal by the Trade Fair Authority of India for excellence.

8.2.5.3 Educational Programmes

— The Museum conducted a summer programme for teenagers of age group 14 to 17 years, on exploring the environment specially designed to provide a first hand experience of observing and understanding nature and to learn how they can contribute to improve the quality of our environment;

— Programmes aimed at encouraging children in nature painting and animal/plant modelling for developing creative talents, were also organised for children of age group 9-13 years;

— The Museum observed the "Wildlife Week" during October 1-7, 1989 by conducting a series of educational programmes including a Nature Painting Competition and special film shows on wildlife;

— A Nature Camp for 45 teenagers was organised by the Museum at Manali in collaboration with the Himalayan Environment Centre in June, 1989 to familiarise the participants on Himalayan Ecology and the role that mountains play in shaping the climate of the Indian sub-continent; and

— The Museum continued its programme of monthly public lectures by eminent environmentalists to promote public awareness on environmental issues and conservation.

8.2.5.4 Publications

— The Museum brought out several publications including a booklet entitled "Our Environment—Our Future", specially for the exhibition at Pragati Maidan, giving details about our environment.

8.2.5.5 Museum of Natural History, Mysore

Construction of the building of the Regional Museum of Natural History at Mysore is under progress. The Museum, functioning from its temporary premises, organised several educational programmes and field trips for local school children in Mysore.

8.3 FELLOWSHIP AND AWARDS

8.3.1 Pitambar Pant National Environment Fellowship Award

The Pitambar Pant National Environment Fellowship Award was instituted in 1978 to encourage and recognise

Fig 27: Entrance view of Exhibition "Our Environment—Our Future" organised by the Ministry in Delhi.

Fig 28: Children working on 'Nature Worksheets' developed by NMNH.

Fig 30: A Nature Painting Contest for Children at NMNH.

excellence in any branch of research related to the Environmental Sciences. The fellowships for the year 1988 and 1989 have been awarded to Dr. V.M. Meher-Homji, Hon. Dean, Salim Ali School of Ecology, Pondicherry and to Dr. K.N. Mehrotra, Principal Scientist, Indian Agricultural Research Institute, New Delhi respectively.

Fig 29: A special stamp of "Likh Florican" released at NMNH during National Environment Month, 1989.

During the tenure of the fellowship Dr. V.M. Meher-Homji and Dr. Mehrotra shall undertake research on "Ecological aspects in developing a conservation strategy in India" and "Environmental impact of pesticides in India" respectively.

8.3.2 Jawaharlal Nehru Professorship

A chair in environmental law entitled "Jawaharlal Nehru Professorship" established by the Department in 1988 at the Jawaharlal Nehru University, New Delhi, started functioning during the year. Besides undertaking research and training, the Chair is also intended to provide consultancy services in the field of environmental law.

8.3.3. Indira Gandhi Paryavaran Puraskar

Instituted in 1987, the Indira Gandhi Paryavaran Puraskar is awarded every year to an Indian organisation or an individual for significant contribution in the field of environment. The Award is of the value of Rs. 1 lakh.

For the 1989 award more than 300 nominations from various individuals and organisations have been received and are under process.

8.3.4 Desert Ecology Fellowship

The Ministry had approved the institution of a fellowship at Jodhpur University for the study on desert ecology. The details of the fellowship are being finalised in consultation with the Jodhpur University. Decision has also been taken to undertake afforestation work and also to set up a 'Museum/Desert Ecology Interpretation Centre' at Khejarli village near Jodhpur as a tribute to the Bishnoi community whose men and women sacrificed their lives to save trees from being felled in 1730 A.D. A society named 'Khejarli

National Martyrs National Environment Society' has been formed to work out the details of the Museum/Interpretation Centre.

8.4 ENVIRONMENTAL INFORMATION

8.4.1 Environmental Information System (ENVIS)

Realising the paramount role that Information plays in effective and rational decision making for the management of environment, the Department, in 1982, set up an Environmental Information System (ENVIS) as a decentralised system using the distributed network of data-bases to ensure integration of national efforts in environmental information collection, collation, storage, retrieval and dissemination to all concerned including policy planners, decision makers, research workers, and the public.

The ENVIS Network with the focal point located at the Department, presently consists of 10 ENVIS Centres on diverse areas of environment such as pollution control, toxic chemicals, environmentally sound and appropriate technologies, coastal and off-shore ecology, energy and environment, degradation of wastes, etc. The Table 13 describes the distribution of ENVIS Centres set up in various specialised and reputed institutions in the country.

Table 13

Institution	Area
Central Pollution Control Board (CPCB), New Delhi	Pollution Control (water and air)
Industrial Toxicology Research Centre (ITRC), Lucknow	Toxic chemicals
Society for Development Alternatives, New Delhi	Environmentally sound and appropriate technology
Environmental Services Group (ESG), New Delhi	NGO, Media and Parliament related to environment
Andhra University, Visakhapatnam	Eastern Ghats Ecology
Tata Energy Research Institute (TERI), New Delhi	Renewable energy and environment
Centre for Environmental Studies, College of Engineering, Anna University, Madras	Bio-degradation of wastes; Environmental Impact Assessment
Centre for Ecological Studies, Indian Institute of Science Bangalore	Western Ghats Ecology
Environmental Planning and Co-ordination Organisation (EPCO), Bhopal	Environmental management related to the state of Madhya Pradesh
National Institute of Occupational Health (NIOH), Ahmedabad	Occupational Health

Fig 31: Black Bucks roam freely at Khejarli Village, near Jodhpur, Rajasthan—A species protected by the local Bishnoi Community.

8.4.2 Activities at the ENVIS Focal Point

8.4.2.1 Documentation

During the year, the focal point acquired various documents like books, reports, journals, bibliographies, etc., to enrich the existing information base for effective and appropriate dissemination of information. The Departmental Library being managed by the Focal Point was also re-oriented to collect National/International scientific journals, technical reports, standards and specifications, conference proceedings, etc., on environment and related areas.

8.4.2.2 Query/Answer Service

The Focal Point regularly receives requests from both national and international user groups seeking information on diverse aspects related to environment. The Focal Point responds to all such queries by providing substantive information wherever possible or otherwise offers referral services.

During the year, more than 3500 queries have been responded to by the Focal Point and the ENVIS Centres out of which more than 1300 queries alone were responded to by ENVIS Focal Point. Table 14 shows the trend of the queries responded to by the Focal Point and ENVIS Centres during the last two years.

Table 14

Year	Queries processed by Focal Point			Queries processed by ENVIs Centres		
	National	Inter-national	Total	National	Inter-national	Total
1988	602	47	649	1872	121	1993
1989	1232	72	1304	1987	264	2251

8.4.2.3 Abstracting Service

A quarterly abstracting journal, viz., "Paryavaran Abstracts" reporting Indian research on environment and related areas continued to be published by the ENVIS Focal Point in the Ministry. More than 500 scientific journals are scanned in the compilation of these abstracts and these are arranged under 12 major environmental disciplines such as Air Pollution, Water Pollution, Noise Pollution, Plant Ecology, Animal Ecology, Nature and Natural Resources Conservation, Health and Toxicology, Wastes, Forestry and Environment, Wildlife, Energy and Environmental Management for easy retrieval of information. The four issues of this journal published during the year contained over 1000 abstracts. A user profile of 'Paryavaran Abstracts' since 1985 is described in fig 32.

8.4.2.4 Development of Data Bases

The Focal Point is increasingly using computers for processing of environmental information to ensure speedy dissemination of information to all concerned. During the year, the following computerised data bases have been developed/updated:

— A bibliographic data base on 'environmental research' in Indian context;

— A data base of Indian sources engaged in environment and related activities;

— A profile of NGOs of the country involved in environmental conservation and protection; and

— A data base of experts in various environmental disciplines.

8.4.2.5 Press Clipping Service

The ENVIS Focal Point also scans all environment related information from the National Dailies and magazines. About 30 newspapers and 10 magazines are scanned regularly and more than 500 clippings related to environment are documented every month to ensure easy retrieval from the documentary data base being maintained in the Ministry.

8.4.2.6 Liaison with Other Information Systems

ENVIS maintains a close liaison with various other National Information Systems like National Information System on Science and Technology (NISSAT), Bio-technology Information System (BTIS), etc., for exchanging environmental information and to avoid duplication of efforts in the concerned fields.

8.4.2.7 INFOTERRA

The Focal Point of ENVIS acts as the National Focal Point (NFP/India) of INFOTERRA (An International Information System on Environment) of the United Nations Environment Programme (UNEP). As NFP, the focal point has registered more than 500 Indian sources engaged in environmental related activities for inclusion in the "International INFOTERRA Directory of Environmental Sources" published by UNEP. These national sources are referred to by UNEP for environmental information in their corresponding disciplines. The ENVIS Focal Point as INFOTERRA's National Focal Point caters to both National and International users.

Based on the information potential of ENVIS, UNEP has also designated ENVIS Focal Point as the Regional Service Centre (RSC) of INFOTERRA to cater to the environmental information needs of the South Asian Sub-region Countries. During the year, ENVIS as NFP and RSC of INFOTERRA processed 3214 National and 336 International queries and provided substantive information to the users.

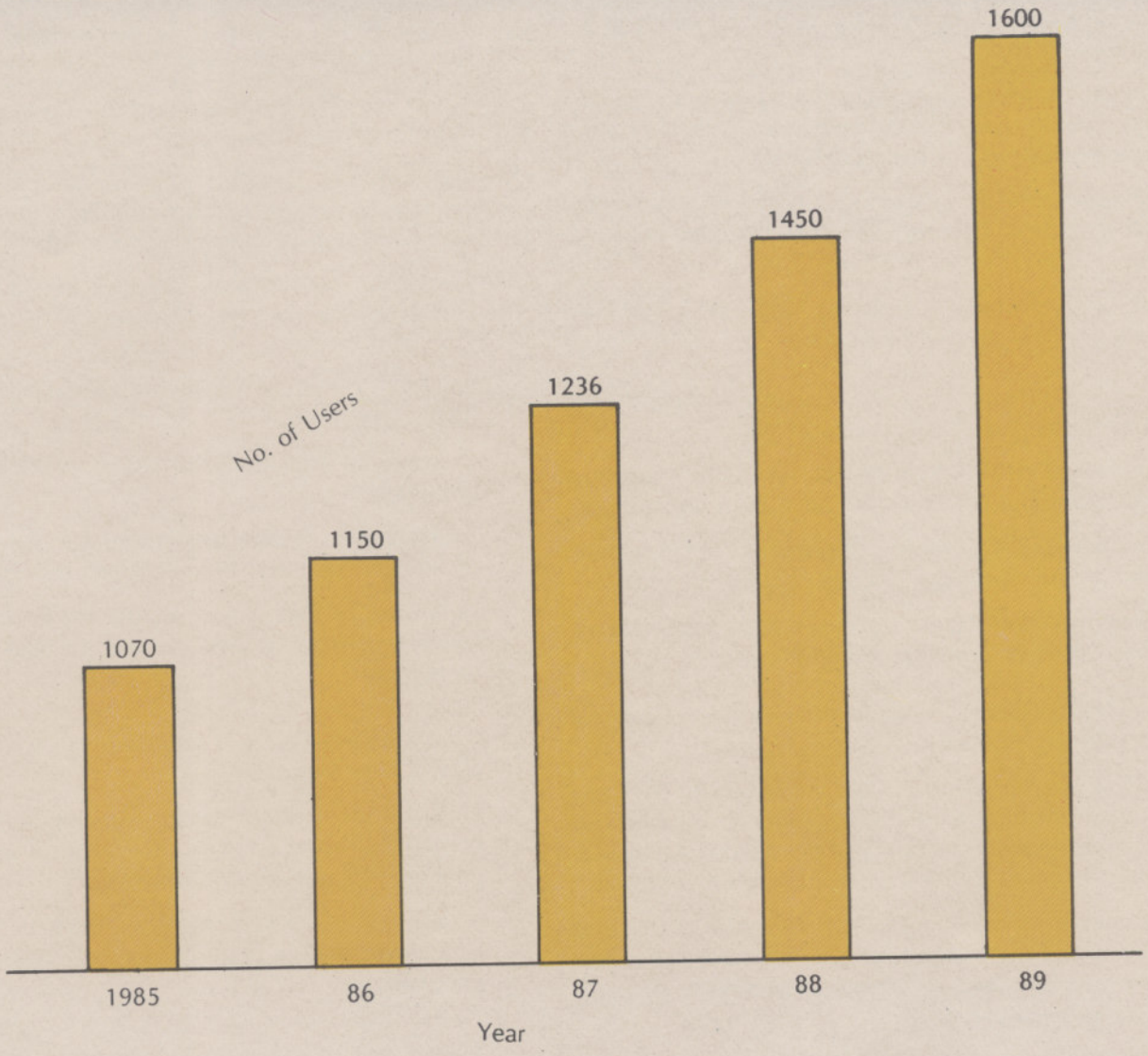


Fig 32: A User Profile of Paryavaran Abstracts

8.4.2.8 Coordination with ENVIS Centres

The Focal Point of ENVIS coordinates, monitors and reviews the activities of the ENVIS Centres periodically and provides necessary guidelines to the Centres to ensure effective functioning of the ENVIS network. Attempts are also being made by the Focal Point to ensure constant inflow of information from these ENVIS Centres, so that a central repository of environmental information on various subject areas is developed for easy and quick dissemination. The Focal Point is also responsible for identifying priority areas and potential institutions for setting up new ENVIS Centres.

8.4.2.9 Publications

During the year, compilation and publication of the following have been undertaken by the Focal Point:

— Annual Report of the Ministry for the year 1988-89; and

— An information booklet on various funding schemes of the Ministry.

8.4.3 Activities at ENVIS Centres

All the 10 existing ENVIS Centres continued their activities in collection, collation, storage, retrieval and dissemination of information in their respective areas of specialisation. A brief account of the activities undertaken by each centre is as follows:

8.4.3.1 ENVIS Centre at Central Pollution Control Board (CPCB), New Delhi

— The national inventory of water polluting industries and effluent treatment plant status has been updated;

— A bibliography of papers in the field of air pollution has been completed;

— A quarterly newsletter containing data, reports, toxicity of pollutants, latest developments in the pollution control technologies etc. has been published;

— A data book on annual water quality of fresh water bodies and wells for the period 1979-1988 has been prepared; and

— Substantive information to National and International users were provided against their queries.

8.4.3.2 ENVIS Centre at Industrial Toxicological Research Centre (ITRC), Lucknow

— Volumes III & IV of toxicity data handbook containing information on 119 pesticides have been brought out;

— Bibliographic listing along with the Abstract of the current literature on toxicology has been published; and

— Information against queries related to toxicology and toxic chemicals were provided to user group.

8.4.3.3 ENVIS Centre at National Institute of Occupational Health (NIOH), Ahmedabad

— Monographs on Asbestos, Dye and Dye-stuff, DDT and chlorine covering their history, production, asociated hazards, effective legislation and precautionary measures to be taken by the workers etc. have been compiled;

— Chemical safety cards for hazardous chemicals containing information on formulae, physical and chemical properties, hazardous symptoms, precautionary measures etc. have been prepared;

— Bibliographies on hazardous trace metals have been compiled; and

— Information was disseminated in response to queries in the fields of medical toxicology, occupational health etc.

8.4.3.4 ENVIS Centre at Centre for Ecological Sciences, Indian Institute of Science, Bangalore

— Descriptive information on Western Ghats and Nilgiri Biosphere Reserve containing information on geology, lithology, climate, hydrology, flora and fauna etc. along with the numerical information on land holding, yield of different crops, human settlement patterns etc. have been collected;

— Bibliographies on Nilgiri Biosphere Reserve and the flora of Karnataka have been prepared; and

— Organised a workshop on Decentralised Planning for Integrated Management of Natural Resources.

8.4.3.5 ENVIS Centre at Environmental Planning & Coordination Organisation (EPCO), Bhopal

— A directory of NGOs working in the field of environment in MP has been updated;

— Information on the status of environmental research in various universities of Madhya Pradesh, tribal areas and water quality have been collected; and

— Abstracting service, press clipping service and query-answer service have been undertaken.

8.4.3.6 ENVIS Centre at Environmental Services Group (ESG), New Delhi.

— Directory of Environmental NGOs in India has been published;

— Information on environmental issues from the proceedings of the Parliament have been collected and compiled; and

— Collection of information on the media coverage on important issues related to environment has been undertaken.

8.4.3.7 ENVIS Centre at Tata Energy Research Institute (TERI), New Delhi

— A bi-annual journal 'Energy Environment Monitor' containing information in the area of energy and environment is being published; and

— A data base in the field of energy and environment has been developed for easy retrieval and dissemination of information to user groups.

8.4.3.8 ENVIS Centre at Centre for Environmental Studies, Anna University, Madras

— State of Art Reports on (i) Bio-degradation of wastes, and (ii) Environmental Impact Assessment, have been prepared; and

— Environmental abstracting service and query-answer service, in the field of 'Bio-degradation of Wastes' and 'Environmental Impact Assessment' have been undertaken.

8.4.3.9 ENVIS Centre at Society for Development Alternatives (SDA), New Delhi

— A data base containing bibliographies and numerical data on Environmentally Sound and Appropriate Technology (ESAT) has been designed and created; and

— A documentary information base on thrust areas of appropriate technologies has been developed.

8.4.3.10 ENVIS Centre at Andhra University, Visakhapatnam

— A documentary and numerical information base related to Eastern Ghats has been developed;

— Preparation of a report on 'State of Environment in India' has been undertaken; and

— Press clipping service, query-answer and current content service in the area of Eastern Ghats are being continued.

9. LEGISLATION AND ORGANISATION

9.1 LEGISLATION

9.1.1 Consequent upon the implementation of Environment (Protection) Act, 1986, the Ministry of Environment and Forests has taken several steps to provide legal and institutional basis which include issue of several rules, notification of standards, action regarding environmental laboratories, strengthening of State Departments of Environment and Pollution Control Boards, delegation of powers, identification of powers for carrying out various activities for hazardous chemicals management and setting up of Environmental Protection Councils in the States. Major additional responsibilities have been placed on the Central and State Pollution Control Boards under the provisions of the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981. Legal actions under these two acts are taken by the respective State Boards.

9.1.2 The Environment (Protection) Act, 1986 has also placed responsibility on the Central Government for laying down procedures and safeguards for handling of hazardous substances and prevention of accidents. Rules have been notified by the Ministry under this Act for regulating hazardous chemicals at all stages of manufacture, import, storage, transport, use and disposal.

9.1.3 During the year the following actions have been taken under the Environment (Protection) Act, 1986:

— Powers under Section 5 of the Act have been delegated by the Central Government to 22 States;

— Actions have been initiated by the Ministry against 91 polluting industries, including the cases identified under the Ganga Action Plan;

— Directions have been issued in 52 cases, out of which 33 units have been instructed for closure and 19 units have been given time to set up their Effluent Treatment Plants (ETP) within the stipulated period;

— Prosecutions have been launched against 4 units for violation of directives;

— As on December, 1989, the number of cases filed by the Central/State Pollution Control Boards is 3777 out of which 1092 have been decided and rest are pending in various courts;

— Standards for discharge of effluent/emissions have been notified in respect of Asbestos, Chloro-Alkali, Large Pulp and Paper, Integrated Iron and Steel Plants and Re-heating (Reverberatory) Furnaces. With this, standards in respect of 31 specified industries have been notified;

— Standards in respect of distillery effluents for disposal on land have been reviewed and the revised standards have been notified;

— Emission Standards for Motor Vehicles have been notified;

— The standards for noise pollution have been notified and the State Governments and the State Pollution Control Boards have been requested to launch a drive against noise pollution. Ambient air quality in respect of noise have been fixed for four categories of areas viz. industrial, commercial, residential and the silence zones;

— Hazardous Waste (management and handling) rules have been notified;

— Rules on the manufacture, storage, import, transportation, prohibition and restriction on handling of hazardous substances including hazardous micro-organisms and prohibition and use of Benzidine based dyes and its salts have been notified;

— Hazardous chemicals with the threshold quantities have also been identified and appended with the rules for application of various provisions; and

— The rules on transport of hazardous chemicals by road, drafted by the Ministry have been notified under the Motor Vehicle Rules, 1989 by the Ministry of Surface Transport and these rules shall become effective from 1st May, 1990.

9.1.4 The Air (Prevention and Control of Pollution) (Union Territories) Amendment Rules, 1988 have been notified. These include:

— Directions under 31 (1) of the Air (Prevention and Control of Pollution) Amendment Act, 1987;

— Manner of giving notice under Clause 8 of Section 1 of Section 43 of the Air (Prevention and Control of Pollution) Amendment Act, 1987;

— A new Form-1 has been substituted for application of consent for emission/continuation of emission under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981;

— The gross and mass emission standards for both petrol and diesel driven vehicles have been notified under rule 151 of Motor Vehicle Rules, 1989;

— The gross emission standards (user end) will come into force with effect from March, 1990;

— The mass emission standards for petrol driven vehicles will come into force with effect from April, 1991;

— The mass emission standards of gas capacity for diesel driven vehicles will come into force with effect from April, 1991; and

— The mass emission standards for diesel driven vehicles will come into force with effect from April, 1992.

9.1.5 During the year, the following actions have been taken by the Ministry in regard to Forest (Conservation) Act, 1980 and National Forest Policy 1988;

— Measures were taken to operationalise the Government resolve contained in the National Forest Policy, 1988 in consultation with the representatives of the States and the Union Territories;

— A High Powered Committee consisting of Members of Parliament and other distinguished persons was constituted to examine various facets of forest conservation implementation aspects of the National Forest Policy, 1988 and the Forest (Conservation) Act, 1980 and to suggest ways and means of achieving conservation along with fulfilling the developmental aspirations of the people especially those living in and around forests;

— A Committee has been set up to suggest relevant amendments to the Indian Forest Act, 1927 in the context of the National Forest Policy, 1988; and

— The amendments made in the guidelines for the diversion of forest lands for non-forest purposes under the Forest (Conservation) Act, 1980 have come into force with effect from 1.1.1990 and shall be applicable in respect of new proposals. This would also be applicable in respect of cases which were referred back to State Governments/Union Territories for clarifications/ additional information and have not been submitted till 3rd February, 1990.

9.2 ORGANISATION AND INFRASTRUCTURE

9.2.1 The State Pollution Control Boards are being strengthened for upgradation of their laboratories, setting up of mobile laboratories, recruitment of technical personnel etc. Eighteen State Pollution Control Boards have so far been provided financial assistance for this purpose. One hundred and twenty two laboratory staff and 228 field staff have been sanctioned to the State Boards to carry out the programmes. An amount of Rs. 71.00 lakhs was disbursed to the State Boards during the year for equipment and scientific and technical staff for laboratories and field.

9.2.2 Assistance to State/UT Department of Environment

The scheme of providing assistance to the State/U.T. Departments of Environment for setting up technical cells with technical/non-technical staff to deal with environmental problems in the State/U.T. and to function as a coordinating agency in concerned State/U.T. was continued. Financial assistance to the tune of Rs. 10 lakhs was provided to the Departments of Environment of 19 States and 5 Union Territories during the year for strengthening their technical set-up.

9.2.3 Assistance to Environmental Laboratories other than State Pollution Control Board's Laboratories:

During the year eight more laboratories were recognised as environmental laboratories by the Ministry. Thus, under Section 12 of the Environment (Protection) Act, 1986, a total of 84 laboratories have so far been recognised as Government Laboratories by the Ministry. Qualified Analysts working in these laboratories have also been recognised as Government Analysts.

As per the recommendations of the Committee of experts appointed for the Environmental Laboratories, proposals were invited from various laboratories to identify the gaps in toxicological testing in order to provide necessary financial assistance.

9.2.4 Mandatory Public Liability Insurance Cover

A proposal for legislation making it mandatory for all hazardous chemical industries to take a public liability insurance cover for providing immediate relief to victims on a prescribed scale in case of accidents is under consideration by the Ministry. The insurance cover is proposed to be on the basis of 'no fault liability'.

10. INTERNATIONAL COOPERATION

10.1 The Ministry of Environment and Forests serves as the nodal agency in the country for the United Nations Environment Programme (UNEP), South Asia Cooperative Environment Programme (SACEP), International Centre for Integrated Mountain Development (ICIMOD) and the International Union for Conservation of Nature and Natural Resources (IUCN). Financial contributions are made to these organisations and efforts are made through active participation to obtain adequate benefits. In addition, the Ministry is the focal point for various global environmental issues such as ozone depletion, green house effect and global warming, sea level rise, transboundary movements of hazardous chemicals and wastes etc.

10.2 The Ministry and its agencies have undertaken projects with the collaboration of United Nations Environment Programme (UNEP), World Bank, European Economic Community (EEC), South Asian Association of Regional Cooperation (SAARC), Canada, United States of America (USA), Sweden, Norway, Denmark, United Kingdom (U.K.), the Netherlands, Federal Republic of Germany (FRG) & Union of Soviet Socialist Republics (USSR). The details of international cooperation are as follows:

10.2.1 United Nations Environment Programme (UNEP)

During the year, the Ministry participated in the UNEP General Council Meeting in Nairobi in May, 1989. India has been re-elected as member of the Governing Council of the UNEP. The Ministry participated actively in the discussions on global environmental issues in the meetings of the Inter-Governmental Panel on Climate Change (IPCC), jointly set up by the UNEP and the World Meterological Organisation (WMO).

10.2.2 World Bank

Preliminary discussions were held to formulate an industrial pollution control project in four states viz. Tamil Nadu, Gujarat, Maharashtra and U.P. with World Bank assistance.

10.2.3 European Economic Community (EEC)

A project on Air Quality Monitoring with EEC assistance is continuing in the Central Pollution Control Board. A high level EEC delegation from the Environmental Directorate has visited India in January, 1990 to broaden the scope of cooperation in the environmental sector.

10.2.4 South Asian Association for Regional Co-operation (SAARC)

A format for undertaking studies on environmental degradation and natural disasters in the South Asian Region has been finalised in a SAARC meeting at Dhaka during the year. Country reports are being prepared by the Member Councils, based on which regional action plans will be drawn up.

10.2.5 Canada

Canada has offered assistance for training programmes for middle and senior level management in the environment and foresty sectors in the next five years. The first batch of trainees has visited Canada during the year.

10.2.6 United States of America (USA)

Based on the Indo-US workshop on the Application of Geographical Information System (GIS) for land use planning and maximisation of bio-mass, held in New Delhi last year, a collaborative project for development of watershed areas of selected regions in Tamil Nadu and Kerala is being prepared in consultation with Gandhigram Rural University and other collaborating institutions in Tamil Nadu and Kerala. A series of training workshops on various topics of environmental impact assessment and siting of industries are being planned with US AID assistance in some States. A Project from Kerala Forest Research Institute is also being explored under Indo-US Co-operation.

10.2.7 Sweden

Areas of cooperation between India and Sweden in the field of environmental protection and management have been identified. These relate to the control of pollution in the pulp and paper industry, establishment of training institutes for pollution control and the management of hazardous wastes. The Swedish International Development Agency (SIDA) continued its support to social forestry projects in the States of Tamil Nadu, Orissa and Bihar. Similar support has also been decided for the state of Rajasthan. An agreement for SIDA support to the Indian Institute of Forest Management (IIFM), Bhopal has become operational from April, 1989 for a period of 5 years.

In addition SIDA has also agreed to support the following proposals:

— Planning and Survey of Natural Resources
— National Forest Data Management Centre (NFMDC)
— Development of Forestry Administration

A Team of 9 officers from Forest Survey of India (FSI) and the States of Bihar, Orissa and Tamil Nadu visited Sweden to study the Swedish forestry practices and methodologies and their application in the context of Indian forestry. A study group consistng of members from Swedish Space Co-operation and FSI was also constituted for preparing a report on SIDA support to NFMDC. In regard to the Development of Forestry Administration, it was decided to organise

regional workshops and a team of 6 Indian officers have been trained by SIDA to act as resource persons for the regional seminars.

10.2.8 Norway

Projects relating to pollution control in the aluminium industry and ferro-alloys industries, coastal pollution monitoring, assistance to the Disaster Management Institute, Bhopal, common effluent treatment plant in Vapi Industrial Estate, Gujarat, and the training of personnel involved in pollution control in Gujarat have been taken up for Norwegian assistance.

10.2.9 Denmark

Project documents on 'Control of pollution in river Cauvery and Vaigai in Tamil Nadu' have been prepared and submitted by a Project formulation mission and are being examined by the Ministry. Projects on the establishment of training institutes in Tamil Nadu and Karnataka and Evaluation of thermal processes for treatment and disposal of hazardous wastes and studies have been taken up with the Danmark for assistance.

10.2.10 United Kingdom

During the year, the British Council has fielded a Mission for formulating a project report on the Integrated Development of Western Ghats in Karnataka. The British Government has also offered 40 million pounds for undertaking projects on environment and also offered to hold a seminar on substitutes for chlorofluorocarbons (CFCs).

Besides providing financial assistance for the implementation of the Karnataka Social Forestry Project and the Mysore Paper Mills Project, the Overseas Development Agency (ODA) is also considering providing assistance to the Wood Science and Technology Institute, Bangalore, the Forest Genetics and Tree Breeding Institute, Coimbatore and to the establishment of a Forestry Information & Record Service in the Forest Research Institute, Dehradun. The British Govt. has also offered to increase the number of fellowships for forest officers from 10-12 to 74, under the Colombo Plan during the year.

10.2.11 The Netherlands

10.2.11.1 The Netherlands continued its financial and technical assistance to Kanpur and Mirzapur sanitation projects under the Ganga Action Plan and Phase-II of the project has been approved.

10.2.11.2 A thorough review was made of the existing projects under this Indo-Dutch collaboration programme and action plans have been drawn up for next year's programme.

10.2.11.3 The projects on bio-monitoring of river Yamuna and setting up of automatic water quality monitoring stations were continued. The second workshop on training in aquatic eco-toxicology was held at the National Environmental Engineering Research Institute, Nagpur.

10.2.11.4 During the year, a number of workshops on various aspects of Environmental Impact Assessment were held at Roorkee, Aurangabad, Calcutta, Kanpur and Hyderabad.

10.2.11.5 A project in the field of industrial counselling for fly ash disposal and utilisation is being contemplated. The follow-up action on the project formulation would be taken up with HUDCO and NTPC after the receipt of the Dutch Mission's Report.

10.2.11.6 A project proposal on control of pollution in leather tanneries has been formulated by CLRI, Madras, CSIR and the Dutch Mission and is awaiting financial assistance.

10.2.11.7 A Dutch Mission visited Gujarat State Fertilizer Company (GSFC), Baroda to suggest measures for control of pollution, and on the basis of the report of the Mission, the GSFC will draw up an action plan for furthering cooperation with the Dutch side.

10.2.11.8 Actions are being taken on various new projects on setting up of pollution control training institutes in U.P., industrial counselling in textile industries, control of pollution in coastal areas etc.

10.2.12 Federal Republic of Germany (FRG)

The Indo-FRG programme on strengthening capabilities of selected State Pollution Control Boards continued during the year. Discussions were also held to strengthen bilateral cooperation between the two countries in the field of environment. A FRG assisted integrated project for development of Dhauladhar (H.P.) was completed. Another project for eco-development of Changer areas of Palampur (H.P.) is under consideration. FRG has also offered assistance of DM 15 million for forestry projects and proposals from the various State Governments have been invited for consideration.

10.2.13 Union of Soviet Socialist Republics (USSR)

Under the Indo-USSR Integrated Long-term Programme of Cooperation in Science and Technology (including environment and ecology), steps have been initiated to formulate specific projects in environment.

10.2.14 FAO/UNDP

Projects on Forest Fire Control Programmes, Assistance to Wild Life Institute of India and Aerial Seeding are being implemented with UNDP assistance under Country

Programme (CP)-III. An agreement with FAO has been concluded for a project on "Genetic Resources of Arid and Semi-arid Zones".

Under the FAO Coordinated programme on "Tropical Forestry Action Plan (TFAP) which aims at mobilisation of resources for regeneration and conservation of the World's tropical forests, a country level TFAP for India is being prepared.

A regional workshop for South Asian countries on "Forest Resources Planning and Utilisation" is proposed to be organised at Bangalore under financial assistance from FAO.

Under CP-IV of UNDP/FAO, the following projects in forestry sector have been formulated with an outlay of US$ 5 million.

— Forest Fire Control Planning US $ 1.6 million
— Assistance to Wildlife Programme US$ 1.4 million
— Assistance to Wastelands Development US$ 2.00 million

10.2.15 New Zealand

Action has been initiated for identifying areas of possible co-operation in the forestry sector with the Government of New Zealand.

10.3 India participated in a number of deliberations in the International Fora on global warning, ozone depletion hazardous chemicals, information and awareness, waste management, mountain development and conservation.

11. NEW INITIATIVES

11.1 The Ministry has recently taken several new initiatives to steer the country towards the basic premises of sustainable development and towards providing ecological security for the future generations. The thrust of these initiatives has been on providing a policy framework to realise conservation, a regulatory framework to make the polluters pay, an institutional framework to place power in the hands of the people to make the polluters pay up their liabilities and an organisational framework to better achieve our goals.

11.2 NEW SYSTEMS FOR ENVIRONMENTAL PROTECTION

11.2.1 Civil liability and Environmental Courts

The legal and organisational structures created so far for protection of environment have yielded only partial results. The modalities of protection have been to enforce environmental regulations through criminal courts of law but the long delays in the courts and inertia of the prosecuting agencies have led to the polluters escaping the full penalties and to exposing the people and the environment to the adverse effects of pollution. One method of promoting environmental protection, therefore, is to empower people to make polluters pay due compensation for the damage caused by them and to create judicial structures to ensure prompt payment of such compensation. The certainty of having to pay for the damage will ensure that the polluters invest in pollution control devices and will refrain from causing damage to the environment or to the people. A legislation to incorporate civil liability in case of environmental damage and a system of environmental courts to give quick disposal of cases claiming compensation has been initiated.

11.2.2 Environment Friendly Products

A large number of products come into the market which may affect the environment or people adversely. Enough attention has not been paid to scrutinise products from an environmental point of view. It is proposed to introduce a system of making environment friendly products so that people can use such products rather than products which harm the environment.

11.2.3 River Action Plan

The protection of environmental status of the rivers is at present not given the importance it deserves. The actions taken are fragmented and are not viewed from a wholistic view point. Such protection involves a comprehensive river management including steps for catchment area treatment, prevention of sedimentation and pollution control. It is proposed to prepare a national river action plan which will take an integrated view of the river management.

11.2.4 Statutory Environmental Clearance

The environmental clearance of projects is at present done through administrative orders and a large number of private sector projects escape the process of impact assessment. It is proposed to plug these loopholes by making the impact assessment for large projects statutory.

11.2.5 Continuous Review of Pesticides

Under a suggestion from this Ministry, an inter-ministerial committee has been set up to continuously review the use of pesticides and in suitable cases, to ban the use of these pesticides whose adverse environmental impact has been amply established.

11.2.6 Waste Management

Conservation of our resources is possible only if waste is minimised and wealth is created from the waste generated. The attempts in our country in this direction have been sporadic and half-hearted. In order to create a focal point to our efforts and to provide an impetus, the Government have created a National Waste Management Council consisting of all of the relevant interests.

11.3 CONSERVATION

11.3.1 Study on Sustainable Use of Marine Resources

The exploitation of natural resources for development must be on a sustainable pattern. India's large coast line and marine resources offer us a unique chance to develop on sound lines but only if the resources are exploited on a sustainable basis. It is proposed to study this aspect thoroughly and prepare a policy for such sustainable use.

11.3.2 Review of Export Policy of Natural Resource Products

The export policy of the country for specific natural resources has been reviewed. The Ministry of Commerce has incorporated a ban on export of wild birds, fruit bats, sea shells and sea weeds in the new export policy. In view of the ecological importance of frogs, export of frog legs has already been banned. However, the frog legs are now smuggled through Bangladesh and this issue will be taken up with the Government of Bangladesh for effective prevention of smuggling. In view of the large scale killing of the National Bird of India i.e. Peacock, for export of its tail feathers the quota on export of peacock feathers has been reduced from 60 lakhs to 20 lakhs.

11.3.3 Prevention of Sandalwood Smuggling

In view of the large scale smuggling of sandal wood in the southern states, it has been proposed to assist these states to strengthen their infrastructure for arresting this smuggling.

11.3.4 Electric Crematoria and Wood Efficient Pyres

The fuel wood scarcity is aggravated by use of large quantities of fuel wood for cremation. It is proposed to encourage electric crematoria and wood efficient burning pyres for the conservation of wood.

11.3.5 New Technologies for Substitution of Fuelwood

New Technologies are now available in India for pelletising garbage as well as leaves of trees to be used as fuel both for domestic and industrial purposes. It is proposed to encourage the use of these technologies in major municipal bodies.

11.4 AFFORESTATION

11.4.1 Greening of Haryana

A large mode programme has been taken up in Haryana to green about three lakh ha over the next three-four years with the cooperation of the Government Departments, industries, panchayats and farmers in the State.

11.4.2 Review of Forest Policy in Relation to Protection of Tribal Interests.

In order to protect the interests of tribals and integrate forest conservation strategies with the tribal welfare, the Government have reviewed the policies and steps are being taken to integrate tribal development, with the principles of long-run sustainable management of forest resources.

11.4.3 National Fund for Afforestation

The Government have already announced for concessions to promote afforestation. Taking advantage of this, a National Fund for Afforestation is being created to step up the pace of afforestation and development of Wastelands.

11.5 WILDLIFE PROTECTION

11.5.1 Burning of Seized Products

In order to wean the Indian public from use of wildlife products, it is proposed that all seized stocks such as rhino horns, ivory etc. should be burnt at public places. The ivory trade in India will be completely banned shortly. The international trade is already banned.

11.5.2 Improvement of Zoos

The Zoos in India are ill-organised at preset ad the animals in these zoos are not provided a proper environment. It is proposed to bring the zoos within the ambit of the Wildlife Protection Act and to constitute a Zoo Authority of India to provide for an improve management orientation.

11.5.3 Indo-Bhutan Elephant Corridor

The Natural habitats of elephants including their migration corridors have been disturbed through human intervention particularly in the North East. This is specially true of the corridor in the Indo-Bhutan border. It is proposed to recreate this corridor in cooperation with Bhutan.

11.5.4 Buxa Tiger Reserve

The buxa Tiger Reserve has been affected because of dolomite mining. It is proposed to extend the area of the reserve to compensate for the area lost due to mining.

11.6 ANIMAL WELFARE

11.6.1 Prevention of Cruelty to Animals

The subject of Prevention of Cruelty to Animals has been transferred from the Ministry of Agriculture to the Ministry of Environment and Forests in view of the need to take a wholistic approach towards animals in the context of their importance to environment. It is proposed to revamp the Animal Welfare Board and activise the structure of Welfare Inspectors throughout the country to prevent cruelty to animals. The concept of a Veterinary Council on the pattern of Medical Council will be pursued to ensure that the only qualified veterinarians treat the animals.

11.6.2 Rehabilitation of Bears

A number of animals, particularly bears, are used by itinerant entertainers to a amuse the people. In the process these animals are subjected to extreme cruelty. It is proposed to liberate the bears from the clutches of these entertainers and rehabilitate them in sanctuaries where a proper environment will be built up. Land for one such sanctuary has been selected at Manesar, Haryana. It is proposed to set up another such sanctuary near Jamshedpur.

11.7 POLLUTION CONTROL

11.7.1 Campaign against Highly Polluting Industries

A special drive has been launched against distilleries, sugar mills, tanneries and pulp and paper units which are the worst polluters in India.

11.7.2 Utilisation of Fly Ash

Indians power industry generates nearly 30 millions tonnes of fly ash annually through the use of coal. This fly ash pollutes both water and air and could pose a major problem unless solved promptly. The fly ash has got several productive uses in agriculture and house building. It is proposed to launch a special drive and give incentives for better use of this fly ash.

11.7.3 Customs Duty Relaxation on Pollution Control Equipment

Ten items have been added to the list of pollution control equipment for which the custom duties have been reduced to encourage industrial units to take up pollution control measures.

11.7.4 Provision of more Resources to Pollution Control Boards

The Water (Prevention & Control of Pollution) Cess Act, 1977 is proposed to be amended to provide for more revenue to the State Pollution Control Boards.

11.7.5 Amendments to the Environment (Protection) Act, 1986.

Several suggestions have been made to amend the Environment (Protection) Act, 1986 to promote public participation. It is proposed to take up these amendments quickly.

11.7.6 Common Effluent Treatment Plant to Kanpur Tanneries.

The tanneries in Kanpur create significant pollution in the river Ganga. A common effluent treatment system has been approved at a cost of Rs. 7.00 crores for these tanneries. In order to promote cooperation by the tanneries in the scheme, the Ministry has issued notices under the Environment (Protection) Act, 1986 to the tanneries. Such notices have made the tanneries more responsive to the scheme.

11.8 AWARENESS

The media, particularly the television and the radio, can help greatly in increasing environmental awareness. A high level committee has been constituted to promote use of media for this purpose systematically.

12. ADMINISTRATION AND BUDGET

12.1 The strength of the Department including National Mission on Wasteland Development at the Headquarter is 1171 (Group 'A': 211, Group 'B': 378, Group 'C': 371 and Group 'D': 211).

12.2 PERSONNEL POLICIES

In accordance with the revised Recruitment Rules for Group 'A' scientific posts in the Department, direct recruitment to several categories of Group 'A' scientific posts in the Ministry as well as its associated offices was made. Out of 69 vacancies at various levels in Group 'A', 46 were filled up during the year. Under the Flexible Complementing Scheme, 160 Group 'A' scientific officers were reviewed and 98 were promoted to the next higher grade with effect from 1-1-1989 and 1-7-1989.

12.3 RESERVATION IN SERVICE-SPECIAL DRIVE TO RECRUIT SCHEDULED CASTES/SCHEDULED TRIBES DURING 1ST JULY, 1989 TO 30TH SEPTEMBER, 1989

12.3.1 A statement showing reservation of Scheduled Castes/Scheduled Tribes in the Department as on 31-12-1989 is given is Table 15.

12.3.2 A special drive to fill up backlog of Scheduled Castes/Scheduled Tribes vacancies for Groups 'A', 'B', 'C' and 'D' posts in the Ministry and its associated offices was taken up. Recruitment action was initiated for 158 backlog posts in all the 4 groups. Selections were made for 115 posts during this period and thus achievement in this regard was 73%.

12.4 ADMINISTRATIVE REFORMS—COMPUTERISATION OF PERSONNEL INFORMATION

As a measure of modernisation of Administration Division, steps have been taken up to computerise all the data related to posts and personnel for immediate retrieval of information as and when needed.

12.5 JOINT CONSULTATIVE MACHINERY

The Departmental Council of the Ministry set up under the Joint Consultative Machinery and Compulsory arbitration for Central Government Employees continued its activities during the year. Four meetings were held to sort out issues raised by the employees. Office Councils set up in the associated offices continued to function regularly. Office Council of the Ministry also held 6 meetings during the year. Regional Councils were also set up in Botanical Survey of India and Zoological Survey of India under the JCM Scheme during the year.

12.6 USE OF HINDI

12.6.1 Hindi as official language is being progressively used in the Ministry and its attached and subordinate offices. The Hindi Salahkar Samiti—an advisory body for the Ministry on language policy, was reconstituted in August, 1989, and has met thrice during the year. The Official Language Implementation Committee of the Ministry also met regularly during the year.

12.6.2 Inspection of Offices

In order to ensure effective implementation of the Annual Programmes and instructions on use of Hindi, 19 offices

Table 15

STATEMENT SHOWING THE TOTAL NUMBER OF GOVERNMENT SERVANTS AND THE NUMBER OF SCHEDULED CASTES AND SCHEDULED TRIBES AMONGST THEM IN THE DEPARTMENT OF ENVIRONMENT, FORESTS & WILDLIFE AS ON 31.12.1989

Group	Sanctioned strength	Number position	Scheduled Castes	Percent to total number of employees in position	Scheduled Tribes	Percent to total number of employees
1	2	3	4	5	6	7
Group 'A'	211	131	11	8.39%	4	3.0%
Group 'B'	378	165	23	10.90%	2	1.2%
Group 'C'	371	219	22	10.01%	4	1.8%
Group 'D' (Excluding Safaiwala)	189	181	51	28.17%	11	6.00%
Group 'D' (Safaiwala)	22	22	15	68.18%	—	—
Total	1171	718	122	16.99%	21	2.92%

under the Ministry of Environment and Forests were inspected.

12.6.3 Training in Hindi

Special arrangements for training in Hindi/Hindi typing/Hindi shorthand were made for employees of the Ministry. During the year, six employees passed Pragya Examination.

12.6.4 Hindi Week

Hindi week was organised during 11-15 September, 1989 in which various competitons were held and prizes distributed to the winners.

12.6.5 Incentive for Hindi Books on Environment Subjects

The prize scheme introduced in 1987 to encourage creative and original writing on topics relating to Environment etc. in Hindi also continued during the year. Out of 39 entires received under this scheme, the following were awarded prizes:

— Paryavaran Aur Hum By Rajiv Garg	Rs. 10,000 (First)
— Paryavaran Pradushan Evam Manav Swasthya by Dr. Suresh Chandra	Rs. 7,000 (Second)
— Jal Pradushan Evam Niyantran by Dr. M. Asrarul Haq.	Rs. 2,000 (Consolation)

12.6.6 Publication of Journal

A quarterly journal 'Paryavaran' in Hindi continued to be published by the Ministry with a view to encourage creative writing in Hindi among its officers and employees.

12.7 TRAINING

12.7.1 Programme on Computer Appreciation

A five-day training programme on computer appreciation for twelve officers of the Ministry was organised with the assistance of the National Informatics Centre during the year.

Some officers of this Ministry were also deputed for the computer training programmes organised in India and abroad.

12.7.2 Orientation Course on Office Procedure

An orientation course was organised in November 1989 for the Scientific Officers of the Ministry, on office procedure, noting and drafting, handling of secret documents and other security aspects, records management and parliamentary procedure.

12.8 SIMPLIFICATION OF PROCEDURES

12.8.1 The administration division of the Ministry has been developed a model unit under the scheme viz. 'Modernisation of Government Offices, evolved by the Department of Administrative Reforms and Public Grievances'. Additional mechanical aids and compact office furniture have been purchased for this unit.

12.8.2 Computerised monitoring is being done for "Very Important References" ((V.I.R.) for the entire Ministry and pending cases of the administration division.

12.8.3 All the forms which are in use in this Ministry have been reviewed by the Forms Control Committee, with reference to their objective, need and use to which they are put.

12.8.4 Necessary action has been taken for increased delegation of powers to the officers of this Ministry for expeditious and smooth disposal of cases.

12.9 CIVIL CONSTRUCTION UNIT

12.9.1 Three Engineering Divisions, two in Delhi and one in Bangalore, were created to plan and execute the construction works. The Chief Engineer and the Divisions under him have been provided functional autonomy for time bound execution of planned projects. Financial and administrative powers have been delegated to the Civil Construction Unit of the Ministry of facilitate quick execution of projects. The Unit has a sanctioned strength of 134 technical and administrative posts, out of which 55 have been filled up so far. Sixty technical posts have been encadred with Central Public Works Department (CPWD).

12.9.2 During the year, the Unit has undertaken various construction activities with a total estimated cost of Rs. 35.47 crores.

12.10 BUDGET

12.10.1 The Budget Estimate (Plan) and Revised Estimate (Plan) of the Ministry for the 1989-90 are Rs. 202.00 crores and Rs. 190.04 crores respectively

12.10.2 Area-wise distribution of funds for the year 1989-90 (Revised Estimate) and the Major Scheme-wise distribution of funds are shown in Fig. 33 and Fig. 34 respectively.

AREA-WISE DISTRIBUTION OF FUNDS FOR THE YEAR 1989-90 (RE) (PLAN) (RS. IN LAKHS)

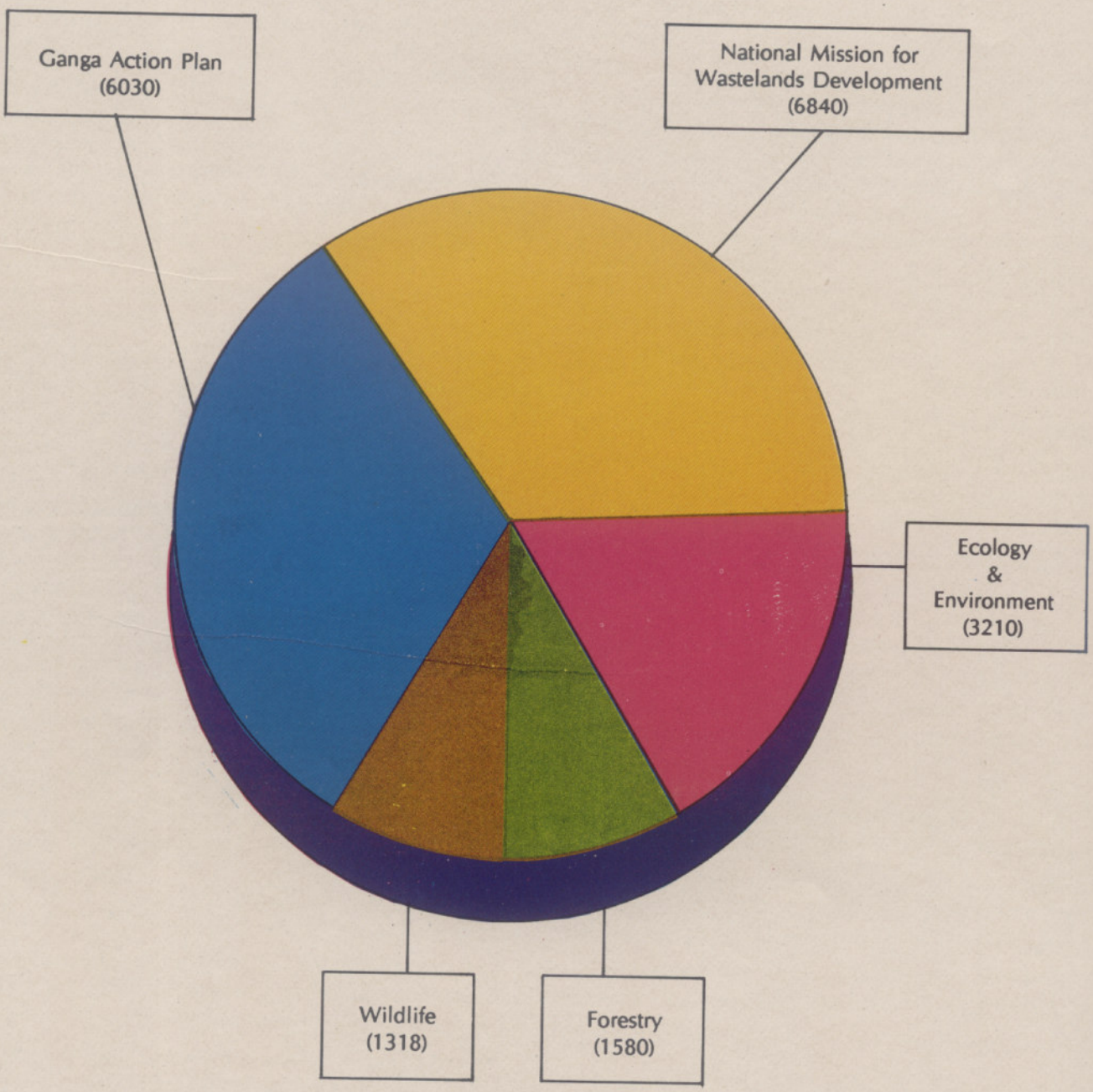


Fig 33:

PROGRAMME—WISE DISTRIBUTION OF FUNDS (PLAN)

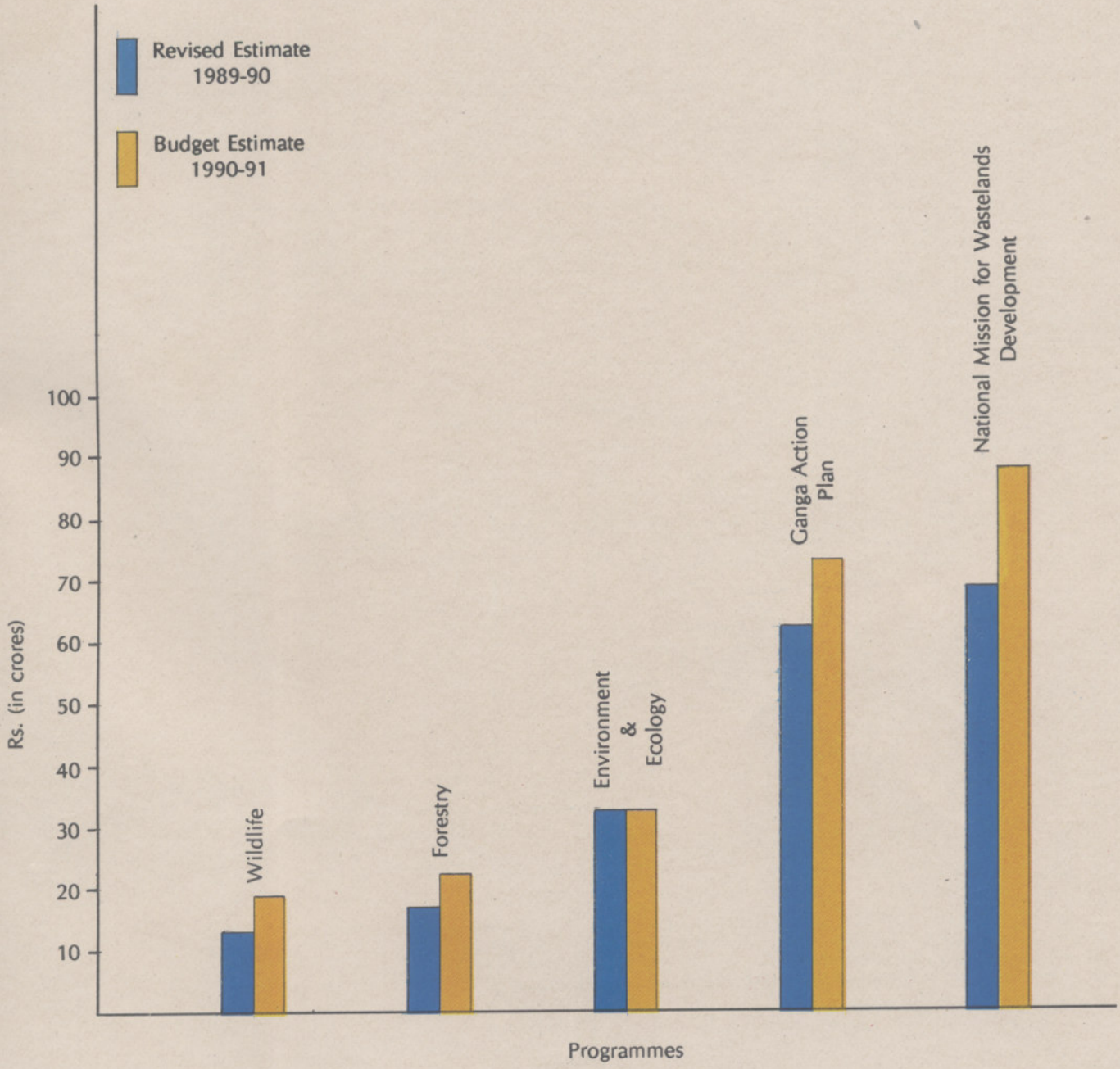
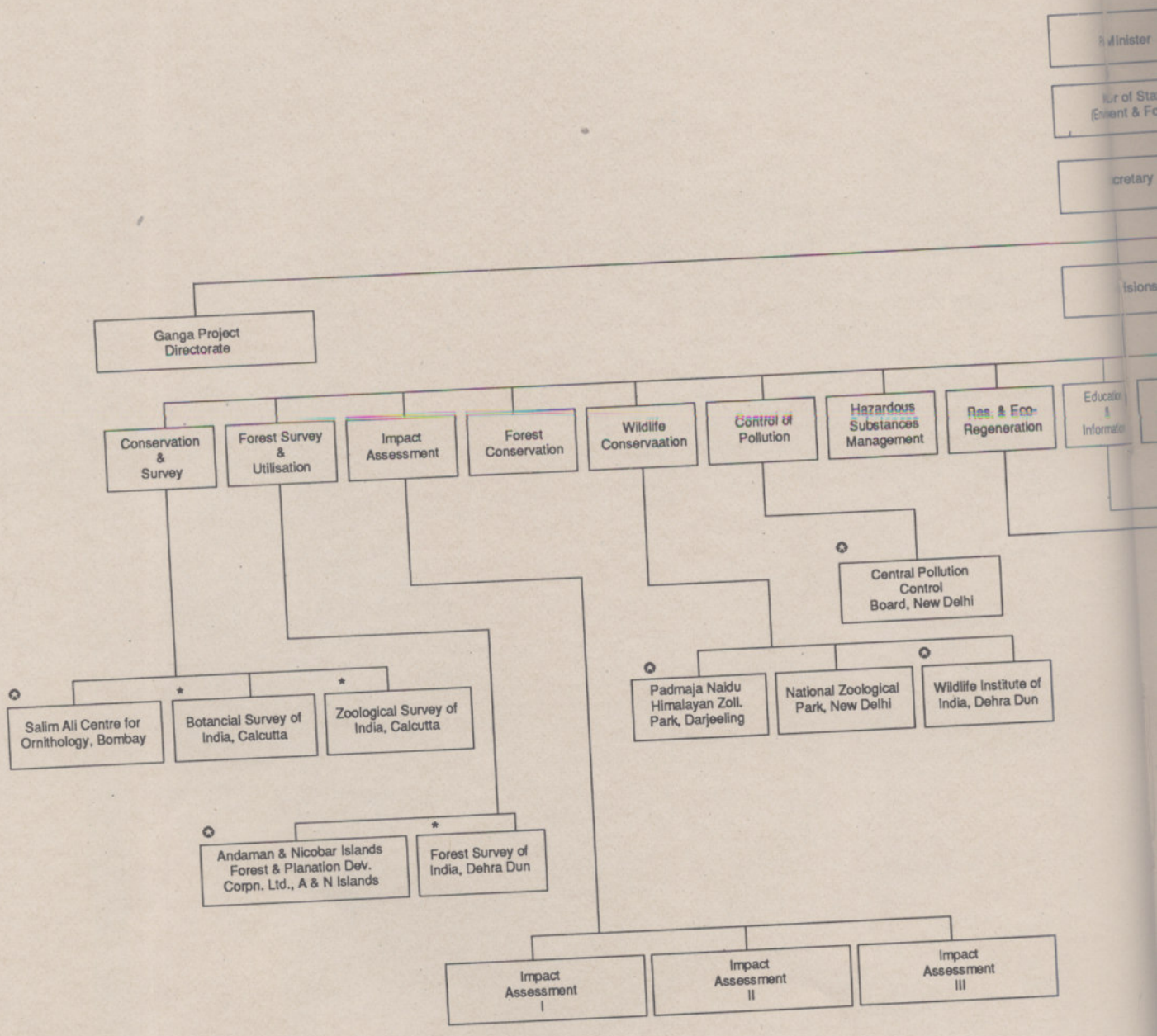


Fig 34:

ANNEXURE

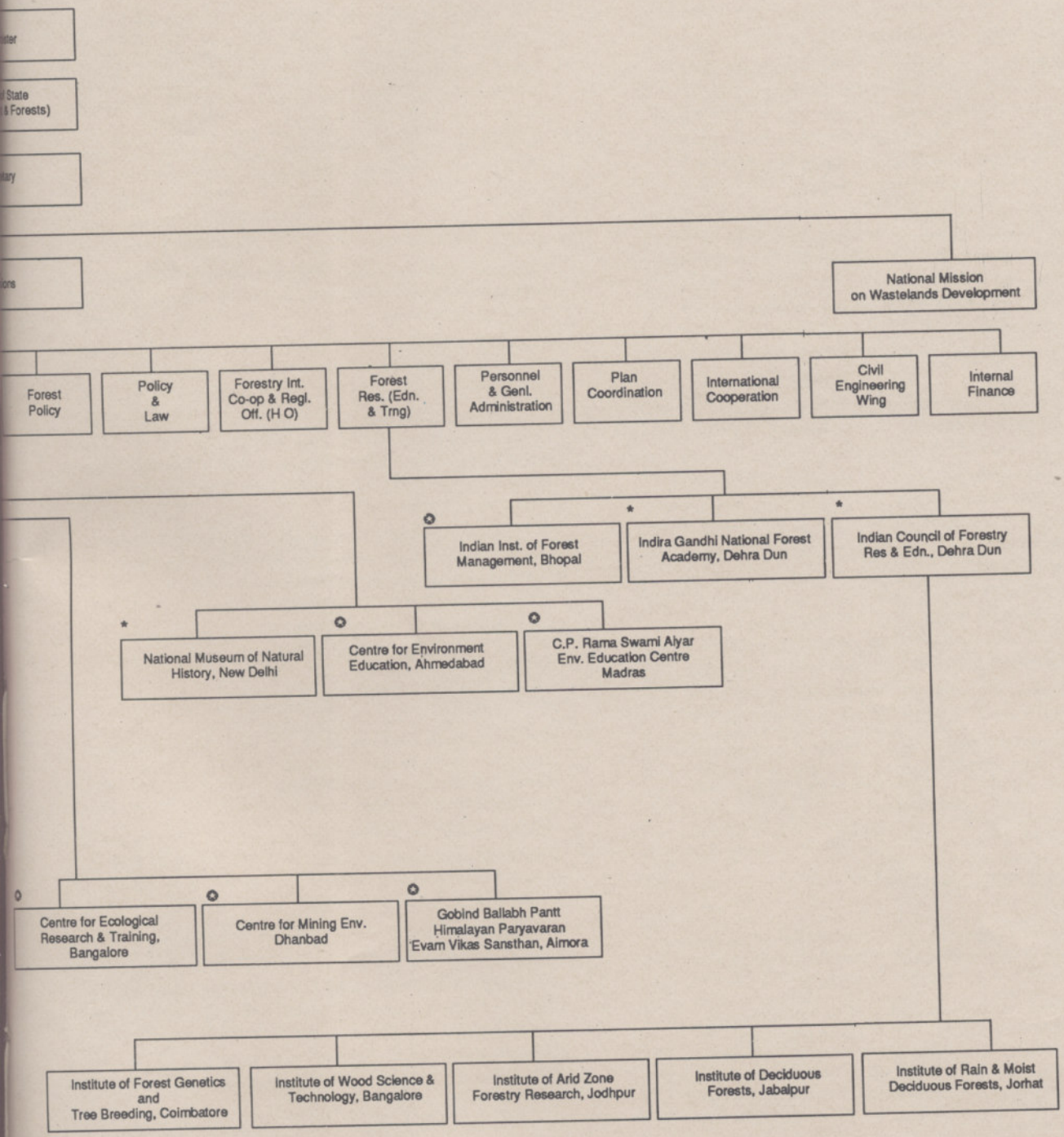
ORGANISATION CHART OF THE MINISTRY



✪ —Autonomous agencies assisted by the Ministry.
* —Associated Units under the administrative control of the Ministry.

RE I

Y OF ENVIRONMENT & FORESTS



ANNEXURE II

LIST OF PROJECTS SANCTIONED DURING 1989-90

Sl. No.	Title of the Project	Institution
	Environment Research/Man and Biosphere	
1.	Environmental Effects of Energy production, transformation and consumption in National Capital Region.	Tata Energy Research Institute, New Delhi.
2.	Solid waste, its compostion, disposal and recycling: a case study of Jaipur city.	Rajasthan University Jaipur.
3.	Studies on the ecology of the effluent channel flowing from Synthetics and Chemical Ltd. Bareilly and its irrigational impact on some Rabi crops.	Bareilly College, Bareilly.
4.	Studies on metal speciations in the environment.	Sri Venkateswara University, Tirupati.
5.	Impact of a thermal power plant on environment and agricultural production.	Aligarh Muslim University, Aligarh.
6.	Investigations into pollution of surface and ground water sources due to effluent of chemical industries under village Bichri, Dt. Udaipur, Rajasthan and its impact on local community.	Centre for Science and Environment, New Delhi.
7.	Interaction studies on selected air pollutants and fungal nemetode plant pathogens in crops pathosystem.	Aligarh Muslim University, Aligarh.
8.	Low cost technique for treatment of phenolic waste water.	Regional Research Laboratory, Jorhat.
9.	Environmental systems modelling with recourse to group method of data handling.	National Environmental Engineering Research Institute, Nagpur.
10.	Role of well humified organic manures (Farm Yard Manure and Compost) on the immobilisation and detoxification of pesticides in soil of varying textures.	Calcutta University, Calcutta.
11.	Studies on aerobic composting of spent wash and its environmental impact assessment.	Environmental Protection Research Foundation, Sangli.
12.	Development and standardisation of pre-concentration methods for monitoring pesticides residues in environmental samples.	Aligarh Muslim University, Aligarh.
13.	Concentration of heavy metals in Milk and Milk powder.	Anna University, Madras.
14.	Hydrological and biological factors affecting riverine fisheries in Allahabad region.	National Academy of Sciences, Allahabad.
15.	Integrated pest management in fresh water ecosystem using the fish aquatic insect communities.	Loyola College, Madras.
16.	Development and use of mycoinse-otiade from indigenous fungal pathogen against brown plant hopper *(Nilapasvata engenstal).*	Faculty of Agriculture Annamalai University Annamalai Nagar, Tamil Nadu.
17.	Study of the vanishing species of *Megapode* (Thermometer bird) of India.	J.B.S. Haldane Research Institute, Central Library, Nagercoil, Tamil Nadu.
18.	Animals & Environment	CARTMAN, Bangalore
19.	Management of Himalayan Pheasants habitat evaluation and captive breeding.	Deptt. of Zoology, Garhwal University, Srinagar, U.P.
20.	studies on mycorrhizae of *Pinus Nilgiris* and Kodaikanal hills of Tamil Nadu.	Centre for Advanced Study in Botany, University of Madras, Madras.
21.	Analysis of ecosystem of the Command and uncommand areas of Indira Gandhi Canal with particular reference to moisture, intercropping behaviour of *Lasirus sindicus.*	Dungar College, Bikaner.
22.	Impact Assessment of bioecological changes in the faunal patterns (selected groups) brought out about by the partial submission of Corbett National Park as a result of Ram Ganga multipurpose hydel project dam, especially in the area contiguous to the proposed water line (II Stage).	Zoological Survey of India, Dehra Dun.
23.	Studies into ecological and socio-economic impacts of open cast coal mining and evaluation of Technology for restoration of site Productivity of colliery overburden heaps.	State Forest Research Institute, Jabalpur.
24.	Ecology and cytogenetical studies of rare, endangered and endemic forests flora of Andaman & Nicobar Islands.	JLN Vidyalaya, Port Blair, A & N Islands.
	Himalayan Region	
1.	Eco-biology of Bhagirathi river system in Garhwal Himalayas with a view to find out remedial measures for the improvement of riverine ecosystem and to enhance fisheries potential of the region.	Gurukul Kangri Vishva-vidyalaya, Hardwar.
2.	The influence of earth worms on decomposition and nutrient circulations in the Oak, Pine forests and Crop fields of Kumaun Himalayas.	Kumaun University, Nainital.
3.	Ecobiology of the commercially exploitable Macrocrustaceans of the Terai and Hills of Kumaun Region.	Kumaun University, Naintal.

Sl. No.	Title of Project	Institution
4.	Germplasm survey and identification of specific fuel and fodder yielding wild shrubs for propagation on specific wasteland of Garhwal Himalayas.	Govt. Post Graduate College, Gopeshwar, Chamoli.
5.	Impact on riverine eco-system due to proposed construction of Hydro-electric Dams and Barrages at Goriganga in District Pithoragarh with special reference to fish management.	Kumaun University Campus, Almora.
6.	Growth of Himalayan Tourism in Gangotri Region; impact on physical resources and economy.	Govt. Post Graduate College, Kotdwar, Garhwal (U.P.)
7.	Environmental development of Garhwal Himalaya with particular reference to landslides hazard zonation and efficacy of innovative control measures.	Central Building Research Institute, Roorkee.
8.	Slope instability in Geo-environmental evaluation of Karmi areas of Central Himalayas.	Kumaun University Campus, Almora.
9.	Ecology, Biology, Nutritional value and cultivable possibilities of some indigenous species of fresh water fishes in North Eastern Hill Region.	North Eastern Hill University, Shillong.
10.	Studies on water pollution in Nainital and Bhimtal lakes of Kumaon, Himalaya.	Kumaun University, Nainital.
11.	Assessment and multiplication of *Ficus* species for agro forestry and social forestry in hills.	H.N. Bahuguna Garhwal University, Srinagar, (U.P.).
12.	Propagation studies on social and agro forestry in mountains.	H.N. Bahuguna Garhwal University, Srinagar, (U.P.).
13.	Geohydrology of springs in Garhwal District (U.P.).	H.N. Bahuguna Garhwal University, Srinagar, (U.P.).
	Western Ghats Region	
1.	Community structure in Western Ghats, Hill Stream Fishes.	Pondicherry University, Pondicherry.
2.	Studies on Sediment Flux of River, Estuary and Adjoining Coastal Waters of Goa, West Coast of India.	Goa University, Goa.
3.	A people's Project on Agro Forestry Alternatives for soil conservation.	Kerala Sasthra Sahitya Parishad, Kerala.
4.	Studies on Water Use, Assimilation and Growth of *Eucalyptus*.	Kerala Forest Research Institute, Peechi, Kerala.
	Eastern Ghats Region	
1.	Environmental aspects of pollination and seeding in some timber plant species of Eastern Ghats.	Botany Department, Andhra University, Waltair, Visakhapatnam.

Sl. No.	Title of Project	Institution
	Wetlands	
1.	Analysis of some lake ecosystems of Himachal Pradesh with special reference to their conservation and management.	Deptt. of Biosciences, Himachal Pradesh University, Shimla.
2.	Eutrophication and fish production in some aquatic environment of central India.	Deptt. of Botany, University of Saugar, Saugar (M.P.).
3.	Ecology, distribution and documentation of freshwater gastropods of Tamil Nadu and their cerearial fauna.	Zoological Survey of India Southern Regional Station, Madras.
4.	Study of wetland ecosystems in Manipur Valley from management perspective of fish wildlife and environment.	Deptt. of Life Sciences, University of Manipur, Imphal.
5.	Conservation of Dal and Nilnagh lakes in Kashmir.	Deptt. of Botany, Kashmir University, Srinagar.
6.	Ecology, biology and pollution on Sasthmkottah lake.	Deptt. of Zoology, Fatima Mata National College, Quilon.
7.	Sedimentation studies of Fatehsagar and Pichola lakes, Udaipur.	Deptt. of Soil and Water Conservation Engineering College of Technology & Agricultural Engineering, Rajasthan Agriculture University, Udaipur.
8.	Limnological studies of aquatic ecosystem in Allahabad region with special reference to the effect of human activities on its biotic potential.	National Academy of Science, Allahabad.
9.	Studies on the upper lake and the water works ecosystems of Bhopal for their hygienic and economic management.	Deptt. of Limnology, Bhopal University, Bhopal.
10.	Environmental status of Kodaikanal lake. A case study.	Bhavan's Gandhi Vidhyashram Golf Club Road, Kodaikanal.
11.	Ecology and productivity of the salt lake of Rajasthan desert and culturing of brine shrimp *Artemia* for aquaculture.	Deptt. of Zoology, University of Jodhpur, Jodhpur.
12.	A limnological study on the impact of human activities on the river Narmada M.P. (from Amarkantak to Hoshangabad).	Deptt. of Botany, Govt. P.G. College, Chhindawara (M.P.).
13.	Mapping and characterisation of the wetlands along the Eastern Coast of Orissa.	Deptt. of Botany, Utkal University, Bhubaneswar.

Sl. No.	Title of Project	Institution
14.	Ecology of lake Mansar with emphasis on conserving associated fish and wildlife populations endangered by creation of recreational tourist and other human interference.	Deptt. of Bio-sciences, Jammu University, Jammu.
15.	Fish conservation in Wullar lake with reference to helminth infestation.	Deptt. of Zoology, Kashmir University, Srinagar.
16.	Ecology and conservation of Kashmir Wetland of Wullar lake.	S.P. College, Srinagar.
17.	Mapping of wetlands: Pichola and Sambhar lake areas using multi-data satellite remotely sensed data products.	Indira Gandhi Centre for Human Ecology Environmental and Population Studies, University of Rajasthan, Jaipur.
18.	Study of the environmental factors of the urban development around the lakes and their catchment: Udaipur.	Centre for Environmental Studies, School of Planning and Architecture, New Delhi.
19.	A comprehensive investigation on great lake system in Amethi and Rae Bareli.	Deptt. of Botany, Feroze Gandhi College, Rai Bareli.
Mangroves		
1.	Ecological studies of mangrove forest eco-systems of Andaman Islands.	School of Studies in Botany Vikram University, Ujjain.
2.	Studies on the effect of environmental pollution on some benthic animals in the Cochin Backwater.	Central Marine Fisheries Research Institute, Cochin.
3.	Studies on the littoral fauna with special reference to molluscan fauna of Vellar estuary and Pichavaram mangroves.	Centre of Advance Study in Marine Biology, Annamalai University, Tamil Nadu.
4.	Human impact on primary productivity and regeneration of mangroves of Maharashtra.	Department of Botany Shivaji University, Kolhapur.
5.	Geo-biological studies on the mangroves of Godavari Delta Complex.	Department of Botany Andhra University, Waltair.
6.	Mangrove soils of Sunderbans ecosystem.	University College of Agriculture, Calcutta University, Calcutta.
7.	Environmental impact assessment of the mangrove ecosystem along the West Coast of India.	National Institute of Oceanography, Dona Paula Goa.
8.	Ecological energetics of the mangrove ecosystem.	Centre of Advance Study in Marine Biology, Annamalai University, Tamil Nadu.
9.	Mangrove ecosystem of Sunderban invirgin and reclaimed areas with special reference to productivity.	Department of Marine Sciences, Calcutta University, Calcutta.
10.	Production of mangroves in the Karwar region.	Department of Marine Biology, Karnataka University, Karwar.
11.	Conservation and management of the mangroves of Krishna Delta.	Department of Botany Andhra University, Waltair.
12.	Propagation and re-establishment studies on mangroves in Bhitarkanika and Mahanadi Delta.	Regional Plant Resources Centre, Bhubaneswar.
13.	Ecological aspects and the role of marine wood borers in the destruction of living mangrove vegetation along the Indian coasts.	Institute of Wood Science & Technology, Bangalore.
Biosphere Reserves		
1.	Studies on Hydrological processes and their impact on Nilgiri Biosphere Reserve using Remote Sensing Techniques.	Centre for Water Resource Development & Management, Kozhikode, Kerala.
2.	Studies on human ecology and eco-restoration of Attapady Valley.	Kerala Forest Research Institute, Kerala.
3.	Ecosystem monitoring through the study of plants, large mammals and insects.	Centre for Ecological Sciences, Indian Institute of Science Bangalore.
4.	Interaction of atomospheric chemistry with the Nilgiri Biosphere Reserve.	Indian Institute of Tropical Meteorology, Pune.
5.	Meteorological and hydrological monitoring and investigations in the core zone of Nilgiri Biosphere, Silent Valley and Nilambur Kovilakam Sub-basins.	Centre for Water Resource Development & Management, Kozhikode, Kerala.
6.	Studies on different land use based water sheds in Nilgiri Biosphere Reserve.	Centre for Water Resource Development & Management Kozhikode, Kerala.
7.	Detailed inventories of the Nilgiri Biosphere Reserve.	Botanical Survey of India, Coimbatore.
8.	Detailed inventories of the fauna of Nilgiri Biosphere Reserve.	Western Ghat Regional Station, Zoological Survey of India.
9.	Pattern of soil and vegetation and factors determining their forms and hydrological cycle in Nanda Devi Biosphere Reserve.	Kumaon University, Naintal.
10.	Detailed inventories of the flora of Nanda Devi Biosphere Reserve.	Botanical Survey of India, Dehra Dun.
11.	Detailed inventories of the fauna of Nanda Devi Biosphere Reserve.	Zoological Survey of India, Dehradun.

ANNEXURE III

LIST OF PROJECTS COMPLETED DURING 1989-90

Sl. No.	Title of Project	Institution
	Environment Research/Man and Biosphere	
1.	Effect of some of the environmental mutagen on the genetics of selected invertebrare and vertebrate models.	Punjab University, Chandigarh.
2.	Development of an environment management plan of the western part of Bengal basin on the study of quartenary geology and ground water resources.	Centre for Study of Man and Environment, Calcutta.
3.	Analysis of the heavy-metal ions and gaseous pollutant induced damage in the structure and functions of higher plant and algae photosynthesis.	Jawaharlal Nehru University, New Delhi.
4.	Effect of environmental pollutants (Pesticides) on humoral and cell mediated immune responses.	Osmania University, Hyderabad.
5.	Studies on the biological characteristics of the river Krishna in Maharashtra.	Y.C. College of Science, Korad.
6.	Clinical and experimental studies on parthenium allergy.	Indian Institute of Science, Bangalore.
7.	Studies on phyto-toxicity of sulphur chloride pollution on some leguminous plants.	M.L.K. Post Graduate College, Balrampur.
8.	Fungi on the environs of occupational importance and their possible role in causing allergenic diseases among workers and degradation of goods.	Sri Jainarain Degree College, Lucknow.
9.	Effect of lead on reproductive performance and brain development in rats.	M.S. University of Baroda, Baroda.
10.	A study on fluoride pollution around a refractory and an aluminium plant.	G.M. College, Sambalpur.
11.	Environmental data bank for Birbhum district of West Bengal—Conservation of resources and planning.	Visva Bharati, Santiniketan.
12.	Interaction of electromagnetic fields with biosphere with special reference to effects on living system.	Voluntary Health Service Medical Centre, Madras.
13.	Effect of fluoride toxicity and fluorosis on the chemical constituent of red blood cell membrans and blood group substances.	All India Institute of Medical Sciences, New Delhi.
14.	Human and animal study of ethiopathogenis of Dental Fluorosis.	Madras Dental College, Madras.
15.	Effect of heavy metal pollution on nitrogen assimilation in some crop plants.	M.D. University, Rohtak.
16.	Biomass energy capturing efficiency and nutrient cycling in the casuarina plantation in the coastal belt in Orissa.	Berhampur University, Berhampur.
17.	The Coleroon Estuary & Adjoining Sea Board (Southern India): A Holistic Study of Benthic Ecology.	Centre of Advanced Study in Marine Biology, Annamalai University, Prangipettai.
18.	Studies on Ethnobiology of the Tribals of Western Ghats.	International Institution of Ayurveda, Coimbatore Tamil Nadu.
19.	Comparative Ecology of rivers Gandak and Burhi Gandak.	University Department of Botany, University of Bihar, Muzaffarpur.
20.	Availability and Utilization of Food Resources: An Anthropo-ecological study of Andaman Archipelago.	Department University of Madras, Madras.
21.	Location and Siting of Industrial Activity—A case study of Udaipur City and its environs.	Department of Geography, College of Social Sciences & Humanities, Sukhadia University, Udaipur.
22.	Ethnobotanical studies in U.P. Himalaya.	Department of Botany Garhwal University, Srinagar.
23.	Eotoxicological studies of free living protozoa of aquatic bodies and arable fields of Andhra Pradesh and *in vitro* studies of their physiological responses to different toxicants.	Department of Zoology, Univ. College of Science Osmania University, Hyderabad.
	Himalayan Region	
1.	Trifunctional approach for eco-development of Distt. Doda, J&K.	Department of Biosciences Jammu University, Jammu.
2.	Study of natural resources conservation and eco-development and carrying capacity of two watersheds.	Deptt. of Economics Himachal Pradesh University, Shimla.
3.	Macrocatchment waters: Macro-catchment water storage schemes for the Garhwal region.	H.N. Bahuguna Garhwal University, Srinagar (U.P.).
4.	Resources survey study of environmental degradation patterns in Rath area of Garhwal.	H.N. Bahuguna Garhwal University, Srinagar (U.P.).
5.	Introduction of social forestry programme in Rath area.	H.N. Bahuguna Garhwal University, Srinagar (U.P.).
6.	Seed and seedling bank for agro and social forestry in Garhwal.	H.N. Bahuguna Garhwal University, Srinagar (U.P.).
7.	Damage potential and control measures for corn worm *Canlendra scopulata* in the Oak Forests of Kumaon Himalaya.	Department of Zoology, Kumaon University, Nainital.

Sl. No.	Title of Project	Institution
8.	Genetic conservation and improvement of Orchit and Bamboo germplasm for eco-development.	Department of Plant Breeding, Assam Agricultural University, Jorhat, Assam.
9.	Coordinated eco-development programme of Mirik Sukhna Region of Darjeeling District.	Department of Geography University of North Bengal, Darjeeling.
10.	Integrated demographic and socio-economic studies including small scale industries in Darjeeling Distt.	Department of Geography University of North Bengal, Darjeeling.
11.	Creation of forests.	Deptt. of Plant Breeding Dr. Y.S. Parmar University of Horticulture & Forestry Solan, Himachal Pradesh.
12.	Conservation of biological diversity of living organisms.	Department of Botany Kashmir University, Srinagar.
13.	Long-term impact of removal of pine needles on the soil properties and forest environment.	Deptt. of Agronomy & Agro Meteorology, Himachal Pradesh Krishi Vishvavidyalaya, Palampur.
14.	Studies on the edaphic environment and water pollution due to agro chemicals.	Department of Agronomy & Agaro Meteorology, Himachal Pradesh Krishi Vishvavidyalaya, Palampur.
15.	Germ plasm reviewing of nursery and plantation technology of maggar bamboo.	Deptt. of Basic Sciences Himachal Pradesh Krishi Vishvavidyalaya, Palampur.
16.	Optional land use for environmental restoration in Kotadun Basin, Kumaon Himalaya Demonstration Scheme.	Department of Geography Kumaon University, Nainital.
17.	Analytical study of the agrarian, socio-economic, flora and conservation and development in Karbi Anglong District, Assam.	Department of Statistics Gauhati University, Guwahati.
18.	Survey of the diversity of living economic flora and their conservation and development in Karbi Anglong District of Assam.	Department of Agricultural Botany, Gauhati University, Guwahati.
19.	Study of the impact of social and economic activities on selected watersheds (Giri catchment in Himachal Pradesh).	Organisation of Socio-economic systems, Delhi.
20.	Integrated states towards improvement of an existing eco-system in Himalayan valleys near Hardwar.	Department of Zoology Gurukul Kangri Vishvavidyalaya, Hardwar.
	Western Ghats	
1.	Hazardous effects of ground water pollution and mitigative measures thereof.	Deptt. of Applied Mechanics and Hydraulics, Karnataka Regional Engineering College Surathkal, Karnataka.
2.	Tribes and other communities of Western Ghats. Their socio-cultural and psychological characteristics, rehabilitation and development in relation to eco-system.	Tamil Nadu Agricultural University, Coimbatore.
3.	A study of environmental and socio-economic problems of rehabilitation of Koyana Project.	Department of Sociology Shivaji University, Kolhapur.
4.	Study of organic productivity nutrient cycling and small watershed hydrology in natural forests and in monoculture plantation in Chikmagalur District, Karnataka.	Sri Jagadguru Chandra Sekhara Bharathi Memorial College, Srinageri, Karnataka.
5.	Studies on soil fauna their diversity and relationship to the ecosystem.	Department of Entomology University of Agricultural Sciences, Bangalore.
6.	Management and conservation of Pookot lake ecosystem of Western Ghat region.	Groundwater Division, C.W.R.D.M. Kozhikode, Kerala.
7.	Long-term environmental and ecological studies of Pooyamkutty Hydro Electric Project, Western Ghats, Kerala, pre-construction stage analysis.	Kerala Forest Research Institute, Peechi, Kerala.
8.	Stream fish community organisation along gradients in Uppugala Hole, Western Ghat, Karnataka.	Salim Ali School of Ecology, Pondicherry University, Pondicherry.
	Eastern Ghats	
1.	Management of conservation of the Herpeto-faunal resources: A study on the natural resources of the Eastern Ghats.	Department of Environmental Sciences, Andhra University, Visakhapatnam.
2.	Sea grass ecosystem of the Coromandel Coast of Eastern Ghats.	Botanical Survey of India, Coimbatore.
3.	Sea grass ecosystem of the Coromandel Coast of the Eastern Ghats.	Department of Botany Bharatiyar University, Coimbatore.
4.	Bio-energetics and methodology of energy flow in important wetlands and lake system (Kolleru and Pulicat areas) of Eastern Ghats.	Institute of Coastal and Offshore Research, Andhra University, Visakhapatnam.
	Biosphere Reserves	
1.	Bio-ecological studies on the aquatic insects of Nilgiri Biosphere Reserve.	Loyola College, Madras.
2.	Ecological studies and long-term monitoring of biological processes in Silent Valley.	Kerala Forest Research Institute, Kerala.

ANNEXURE IV

SCOPE AND INSTITUTIONS INVOLVED IN INTEGRATED RESEARCH PROGRAMME ON RIVER KAVERI

A. Monitoring Water Quality

1. Mangalore University, Mangalore.
2. Bangalore University, Bangalore.
3. Mysore University, Mysore.
4. Bharathiar University, Coimbatore.
5. Bharathidasan University, Tiruchirapalli.
6. Annamalai University, Parangipettai.
7. K.N. Arts and Science College, Coimbatore.
8. N.G.M. College, Pollachi.
9. C.N. College, Erode.
10. Government Arts College, Namakkal.
11. National College, Tiruchirapalli.
12. Bishop Heber College, Tiruchirapalli.
13. Holy Cross College, Tiruchirapalli.
14. St. Joseph's College, Tiruchirapalli.
15. Jamal Mohd. College, Tiruchirapalli.
16. A.V.C. College, Mailaduthurai.
17. A.V.V.M. College, Poondi.

B. Aquatic Insects

1. Madura College, Madurai.

C. Epidemeological Studies

1. Bangalore University, Bangalore.
2. AVC College, Mailaduthurai.

D. Inventorisation of Pollution Sources

1. Mysore University, Mysore.
2. Bishop Heber College, Tiruchirapalli.

E. Analysis of Metals, Pesticides and Micro-organisms

1. Anna University, Madras.
2. Madurai Kamaraj University, Madurai.