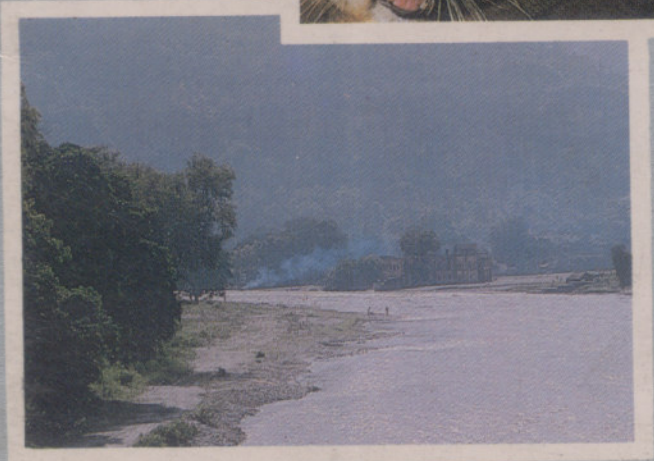


ANNUAL REPORT 1986-87



MINISTRY OF ENVIRONMENT & FORESTS
GOVERNMENT OF INDIA

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1. ROLE & ORGANISATION

The Department of Environment, Forests and Wildlife in the Ministry of Environment and Forests was created in September, 1985. The Department serves as the focal point in the administrative structure of the Central Government for planning, promotion and coordination of environmental and forestry programmes. Besides monitoring the protection of environment, the Department discharges the tasks of protecting the environment in coastal waters, mangroves, coral reefs and wetlands; environmental appraisal of development projects; eco-regeneration and development; assessment survey and conservation of biotic and abiotic resources; environmental research, education, awareness and information; pollution control and monitoring; checking destruction of forests; restricting diversion of forest lands to non-forestry uses, developing a rational forest policy, developing social farm forestry schemes and protecting and preserving wildlife.

1.1 Allocation of Business Rules

The following are the items of work allocated to the Ministry of Environment & Forests:—

- Environment and Ecology, including environment in coastal waters, in 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 Landuse and Wasteland Development Council;
- National Wastelands Development Board; and
- Central Ganga Authority.

1.2 Organisation

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

2. AN OVERVIEW OF ACTIVITIES DURING THE YEAR

2.1 The Environment (Protection) Act, 1986

- The Environment (Protection) Act, 1986, a landmark legislation to provide a single focus in the country for the protection of environment and to plug the loopholes in the existing legislation, was passed by the Parliament and received Presidential assent in May, 1986. The Act has come into force, and rules under the Act notified, from November 19, 1986.
- Necessary powers for implementation of the Act have been delegated to the States and various existing Central and State authorities.
- Assistance has been given to the States to strengthen the implementation of the Water and Air (Prevention and Control of Pollution) Acts and the Environment (Protection) Act.
- Various agencies of the Central and State Governments have been identified and specific duties entrusted in regard to prevention, control and management of chemical accidents.
- The Environment Protection Councils, being established in the States at the instance of the Prime Minister, would help to promote the implementation of the Act.
- The existing laboratories which are adequately equipped and manned are being recognised as environmental laboratories and qualified personnel appointed as Government Analysts under the Act.
- Standards for discharge of pollutants from ten industries have been statutorily notified as applicable throughout the country. Experts are studying eight more priority industries for setting the standards.

2.2 Pollution Monitoring and Control

- The Central Board for the Prevention and Control of Water Pollution (CBPCWP) has evolved guidelines for industries and regulatory agencies for the control of pollution.
- The Minimal National Standards (MINAS) for effluents from the pesticides industry have been evolved and notified to the industrial units in the country.
- Emission standards for boilers of small scale industries and guidelines for stack heights have been evolved.
- The CBPCWP has monitored the carbon monoxide emissions from exhausts of petrol driven vehicles with a view to checking compliance with emission regulations.
- Thirteen more monitoring stations have been established for the water quality monitoring programmes under the United Nations Global Environmental Monitoring Systems (GEMS) and the Monitoring of Indian National Aquatic Resources System (MINARS).
- The biomonitoring programme of the Yamuna River in five district zones and establishment of their assimilative capacities for pollution has been continued.
- Studies on the river basins of Brahmaputra, Cauvery, and Sabarmati have been continued.
- The coasts of Andhra Pradesh, Orissa and West Bengal have been surveyed for identification of pollution sources. The entire coast line of India has thus been covered for use-based classification and zoning of saline water. A detailed coastal water quality monitoring project has been prepared under which the coastal water along the entire Country's coastline will be monitored at selected locations.
- The network of monitoring stations under the National Ambient Air Quality Programme has been expanded to comprise 75 stations covering 21 cities/towns.
- The status of pollution control at source and implementation of MINAS in respect of the various industries (chlor alkali, man-made fibre, fertiliser,

pesticide, pharmaceutical, paper and pulp, integrated iron and steel) has been surveyed and monitored.

- A task force has been constituted to assess the pollution status in the steel mills and to advise a control strategy.
- A study has been initiated by the CBPCWP to evolve efficient methods to control fugitive emissions of dust from stone crushing units.

2.3 Central Ganga Authority

- 114 schemes have been sanctioned and are under execution in the three States of UP, Bihar and West Bengal. Several new schemes are under consideration.
- Work was started in 23 out of 27 cities under the Ganga Action Plan.
- Two schemes in Hardwar-Rishikesh have been completed.
- A sewage treatment plant and sewage farm have been completed at Ramnagar near Varanasi.
- In Patna, two treatment plants at Saidpur and Beur have been renovated and recommissioned.
- Detailed discussions have been held with State Governments to identify and implement non-engineering schemes to supplement the sewerage and drainage projects.
- Water quality monitoring has been taken up in different stretches of the river.
- The Ganga Project Directorate is coordinating the integrated eco-development research project on the Ganga currently being undertaken in 18 Universities.
- A research committee has been constituted to consider necessary research programmes and to review the technological needs and options for implementation of the Ganga Action Plan.
- The National Laboratories (ITRC & NEERI) have been given the task of monitoring of heavy metals and pesticides and analytical quality assurances.
- Diverse public participation programmes have been

organised to generate public awareness and cooperation.

—Financial and technical assistance being offered by the United Kingdom, Netherlands and the World Bank for the implementation of the Ganga Action Plan is being considered in the context of specific technology/resources requirement.

2.4 Environmental Impact Assessment

—Questionnaires and guidelines have been evolved for development projects in selected sectors such as industry, river-valley and hydel projects, beaches, ports and harbours, mining, etc.

—Guidelines for siting of industries and thermal power plants have been finalised.

—The proposal for introduction of Light Rail Transit (LRT) System in Delhi is being appraised environmentally for consideration of aspects such as noise pollution, loss of vegetation, aesthetics and urban renewal.

—A list of totally protected and non-polluting industry districts has been prepared along with alternative industries in these areas, with a view to providing incentives for setting up industries in 'No Industry Districts'.

—Draft guidelines for environmental assessment of new towns has been prepared and circulated to all Ministries.

—An Island Development Authority has been constituted to evolve strategies for integrated development of the Andaman, Nicobar and Lakshadweep Islands compatible with ecological conservation.

—The Department has been made the nodal agency for the World Health Organisation's (WHO) project on 'Human Exposure Assessment Location' to be undertaken by several countries.

2.5 Eco-Regeneration and Development

—The National Eco-Development Board has been reconstituted to evolve and adopt policies and development strategies to arrest ecological degradation and to demonstrate the feasibility of economic development without ecological imbalance.

—Field demonstration projects were undertaken specifically for the eco-regeneration of Pushkar Lake Valley (Ajmer), Shivalik foothills (Hoshiarpur), Auroville (Pondicherry) and Cherrapunjee (Meghalaya).

—The Department has approved an environmental improvement plan for Santiniketan called 'Project Visva-Bharti'. The lake and gardens surrounding Gurudev Rabindranath Tagore's farm house in Sriniketan have been reclaimed and beautified under the project.

—A detailed programme for the Indira Gandhi Institute of Himalayan Environment and Development has been developed to include research work on energy, food, high altitude ecology, plant resource management, hazard zoning etc.

—The Centre of Excellence on Ecological Research and Training at the Indian Institute of Science, Bangalore is working on the impact of man on biological diversity to evolve a practical strategy for conserving the genetic resources of the Western Ghats.

2.6 Flora & Fauna : Assessment & Survey

—The Botanical Survey of India (BSI) continued its activities on the survey, identification, exploration, and assessment of the plant resources of the country. 60% of the country has been surveyed.

—As part of the Plant Conservation Programme, the first volume of the Red Data Book on threatened species of Indian Plants has been completed. Flora of Corbett National Park has been published. A National Gymnosperm Sanctuary is being developed at Pauri.

—A Site Selection Committee has been constituted for advising the Government about the suitability of a site for setting up of a National Botanical Garden during the Seventh Five Year Plan in and around Delhi. The proposed National Botanical Garden will serve as a living laboratory for the life scientists, ecologists and environmentalists, and will also serve as "ex-situ" conservation of diverse and rare species of plants.

—A multi-departmental National Natural Resources Management System (NNRMS) has been established in view of the increasing need for

scientific monitoring and assessment of natural resources.

- The Zoological Survey of India has been engaged in the survey of faunal resources and collection of baseline data with regard to their taxonomy, bio-ecology, animal behaviour, population dynamics etc. Special emphasis has been given to assessment of fauna in the National Parks and Sanctuaries, and development of National Zoological Collections.

2.7 Forests : Resources & Development

- The Forest Survey of India has been reorganised, following a critical review of the activities, with a view to creating a sound forestry-oriented data base relevant to the needs of the country.
- 28% of the forest cover of the country has been surveyed and inventoried and thematic maps covering 31% forest area have been prepared.
- It is proposed to prepare a National Forest Vegetation Map once every two years. In this connection, area-wise data sheets have been prepared.
- The Inter-Ministerial Group constituted to examine the present utilisation pattern of wood submitted its recommendations which include among others the encouragement of use of non-conventional sources of energy, provision of fiscal incentives for reduction of wood consumption etc.
- The Forest (Conservation) Act, 1980 was enacted to check indiscriminate deforestation/diversion of forest lands for non-forestry purposes. To avoid delays in disposal of cases, comprehensive guidelines have been issued for adequate formulation of proposals under the Act. Procedures under the Act have been simplified.
- Special emphasis has been laid on compensatory afforestation in alternative areas, while releasing forest lands for other uses. Five regional offices have been established at Lucknow, Bhubaneshwar, Shillong, Bhopal and Bangalore to ensure observance of conditions stipulated for diversion of forest lands.

2.8 National Wastelands Development Board

- The National Wastelands Development Board was

established in May 1985 primarily to formulate, coordinate and catalyse programmes for the management and development of wastelands in the country.

- The Action programmes include, among others, setting up of decentralised nurseries by small and marginal farmers, schools, women and other groups and providing tree Pattas to the landless and rural poor.
- A pilot project to promote tree growers cooperatives in 256 villages of five States has been implemented in collaboration with the National Dairy Development Board.
- The definition and categorisation of wastelands over the country has been completed. State Governments have been advised to compile and send detailed information on the wastelands categories.
- In collaboration with the Department of Space, a project has been finalised to integrate remote sensing data, topographical maps and village cadastral survey maps for a precise identification of wastelands.
- Fifteen social forestry programmes currently in operation are being funded by Swedish International Industries Development Agency (SIDA), World Bank, United States Agency for International Development (USAID), Danish International Development Agency (DANIDA) and Overseas Development Agency (ODA) of the United Kingdom.
- A Standing Committee has been constituted to coordinate research work for appropriate agro-technologies for wastelands development.
- An operational Guide to Monitoring and Evaluation of Social Forestry in India has been prepared to streamline reporting procedures and formats as well as to ensure effective monitoring and evaluation.
- In recognition of the contribution of the late Prime Minister Smt. Indira Gandhi to the cause of eco-development and afforestation, the 'Indira Priyadarshini Vrikshamitra Award' was instituted. The Awards were presented on 19.11.86 to 26 awardees.

2.9 Wildlife

- The Wildlife (Protection) Act, 1972 has been amended and the enforcement of the amendment notified with a view to prohibit trade in endangered species of wild animals and derivatives thereof. Schedules I and II of the Act have also been revised.
- For better enforcement and implementation of the Wildlife Act, a scheme for strengthening Central Wildlife Organisation has been approved under which three Sub-Regional Wildlife Preservation Offices are being established at Cochin, Pathankot and Shillong. The Government has decided to impose a ban on the export of frog legs because of the beneficial role of frogs in controlling vectors and agricultural pests.
- A Centrally sponsored scheme, providing assistance on 50 : 50 cost sharing basis between the Centre and State/UT for non-recurring items of expenditure for the control of poaching and illegal trade, has been initiated.
- A Centrally sponsored scheme to provide assistance for captive breeding and rehabilitation of endangered species has been initiated to enhance and supplement the efforts of the States and Union Territories.
- A Centrally sponsored scheme for providing assistance for wildlife education and interpretation programme to the States and Union Territories has also been initiated. Under the scheme, facilities will be developed for more frequently visited national parks and sanctuaries.
- On the basis of an all-India survey of national parks and sanctuaries, a Directory on national parks and sanctuaries has been prepared. At present there are 59 national parks and 254 sanctuaries in the country covering an area of about 1,32,000 sq. kms which is roughly 4 per cent of the total geographical area and about 15% of the total forest area of the country. This represents an increase of 6 national parks and 7 sanctuaries and an addition of about 32,000 sq. kms of area under protected areas during the year.
- A Centrally sponsored scheme 'Conservation of Rhinos in Assam' has been introduced to provide assistance to the Government of Assam for the protection of the rhinos and its habitats in Assam.

—A Centrally sponsored scheme 'Project Tiger' ensures the maintenance of a viable population of the tigers in India, and seeks to preserve for all times, areas of such biological importance as national heritage. Presently there are 15 tiger reserves in the country covering 25,000 sq. km in 12 States. The establishment of the 16th Reserve in U.P. is under process.

—A significant achievement has been the reduction in instances of man-eating in the Sunderbans Tiger Reserve which has been made possible because of better protection measures and strategic positioning of electrically charged decoys, to discourage tiger attack.

—It has been decided to start a 'Snow Leopard Project' on the lines of 'Project Tiger'. For the purpose, a survey of snow leopards has been taken up under the aegis of the Wildlife Institute of India.

2.10 Research Promotion

—A profile, identifying the priority areas of research, has been drawn up following a review of the research programmes undertaken so far. Two basic approaches are to be emphasised viz. ecosystems management and ecological analysis.

—Several projects have been executed by Universities, R&D Institutions and Non-Governmental Organisations covering studies on impact of development activities on natural ecosystems, survey and monitoring of environmental indications, alternative technologies, pollution control, conservation/eco-regeneration, energy use, etc.

—Concerted efforts continued on the All India Coordinated Projects on Heavy Metals, Ethnobiology, Conservation of Endangered Plants (Seed Biology and Tissue Culture), Effect of Air Pollutants on Plants, Beas Sutlej Link Project and Arid Lands.

—The Integrated Action-oriented programmes on eco-regeneration of the Himalayan Region, Eastern and Western Ghats and the Ganga, continued to generate data for effective implementation of innovative conservation strategies.

—The Nilgiri Biosphere Reserve has been established with effect from September, 1986. Integrated action and management plans and identification of

priority areas for research are being taken up in consultation with the State Governments.

- A new programme of Wetland management has been launched with a view to identify priorities for conservation/management in these areas.
- A State of the Art report on Mangroves is being prepared along with guidelines for research and formulation of an All India Coordinated Project on Mangroves Research.
- In the area of forestry research, the Forest Research Institute, Dehra Dun has undertaken several projects related to storage of seeds, development of nursery techniques for specific species, clonal multiplication of tree species, tissue culture and mutation breeding.
- The existing set up of the Forest Research Institute and Colleges, Dehra Dun has been thoroughly reviewed during the year. Pursuant to the review, it was decided to separate forestry research, education and training to strengthen each individually.
- An Indian Council of Forestry Research and Education has been set up with the objective of entrusting to it all the work related to forestry research.
- It is proposed to upgrade the existing Regional Research Centres into full-fledged Forestry Research Institutes to cater to the needs of different eco-geographic regions of the country.
- Aspects of forest protection that were studied include defoliation and control measures for *Betula alroides*, monitoring of insect and fungal pests in different areas and selection of trees resistant to the spike disease.
- Fibre structures of 17 plant raw materials have been studied and their suitability for paper manufacture assessed.
- Research projects involving habitat evaluation, elephant movement, ecology of gharials and turtles, status of endangered species, animal behaviour, animal health and other ecological status indicators are under way in different parts of the country. New projects concerning the ecology and status of endangered species like lion and snow leopard have also been initiated.

2.11 Education and Awareness

- A National Environmental Awareness Campaign (NEAC) was launched in July 1986 to create environmental awareness at all levels of society. All possible media and target groups have been involved in this Campaign.
- As part of NEAC, a National Environment Awareness Month was organised between November 19 and December 18, 1986 all over the country. Several organisations participated in various programmes such as seminars, workshops, rallies, tree plantation drives, poster displays, exhibitions, audio-visual shows etc.
- The Pitambar Pant National Environmental Fellowship Award for 1985 was awarded to Prof. P. S. Ramakrishnan of Jawaharlal Nehru University, New Delhi for work on Ecology of Shifting Agriculture.
- The National Museum of Natural History continued educational programmes for promotion of conservation awareness among the lay public. The Museum displayed several exhibits at Teen Murti House during the New Biology Exhibition organised by the Department of Biotechnology.
- World Environment Day was observed on June 5, 1986 all over the country through tree planting drives, seminars, workshops, competitions etc.
- The quarterly Journal 'Paryavaran Abstracts' giving abstracts of Indian research inputs on environment and related areas continued to be published.
- As the National Focal Point for the International Referral System for Sources of Information on Environment (INFOTERRA), the Environmental Information System (ENVIS) in the Department responded to over 200 national/international queries. The ENVIS has also been designated as the Regional Service Centre for the South Asia Sub-region under the INFOTERRA Programme of the United Nations Environment Programme.

2.12 International Cooperation

- the Ministry functions 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).

—Under the Cultural Exchange and Science and Technology Programmes, bilateral programmes on environment with France and Norway have been evolved.

—An agreement was signed between India and Sweden relating to the support for the Logging Development Institute, Dehra Dun.

—The third phase of the Erosion Control Dhauladhar

Range Project, which is being implemented with the assistance from Federal Republic of Germany, is under consideration.

—India is one of the participating countries in the Regional Wood Energy Development Project of the FAO.

—An agreement between the Department and UNEP has been signed under which UNEP has offered a sum upto US \$ 5000 per year towards meeting the actual costs of information services rendered by the Department to INFOTERRA users.

1. INTRODUCTION

There are about 30 major enactments related to control of pollution now being administered by the Central and State Governments. The Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981, the Factories Act, the Insecticides Act, are some of the prominent ones among these enactments. These acts are implemented through several organisations like the Central and State Pollution Control Boards, Chief Inspectors of Factories and Insecticides Inspectors of Agriculture Department. In spite of the several organisations functioning in the field, industrial accidents occurring have led to widespread concern regarding the danger to environment from hazardous substances. The several existing laws to cover such hazards, do not provide a clear focus of authority to prevent or limit the damages. Taking into account these factors, the Government of India have enacted the Environment (Protection) Act, 1986 to provide a single focus for environmental issues in the country and to plug loopholes in the existing acts. This act has been brought into force with effect from 19th november 1986.

2.1 Important Features of the Act

2.1.1 The important features of this landmark legislation are as follows:

It confers powers on the Central Government to:

- take all necessary measures for protecting the quality of environment;
- co-ordinate the actions of state governments, officers and other authorities under this act or under any other law which is relatable to the objects of this act;
- plan and execute a nation-wide programme for the prevention, control and abatement of environmental pollution;
- lay down standards for discharge of environmental pollutants;
- empower any person to enter, inspect, take samples and test;
- establish or recognise environmental laboratories;
- appoint or recognise government Analysts;
- lay down standards for the quality of environment;
- restrict areas in which any industries, operations or processes may not be carried out or shall be carried out subject to certain safeguards;
- lay down safeguards for prevention of accidents

and take remedial measures in case of such accidents;

- lay down procedures and safeguards for handling hazardous substances;
- constitute an authority or authorities for exercising its powers;
- issue directions to any person, officer or authority including the power to direct closure, prohibition or regulation of any industry, operation or process or stoppage or regulation of supply of electricity, water or any other service;
- require any person, officer, State Government or authority to furnish any prescribed information; and
- delegate powers to any officer or State Government or authority.

2.1.2 It confers powers on persons to complain to the courts regarding any violation of the provisions of the Act, after a notice of 60 days to the prescribed authorities.

2.1.3 The Act makes it obligatory for the person in-charge of a place to inform the prescribed authorities regarding any discharge or apprehended discharge of any pollutants in excess of standards by accident.

—the authorities, on receipt of such information or otherwise, shall cause remedial measures taken to prevent or mitigate the pollution caused by such accidents;

—the expenses incurred by the authorities in respect to remedial measures are recoverable with interest from the polluter.

2.1.4 The Act prescribes stringent penalties for violation of the provisions of the Act. No distinction is shown between Government Departments and other companies.

2.1.5 The jurisdiction of civil courts is barred under the Act.

2.2 Principles of Implementation of the Act

2.2.1 There are a number of existing legislations such as the Factories Act, the Insecticides Act, the Explosives Act, the Water and Air (Prevention and Control of Pollution) Acts, etc. which are implemented by various agencies such as Factories Inspectorates, Insecticides Inspectors, Inspectorates of Explosives and Pollution Control Boards. These agencies look

after the protection of environment in specific areas.

2.2.2 In order to coordinate the activities of these agencies effectively and to avoid proliferation of bureaucracy, it has been decided that the Ministry of Environment and Forests will adopt the following principles of work in implementing the Environment (Protection) Act.

(a) It will work through existing agencies to:

- assess situation;
- set standards;
- determine time-frame to attain standards;
- monitor implementation and enforce time frame.

(b) Where no agency owns up an area, the Ministry will do the work itself.

2.3 Implementation of the EP Act

The following actions have been taken to implement the mandate given to the Ministry under the Act, consistent with the policy mentioned above.

2.4 Preparation and notification of rules

Simultaneously with bringing into force the Act on 19th November, 1986, necessary rules have been framed under various sections of the Act, notified and placed on the table of the Parliament.

The rules framed are explained below:

- Section 3(2)(iv)—Standards have been laid down for discharge of effluents from 10 industries;
- Section 5—Procedures to be followed by the Central Government in issuing directions have been prescribed.
- Section 6(2)(e)—Procedures for the Central Government to prohibit or restrict the location of industries and carrying on of processes and operations in different areas have been prescribed;
- Section 9—The authorities who are to be intimated in case of accidental discharge of pollutants have been specified.
- Section 10—The persons empowered to enter and inspect have been specified.
- Section 11—The persons empowered to take samples have been specified.

—Section 11(1)—Procedures for taking samples have been prescribed.

—Section 11(2)(b)—Procedures for submission of samples for analysis and form of laboratory report have been prescribed;

—Section 11(3)(a)—The manner of serving a notice for the purpose of taking samples and the format in which the notice is required to be served have been notified.

—Section 13—Qualifications for Government Analysts have been prescribed.

—Section 19(b)—The procedure which a person has to follow in giving notice of his intention to make a complaint to the court has been prescribed and the authorities to whom notice has to be given have been specified.

2.5 Standards Setting

2.5.1 The Central Board for Prevention and Control of Pollution and the Indian Standards Institution had prepared non-statutory effluent standards for some industries in the past. These standards have been analysed through Expert Committees and the standards for the following industries have been statutorily notified:

- Caustic Soda
- Man-made Fibres
- Oil Refineries
- Sugar
- Thermal Power Plants
- Cotton Textiles
- Composite Woollen Mills
- Cement
- Electroplating
- Dyes and Dye intermediates

2.5.2 The following priority industries have been identified for preparation of standards and experts are being appointed for this purpose:

- Pesticides
- Petrochemicals and Plastics
- Glass and Ceramics
- Mining
- Drugs and Pharmaceuticals
- Stone Crushing
- Foundries
- Bullion Refinery

The work of preparation and notification of standards will be continued and the remaining industries covered.

2.6 Environmental Laboratories and Government Analysts

2.6.1 It has been decided that all existing laboratories in the country will be invited to participate in the Environment Protection programme to the extent of their capabilities. Information has been sought regarding these capabilities from 897 government and semi-government laboratories in the country with a view to recognising them as Environmental Laboratories. An advertisement has also been issued in the national newspapers inviting offers from laboratories to serve as environmental laboratories. The laboratories adequately equipped and with qualified manpower have been recognised as environmental laboratories and the technically qualified persons have been appointed as government analysts.

2.6.2 After completing the scrutiny of the facilities available in the existing laboratories throughout the country, action will be taken to strengthen suitable existing laboratories or to start new environmental laboratories in the country so that all parts of the country are adequately covered by the services of environmental laboratories.

2.7 Assessment and Strengthening

2.7.1 Legislation

The existing legislation has been scrutinised by the Ministry of Environment and forests and by the other concerned Central Government Departments and action has been taken to strengthen the provisions of the relevant Acts.

The Ministry of Environment and Forests has taken action to amend the Water and Air (Prevention and Control of Pollution) Acts suitably to confer more powers on the State Governments to control pollution and to impose more stringent penalties for violation of the Acts.

The Motor Vehicles Act, the Merchant Shipping Act, the Industries (Development and Regulation) Act and the Factories Act are being amended by the concerned departments to incorporate provisions for protection of environment.

2.7.2 Institutions

A review has been made of the existing institutions in the States for protection of environment. It is considered that each State must have a Department of Environment at the level of the Government to coordinate various actions to protect environment. 18 States have so far set up Departments of Environment. Specific proposals have been called for from each State to strengthen them. A sum of Rs. 80 lakhs is provided for this purpose for 1986-87. The scheme will be continued during the remaining part of the Seventh Plan.

2.7.3 Pollution Control Boards

The Pollution Control Boards established in 18 States are under-staffed and under-equipped to discharge their duties of protection of water and air quality. It has been decided that they should be strengthened adequately both in respect to technical manpower and in respect to laboratory equipment. This scheme will be implemented during the end of the Seventh Plan.

2.8 Delegation of Powers

Consistent with the policy of utilisation of existing agencies, rules have been notified delegating powers to the officers of the following agencies of Central and State Governments throughout the country:

- Factories Inspectorates
- Dock Safety Inspectorates
- Indian Bureau of Mines
- Port Authority
- Inspectorate of Plantations
- Marine Department
- Central/State Pollution Control Boards
- Transport Authorities of the States
- Food (Health) Authorities of the States
- Atomic Energy Regulatory Board
- Drug Controllers and Inspectors
- Chief Controller and other Controllers of Explosives
- Insecticides Inspectors
- Inspectorate of Boilers
- Directorate General of Shipping
- Officers under the Smoke Nuisance Acts of West Bengal, Maharashtra and Gujarat.

2.9 Hazardous Substances

2.9.1 The Act places the responsibility on the Central government for laying down procedures and

safeguards for the handling of hazardous substances for the prevention of accidents which may cause environmental pollution and for taking remedial measures if accidents occur.

2.9.2 Regarding hazardous chemicals, the existing systems cover only some aspects of some chemicals under legislations such as Insecticides Act and Explosives Act. The existing procedures have been thoroughly reviewed. Various agencies of the Central and State Governments have been identified to look after the following aspects and further action is being taken:

- Listing of hazardous chemicals and maintenance of a data bank;
- Prescribing procedures with reference to manufacture, storage, import, transport, use and disposal of hazardous chemicals and implementation of the procedures;
- Prescribing procedures for location of chemical industries and implementation;
- Guidelines regarding safety measures and safety audit of hazardous installations and implementation;
- Procedures for preparation of on-site and off-site emergency and post-emergency plans and implementation;

- Procedures in case of accidents; and
- Research.

2.10 Environment Protection Councils

2.10.1 The Prime Minister has suggested to all States to constitute Environment Protection Councils in each State under the chairmanship of Governor and Vice-chairmanship of the Chief Minister/Minister for Environment with representative MPs and MLAs of all political parties, the non-governmental organizations engaged in promoting protection of environment, environmental experts and the concerned officials. The Prime Minister has suggested that these Councils may review periodically the totality of environmental problems of the State and possible solutions and involve all sections of the people in the protection of environment.

2.10.2 The States of Jammu and Kashmir, Himachal Pradesh and Orissa have already agreed to set up such Councils. The Ministry of Environment and Forests have nominated two representatives to each of the Councils set up. It is expected that the environmental concerns of the country will be reflected in the discussions of these Councils and help in implementing the aims of the Environment Protection Act.

1. INTRODUCTION

The enforcement of the Acts for Prevention and Control of Pollution of Water (1974) and Air (1981), as also in respect of the Water Cess Act (1977) is carried out through the Central Board for Prevention and Control of Water Pollution (CBPCWP). The Central Board also coordinates activities of the 18 State Pollution Control Boards statutorily constituted in various States and Union Territories for nationwide implementation of pollution control.

The country has been divided into five major regions to facilitate closer co-ordination and interaction between the State Boards and the Central Board. Of these five regions, the Central Board has established the following four regional Offices:

- East and North-East Region Office (ENERU), located at Calcutta, co-ordinates activities of the States of Arunachal Pradesh, Assam, Bihar, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tripura and West-Bengal, and directly controls the Union Territory of Andaman and Nicobar Islands;
- North-West Region Office (NWRU), located at Chandigarh, coordinates activities of the States of Haryana, Himachal Pradesh, Jammu and Kashmir and Punjab and directly controls the Union Territory of Chandigarh;
- The South Region Office (SRO), located at Hyderabad, coordinates activities of the States of Andhra Pradesh, Karnataka, Kerala and Tamil Nadu and directly controls the Union Territories of Pondicherry, Karaikal Yanam, Mahe and Lakshadweep;
- Activities of the States of Madhya Pradesh, Rajasthan and Uttar Pradesh which belong to the North Central Region (NCR) are coordinated by the Central Board's Head Office at Delhi. Activities of the Union Territory of Delhi are directly controlled by the Sectional Office at Delhi.
- The proposed Western Region Office (WRO) would coordinate activities of the States of Gujarat and Maharashtra and would control directly the Union Territories of Goa, Daman and Diu, Dadar and Nagar Haveli. At present, the Union Territories are controlled directly from Sectional Office, Goa and the coordination is done from the Head Office at Delhi.

2. PREVENTION OF POLLUTION

2.1 Guidelines for Cooling Water Management

Proper management of cooling water in industries plays a significant role in the control of industrial water pollution and conservation of water resources. With this in view, guidelines for cooling water management have been prepared for use by industries and regulatory agencies in controlling pollution.

2.2 Effluent Standards and Emission Limits for Polluting Industries.

Effluent Standards (Minimal National Standards, MINAS) have been evolved with respect to the pesticides industry and notified to the industrial units in the country. The effluent standards for the following industries, evolved earlier, have been notified in the Gazette of India, under the provisions of the newly enacted Environment (Protection) Act, 1986 (29 of 1986):

- Caustic soda
- Man-made fibre (synthetic)
- Oil refinery
- Sugar
- Thermal Power
- Cotton textile (composite and processing)
- Composite woollen
- Cement
- Electro-plating
- Dyes and Dye Intermediates.

Emission standards for boilers of small scale industries and guidelines for stack heights have been evolved. Emission standards for the following industries are also being evolved:

- Asbestos
- Caustic soda
- Foundry
- Petrochemical
- Pulp and Paper (large-scale)

2.3 Pollution from Vehicular Exhausts in the Union Territory of Delhi

2.3.1 Carbon-monoxide Emission

The Central Board for the Prevention and Control of Water Pollution, in collaboration with the Indian Oil Corporation (IOC), monitored the CO emissions in the exhausts of 1633 petrol-driven vehicles (1354

scooters and motor cycles, and 279 cars) plying on the roads of Delhi. All the two-, and three-wheeler vehicles monitored had an engine displacement value of 50 cubic centimetre. Monitoring was conducted at nine gasoline filling stations of the IOC for three weeks. The observations of the monitoring of the two-, and three-wheelers (scooters and motor cycles) and cars are summarised in Tables 1 and 2 respectively:

TABLE 1
CO EMISSION IN THE EXHAUSTS OF SCOOTERS AND MOTORCYCLES

Type of Vehicle	Number of vehicles with CO emission in the range of 0 to 4.5%	Number of vehicles with CO emission in the range of 4.6 to 6.5%	Number of vehicles with CO emission in the range of 6.6% and above	Total Number of Vehicles monitored
2-Wheeler Scooters	656	251	229	1136
2-Wheeler Motor-cycles	75	25	34	134
3-Wheeler Scooters	50	19	15	84
Total	781 (58%)	295 (22%)	278 (20%)	1354 (100%)

58% of the total vehicles monitored complied with the prescribed emission standard of 4.5% for CO in the exhausts of two- and three-wheelers.

TABLE 2
CO EMISSION IN THE EXHAUST OF FOUR-WHEELERS (CARS)

Number of cars with CO emission in the range of 0 to 4%	Number of cars with CO emission in the range of 4.1 to 6%	Number of cars with CO emission in the range of 6% and above	Total number of cars monitored
142 (51%)	47 (17%)	90 (32%)	279 (100%)

It has been observed that 51% of the total cars monitored have complied with the prescribed emission standard of 4% for CO in the exhausts of four-wheelers.

A study on the effect of engine tuning on CO emission revealed the following:

—CO emission from two-, three-, and four-wheelers

has been reduced to well below the prescribed emission standards after proper adjustments in carburettor (air-fuel mixture) and rotations per minute (RPM) of the engine.

—Average CO emission of 87 two-wheelers has been reduced from 8.14% to 3.05% after proper adjustments in the carburettor.

—Average CO emission of 35 four-wheelers has been reduced from 6.77% to 2.53% after proper adjustments in the carburettor and the RPM of the engine.

2.3.2 Smoke Emission

In order to assess the smoke pollution from motor cycle rickshaws (MCRs) in Delhi, the CBPCWP carried out smoke intensity monitoring (Table 3) in co-operation with the Delhi Traffic Police (North District). The survey was carried out at Fountain terminal (near old Delhi Railway Station). 72 MCRs (fitted with 500 cc (SHP) IC engine having compression ignition using diesel oil) were monitored out of about 100 which shuttle regularly between the Fountain terminal and Connaught Place, New Delhi.

TABLE 3
ASSESSMENT OF SMOKE POLLUTION FROM THE MOTOR CYCLE RICKSHAWS

Range of Smoke emission (Hartridge Smoke Units, HSU)	Number of vehicles
Less than 65	7
65 to 70	3
71 to 80	11
81 to 90	14
91 to 100	37
Total	72

The stipulated limit for the smoke density of exhaust of the motor vehicle powered by diesel engine (compression ignition) is 70 HSU. 86% of the MCRs surveyed have been found complying with the stipulated limit.

It has been found that there is no proper exhaust system installed on MCRs and the silencer pipes consisted of only a mild steel hollow pipe of about 5 centimeter diameter without any mufflers. This has caused not only unintercepted smoke emission but also resulted in high intensity of noise. The smoke emission from better maintained MCRs is considerably low. Smoke emission can be reduced by proper

adjustment and maintenance of nozzle and fuel injection system.

3. ASSESSMENT OF WATER AND AIR QUALITY

3.1 National Water Quality Monitoring Network

The two tier water quality monitoring of the major and medium rivers has been continued under the United Nations Global Environmental Monitoring Systems (GEMS) and the Monitoring of Indian National Aquatic Resources (MINARS) programme. The water quality monitoring network under both the programmes has comprised of 160 monitoring stations, at the end of 1985-86. During this year, nine stations have been established on the rivers Cauvery, Krishna, Muvattupuzha (Kerala), Narmada, Subarnarekha and Tapti under the GEMS programme. Under the MINARS programme, four stations have been established on the tributaries, Koel and Sank of the river Brahmani in Bihar. Three stations on the rivers Ganga and Yamuna which were established earlier under the MINARS programme have been deleted from the network. With these additions and deletions of monitoring stations, the water quality monitoring network is now comprised of 170 monitoring stations out of which 51 are under GEMS programme (Table 4) and 119 are under MINARS programme (Table 5).

TABLE 4
WATER QUALITY MONITORING STATIONS UNDER
GEMS PROGRAMME

S. Rivers No.	States	Number of Stations
01. Cauvery	Karnataka	3
	Tamil Nadu	4
02. Godavari	Andhra Pradesh	4
	Maharashtra	2
03. Krishna	Andhra Pradesh	5
	Karnataka	2
	Maharashtra	3
04. Mahi	Gujarat	3
05. Narmada	Gujarat	1
	Madhya Pradesh	2
06. Pennar	Andhra Pradesh	1
07. Sabarmati	Gujarat	3
08. Subarnarekha	Bihar	4
09. Tapti	Gujarat	2
	Madhya Pradesh	3
10. Chaliyar	Kerala	3
11. Kallada	Kerala	2
12. Muvattupuzha	Kerala	1
13. Periyar	Kerala	3
	Total	51

TABLE 5
WATER QUALITY MONITORING STATIONS UNDER
MINARS PROGRAMME

S. River No.	State	Number of Stations
01. Brahmani	Bihar	4
(including Baitarni river, Koel and Sank tributaries)	Orissa	14
02. Brahmaputra	Assam	3
03. Ganga*	Bihar	11
(including Sone and Tones tributaries)	Madhya Pradesh	3
	Uttar Pradesh	21
	West Bengal	9
04. Ghaggar	Haryana	3
	Punjab	2
05. Indus	Himachal Pradesh	15
(Beas, Ravi and Sutlej)	Punjab	11
06. Krishna	Karnataka	3
(including Bhadra and Tunga Bhadra)		
07. Yamuna	Delhi	3
(including Yamuna Canal)	Haryana	10
	Uttar Pradesh	7
	Total	119

*27 Stations on the Ganga, out of 44, are being monitored by the Central Board under the Ganga Action Plan of the Ganga Project Directorate.

3.2 Water Quality Monitoring of the river Ganga at Hardwar on the occasion of Kumbh Mela

The Ganges was monitored round the clock at Hardwar at two stations, namely, (i) Upstream point of Hardwar near Bhimgoda and (ii) Down stream point of Hardwar near Jwalapur bridge. The water quality was tested for temperature, pH, conductivity, dissolved oxygen, biochemical oxygen demand (BOD), chlorides and coliform bacteria. The major drains joining the river were also monitored for their contribution of pollution in terms of BOD, suspended solids and heavy metals. Flow based composite samples were collected from these drains and were analysed for BOD, chlorides and suspended solids.

It was observed that in the Ganga at Hardwar, coliform density and organic matter loading increased by 2 to 5 times of the background value after about 40 lakh people took the holy dip. The preventive measures taken by various authorities for containing pollution had helped in maintaining the water quality at a satisfactory level as compared to the earlier occasions of mass bathing.

3.3 Inter-State Yamuna Monitoring

In continuation of the earlier programme of biomonitoring of the Yamuna river, during 1986-87, five district zones have been characterised ecologically and their assimilative capacities for pollution have been established. The main parameters monitored for characterising the zones have been discharge, velocity, reaeration rate, deoxygenation rate, oxygen deficit, oxygen demand, diurnal oxygen concentration, photosynthesis rate, respiration rate, chlorophyll content and planktonic density, diversity and productivity.

The study will help in establishing the extent of damage caused to the riverine ecology by various outfalls carrying pollution loads into the river and in assessing the extent of pollution control required at various places. Establishing such a relation between the pollution loads and the ecological damage will assist in rationally evolving the effluent and water quality standards for various stretches of the river. This approach will also help in proper planning of various pollution control strategies and utilisation of the river's assimilative capacity to reduce the cost of effluent treatment.

3.4 River Basin Studies

Brahmaputra River: The studies on Brahmaputra river basin, initiated during 1985-86, are expected to be completed during 1986-87. Accordingly, water quality has been monitored at the 24 stations identified on the river. However, the inventorisation of water polluting sources (dry study) has not been initiated due to lack of funds with the Assam State Pollution Control Board as a result of which the project has been deferred.

Cauvery River: The project proposals have been prepared for the basin areas in the States of Karnataka, Kerala and Tamil Nadu. The water quality monitoring (wet) studies and the inventorisation (dry) studies are scheduled to be continued through the next financial year.

Sabarmati River: The studies on the river basin have been initiated during the year.

3.5 Coastal Pollution Survey

The coasts of Andhra Pradesh, Orissa and West Bengal were surveyed for identification of pollution sources along the coast. With the completion of this

stretch, the entire coastline of India has been covered for use-based classification and zoning of the coast. The survey reports on (i) Gujarat and Maharashtra coasts, (ii) Andhra Pradesh coast, and (iii) Orissa and West Bengal coasts are under preparation. Based on these preliminary surveys, a detailed coastal water quality monitoring project has been prepared, under which the coastal water along the entire coastline of India will be monitored at selected locations. The project is proposed to be conducted upto the end of Seventh Five Year Plan.

3.6 National Ambient Air Quality Monitoring Network

A national network of ambient air quality monitoring stations (Table 6) initiated during the year 1984, has been progressively expanded to comprise 75 stations covering 21 cities/towns. Out of the 75 stations, 43 are operating as at the end of December 1986. Processing of the data generated at the stations has also been initiated.

3.7 Air Pollution Control Areas in the Union Territory of Delhi

During 1982-83 two 'Air Pollution Control Areas' were identified by the CBPCWP and the same were notified in the Gazette vide Notification dated 16th November 1984. Two more Air Pollution Control Areas were identified in 1985 and notified in the Gazette of India in 1986. These areas are described below.

3.7.1 Air Pollution Control Area III (APCA/UTDLH/III)

The area covered is shown in *Figure 1* as starting clockwise from North-West-end through Wazirabad barrage-cum-bridge on river Yamuna and following Road No. 59 and then Road No. 63 upto the boundary of Union Territory of Delhi, then moving south along the boundary, till it meets the National Highway (NH 24) by-pass, also known as Mother Dairy Road and then following the road upto Humayun Tomb bridge on the Yamuna, then moving up along the river upto the Wazirabad barrage-cum-bridge.

3.7.2 Air Pollution Control Area IV (APCA/UTDLH/IV)

The area covered is shown in *Figure 2* as starting clockwise from North-West-West-end of Humayun Tomb bridge on the Yamuna and moving along the National Highway (NH-24) by-pass, also known as

TABLE 6
NATIONAL AMBIENT AIR QUALITY MONITORING STATIONS

S. No.	City/Town	Number of Stations Sanctioned			Total	Number of Stations in operational stage as at the end of December, 1986	Number of Stations yet to be made operational
		1984-85	1985-86	1986-87			
1.	Agra, Uttar Pradesh	5	—	—	5	5	—
2.	Anapara, Uttar Pradesh	3	—	—	3	2	1
3.	Baroda, Gujarat	—	5	—	5	5	—
4.	Cochin, Kerala	—	5	—	5	5	—
5.	Delhi	5	1	—	6	6	—
6.	Dhanbad, Bihar	—	3	—	3	1	2
7.	Faridabad, Haryana	—	2	—	2	Nil	2
8.	Goa	—	—	2	2	Nil	2
9.	Haldia, West Bengal	3	—	—	3	3	—
10.	Haora, West Bengal	5	—	—	5	5	—
11.	Hyderabad, Andhra Pradesh	—	3	—	3	3	—
12.	Kota, Rajasthan	5	—	—	5	5	—
13.	Ludhiana, Punjab	—	3	1	4	Nil	4
14.	Madras, Tamil Nadu	—	—	5	5	Nil	5
15.	Mysore, Karnataka	—	—	3	3	Nil	3
16.	Nagda, Madhya Pradesh	—	—	3	3	Nil	3
17.	Pondicherry	—	—	2	2	Nil	2
18.	Pune, Maharashtra	—	3	—	3	Nil	3
19.	Simla, Himachal Pradesh	—	—	2	2	Nil	2
20.	Surat, Gujarat	3	—	—	3	3	—
21.	Talcher, Orissa	—	—	3	3	Nil	3
	Total	29	25	21	75	43	32

Mother Dairy Road upto the Union Territory of Delhi boundary, then following the boundary upto Mathura road until it meets the Mehrauli-Badarpur road, then following the Mehrauli-Badarpur road until it meets Road No. 13, (also known as Dr. Bhim Rao Ambedkar Marg), then following the Road No. 13 and then Josip Broz Tito Marg until it meets the inner Ring Road passing through Ashram upto the Humayun Tomb bridge.

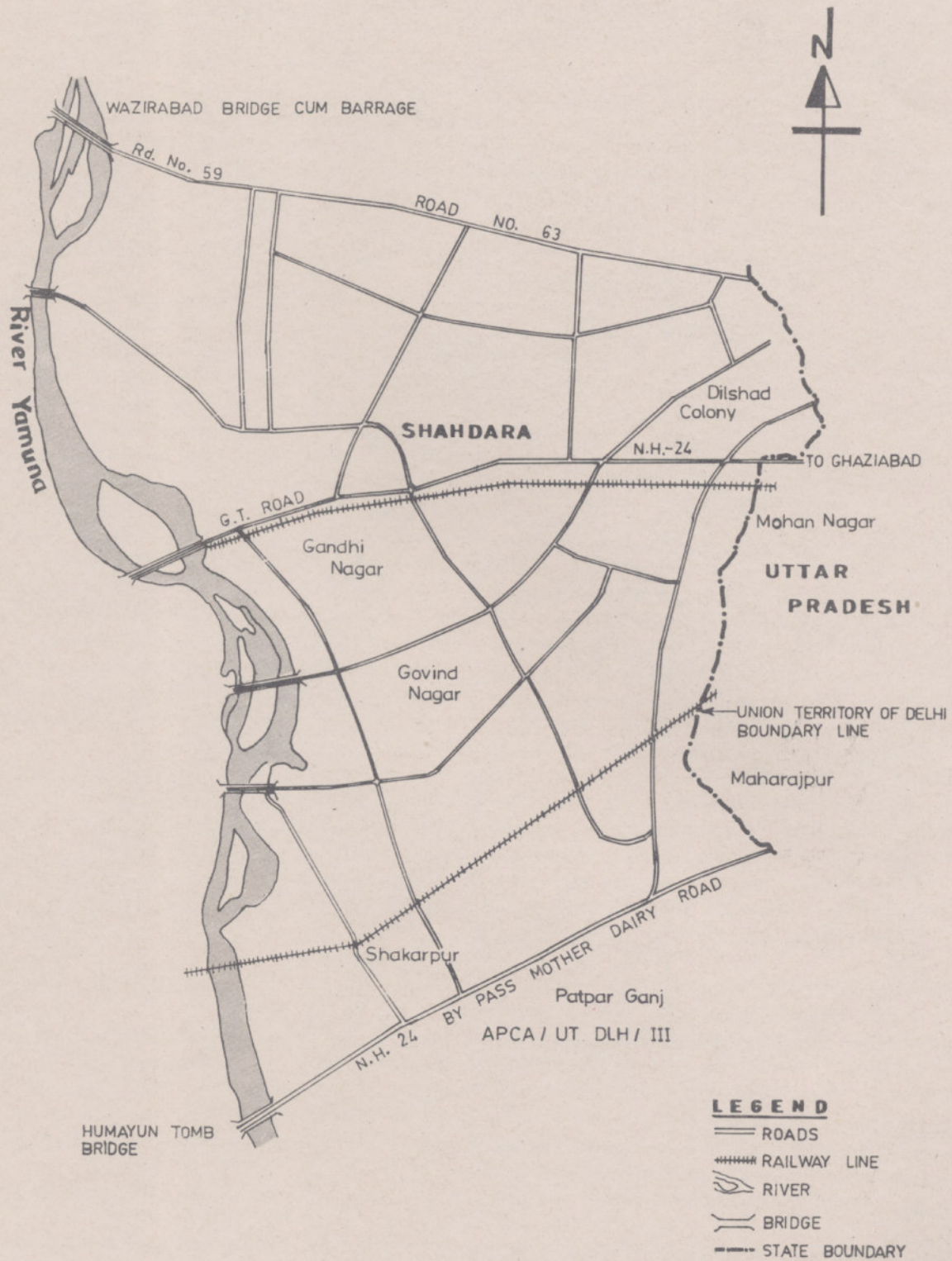
4. POLLUTION CONTROL AT SOURCE

Status of pollution control at source and implementation of Minimal National Standards (MINAS)

in respect of various industries is as follows:

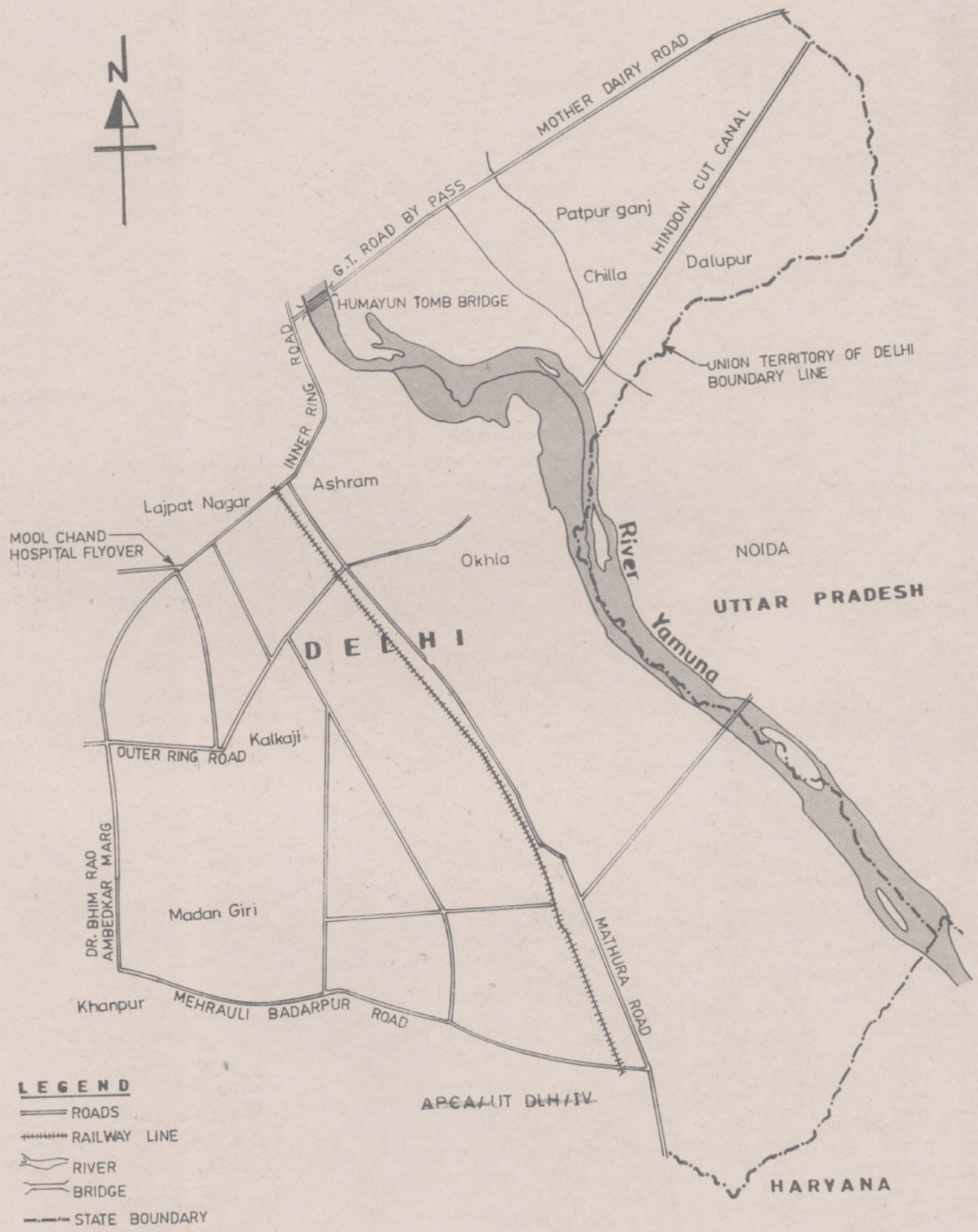
4.1 Chlor-Alkali (Caustic soda) Industries

Four industries have been found not complying with the implementation of MINAS by zonal committees constituted by the Central Board during 1985-86. The State Pollution Control Boards have been directed to initiate legal proceedings against those four defaulters if they failed to implement the required conditions for control of mercury bearing effluent. Subsequently during 1986-87, three units have completed the desired implementation work whereas one unit is in the process of implementation of MINAS.



AIR POLLUTION CONTROL AREA-III DELHI (APCA/UT DLH/III)

Fig. 1



AIR POLLUTION CONTROL AREA-IV DELHI (APCA/UT DLH/IV)

Fig. 2

4.2 Man-made Fibre Industries

The efforts for implementation of MINAS in Man-made Fibre Industries, both in synthetic and semi-synthetic units, were continued. It has been observed that some of the Man-made Fibre units have implemented MINAS and persuasion of other industries is continuing.

4.3 Fertiliser Industries

The programme for implementation of MINAS and stack emission standards were prepared and discussed with industries for compliance. For effective implementation, Four Zonal Task Forces were constituted by the Central Board where concerned State Pollution Control Boards were represented. The Task Forces monitored the industries for the implementation of standards by conducting zonal and statewise meetings with the representatives of industries and during inspection of pollution control systems installed at the industries. Central Board has developed the format for continuous flow of information on the progress of implementation of standards. In general, all the fertiliser industries in the country have taken up the implementation of pollution control measures for compliance of MINAS and stack emission standards.

4.4 Pesticide Industry

The MINAS developed were circulated for implementation in the pesticides industries. The aspect of achievability of limits with presently available treatment technology is under review by the Central Board.

4.5 Pharmaceutical Industry

The comprehensive industry document prepared on the subject is being reviewed. The achievability of quality of effluent with the treatment systems practised in pharmaceutical industries is being assessed by conducting indepth studies.

4.6 Pulp and Paper Industries (Small)

Comprehensive industry document and Minimal National Standards were published. Four zonal Task Forces were constituted by the Central Board to assess the pollution status and implementation of MINAS in 248 small pulp and paper industries. Persuasion continued through the Task forces, State Pollution Control boards and the All India small Pulp

and Paper Mills Association for installation of effluent treatment plants in the industries.

4.7 Pulp and Paper Industries (Large)

Preparation of comprehensive documents on large pulp and paper industry with production capacity more than 10,000 tonnes per year and having chemical recovery system has been initiated. Information with regard to raw materials, manufacturing processes, wastewater generation, water and fuel consumption, stack emissions, pollution control installations and characteristics of final effluent are being collected through a comprehensive questionnaire and visits to industries. Out of 42 industries information has been received from 28 industries. In depth study in some of these mills is planned to assess treatability of the various pollution control systems and to evolve MINAS.

4.8 Integrated Iron and Steel Industries

Subsequent to the complaints made by the Central Board to the Ministry of Steel and Mines with regard to the non-compliance of the recommendations made by the Central Board teams who visited all the major steel industries in the country, a meeting was organised with the Steel Authority of India and the representative of the Ministry of Steel. It has been decided in this meeting that the various steel industries will submit their time-targetted action plans and up-to-date progress in respect of pollution control activities. It has also been decided that the various industries will furnish the quarterly progress reports on pollution control activities to the Central and, the respective, State Pollution Control Board.

A task force was constituted to assess the pollution status in the steel mills and to advise on control strategies. The task force visited Bokaro Steel Plant and Tata Iron and Steel Company (TISCO), Jamshedpur. Two other steel mills, namely, Durgapur Steel Mills and the Indian Iron and Steel Company (IISCO), Burnpur, have also been visited by a Central Board's team and comprehensive monitoring of water and air quality has been conducted.

4.9 Control of Dust Emission from Stone Crushers

The Central Pollution control Board initiated a study, in collaboration with the National Productivity Council, to evolve better house-keeping methods to control fugitive emissions of dust from stone crushing units. The fugitive emissions may be controlled by enclosing

the main dust generating portions of the crushing operations. The main dust generation points are crushers (both joint type and roller type), transfer points, screens, chutes and conveyors. In addition to the provision of enclosures, water spray systems are

also required to be provided at transfer points and over stone and sand heaps. The water spray system may be interlocked to the rotary screen motor so that the stone crushing operation will stop if the water spraying is not done.

1. INTRODUCTION

The Central Ganga Authority was constituted in February 1985 to evolve and oversee the implementation of a long-term programme for restoring the quality of the river Ganga. The Authority, under the Chairmanship of the Prime Minister, includes, as its members, the Chief Ministers of Uttar Pradesh, Bihar and West Bengal. During the year the membership of the Central Ganga Authority was expanded to include five Members of the Parliament.

Regional offices of the Ganga Project Directorate have been sanctioned at Lucknow, Patna and Calcutta to facilitate liaison with State Governments and for performing activities relating to public information, participation and creating of public awareness.

2. STATUS OF SCHEMES

The types of Schemes under the Ganga Action Plan may broadly be classified as follows:

- Schemes for diversion of waste waters including reservation/installation of interceptors and pumping stations.
- Schemes for renovation or installation of sewage treatment plants including bio-energy and other resource-recovering components as feasible.
- Other schemes for low cost sanitation facilities for river front development and biological conservation.

After detailed discussions with the State Governments, the planning and strategy of waste water management in major cities have been reviewed and schemes considered necessary as part of the waste water plan and to meet the objectives of the Ganga Action Plan have been finalised. It is expected that in all about 250 schemes will be taken up under Ganga Action Plan in 27 cities. Of these, till 31st December, 1986, 114 schemes have been sanctioned and are under execution in the three States (Table 7).

In addition, several more schemes estimated to cost Rs. 75 crores are under consideration and appraisal.

It is expected that by the end of 31st March 1987, all the schemes identified will be prepared and submitted for consideration.

**TABLE 7
SCHEMES SANCTIONED FOR WASTE WATER
MANAGEMENT IN THREE STATES UPTO DEC., 1986**

State	No. of Schemes	Estimated Cost (Rs. in crores)
U.P.	50	48.33
Bihar	20	6.10
West Bengal	44	20.93
	114	75.36

During the year, work has started in 23 out of 27 cities under the Ganga Action Plan. The cost of major schemes costing more than Rs. 50 lakhs which are under execution in different towns is presented in Table 8.

**TABLE 8
MAJOR SCHEMES FOR WASTE WATER MANAGEMENT
UNDER EXECUTION**

	(Rs. in Crores)
HARDWAR-RISHIKESH	
—Laying of outfall sewer with a capacity of 10 mld	1.56
—Schemes for laying of sewer, construction of pumping stations in zone E,&C and A&B	1.60
—Schemes for construction of check-dams to prevent silt intrusion into the sewers	0.41
KANPUR	
—Cleaning of trunk and main sewer	0.47
ALLAHABAD	
—Construction of pumping station at Daraganj ghat and laying of sewer	0.68
VARANASI	
—Construction of sewage treatment plant at BHU (with capacity of 11 mld)	2.74
—Laying of sewer lines for disposal of treated effluent from DLW sewage treatment plant	0.88
—Interception of Mansarover	0.50
—Interception of Rajghat drain	0.68
—Construction of sewage treatment plant (80 mld capacity) Konia-Dinapur	23.78

(Continued)

	(Rs. in Crores)
BHAGALPUR	
—Low cost sanitation	0.91
—Monghyr low cost sanitation	0.45
CHAPRA	
—Interception and diversion for Khanua Nala	0.79
TITAGARH	
—Schemes for interception and diversion zone I and II	1.39
—Low cost sanitation schemes in areas within Calcutta Metropolitan district	3.98
CHANDANNAGAR	
—Construction of sewage treatment plant in zone IV	1.70

3. WORKS COMPLETED

A programme of works for the three States U.P., Bihar and West Bengal, with an outlay of Rs. 291.31 crores has been approved in principle by the Central Ganga Authority. In Hardwar-Rishikesh, two schemes at a cost of Rs. 1.60 crores have been completed. As a result, 10 out of 12 nalas discharging about 12 mld of waste water have been tapped and diverted away from the river.

At Ramnagar near Varanasi, a sewer treatment plant and sewage farm have been completed. Waste water is now diverted to sewage farms for utilisation for irrigation.

In Patna, two treatment plants at Saidpur and Beur with a capacity of 6.2 mgd and 3.3 mgd respectively have been renovated and recommissioned.

4. SCIENTIFIC CONTENT

Though the focus in the initial phase of the Ganga Action Plan is on sewerage schemes, a holistic approach in the action plan is necessary to ensure that various non-engineering issues in the maintenance of river quality are addressed adequately.

4.1 Detailed discussions have been held with the State Governments to identify and take up non-engineering schemes which will supplement the sewerage and drainage schemes. These include the prevention of silt intrusion into the sewers at Hardwar-Rishikesh, afforestation and plantation in the

catchment areas, schemes for river front development and improvement of facilities for direct river users.

4.2 Alternative technological choice including non-mechanical treatment processes and applications of biotechnological and biological processes are being considered.

4.3 A guide paper on technology and management needs and options in the context of Ganga Action Plan has been prepared.

4.4 A paper on minimum flows necessary to maintain the river regime has been prepared in consultation with the Ministry of Water Resources, and Central Board for the Prevention and Control of Water Pollution (CBPCWP).

4.5 Water quality monitoring has been taken up in different stretches of the river by an inter-organisational group comprising GPD, CWC and Central Pollution Control Board.

4.6 The State Governments have been asked to constitute a committee of experts to ensure that, for the preparation of schemes at the State level, all the available technical expertise is utilised. The Government of Bihar has already constituted such a committee and the Government of Uttar Pradesh and West Bengal are expected to set up the committees shortly.

4.7 The Ganga Project Directorate is coordinating the integrated eco-development research project on river Ganga currently being undertaken in 18 universities. The work done so far has been reviewed and it is expected that extensive data relating to fauna, microphytes, flora and physico-chemical parameters will be available in stages from February, 1987.

4.8 A Research Committee consisting of academicians and experts, headed by the Vice-chancellor, Madurai Kamraj University has been constituted. In its first meeting on 6th January 1987, the Committee considered various research programmes necessary in the context of Ganga Action Plan. The terms of reference include review of technological needs and options for implementations of Ganga Action Plan, data on water quality and review of the mathematical model for river water quality and consideration of the biological aspects of the river and suggesting measures for enhancing the biological status of the river.

4.9 The National Laboratories such as Industrial Toxicology Research Centre (ITRC), Lucknow and National Environmental Engineering Research Institute, Nagpur, have been associated with the monitoring of heavy metals and pesticides and analytical quality assurances. The ITRC, Lucknow is also collaborating with the CBPCWP and the State Pollution Control Boards of Uttar Pradesh, Bihar and West Bengal regarding monitoring of heavy metals and pesticides. The Indian Agricultural Research Institute (IARI) and the Central Soil Conservation Institute, Dehradun have assisted in the preparation of a watershed conservation plan for Hardwar.

4.10 Arrangement for water quality monitoring has been stepped up. 24 parameters have been identified for monitoring in 27 locations on a continuous basis by the CBPCWP. In addition, schemes for intensive water quality monitoring have been sanctioned for Hardwar-Rishikesh, Kanpur, Allahabad and Varanasi.

4.11 A joint Indo-US Workshop on utilisation for land use of treated effluent was held in January 1986 at New Delhi. This was organised by the IARI in collaboration with Ganga Project Directorate. As a follow-up action, the experts from IARI prepared a plan for intensive utilisation of treated effluents for irrigation near Rishikesh.

4.12 A Workshop on 'Recycling and Reuse of Treated Waste Water in Industries' has been organised in collaboration with the Confederation of Engineering Industries, New Delhi in September, 1986. A few selected industries have been identified to consider the possibilities of recycling and reuse of waste water.

4.13 Another Workshop on 'Biological Conservation and Bio-monitoring in Receiving Waters' has been organised in collaboration with the School of Environmental Sciences, Jawaharlal Nehru University, New Delhi in November, 1986. As a follow-up, a long-term study will be undertaken in collaboration with the Indian universities and institutions to consider the various biological indicators and biological conservation schemes in detail. The possibilities of non-mechanical treatment processes will also be considered.

4.14 An international workshop on treatment technologies has been organised at Bombay by Indian Institute of Technology, Bombay in Jan., 87 where experts from U.K., Netherlands, U.S.A., France and West Germany, among others, have interacted with

their Indian counterparts. In addition, two more Joint Workshops relating to land use in the river basin and water quality monitoring are also due to be held in 1987.

5. PUBLIC PARTICIPATION, INFORMATION & PUBLIC AWARENESS

The Ganga Action Plan was launched by the Prime Minister as a People's Project in an impressive ceremony at Varanasi on June 14, 1986.

5.1 Following the discussions with eminent non-officials and experts engaged in voluntary work, public involvement activities are being organised in three broad streams, namely public awareness, public cooperation and direct public participation:

- Public awareness programme will focus on identified target groups to convey information about the problems of pollution, water resources, the concern to the citizens and what the citizens can do to help. The programmes will use conventional and non-conventional media.
- Public co-operation activities will be undertaken in specific areas to discourage practices causing pollution of the river as defecation on the river banks, washing of cattle, use of shampoos and detergents and throwing carcasses. Campaigns in selected locations will be mounted to persuade people to stop such practices and use alternative facilities such as Shauchalayas which are being provided. The assistance and co-operation of religious leaders has also been sought.
- Direct public participation activities will be through shramdan for river front development, tree planting on the banks, soil conservation, cleaning of ghats, etc. For these activities, non-government organisations are expected to take the initiative. Such organisations have been identified already for Hardwar and Varanasi. The Nehru Yuvak Kendras, the N.S.S. and the Rama Krishna Mission have agreed to be involved in the programme. The experience gathered during the Kumbh'86 campaign and the Ganga Seva Shivar at Hardwar is being used in coordinating these activities. Camps have been held at Kanpur, Patna and Varanasi. Involvement of youth in schemes of national importance such as Ganga Action Plan is now part of the 20 Point Programme, 1986. Following specific schemes have been identified:



Fig. 3 Pilgrims participating in afforestation work during Kumbh Mela at Hardwar.

- Youth participation in simple, non-engineering schemes and items to be taken up as part of the projects.
- Activities in areas such as renovation, cleaning up of ghats, plantation, extension programmes, etc.
- Exhibition on pollution in different schools and colleges and distribution of kits for assessment of simple water quality parameters.

5.2 Public will be periodically informed of important works being undertaken under the Plan. The time schedule for major schemes and data regarding water quality will be published appropriately in the media and regional languages. Teams from the national press will also visit important locations. One press team has visited Patna in September, 1986. News reports for television on present conditions of pollution, the schemes proposed under Ganga Action Plan and the progress made are being prepared for

Kanpur, Allahabad, Varanasi, and Calcutta whereas those for Hardwar and Patna have been prepared.

Doordarshan has telecast three programmes relating to the pollution problem of Ganga and a six part travelogue on Ganga is also being telecast. Akashwani has organised area-specific broadcasts using programmes with established listenership.

The exhibition on Ganga which was inaugurated by the Prime Minister in Varanasi in June, 1986 has been displayed at Patna, New Delhi, Calcutta and Allahabad.

6. EXTERNAL ASSISTANCE

Various foreign governments and organisations have offered financial and technical assistance for the implementation of the Ganga Action Plan. The proposals are being considered in the context of specific technology/resources requirement.



Fig. 4 Young volunteers of Himalaya Banya Jeev Sansthan and Daliyon Ke Dagriya at Harki Pauri after the Ganga Padyatra from Badrinath and Gangotri, December, 1986.

6.1 United Kingdom

Advisory services were provided by experts from Thames Water Authority on the River quality modelling; organisational and management issues in the operation and maintenance of treatment facilities; and technical issues in treatment processing and issues for evaluation of technology choices.

The recommendations of the Thames Water Authority are being discussed with the concerned agencies. A static water quality model for the river has been evolved and the concerned Departments such as the CBPCWP, State Pollution Control Boards and the Ministry of Water Resources are being associated with the study of evolution of a dynamic model.

6.2 Netherlands

Outlines of the project proposal for integral sanitation schemes for Jajmau area in Kanpur and for Mirzapur town have been received from the Govt of Netherlands. Further discussions are being held for preparation of the schedule for completion of the schemes. The following areas have also been

identified for possible Indo-Dutch cooperation:

- Study of technological processes in major polluting industries and ways and means for change in process to reduce pollution and utilisation of wastes and resource recovery; and
- Building up of capabilities and capacities in Indian institutions to address issues relating to environmental management.

6.3 World Bank

A list of items estimated to cost about Rs. 46.24 crores as follows are under discussion with the World Bank:

- Training and technical assistance (Rs. 2.95 crores);
- Procurement of equipment for sewage cleaning, maintenance of sewers and automatic river quality monitoring station (Rs. 4.29 crores); and
- Major treatment facilities at Hardwar, Rishikesh, Allahabad (Rs. 39 crores).

The technical specifications for these projects have been prepared in consultation with the World Bank.

1. INTRODUCTION

Development projects have a profound influence on society and environment. While they provide employment, generate goods and services and are responsible for a distinct rise in standard of living as positive impacts, they also bring in their wake the associated ills of environmental pollution, resource depletion, over-crowding, health hazards, corrosion of structures, buildings and monuments, loss of yield of crops, destruction of wildlife, deforestation, etc. Environmental Impact Assessment (EIA) procedures can help to anticipate such fall-outs of developmental projects and thereby help to decide on alternative technology and re-siting as well as indicate preventive and control measures. They also make possible anticipatory planning and implementation of adequate environmental safeguards specially for pollution abatement and even for undertaking, simultaneously, environmental improvement programmes.

The techniques of environmental impact assessment have been evolved in the last decade in developed countries and have become an essential tool for environmental planning and management. Several approaches which attempt the evaluation of both adverse and beneficial impacts of development on environmental systems serve to provide basis for the analysis of problems relating to optimal decisions devolving on such projects. The analysis when built into the economic analysis of the project costs and benefits, helps the decision makers to perceive, more or less objectively, some of the major environmental concerns arising out of the projects.

The objective of Environmental Impact Assessment is to achieve sustained development with minimal environmental degradation and prevention of long term adverse effects on environment by incorporating suitable preventive and control measures.

Projects such as mining, dams for hydro-electricity, harbours, etc. are site-specific, giving in almost all cases no choice of site. On the other hand, industrial projects and thermal power stations are not quite site specific. However, coal-based thermal power projects are now tending to become site dependent with more and more pithead super thermal projects being built. Industries are also not always site independent, considering their infrastructural needs for power, water, raw materials, land, skilled labour, waste disposal sites and proximity to market. The Government of India adopted an Industrial Policy

Resolution in 1956, with a view to disperse industries to the more undeveloped areas of the country. According to this, and other concurrent decisions, large industries are not to be located in or near metropolitan cities. Industries sited in backward areas receive several kinds of financial incentives and other concessions such as relief from excise duties, raw material allocation, import facility, etc. A formalised procedure has been set up for 20 polluting industries for site clearance from environmental angle.

Environmental appraisal of projects is an important responsibility of the Department. Accordingly, questionnaires and guidelines have been evolved for development projects in selected sectors such as industry, river-valley projects, hydel projects, thermal and atomic power projects, ports and harbours, mining, etc. The questionnaires and guidelines are updated periodically to facilitate relevant data collection necessary for critical analysis of the project from environmental angle. Guidelines for siting of industries have also been brought out. Similarly, guidelines for thermal power Plants have been finalised.

Presently, the Department has Environmental Appraisal Committees for following sectors of development project activities:

- River valley projects/irrigation, hydel power and multipurpose;
- Mining projects;
- Industrial projects; and
- Thermal power projects.

Special expert groups/committees and task forces are constituted for assessment of other major projects referred to the Department from time to time.

2. RIVER VALLEY PROJECTS—HYDEL AND MULTIPURPOSE

The Environmental Appraisal Committee constituted in December, 1980 for environmental appraisal of irrigation, multi-purpose and hydro-electric projects has now been reconstituted with broader technical base and multi-disciplinary approach.

During the year, 37 projects have been accorded approval from environmental angle. For effective implementation of the suggested mitigative measures, the projects authorities have been requested to constitute Monitoring Committees and to initiate the

work only after ensuring that the suggested safeguard measures form an integral part of the project.

For facilitating comprehensive data collection by the project authorities the existing checklist is being improved. With a view to make the existing impact assessment procedure more effective, project proposals are also under preparation for undertaking case studies of completed projects, developing models for predicting water qualities, multi-disciplinary study for developing strategies, evolving tool for environmental management etc.

3. MINING PROJECTS

Twenty one new mining projects have been received for environmental appraisal during the first 9 months of the current year. In addition to these, completed documents have been received in respect of several other projects referred during the previous years. Of the 46 projects appraised, 16 have been cleared while additional information has been sought in respect of 14 others. Three projects have been rejected while six have been withdrawn by the Department of Coal. Seven cases have been deleted from the list of projects under active consideration as the project proponents have informed that the documents were still being prepared.

In several cases, site visits have been made and the project proponents have been advised regarding the environmental management programmes for control of adverse impacts. The environmental issues relating to Gandhamardan Bauxite Mining Project of BALCO have been discussed at length.

A training programme has been finalised during the current year for the personnel working in the mining industry on the preparation and implementation of environmental management strategies. The one-week course will be organised at the Indian School of Mines, Dhanbad. A Workshop is also being organised at Banaras Hindu University, Varanasi for the environmental managers to provide a forum to discuss the present status of environmental management in the Indian Mining Industry. The agenda also includes a discussion on the status papers prepared by experts in the areas of land reclamation, water pollution control, air pollution control, etc. The preparation of a case study regarding Environmental Management in Neyveli Lignite Mine has been initiated. This will document the environmental management strategies adopted for this projects; short-falls, if any;

constraints-financial/technical, faced in the implementation of these strategies; the cost of implementation vis-a-vis the benefits accrued. It is also proposed to commission an agency for preparation of a Model EMP in respect of a large opencast mining project.

4. INDUSTRIAL PROJECTS

The Environmental Appraisal Committee for Industries, considered 32 industrial projects, & approved six and rejected four. In the remaining 22 cases, additional information/data have been sought on process emissions, material balance statements, ambient air quality, environmental impact statement, disaster management plan, etc. In some instances site visits have been made. While clearing the projects, necessary preventive and control measures have been suggested to keep the impact on the environment to the absolute minimum.

The questionnaire for environmental appraisal of the industrial projects has been revised and updated to make it more comprehensive for eliciting the requisite information from the project authorities and to facilitate analysis.

5. THERMAL POWER PROJECTS

While 20 projects have been accorded environmental clearance, two have been rejected on grounds of environmental incompatibility. Suggested preventive and control measures included conservation of water by way of its recycling and reuse as well as utilisation of fly ash for construction purpose such as in bricks, blocks, cement, building material, etc. Periodic stack and ambient air quality monitoring has been advised. Monitoring of efficiency of electrostatic precipitator and other pollution control equipment and abatement systems at regular intervals of time, and the raising of green belts all around the power plant have been suggested.

The Thermal Power Appraisal Committee has been reconstituted by including more members from the relevant scientific and technical organisations. The document on environmental guidelines for thermal power plants has been finalised. To aid project authorities in proper site selection, adoption of preventive and control measures, preparation of environmental impact statements and environmental management plans. The questionnaire for environmental appraisal of thermal power projects has

also been reviewed and revised to make it more comprehensive.

A project on "Preparation of Manual for Thermal Power Projects with Special Reference to Impacts on Ambient Air Quality" has been commissioned by the Department. This will be useful to the project authorities in preparation of EIS reports, particularly in investigating the impact on ambient air quality, computations of ground level concentrations of pollutants considering the existing levels vis-a-vis emissions from the stacks and the meteorological conditions.

6. MONITORING COMMITTEE FOR FOUR PROJECTS IN BOMBAY

The tenure of the Committee set up by the Department for monitoring the implementation of four projects viz. ONGC Supply Base at Nhava, Nhava Sheva Port, Sassoon Fishing Harbour and RCF township has ended in September, 1986. As the projects are under different stages of completion, it is proposed to reconstitute the Committee.

Based on discussions of the Monitoring Committee meeting held in July, 1985 additional information was received from the Nhava Sheva Port Authorities. On examination it has been observed that the information is still not complete. The outstanding issues regarding the projects have been discussed in the meeting of the Empowered Committee on Nhava Sheva Port Project held on October 30, 1986. It has been agreed that a Working Group would be set up to report on the compliance of Government directives by the Nhava Sheva Port Trust as well as the Bombay Port Trust. As a follow up, a Working Group has been constituted to visit Bombay for discussions.

Plans for the development of a Regional Park at Nhava have not been received. The Department has requested the Department of Petroleum to review progress of the project in the light of the Government directives and take necessary action for the compliance of assurances given to the Monitoring Committee.

Development of an environmental park on one-half of the reclaimed land in Sassoon Dock has not made headway due to the litigations with the contractor. The outstanding issues regarding the project have been taken up with the Ministry of Agriculture for speedier execution of the project.

7. BOMBAY TRANS HARBOUR LINK PROPOSAL

It had been suggested to the Government of Maharashtra to defer the proposal for Trans Harbour Link until development of New Bombay has sufficiently picked up and other proposals like East-West Rail Corridor and East and West Island Freeways completed. The Government of Maharashtra and the Steering Committee set up by the State Government have approached the Centre to further examine and lift the ban on construction of additional links between Bombay and Main-land. Based on the discussion of the Committee of Secretaries in September, 1986 it was decided that a group of experts would further examine the proposal and submit its recommendations

8. DEVELOPMENT OF BEACHES

In the context of the decision to conserve beaches upto 500 m from the high tide level for their aesthetic and environmental values, the Coastal States have been asked to prepare status reports and Master Plans for coastal areas. As proposed by the Ministry of Tourism it has been decided to examine proposals for setting up beach resorts in the approved locations of Goa, Trivandrum, Puri-Konarak and Mahabalipuram. To examine such proposals an Inter-Ministerial Committee has been set up by the Ministry of Tourism. In the absence of relevant data, the projects have been rejected. It has been communicated to the Ministry of tourism that the consideration of the proposals is subject to the availability of complete information along with environmental impact assessment reports.

9. PROPOSAL FOR RAPID TRANSIT SYSTEM IN DELHI

As a follow up of the proposals contained in the Draft Revised Master Plan for Delhi, 2001 to introduce Light Rail Transit (LRT) System in Delhi, the Department of Railways, Ministry of Transport set up a Working Group to examine the proposal in detail and suggest alignments for the proposed East-West Corridor for the LRT System. The Department has suggested completion of certain studies related to environmental aspects of noise pollution, loss of vegetation, aesthetics and urban renewal. The proposal is to be further looked into in detail after findings from these studies were made available.

10. REVIEW OF THE POLICY FOR INDUSTRIALISATION OF BACKWARD AREAS

The policy to provide incentives for setting up industries in 'No-Industry Districts', has been examined. A list of totally protected districts and non-polluting industry districts along with the list of industries which can be considered in these areas have been recommended based on the following parameters:

- Extent of closed forest available in the district;
- Ecological sensitivity of the area;
- Ecological degradation of the area; and
- Districts needing special protection to conserve genetic reserves.

11. DEVELOPMENTS IN MURUD-JANJIRA, MAHARASHTRA

A suggestion for developing the Murud-Janjira area for tourism and recreational activities has been examined. The State Government has set up a Committee to look into the aspects of development of coastal areas in the State. The Report is awaited.

12. OTHER ENVIRONMENTAL ISSUES IN BOMBAY

12.1 Floor Space Index (FSI) in the Island City of Bombay

After a comprehensive review of the proposed relaxation of FSI by the State Government for reconstruction of dilapidated buildings and setting up luxury hotels, the Department advised the State Government in June, 1985 against any such move. It was also suggested that detailed urban renewal plans should be undertaken to improve the civic services and other infrastructural facilities. It has been brought to notice that relaxation of FSI has come into force through an Act of the State Government. The matter has been taken up with the State Government for reconsidering the clause permitting the FSI increase.

12.2 Naval Constructions at Colaba

It was brought to the notice of the Department that the Ministry of Defence have not obtained approval from the Municipal Authorities of Bombay before undertaking construction of multistoried structures at

Colaba. Ministry of Defence have been advised to prepare a Master Plan for the development and obtain approval from the State Government. It has been suggested to the Ministry of Defence and the State Government that a Working Group with representatives of the State Government and the Ministry of Defence be set up to resolve the issues. The suggestion has been agreed to by the concerned parties.

12.3 Proposal for Storage Facilities by Antop Hill Warehousing Corporation

The construction of storage facilities for chemicals at Wadala, Bombay, a project approved by the Government of Maharashtra started in 1985. It was, however, noticed by the Department that the project site was surrounded by the residential colonies. This posed a risk for the people residing in those colonies. The Department took up this matter with the Government of Maharashtra which resulted in stoppage of the construction. An expert committee has been constituted by the State Government to examine the proposal further.

12.4 The Issues on Reclamation and Construction Work at Backbay and Preservation of Greenery at Bandra Lands End

Other issues that have been taken up with the Maharashtra State Government include stoppage of further reclamation and construction work at Backbay and preservation of greenery at Bandra Lands end.

13. FSI CANTONMENT TOWN

The Southern Command had imposed a scheme of restrictions on construction to preserve the quality of environment of cantonment towns. The Ministry of Defence has been advised to adopt the measures already taken by the Southern Command in the cantonment towns of other zonal commands as well.

14. GUIDELINES FOR NEW TOWNS

The draft guidelines for environmental assessment of new towns has been circulated to the concerned Ministries. The Ministry of Urban Development has conveyed its approval on the draft report. The guidelines will provide a frame work for environmental appraisal of new towns referred to the Department for environmental scrutiny.

15. ENVIRONMENTAL GUIDELINES FOR MILITARY STATIONS

Environmental guidelines for the planning of Military Stations by Working Group set up by the Department have been circulated to the Ministry of Defence. Suggestions of the Working Group would be kept in view in the development of Military Stations.

16. PORTS AND HARBOURS PROJECTS

The Department received a proposal for construction of Breakwater at Rangat Bay in Andaman and Nicobar Islands. With adequate measures for environmental protection, the proposal was approved.

Proposals for the development of Paradeep Port and extension of facilities at Cochin Shipyard Ltd. have been received.

17. PROPOSALS FOR DEVELOPMENT ACTIVITIES IN ANDAMAN AND NICOBAR, LAKSHADWEEP ISLANDS

An Island Development Authority has been constituted to evolve strategies for integrated development of the islands compatible with ecological conservation. Proposals for development activities in the islands would be considered in the overall framework outlined by this Authority.

18. PROPOSED AIRPORT AT PONDICHERRY

To ascertain environmental implication of the proposed location of airport at Pondicherry, a team was deputed to visit the site for collection of data. The team has reported the unsuitability of the proposed location near the JIPMER Hospital and other educational institutions. Alternate sites for consideration were identified by the team.

19. DEVELOPMENT OF DAL LAKE

The proposal received from the Government of Jammu

and Kashmir for the development of Dal Lake was examined and approved for implementation along with certain measures to be taken up simultaneously for long-term environmental improvement.

20. HUMAN EXPOSURE ASSESSMENT

World Health Organisation (WHO) has initiated a new programme known as the Human Exposure Assessment Location (HEAL) project. The HEAL project refers to the areas where intensive health assessment of human beings will be taken up in relation to the overall exposure to the environmental pollutants. India will be one of the participating centre and the Department will be the nodal agency.

The HEAL project is likely to be taken up at two locations in India i.e. at Bombay and at Kanpur by National Institute of Occupational Health, Ahmedabad and Industrial Toxicology Research Institute, Lucknow, respectively.

The primary objectives of the Project would be as follows:

- Environmental monitoring of air, water and food samples for selected pollutants such as DDT, BHC, Lead, Cadmium, SO₂, NO_x, SPM etc;
- Assessment of human exposure through biological monitoring of blood and body tissues for the selected pollutants (pesticides & heavy metals);
- Evaluation of potential health risks or exposure related morbidity in the selected population;
- Provision of an over view of existing exposures of selected population to pollutants and if possible to observe trends in this regard; and
- Evolution of an appropriate approach for prevention and control of health risks attributable to environmental pollutants.

1. INTRODUCTION

Economic development in harmony with ecological balance is the primary objective of eco-development. Various programmes undertaken aim at speedy restoration of degraded ecosystems through public participation viz. mobilisation of ex-servicemen, organisation of eco-development camps and field demonstration projects. The emphasis of various activities has been on creation of awareness and demonstration of viability of technology and management packages in the ecologically fragile areas. Various activities of eco-regeneration are being undertaken under the aegis of the National Eco-development Board.

2. NATIONAL ECO-DEVELOPMENT BOARD

The National Eco-Development Board has been reconstituted in July, 1986 with the following major objectives:

- to evolve and adopt policies and development strategies to arrest ecological degradation;
- to demonstrate the feasibility of economic development without ecological imbalance;
- to plan and implement programmes for arresting further damage to degraded ecosystems and to undertake programmes for speedy restoration; and
- to sensitise youth on the importance of conservation.

3. ECO-TASK FORCES

3.1 Eco-Task Force (TA 127), Uttar Pradesh

The Task Force is presently deployed for ecological restoration in the Kiarkuli microcatchment area through afforestation, soil conservation and mined area reclamation. During the year extensive soil conservation and reclamation works have been undertaken (Table 9).

3.2 Eco-Task Force (TA 128), Rajasthan

This Task Force continued to be deployed on the left bank of the Indira Gandhi Canal, Rajasthan and during the year extensive works relating to afforestation and pasture development have been undertaken besides maintenance works. (Table 10).

TABLE 9
TASKS ACCOMPLISHED BY TA 127 DURING ITS DEPLOYMENT UPTO OCT. 31, 1986

I. Afforestation	8,47,418 Nos.
Pasture development	86 ha.
Fencing (area covered)	420.24 ha.
II. Soil Conservation	
Check Dams	84 Nos.
Retaining Walls	68 Nos.
III. Reclamation of mined areas	
Pits for plantation	331 Nos.
clearing of closed mined area	4 ha.

TABLE 10
TASKS ACCOMPLISHED BY TA 128 DURING ITS DEPLOYMENT UPTO OCT., 1986

Plantation (Saplings)	30,51,663 Nos.
Pasture development	3425 ha.
Fencing	1,12,600 Meters.

4. ECO-DEVELOPMENT CAMPS

Several eco-development camps were organised during the year involving non-governmental organisations.

5. FIELD DEMONSTRATION PROGRAMME

5.1 Eco-regeneration of Pushkar Lake Valley, Ajmer

Major activities of the project during the year have been the survey in the buffer zone of the project area pertaining to rose growing (both production and sale), domestic energy consumption vis-a-vis utilisation, water borne and other diseases. The information is being computerised.

A small nursery at Budha Pushkar has been established and the six nurseries set up last year are being maintained.

Wind mills have been installed near Lavana Railway Station and at Nedlia Ganahera.

Afforestation (20,800 saplings) and sand dune stabilisation (1 km) works in Sardana and Srinagar area including fencing with live Euphorbia hedge have been undertaken.



Fig. 5 Sand dune fixation—A view

5.2 Eco-Development in Shivalik Foothills, Hoshiarpur, Punjab.

The project is operational since 1983 at Malewal village situated in the choe infested Shivaliks of Hoshiarpur district, with the objective of mobilising public participation in the ecological restoration process. The salient activities include development and introduction of efficient rain water management (water harvesting reservoirs), afforestation in two micro watersheds for fuel and fodder on sustainable basis, creation of environmental awareness etc. Accomplishment during the year include the involvement of 19 landless families in undertaking share cropping in tree farming; plantation (1,46,000 saplings) in the project area involving 330 farmers in 63 ha; installation of fuel efficient chulas (40); and creation of reservoirs (2) to provide irrigation facilities at critical stage.

5.3 Environmental Regeneration in Auroville, Tamil Nadu

The project site (800 ha.) in Auroville was taken up

during 1983 for environmental regeneration as also for creation of environmental awareness through afforestation and soil and water conservation works to improve the status of the natural resources. Major achievements include raising of mixed plantations on the barren and marginal land; creation of wind breaks and experimentally controlled plantations in block of 100 Nos. including species for fuel, fodder and fertilisers; soil conservation measures of contour bunding and field bunding in the plantation areas resulting in control of run off and erosion, greater moisture retention in the soil and recharging of ground water; afforestation and soil conservation activities in the farmers field; social forestry plantation (17 acres) in Pattanur village (Aurobrindaban); and organisation of training workshop for twenty groups to inspire people to take up afforestation programmes.

5.4 Ecological restoration of Cherrapunjee, Meghalaya

The project initiated in 1984 envisages restoration of ecological conditions in Cherrapunjee—a high rainfall desert area situated in the southern aspects of east

Khasi Hill district. This is being achieved through engineering (soil conservation) and biological (afforestation) measures. Activities taken up under the projects include establishment of permanent nursery (1 ha.); standardisation of techniques for raising nursery of Plant Species sensitive to transplantation; pilot programme for plantation in highly refractory areas (98 ha)—Mawm Luh (80 ha) and Mawmihtheid (18 ha.); techniques has been standardised by planting 1½ years old saplings in polythene bags.

6. PROJECT VISVA BHARTI

A project on environmental improvement of Visva Bharati, Santiniketan has been initiated. Various components include afforestation in barren and denuded areas; fresh plantation; soil conservation; pasture development; water resource development; improving/preserving cultural heritage and lake

improvement works which would improve environmental quality and life of inhabiting communities. The lake and gardens surrounding Tagore's Farm house in Sriniketan have been reclaimed and beautified. Other works are in progress.

7. INSTITUTE OF HIMALAYAN ENVIRONMENT AND DEVELOPMENT

Detailed programme of work for the Institute has been developed. The areas include energy, food, natural resource conservation, impact assessment, population—demographic pressure and disasters. Projects in the area of high altitude plant resource management, hazard zonation and disaster management (land slides) and recovery of forest ecosystems have been developed and are proposed to be initiated.

1. FLORA

1.1 Botanical Survey of India

Botanical Survey of India (BSI) is primarily devoted to survey and assessment of the plant resources of the country. The BSI, has gathered a wealth of information in this regard. It has about two million sample specimens in its central and nine regional herbaria. So far 60% of the country has been surveyed. A number of books and research papers have been published by the scientists of BSI. The BSI is recognised as the scientific authority for the flora of India for the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). It is estimated that 1500-2000 species of Indian flora are in the threatened category. Many rare plants which are facing extinction are being cultivated in the Botanic Gardens of BSI located in different parts of the country. A Programme Advisory Committee provides guidelines to achieve the objectives of BSI.

1.1.1 Flora of India

The material for the first volume of Flora of India has been compiled and is under printing. The enumeration of flowering plants of India (volume one) encompassing monocotyledons has been finalised for publication.

The work on six families of flowering plants has been completed. Work on 25 families of flowering plants and four-non-flowering plants is in progress

1.1.2 State Flora

State Flora analysis of Tamil Nadu (Vol. 2) and Flora of Rajasthan (Vol. 1) have been finalised and are under printing. Work on State Floras of Maharashtra, Madhya Pradesh, Jammu and Kashmir, Nagaland and West Bengal is in progress. Check-list of flowering plants of Andaman and Nicobar Islands has also been taken up.

1.1.3 District Flora

The District Flora of the mountains of Nallamalas (Andhra Pradesh), Courtallam (Tamil Nadu) & Bilaspur (Madhya Pradesh) have been completed and are in the press. Work on following districts is in progress: South District (Sikkim), Koraput, and Kalahandi districts (Orissa), Garo Hills and Cherrapunji (Meghalaya), Kolhapur, Chandrapur, Duldhana, Bhandra, Jalgaon, Nasik and Satara District (Maharashtra), Pithoragarh,

Moradabad and Gonda Districts (Uttar Pradesh) Bilaspur and Sirmur (Himachal Pradesh), Kasargod, Cannanore, Idduki, Trivandrum and Palghat (Kerala), South Arcot and Kanyakumari (Tamil Nadu), Panna, Raigarh, Mirzapur, Chattarpur (Madhya Pradesh), Pali and Sawaimadhopur of Rajasthan.

1.1.4 Explorations and Collections

Botanical Explorations were conducted in the following areas of the country to collect, identify, assess plant wealth for the writing up of floras:

Andaman & Nicobar Islands: Rutland Island
 Arunachal Pradesh: Itanagar and its surrounding areas, Ganga Lake & Chessa Reserve Forest.
 Kerala: Calicut District.
 Manipur: East District
 Meghalaya: Garo Hills, Cherrapunji
 Nagaland: Pheg and Tuensang districts
 Sikkim: East, South and North districts.

Special tours were undertaken to survey areas of Arunachal Pradesh and Chamoli district, Uttar Pradesh to collect materials for the preparation of Lichen and Liverwort flora and Fern flora respectively.

During these surveys more than 5000 specimens were collected and preserved. More than 8000 specimens of previous and current year's collections were mounted on herbarium sheets and about 4000 of them were identified and incorporated to enrich the National and Regional Herbaria. Apart from collection of specimens for herbaria, live plants (to introduce into gardens) were also collected for critical studies. Pickled specimens and air dried samples were collected at the request of scientists of BSI and other research Institutions for laboratory studies.

1.1.5 Plant Conservation Programme

Rare, endemic and endangered species

A "Red Data Book" on the threatened species of Indian plants (Volume I) was completed and sent for publication. Particulars on orchid rich areas in India and vulnerable species in endemic centres are periodically furnished to the Wildlife Directorate. The National Gymnosperm Sanctuary is being developed at Pauri under the Northern Circle of BSI. A proposal with notes for inclusion of 55 threatened species in the schedules of Wildlife Act, was sent to the Indian Board for Wildlife,

National Parks/Tiger Reserves/Biosphere Reserves/Sanctuaries:

The flora of Corbett National Park has been published. The floristic survey and assessment of the following National Parks/Tiger Reserves/Sanctuaries have progressed satisfactorily.

- Shivpuri National Park, North Sikkim;
- Rhododendron Sanctuary near Yumthang, North Sikkim;
- Orchid Sanctuary near Gangtok, Sikkim;
- Kaibul Lamjo National Park, Manipur;
- Namdapha Biosphere Reserve, Arunachal Pradesh;
- Melghat Tiger Project, Maharashtra; and
- Borivili National Park, Maharashtra.

1.1.6 Specialised Survey Units

The Central National Herbarium (CNH), as a repository of collection of herbarium specimens representing all areas of the country as well as from other parts of the world, enriched its collections by incorporating the specimen received. The type section, besides extending invaluable collections for the revision of National Flora, enriched its collections with about 50 type specimens (specimens based on which the new species are described) received from scientists of BSI and other Institutions in India. About 60 CIBA—Chrome prints and photo-negatives of Indian plants deposited in European herbaria have been received. To assist the scientists of BSI working on National Flora more than 453 herbarium specimens from different European Herbaria have been procured on loan. Similarly about 400 herbarium specimens have been sent on loan to the workers in India and abroad from this Herbarium. On exchange basis 250 specimens have been received from UK, USA, Australia and Thailand and about 200 specimens have been sent from India. The Central National Herbarium and other Regional Herbaria have been maintained to keep the specimens unaffected by insects and fungi and remounting of the old and brittle sheets.

The libraries of BSI and its regional circles have been strengthened with the latest books and periodicals to provide the current references on the subjects. About 2,000 books and periodicals have been added to the Headquarters Library. The Documentation Unit provided the scientists with copies of required reference works from periodicals and books.

The Economic Botany Section has identified and

listed about 60 plants having ethnobotanical uses amongst the collections made from Malda, West Dinajpur, Bankura, Midnapur and Darjeeling districts of West Bengal. Ethnobotanical data collected from plants and field tours of New Jalpaiguri district have been compiled. Work on less known economic plants has been initiated.

The Pharmacognosy Unit has enriched the collections of crude drugs and herbarium of wild medicinal plants. The Unit also prepared 500 reference cards towards the documentation of bibliography of pharmacognosy works.

The Phytochemistry Unit has screened barks of *Goniothalamus griffithii*, *Artobotrys uncinatus*, *Desmos chinensis*, *Annona muricata*, *Milusa roxburghii*, and *Polyalthia suberosa* for saponins, steroids and leucoanthocyanidins and also chemical screening of leaves of *Psychotria adenophylla* (Rubiaceae) whose chemical constitution is unknown. The Unit has screened 15 samples of fodder plants and furnished the findings to the Director, Padmaja Naidu Himalayan Zoological Park, Darjeeling.

The Physiology Unit has conducted germination studies on various garden plants and those of economically important plant species.

The Ecology Unit has studied the ecology of the Wildlife Sanctuaries and Tiger Reserves of Jaldapara and Sundarbans respectively. Field tours have been conducted to these areas for collection of plant materials, ecological data and feeding habit of herbivorous animals. Specimens collected from these ecosystems have been identified and incorporated into the herbarium. The work on impact of oil palm cultivation on Little Andaman Island and Dudhwa National Park is in progress. The Unit has prepared identification manual data sheets of eleven species of plants banned/restricted for export. Studies on microflora in polluted soil/water system with special reference to cyanobacteria as indicators are being carried out in the Unit.

The Industrial Section, Indian Museum (BSI) has maintained its galleries and prepared catalogues of the exhibits of plant products having industrial uses. Modernisation of galleries has been taken up to impart visual education to general public and students. Technical assistance with regard to economic plants has been provided to all interested workers.

The Indian Botanic Garden, besides regular



Fig. 6 The Great Banyan Tree—A view from the supporting prop roots (Indian Botanical Garden)

maintenance of the Garden has introduced several species of rare and economically important plants in its orchidaria, palm houses, Bambusetum, Pinetum and medicinal plants garden. Specialised plots of wild Jasminums and Nymphaeas have also been enriched and maintained. The experiments on rooting of various species for multiplication were also conducted in the Garden. Seed materials of *Swietenia mahagoni*, *Aegle marmelos*, *Mimusops elengi* have been supplied to other Institutions in India and abroad for afforestation and other eco-development programmes. The orchidaria and experimental gardens attached to regional circles of BSI have introduced 1,500 sets of orchids and other rare plants for multiplication as part of the ex-situ conservation programme.

1.1.7 Floristic Assessment for Environmental Analysis

The following projects have been referred by State Governments for floristic and environmental analysis.

—Water Supply to Coimbatore Local Planning, Tamil

Nadu;

- Chemplast India Ltd. in Semman Kuppam Village, Tamil Nadu;
- Tamil Nadu State Electricity Board—Detailed investigation of Gomukanandhi Hydro-electric Project;
- Ecological aspects of hydro-electric projects (Madas project—Wardha Irrigation Division, Maharashtra);
- Upper Manar Irrigation Projects, Taluka Kandhar, District Nanded, Maharashtra—Detailed ecological aspects;
- Furnishing of environmental information of Upper Kundalika Medium Irrigation Project;
- Maravakandy Mini Hydro-electric Project, Tamil Nadu;
- Sarambala Medium Scheme, Swantwadi—Sindhudurg, Maharashtra;
- Jamda Irrigation Project, District Ratnagiri and Mahamadwadi Irrigation Project, Dist. Sindhudurg, Maharashtra;
- Shahanoor Project—Amaravati, Maharashtra;
- Ecological aspects of Pumpalgaon Irrigation

- Project, Tal Barshi, District Sholapur, Maharashtra;
- Report of Kalu, Shai & Gargai River Project;
- 250 MW Combined Cycle Captive Power Project—Tamil Nadu;
- Gomai, Dara Nagar, Lower Panzara—Submergence Area Project Survey;
- Kordi, Jamkhedi, Waldi, Upper Karwa, Submergence Area Project;
- Major and minor irrigation projects—Phonda Ghat, Ratnagiri, Maharashtra;
- Proposal for generation of power—Thirumurthy Dam Mini Hydro-electric Project, Tamil Nadu;
- Chinnar Chittar Division Project in Coimbatore District, Tamil Nadu;
- Amaravathy Dam Mini Hydro-electric Project, Tamil Nadu;
- Teesta Valley Hydro-electric Project, West Bengal;
- Tamil Nadu Electricity Board—Kodavanar Hydro-Electric Project and Sattiyar Hydro-electric Project;
- Tamil Nadu Electricity Board—Kundha additional Division Hydro-electric Project—Part. II, Nilgiris—Tamil Nadu; and
- Tamil Nadu Electricity Board—Vaigari-Peranai Barrage Hydro-electric Project, Tamil Nadu;

1.1.8 Identification Service

BSI and its regional circles constantly provided information on identification, distribution, occurrence, economic utility, ecology of plants to Institutions and individuals. About 20 research proposals on plant research and related fields submitted to Department of Environment, CSIR and Department of Science and Technology for financial assistance have been reviewed and assessed.

1.1.9 Publications

Following publications were brought out during the year:

- Flora of Corbett National Park;
- Poppies of Indian region;
- Chromosome Atlas Vol. I;
- Endemic Plants of India Vol. I;
- Flora of Tamil Nadu Vol. II;
- Flora of Courtallum Vol. I;
- Red Data Book of Indian Plants— Vol. I;
- Key Works to the Taxonomy of Flowering Plants— Vol. 5;
- Key Works to the Floristics of India— Vol. I;
- Bulletin of the Botanical Survey of India Vol. 26 (Nos. 3 & 4) volume 27 (Nos. 1-4);
- Insectivorous Plants of Meghalaya; and

- Selected Poisonous Plants from Tribal areas of India.

1.2 National Botanical Garden, Delhi

It is proposed to set up a National Botanical Garden during the Seventh Five Year Plan, New Delhi. This has been conceived as a garden of the highest scientific and technical standards comparable to the Royal Botanical Garden at Kew, the Botanic Garden at Berlin, the Moscow Botanic Garden and the New York Botanic Garden. It will serve as a living laboratory for the life scientists, ecologists, and environmentalists and will also serve as "ex-situ" conservation of diverse and rare species of plants.

A Site Selection Committee for advising the Government about the suitability of a site, has been constituted. The report of the Committee has been received and is under process.

1.3 National Natural Resources Management System

In view of the increasing need for scientific monitoring and assessment of natural resources, the Govt of India have set up a multi-departmental National Natural Resources Management System (NNRMS). The Preparatory Committee for the NNRMS (PC-NNRMS) has constituted eight Standing Committees to accomplish the tasks in various areas. Secretary, Ministry of Environment and Forests is the Chairman of the PC-NNRMS Standing Committee on Bio-resources and Environment.

First meeting of the PC-NNRMS Standing Committee on Bio-resources and Environment (SC-B) was held in the Department on April 18, 1985 wherein it was recommended that six areas be taken for application of remote sensing in environment and bioresources, viz., Vegetation Mapping, Himalayan Ecosystem, Biomass Estimation, Air Pollution, Impact of Industrialisation and Impact of Mining on Environment.

Accordingly, Ministry of Environment and Forests, constituted six Expert Sub-Groups for technical formulation of projects, identification of executing agencies and monitoring of the projects.

1.4 Environmental Mapping

A scientific data base for optimum and efficient utilisation of natural resources is essential for

environmentally sustainable development. The Department of Environment, Forests and Wildlife has taken up a scheme to bring out maps on environmental themes by making use of latest scientific techniques such as remote sensing.

The first project in this series is the National Forest Vegetation Mapping of the country which aimed at monitoring the changes in vegetation cover of the country at periodical intervals. The Map is being prepared with the help of False colour Composites of 190 scenes covering the entire country, which have been supplied to the Forest Survey of India by the National Remote Sensing Agency, Department of Space. The tentative maps in respect of States and Union Territories have been prepared and are under scrutiny. Further areas for mapping are being finalised in the context of the newly emerging activities of the National Natural Resources Management System.

2. FAUNA

2.1 Zoological Survey of India (ZSI)

The Zoological Survey of India is engaged in the

survey of faunal resources and collection of base line data with regard to their taxonomy, bio-ecology, animal behaviour, population dynamics, etc. It is the custodian of the national zoological collections, which comprise nearly one million specimens, belonging to 65,000 species. It provides identification of zoological specimens of economic and general interest to various institutions including universities, colleges, etc. It has 15 regional offices located in different parts of the country.

2.1.1 Faunistic Explorations

Field surveys were conducted in 38 districts in the States of Assam, Andhra Pradesh, Bihar, Haryana, Himachal Pradesh, Maharashtra, Meghalaya, Rajasthan, Tamil Nadu and West Bengal for certain groups of fauna. Chilka Lake, Orissa, was resurveyed.

Dudhwa and Rajaji National Parks in Uttar Pradesh and Chail Sanctuary in Himachal Pradesh were surveyed for faunal assessment. The survey of Sariska (Rajasthan) and Melghat (Maharashtra) Tiger Reserves was also taken up.



Fig. 7 Nanda Devi National Park—An alpine pasture

Faunal assessment of Corbett National Park and Nanda Devi National Park was finalised and published.

2.1.2 Development of National Zoological Collections

As a result of research work undertaken by the scientists of the Department, National Zoological Collections were enriched by the addition of 16,939 identified specimens, including 89 specimens belonging to 47 species new to the Zoological Survey of India and 89 type specimens belonging to 46 species new to science.

2.1.3 Research Projects

Some of the important research projects in key areas are mentioned below:

(a) Taxonomy

- Taxonomic studies on the fauna of West Bengal;
- Studies on Coelenterata, Asterozoa, Sipuncula, Polychaeta, Crustacea and Mollusca of Lakshadweep Islands;
- Studies on the fauna of Chilka Lake, Orissa;
- Handbook of Leeches and Lizards of India;
- Studies on Isoptera, Hemiptera and Wood boring insects of Arunachal Pradesh;
- Fish resources of the River Ganga;
- Herpetofauna of Andhra Pradesh; and
- Revision of Indian species of the genus *Mus* (Rodentia)

(b) Ecology

- Population studies on the protozoans and nematodes associated with jute, pulses and vegetable crops;
- Species composition and seasonal dynamics of some freshwater Cladocera in and around Calcutta; and
- Hydrobiological investigations on Rushikulya (Orissa) and Matla (West Bengal) estuaries, Gopalpur Creek (Orissa) and freshwater bodies around Hyderabad and Madras.

(c) Wildlife, Conservation and Environment

- Survey of wetlands in Calcutta Metropolitan district areas;

- Environmental impact assessment of Narmada Sagar, Madhya Pradesh;
- Impact assessment of the proposed Thampraparani Hydel Project, Tamil Nadu on the fauna of the area;
- Biomonitoring studies of the polluted stretches of Chaliyar river, Kerala;
- Ecological and behavioural studies on Hoolock Gibbon in Meghalaya and Arunachal Pradesh and on Hanuman Langur in Western Ghats;
- Status survey of Hispid Hare in northern India;
- Ecology and ethology of Goral in Himachal Pradesh;
- Faunal assessment of Sunderbans and Simlipal Tiger Reserves; and
- Preparation of Red Data Book on Mammals.

2.1.4 Publications

Following publications were brought out during the year:

- Fauna of India:
 - Protozoa
 - Cladocera
 - Phytoseiidae
 - Carcaria
 - Chalcidoidea—2 Vols.
 - Cobitidae
 - Schizothoracinae;
- Records of the Zoological Survey of India, Vol. 83;
- Bulletin of the Zoological Survey of India, Vol. 7(2 & 3), 8(1-3);
- Memoirs of the Zoological Survey of India Vol. 16(4);
- Occasional Papers—16 Nos;
- Technical Monographs—4 Nos;
- Fauna of Conservation Areas—2 Nos;
- Bibliography of Indian Zoology, Vol. 21;
- Fauna of Indian States: Orissa;
- Zoologiana, Vol. 5;
- Z.S.I. News—4 Nos;
- Handbook of India—Spiders;
- Sea Shore Animals of Andaman & Nicobar Islands; and
- Proceedings of Workshop on Mammalogical Collection.

1. INTRODUCTION

Forests are a renewable resource and have contributed substantially to the economic development of the country by providing goods and services. Forests also have a major role in enhancing the quality of environment. The rapid depletion of forest lands in recent times has resulted in socio-economic and ecological stress. To meet this situation, the Department is giving a new thrust to the entire gamut of forest related activities for immediate and effective implementation. Several programmes and schemes have been initiated, the important among them being the social/farm forestry and afforestation projects.

2. FOREST SURVEY OF INDIA

The Forest Survey of India (FSI) was constituted in 1981, as a successor to Pre-Investment Survey of Forest Resources Organisation, with the primary objective of undertaking periodic surveys of forest resources in the country for proper planning.

Following a critical review of the activities so far undertaken, the Forest Survey of India has been reorganised in June, 1986. The objectives have been reformulated in order to make it more purposeful for creating a sound forestry-oriented data-base relevant to the needs of the country.

The new objectives include the following:

- Preparation of a comprehensive State of the Forest Report (SFR) including National Vegetation Map (NVM) once in every two years. Thematic maps will also be prepared through use of remote sensing data with minimum essential ground-truth verification (most ground-truth verification would be done by the respective State Governments) on a ten year cycle;
- Collection, storage and retrieval of necessary forestry and forestry-related data for national and state level planning and creation of a computer based National Basic Forest Inventory System (NBFIS);
- Designing of methodologies relating to forest surveys and subsequent updating. This would include methodologies for vegetation mapping including thematic maps through use of satellite imageries/aerial photographs; ground-truth verification and growing stock and volume assessment;

- Preparation of forest inventory in selected States/UTs on agency basis until establishment of their own resources survey units;
- Imparting training in modern forest survey techniques to foresters at various levels of responsibility in the States/Union Territories/Government of India;
- Advising the States/UTs on design and development of regional NBFIS; and
- Supporting and overseeing the techniques/inventory work undertaken by State/UT Forest Departments.

In line with the above objectives, the Forest Survey of India has been reorganised into the following six units:

- Vegetation Mapping Unit (VMU);
- Machine Data Management Unit (MDMU);
- Methodology Unit (MU);
- Agency Work Unit (AWU);
- Training Unit (TU); and
- Personnel and Administrative Unit (PAU).

The major achievements include the Survey and inventory of about 28% forest cover of the country; preparation of thematic maps covering 31% forest area and processing of data generated as a result of inventory. Wood consumption studies have also been undertaken.

Two short duration training courses were hosted—one on 'The Application of Electronic Data Processing in Forest Inventory' and the other on 'Application of Remote Sensing in Forestry' for the benefit of participants from South-East Asia and the Pacific region in Phase I of the FAO/UNDP/GOI Regional Training Project. Both the courses were attended by 16 participants each, giving a total output of 32 including 8 from India.

The FSI has also been organising short duration (6 to 8 weeks) courses in Application of Remote Sensing in Forestry for the benefit of untrained technical personnel of FSI as well as Forest Rangers of States/UTs Forest Departments. During 1985-86, five courses were organised with a total output of 55.

2.1 Inventory

The Forest Survey of India has a target of 16,000 Km²

for inventory during 1986-87. This target is distributed in the North-Eastern States as below:

Meghalaya	5,500 Km ²
Manipur	5,000 Km ²
Nagaland	2,700 Km ²
Andhra Pradesh	2,200 Km ²
Sikkim	600 Km ²
	<hr/>
	16,000 Km ²

Till the end of November, 1986, an area of 10,818 Km² has been covered. It is expected that the target will be achieved in full.

2.2 Processing of Inventory Data

It is proposed to undertake data processing of the 36,000 Km², inventory for which has already been made.

Till the end of November, 1986, an area of 21,496 Km² has been covered. The target is expected to be achieved in full.

2.3 Thematic Mapping

Thematic mapping is usually done on a 10-year cycle with the total number of sheets (of 1 : 50,000 scale) to be covered being about 2600.

Till the end of November, 1986, 135 sheets of 1 : 50,000 scale have been prepared. A short fall of 16 sheets, covering part of Rajasthan is anticipated as the security clearances required for the relevant aerial photographs have not been received. However, the matter is being pursued vigorously.

2.4 Vegetation Mapping

182 sheets on 1 : 2,50,000 scale are proposed to be prepared with a view to preparing a National Forest Vegetation Map once in every two years. This target covers Maharashtra, Karnataka, Tamil Nadu, Kerala, Goa, Daman and Diu and Pondicherry (UT), all North-Eastern States, Sikkim, Orissa and Andhra Pradesh.

2.5 Wood Consumption Study

Wood consumption studies are to be undertaken in the three inventory areas of

- Chickmangalur district in Karnataka, Raipur and Bilaspur in Madhya Pradesh and Ambala district in Haryana.

The field work in Chickmangalur has already been

completed and the report is under compilation. Work in the other two areas is under progress.

2.6 Installation of VAX/11/780 Computer

A National Forest Data Management Centre is proposed to be set up at New Delhi and provide FSI with VAX/11/780 interactive Computer System to facilitate digital interpretation of satellite imageries for vegetation mapping and processing/storage of forestry related data collected/generated by FSI. During 1986-87, a sum of Rs. 140 lakhs has been earmarked for this scheme.

3. CONSERVATION OF WOOD

In 1985, the Government had constituted an Inter-Ministerial Group to examine the present pattern of utilisation of wood and to recommend appropriate measures to mitigate pressure on existing forests by suggesting steps for substitution of wood. The Group has submitted its report (April, 1986) and the following are the salient recommendations:

- Encouragement of the use of non-conventional sources of energy and introduction of efficient wood burning stoves;
- Provision of fiscal incentives to industries for reducing wood consumption;
- Relaxation of Excise Duty for imports aimed at substituting use of wood;
- Restriction in use of timber in Government Departments; and
- Use of alternate raw materials in various wood-based industries.

The Group had also recommended appropriate research and development activities besides advocating large scale plantations.

During the year the "Report on Task Force on the Use of Wood for Packaging Fruits and Vegetables" was finalised. Wood requirements of the packaging industry had been studied in detail and a number of measures were suggested for reducing the consumption of wood. The recommendations had included use of alternate packaging material, disincentive to manufacturers of wooden packing boxes, research and development for identifying secondary timber species for this purpose and large scale plantations of fast growing species.

4. ANDAMAN & NICOBAR ISLANDS FORESTS AND PLANTATION DEVELOPMENT CORPORATION LTD.

The Corporation was incorporated under the Companies Act on 21.1.77 as a Government of India undertaking. A target of 29,500 M³ of timber has been fixed for harvesting, extraction upto sale depots and disposal. The harvesting will be done over an area of 470 ha. The Corporation is undertaking a Red-Oil-Palm Plantation Project using imported seeds from Malaysia, Nigeria, Ivory Coast, Papua New Guinea and Zaire. During the year, 78,378 seedlings have been raised in the nurseries for plantation. 150 MT of red-palm-oil and 500 MT of rubber will be extracted for distribution. However, continuance of the plantation programmes is being subjected to close scrutiny for its impact on environment and ecology.

5. THE FOREST (CONSERVATION) ACT, 1980

The Forest (Conservation) Act was enacted in 1980 primarily to check indiscriminate deforestation/diversion of forest lands for non-forestry purposes. The average rate of deforestation, which was of the order of 1.5 lakh ha. per year, prior to the promulgation of the Act, has come down to 5,500 ha. per annum after 25th October, 1980 when the Act came into force. While releasing forest lands for non-forestry use, under the provisions of the Act, compensatory afforestation in alternative areas is being insisted upon.

Since the enforcement of the Forest (Conservation) Act, 1980, 37,506 ha. of forest lands have been approved by the Government of India to be diverted for non-forest use. Compensatory afforestation has been stipulated over 21,000 ha.

A Working Group was constituted to examine and suggest simplification of the procedure under the aforesaid Act. After an in-depth review, the Working Group issued detailed guidelines to all States/UTs. Cases relating to surveys and investigations in forest areas, which do not involve cutting trees, have been exempted. Further, the procedure for laying of transmission lines or pipes for water supply, which do not involve felling of trees, has been simplified. To avoid delays in disposal of cases, comprehensive guidelines have been issued in July '86 for adequate formulation of proposals under the Act.

5.1 Statistical Review of Proposals

Till 21.12.86, 2290 proposals for diversion of forest lands for non-forest uses were received from various States and UT Administrations. Of these, 1100 were approved, 386 rejected and 699 closed for want of information/clarification. 32 proposals were withdrawn by the State Government.

5.2 Monitoring of Observance of Stipulated Conditions

The reports from the various State Governments and UT Administrations reveal that, by and large, steps have not been taken for compensatory afforestation which is one of the most important conditions stipulated in approving diversion of forest lands for non-forest uses. The State Governments have been requested to take immediate necessary action for monitoring and implementation of the conditions stipulated in all the approved cases. The Government of India have set up five regional offices at Lucknow, Bhubaneswar, Shillong, Bhopal and Bangalore to ensure observance of stipulated conditions in diversion of forest lands.

1. INTRODUCTION

The National Wastelands Development Board (NWDB) was set up in May 1985, with the following principal objectives:

- to achieve a quantum leap in afforestation activities;
- to take the programme of afforestation to the people, especially farmers and the landless as also increase the involvement of women;
- to secure widespread involvement of other governmental and non-governmental agencies;
- to place greater emphasis on the development of fuelwood and fodder; and
- to evolve ways and means of securing institutional support.

2. TARGETS AND POLICIES

2.1 Taking into account available funds, the total afforestation target for 1986-87 was fixed at 1.71 million hectares (corresponding to 342.84 crores seedlings). The achievement till the end of Jan. 87

was 1.72 million hectares (corresponding to 344 crores seedlings). Although sudden failure of monsoons in many States after the initial plantation activities caused a setback, it is expected that the target will be achieved.

2.2 Against the target for aerial seeding of 47,000 hectares the coverage reported so far is 52,192 hectares.

2.3 Decentralised Nurseries

The Decentralised Nurseries Programme introduced in 1986-87 was one of the most significant initiatives for taking the programme to the people. The target fixed under this programme was 115.55 crore seedlings including school nurseries.

2.4 School Nurseries

Highlights from some States where intensive monitoring has been done are as follows:

In Karnataka, 10,000 schools involving 16 lakhs



Fig. 8 A woman at work in her decentralised nursery



Fig. 9 Starting young—A school nursery in Meerut (U.P.)

children planted 22 lakhs seedlings during a special drive in August 1986. 96 school nurseries were planned for 1986-87. In Rajasthan, besides the existing 36 nurseries, about 135 more were planned for 1986-87 at the rate of five per District. In U.P. where presently there are 672 school nurseries, it is planned to have 10,000 in the current year. In Maharashtra, 140 nurseries were established till 1985-86 and 160 more are proposed. In Gujarat, 1000 school nurseries were planned for 1986-87 in addition to the existing 373 nurseries—the total production from which would be of the order of 1.5 to 2 crore seedlings.

A special 5% earmarking (Rs. 41.5 crores) from poverty alleviation funds for raising decentralised nurseries was secured. In an innovative move, NWDB have planned to raise over four crore saplings through decentralised people's nurseries by village milk cooperatives, through the agency of the National Dairy Development Board.

2.5 Tree Patta Scheme

While nine States have an on-going tree patta scheme

or a variant thereof, not all the States have reported up-to-date achievement. U.P. has reported 42,538 beneficiaries over 39,000 ha. Rajasthan has reported that 62,956 ha. have been leased out for afforestation purposes. The other States are being requested to take up the scheme and achieve results.

2.6 Following up on a National Conference of State Land Development Banks held in April 1986, a target of 21,000 ha of Wastelands to be afforested has been fixed. Karnataka has achieved 6,000 ha. The achievement in other States is being monitored.

2.7 Tree Grower's Cooperatives

2.7.1 In collaboration with the National Dairy Development Board, a Pilot project has been implemented to promote tree growers' cooperatives in 256 villages in eight districts of five States (Rajasthan, Gujarat, Andhra Pradesh, Orissa and Maharashtra).

2.7.2 All the State Cooperative Milk Federations have been addressed to involve the 49,022 primary village dairy cooperatives in the country to take up fodder plantations and nurseries for tree seedlings. A

joint project on village common lands and on the fields of small and marginal farmers is being worked out.

3. IDENTIFICATION OF WASTELANDS

3.1 In collaboration with the Planning Commission, State Governments and Expert Agencies, the definition and categorisation of wastelands has been finalised.

3.2 At a National Conference on Identification of Wastelands held on April 24, 1986, State Governments were advised to compile and send detailed information to NWDB about wastelands in these categories in at least 10% of their districts, by September 30, 1986. The States have been asked to complete the task in respect of the entire State by March 31, 1987.

3.3 Meanwhile, NWDB, in collaboration with the Department of Space, has finalised a Project to integrate remote sensing data, topographical maps from the Survey of India and village cadastral survey maps for a precise identification of wastelands down to the village level. This exercise is proposed to be carried out in 147 districts in 24 States/UTs which have more than 15% of their geographical areas as wastelands as per existing remote sensing data, and will cover about 30 million ha. of wastelands. It is a time-bound programme of 12 calendar months commenced in November, 1986. Phase I would be completed within three months of the start and would generate data in respect of 12 out of 147 districts. This would be a pioneering and a major step in the exercise on identification and extent of wastelands.

3.4 After such identification, NWDB proposes to involve the Agricultural Universities, select CSIR/ICAR research centres, Forestry and other specialised institutions to carry out Pilot projects on such identified wastelands, with a view to demonstrate techniques, formulate viable projects and identify location-specific species.

4. INSTITUTIONAL FINANCE

4.1 NABARD have extended their refinance facility for the development of wastelands to each Block of the country, whereas, earlier on, such programme for funding nurseries was confined only to about 19 districts of 11 States in the country. As on 31st December, 1986 financing done under the various NABARD afforestation schemes is Rs. 162.34 crores.

4.2 The Board, along with nine commercial banks, has funded the Agricultural Finance Corporation to draw up bankable projects for block areas of 1,000 hectares of wastelands identified in each of six selected States. These projects will enable the Board to offer them as Model Projects for execution on wastelands in not only the concerned States, but depending on similarity of agro-edaphic conditions, in other States as well.

5. EXTERNAL ASSISTANCE

There are 15 on-going externally assisted social forestry projects with funding by SIDA, WORLD BANK, USAID, CIDA, DANIDA and ODA. Funding of other Projects such as tree growers' cooperatives, voluntary action for wastelands development, school nurseries, and urban green belts is being actively explored.

6. AGRO-TECHNOLOGIES

6.1 A Standing Committee of NWDB and CSIR has been constituted to coordinate research work for appropriate agro-technologies for wastelands development.

6.2 In the first round, promotion of the polymer Jalashakti developed by National Chemical Laboratory (NCL) with particular reference to its use in seeding arid areas, pelletisation for aerial seeding and promotion of Jojoba and Salvadora for coastal and saline areas has been taken up.

6.3 Promotion of vetiver grass for soil conservation in highly eroded areas is also being undertaken.

6.4 Nine laboratories of the CSIR are involved in such projects, with a view to develop location-specific technologies, to be tested in field trials all over the country in the next year.

6.5 A NABARD funded project being carried out by National Chemical Laboratory for tissue culture and clonal multiplication is being actively monitored.

6.6 The formulation of projects for coastal development in 10 coastal States and two islands of the country is under discussion with the Department of Ocean Development.

7. MONITORING & EVALUATION

7.1 With a view to streamline reporting procedures and formats, as well as to ensure effective monitoring

and evaluation, a Red Book (An Operational Guide to the Monitoring and Evaluation of Social Forestry in India) has been prepared by the Board with the collaboration of FAO and World Bank.

7.2 Steps to instal computers in 26 States/Union Territories of India, and linking them to the computer at the Board's Headquarters which, in turn, would be linked to the Central Computer at NICNET have been initiated. The system is expected to be operational in three States by the end of 1987 with CMC having been given a turnkey job.

8. COMMUNICATION

8.1 Five regional workshops were held with the media representatives to create awareness and disseminate the Board's policies and programmes which resulted in considerable awareness and action projects.

8.2 A leading journalist had been commissioned to visit a number of voluntary agencies to gain an insight into afforestation problems from the people's point of view and also to disseminate information.

8.3 Efforts to produce video films on outstanding examples of individual efforts as well as community afforestation are on.

9. GRANT-IN-AID TO VOLUNTARY AGENCIES

From the commencement of the Grant-in-Aid Programme, 75 voluntary agencies have been sanctioned grants-in-aid of Rs. 6.90 crores for demonstration, block plantation, nursery raising, seedling distribution and awareness raising activities in support of the Wastelands Development Programme.

10. COMMITTEES

The National Wastelands Development Board has received the reports from high powered Committees, set up to examine the following subjects and make policy recommendations for the Government:

—Current demand, supply availability and future patterns of demand supply and production of fuel-wood in the country;

—Current demand, supply, availability and future patterns of demand supply and production of fodder and grasses in the country;

—Legal provisions relating to cutting, removal, transportation and storage of trees and forest produce with a view to streamline the same and promote people's participation in forestry; and

—Involvement of industry in wastelands development.

11. GENERAL

11.1 The National Wastelands Development Board met twice during the year.

11.2 World Environment Day was celebrated on June 5, with the plantation of a Tree for Peace at Shaktisthal by the Prime Minister.

11.3 A massive tree plantation at Shaktisthal on July 31 by 5,000 school children of Delhi was followed by nearly 1 lakh more children planting trees in their schools, homes and public places on the same day. Similar functions were also held in various States with school children and other educational institutions.

12. SPECIAL EVENTS

12.1 In recognition of the contribution made by late Prime Minister Smt. Indira Gandhi, an Award entitled "Indira Priyadarshini Vrikshmitra Award" was instituted during the year to promote eco-development and afforestation. The Awards are made to outstanding individuals, panchayats, schools, voluntary agencies (including Mahila Mandals, Yuvak Mandals and the like), industry and cooperatives.

12.2 The first Awards were presented on November 19, 1986 by the Prime Minister to the following 26 Awardees:—

—7 Voluntary Agencies;

—11 Individuals;

—2 Panchayats;

—1 School;

—2 Cooperatives;

—1 Bank,

—1 Industrial Unit; and

—1 Municipal Corporation.

1. INDIAN BOARD FOR WILDLIFE

Pursuant to the recommendations made in the XVII meeting of the Indian Board for Wildlife (IBWL) held in September, 1985 under the chairmanship of the Prime Minister, action has been initiated on their implementation and has led to notification of a number of National Parks and Sanctuaries, chief amongst them being Rajaji, Neora Valley and Nameri. At the insistence of this Department, followed up by a decision to only fund sanctuaries and national parks which have been placed under the control and management of the Chief Wildlife Wardens, most States/Union Territories have transferred the control of their Wildlife areas alongwith the territorial staff to the Wildlife organisations.

The Standing Committee of IBWL met twice on 7th April, 1986 and 17th June, 1986 to consider the revision of the schedules to the Wild Life (Protection) Act, 1972. On the basis of these deliberations, Schedules I and II to the Act have been revised and so notified.

2. NATIONAL WILDLIFE ACTION PLAN

Action has been initiated on the main components of the National Wildlife Action Plan. The Central Directorate of Wildlife Preservation and Wildlife Institute of India, Dehradun, are the nodal agencies for initiating and monitoring programmes and projects envisaged under the plan with the help of States and Union Territories, who are directly responsible for the actual protection and management of wildlife in the country. Cooperation of other governmental and non-governmental agencies has also been enlisted.

The implementation of the National Wildlife Action Plan continues to be the Central theme of Wildlife conservation programmes in the VII Plan. The salient features of the steps initiated on the components of the Action Plan are:

- Management Plans of wildlife reserves are being drawn on the basis of guidelines given by the Department;
- The Wildlife (Protection) Act, 1972 has been amended and the enforcement of the amendment notified with a view to prohibit trade in endangered species of wild animals and derivatives thereof. Schedule I and II of the Act have also been revised. Certain notified Government of Indian

undertakings have been specifically exempted to enable them to acquire stocks from traders and manufacture articles solely for export. A Centrally sponsored scheme providing assistance on 50:50 cost sharing basis between the Centre and State/UT for identified non-recurring items of expenditure for the control of poaching and illegal trade has also been initiated in 1986-87 under the VII Five Year Plan. The Central outlay for the scheme has been enhanced to Rs 18.00 lakhs from Rs 0.50 lakhs earmarked for last year;

- Captive breeding and rehabilitation programmes including the rhino re-introduction programme and the white-winged wood duck breeding scheme have continued successfully. A centrally Sponsored Scheme to provide 'assistance for captive breeding and rehabilitation of endangered species' was initiated this year with Central outlay of Rs 6.00 lakhs to enhance and supplement the efforts of the States and Union Territories in this direction. The pattern of assistance being 50:50 cost sharing between the Centre and the State/UT on identified items of non-recurring expenditure;
- Model nature interpretation facilities are being developed in some zoos and reserves. A new Centrally Sponsored Scheme for providing 'assistance for wildlife education and interpretation programmes' to that States and Union Territories has been initiated this year with an outlay of Rs 15.00 lakhs. The intention of the scheme is the development of facilities at some of our more frequently visited national parks and sanctuaries that would expose the visitors to the importance of nature conservation and its significance. Under the scheme, Centre provides 50% funding for approved items of non-recurring expenditure for development of such facilities.

3. WILDLIFE PROTECTION

Forest Departments/Wildlife Organisations are entrusted with the responsibility for the protection of their wildlife through the implementation of the Wild Life (Protection) Act, 1972. There are, in addition, four regional wildlife preservation offices headed by Regional Deputy Directors, one each at Delhi, Bombay, Calcutta and Madras. They assist in wildlife protection in discharging their duties assigned under the Wildlife (Protection) Act, 1972 and in enforcing trade/commerce and import-export regulations. Responsibility for the enforcement of the convention on International Trade in Endangered Species of Wild



Fig. 10 Great Indian Rhinoceros, Kaziranga National Park

Fauna and Flora is also entrusted to them. These regional offices work under the direction and control of the Director, Wildlife Preservation, Govt. of India. A number of cases of violation of the Act and of import-export regulations have been detected and action initiated by these regional offices as per the procedures laid down under the law.

For better enforcement and implementation of the Wildlife Act, a scheme for strengthening Central Wildlife Organisation has been approved under which three sub-regional wildlife preservation offices headed by Asstt. Directors are being established at Cochin, Pathankot and Shillong. The matter of imposing complete ban on the export of frog legs has been taken up with the Ministry of Commerce.

To exercise a more effective control on trade and taxidermy of endangered species of wildlife and products derived therefrom, the Wild Life (Protection) Act, 1972 was amended by Parliament in 1986, whereby trade in certain listed species was completely banned and the traders were given certain time-limit to dispose off their existing stocks.

4. PROJECT TIGER

The Centrally Sponsored Plan Scheme 'Project Tiger' was initiated on 1st April, 1973 and is continuing in the VII Five Year Plan. Its objectives are:

- 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.

To achieve these objectives, 15 Tiger Reserves have so far been established in 12 States. (These Tiger Reserves cover about 25,000 sq. km forest area. The names and areas of the Tiger Reserves are given in Table 11. The population of tigers in various Tiger Reserves is given in Table 12. The Project Tiger has an approved outlay of Rs 10.60 crores for the VII Five Year Plan period with Rs 2 crores (approx.) for the financial year 1986-87.

TABLE 11

STATEMENT GIVING NAMES OF TIGER RESERVES & THEIR RESPECTIVE AREAS

Name of the Reserve and State	Year of formation	Initial area (in sq. kms.)		Present area (in sq. kms.)		Legal status at present	
		Total	Core	Total	Core	Core	Buffer
1	2	3	4	5	6	7	8
Bandipur (Karnataka)	73-74	690	335	866	523	NP	NP
Corbett (UP)	73-74	520	320	520	320	NP	NP
Kanha (MP)	73-74	1208	935	1945	940	NP	GR
Manas (Assam)	73-74	2840	391	2840	391	SA	RF
Melghat (Maharashtra)	73-74	1571	311	1571	311	SA	RF
Palamau (Bihar)	73-74	930	200	930	231	NP	GF
Ranthambhore (Rajasthan)	73-74	825	167	825	392	NP	—
Simlipal (Orissa)	73-74	2250	301	2250	846	NP	SA
Sunderbans (WB)	73-74	2585	1330	2585	1330	NP	SA
Total upto	73-74	13486	4290				
Periyar (Kerala)	78-79	777	350	777	350	NP	SA
Sariska (Rajasthan)	78-79	800	498	800	498	NP	SA
Total upto	78-79	15073	5138				
Buxa (West Bengal)	82-83	745	313	745	313	SA	RF
Indravati (MP)	82-83	2799	1258	2799	1258	NP	SA
Nagarjunsagar (Andhra Pradesh)	82-83	3560	1200	3560	1200	SA	SA
Namdapha (Arunachal Pradesh)	82-83	1808	695	1985	1808	NP	NP
Total upto	85-86			24998	10711		

NP—National Park SA—Sanctuary GR—Game Reserve
RF—Reserve Forest GF—Government Forest

TABLE 12
STATEMENT SHOWING POPULATION OF TIGERS IN
TIGER RESERVES

Name of the Reserve & State	Tiger Population in		
	1972	1979	1984
Simlipal (Orissa)	17*	65	71
Palamau (Bihar)	22	37	62
Bandipur (Karnataka)	10	39	53
Kanha (Madhya Pradesh)	43	71	109
Melghat (Maharashtra)	27	63	80
Ranthambhore (Rajasthan)	14	25	38
Corbett (Uttar Pradesh)	44	84	90
Sunderbans (West Bengal)	60*	205	264
Manas (Assam)	31	69	123
Periyar (Kerala)	—	34	44
Sariska (Rajasthan)	—	19	26
Buxa (West Bengal)	—	—	15
Indravati (Madhya Pradesh)	—	—	38
Nagarjunsagar (Andhra Pradesh)	—	—	65
Namdapha (Arunachal Pradesh)	—	—	43
Total	268	711	1121

*Whole area could not be covered during census

During 1986-87, the pattern of Central assistance to be provided to the State Governments was changed from a cost-sharing basis between the State and the Centre to a 100% grant on items of non-recurring expenditure approved for the management of tiger reserves.

The main works to be carried out under the Scheme during the year include construction of buildings, e.g. research laboratories, interpretation centres, museums, development of roads and wireless communication, provision of scientific and other equipments including arms and ammunition, development of water facilities, shifting of villages and cattle camps, eradication of exotic weeds like lantana, eupatorium, improvement of pasture land, fire protection, maintenance of firelines and roads, compensation to cattle owners, research activities, monitoring of flora and fauna, training of staff, publicity and extension activities.

The break-up of the amount of Rs. 200.00 lakhs

provided for Project Tiger during current financial year is as follows:

	(Rs. in Lakhs)
1. Assistance to 15 Tiger Reserves in States	195.00
2. Headquarters	5.00
Total	200.00

The Steering Committee held its 26th and 27th meetings in August and December 1986 respectively. In its 26th meeting, the establishment of 16th Tiger Reserve in Uttar Pradesh was recommended with Dudhwa National Park and Kishanpur Sanctuary as its core areas. In the 27th meeting, the inclusion of research work (both recurring and non-recurring items) in Tiger Reserves for 100% Central assistance was recommended. This will have far reaching effects in promoting field-oriented wildlife research in India.

Another significant feature has been the marked

decline in man-eating tigers in Sunderbans Tiger Reserve this year which may be attributed to the better protection measures thereby lessening the ingress of human beings into tiger territory. The success may also be in fact due to an experiment currently under way in Sunderbans in which electrically charged dummies of wood-cutter, honey gatherer, fisherman, etc. have been placed at strategic locations which give a non-fatal stunning electric shock to the tiger when it touches them. The tiger is thus taught to keep away from human beings. As a result of these measures the average number of man-eating cases in Sunderbans which was 49 per annum before the inception of the Project Tiger in 1973 has dropped down to 23 per annum in recent years.

5. CONSERVATION PROGRAMMES

5.1 National Parks and Sanctuaries

On the basis of an all India survey of national parks and sanctuaries, the Directory on national parks and sanctuaries has been prepared. At present there are



Fig. 11 The Central Indian Barasingha, Kanha National Park



Fig. 12 The Blackbuck owes greatly to the religious sentiments of the people

59 national parks and 254 sanctuaries in the country covering an area of about 1,32,000 sq. kms. which is roughly 4 per cent of the total geographical area and about 15% of the total forest area of the country. This represents an increase of 6 national parks and 7 sanctuaries and an addition of about 32,000 sq. kms of area under protected areas during the year. Two separate Centrally Sponsored Schemes viz. 'Assistance for the development of national parks' and 'Assistance for the development of sanctuaries' are being implemented in the VII Plan to supplement the efforts of the States and Union Territories for management of their protected areas. The pattern of financial assistance under the schemes has been upgraded this year and now provides for 100% Central assistance for non-recurring items of expenditure under both the schemes. However, for the recurring items of expenditure while there is no provision of Central assistance for sanctuaries, the national parks may be provided 50% assistance in such items. The outlays for the two schemes have also been substantially enhanced this year. For the national

parks the outlay is Rs. 100 lakhs compared to Rs. 47 lakhs last year and for sanctuaries, it is Rs. 120 lakhs compared to Rs. 50 lakhs last year.

5.2 Zoological Parks

Padmaja Naidu Himalayan Zoological Park

This zoological park at Darjeeling is a grant-in-aid scheme under the administrative control of the Govt of West Bengal. The Central Govt. provides grant-in-aid for development, improvement and preservation of landscape, habitat and wildlife and display of a cross section of the Himalayan fauna, farming, rearing and breeding of endangered and dwindling species of Himalayan wildlife and for ensuring multiplication and conservation of species. A pair of snow leopards has been acquired by the park for breeding of this highly endangered species. Against a total grant of Rs. 10.30 lakhs last year covering both plan and non-plan budget, the provision for the current year is Rs. 12.00 lakhs.

National Zoological Park

The park in addition to activities of conservation education, display and recreation of the public, continued its efforts towards captive breeding of endangered species. Enclosures have been constructed for new species. Emphasis is on keeping the animals in surroundings similar to that in the wild as far as possible. Programmes of painting, drawing, essay writing and participation in nature study were conducted for children.

5.3 Assistance for Development of Zoos and Establishment of a Model Zoo

Under this scheme assistance is provided to the State Governments for education programmes, research activities, sanitation and veterinary facilities, display methods, public amenities and training of personnel and construction works. In the current year the budget provision for this scheme has been enhanced to Rs. 18.00 lakhs compared to an outlay of Rs. 15.00 lakhs last year. The pattern of assistance being 50% funding

of all approved items of expenditure. The Department, however, is not encouraging establishment of mini zoos with inadequate facilities.

5.4 Other Projects

A Centrally Sponsored Scheme 'Conservation of Rhinos in Assam' with an outlay of Rs. 40.00 lakhs has been introduced this year to provide assistance to the Government of Assam for the protection of the rhino and its habitats in Assam. The scheme provides for 100% funding on all identified items of expenditure both recurring and non-recurring.

In the Fifth International Show Leopard Symposium held in October, 1986 in Srinagar it was decided to start a 'Snow Leopard Project' on the lines of 'Project Tiger'. The concerned States were requested to prepare proposals for central assistance for this purpose. Some proposals have been received and are being examined. A survey of snow leopard has already been taken up under the aegis of the Wildlife Institute of India.

1. ENVIRONMENTAL RESEARCH PROGRAMME

The main functions of this programme are to develop strategies for sustainable resource management and create facilities and trained manpower to conduct environmental research in the country. Major programmes include:

- Integrated Action Oriented Eco-development Research Programmes on
 - Western Ghats
 - Eastern Ghats
 - Himalayan Region
 - River Ganga
- All India Coordinated Research Projects on
 - Ethnobiology
 - Air Pollution and Plants
 - Conservation of Endangered Plant Species (Seed Biology and Tissue Culture)
 - Heavy Metals.

Apart from the above, a number of smaller location-specific research projects have been initiated. Two research committees, namely, the Indian National Man and the Biosphere Committee (MAB) and Environment Research Committee (ERC) make recommendations on priority areas for environmental research, scrutinise research proposals received from various research institutions, evaluate the progress and recommend suitable means for implementation of research projects.

1.1 Research Priorities

On the basis of a review of research programmes undertaken in the past and an assessment of future requirements, a profile identifying the priority areas of research has been drawn up.

The plan of action is being considered under the five fundamental elements viz. land, water, air, space and energy, with two basic approaches for study viz. the ecosystems management and the ecological aspects.

The ecosystems include the mountains, forests, wetlands, mangroves, islands and coastal areas, arid and semi-arid zones, rivers and river basins. Similarly the management and technological aspects include monitoring and control, development process systems and instruments, health and toxicology, impact assessment and management.

These elements, though separate, are not mutually

exclusive and the different programmes have been integrated under a broad canvas of the research plan.

1.2 Environment Research Committee (ERC)

The Environment Research Committee has approved the following projects during the year:

- Level of air pollution and its effect on the health of workers and general population in Lodha-Bagdigi, Bararee Fire Area in Jharia Coal Field;
- Photo decomposition of DDT and HCH;
- Studies on bioconversion of domestic and industrial wastes through bio-gas;
- Interaction of electro-magnetic fields with biosphere with special reference to effects on living systems;
- Studies on the effect of Mercury compounds on soil bacteria;
- Dispersion of air pollutants and its control by green belts;
- Role of earthworms in the decomposer system and its comparative aspects as well as earth-worms in soil fertility in agro-ecosystem and wildlife park;
- X-Ray fluorescence study of aerosols and water samples;
- A study to evaluate and correlate the effects of pesticide exposure on humans and experimental animal with particular reference to their nutritional status;
- Microbial degradation of waste water from coal gasification industries in treatment plants;
- Safety evaluation of phototoxicity of environmental pollutants;
- Ecophysiological and biochemical studies on vegetation of heavy metal deposit in polluted regions;
- Development and application of physico-chemical speciation schemes for assessment of environmental impact of heavy metals with special reference to chromium, cadmium, lead and mercury;
- Impact of agro-chemicals and carpet industrial effluents on eco-terrestrial environments with particular emphasis on bionomics, human health and safety value;
- Environmental impact of lead-zinc mining workers—a genetic and chromosomal study;
- Microbial degradation of some basic organic chemicals present in waste water of dye industries;
- Ecological studies in relation to micro-organism in various fresh water bodies in and around Hyderabad;
- Biochemical mechanism of functional toxicity of

propane 1, 2-dio on unsuspected environmental hazards;

- Air Pollution due to fugitive and stack emission from thermal power plants;
- Environmental improvement in and around Santiniketan;
- Monitoring and surveillance of residues of organochlorine pesticides and heavy metals in fishes from selected environmental components of Madhya Pradesh and Rajasthan;
- Study on removal of lignin/color from pulp and paper mills waste by biodegradation on waste cellulosic materials during anaerobic conditions; and
- Soil exchange due to deforestation and cultivation: A case study in Simlipal National Park.

The following 11 projects were completed during the year:

- The application of X-Ray fluorescence technique to some multi-disciplinary areas.
- Monitoring of pesticides pollution in food, vegetable, soil, water, cow, buffalo and human-milk and tissue and meat of animals in the jurisdiction of Marathwada Agricultural University;
- The effect of sulphur dioxide on plants;
- Socio-economic and cultural impact on environmental changes due to industrialisation in rural areas;
- Design of simulated model system for the study of pesticides in the environment;
- Studies on the effects of cement dust pollution on plants;
- Physiological responses of fresh water biota to pollutants identification of bio-monitors and development of bioindices;
- A study of estuarine environment of major Indian rivers;
- To study the chemistry and biology of lake sediments;
- Study of pollution load and water quality of Mahanadi Water System; and
- A retrospective study to identify trends, incidence of cancer attributable to environmental factors.

1.2.1 Integrated Projects on Heavy Metals

The work on this project is proceeding as per schedule in all the six identified institutions.

A workshop was also organised to assess the progress in these projects in May, 1986. The analysis of samples has been completed and the results will be

discussed in a workshop to be shortly organised.

1.3 Programme on Man and the Biosphere (MAB)

The multidisciplinary MAB programme seeks to promote scientific basis and to solve the practical problems of resource management through an understanding of the structure and function of the ecosystem and systematic monitoring of the impact of human activities on the biosphere and vice-versa.

During the year, the following 14 research proposals were approved for financial support:

- Impact of mining on the living and fossil flora of Rajmahal hills (Bihar);
- Conservation of folk/tribal medicines of Kerala;
- Allelopathic properties of Eucalyptus;
- Impact of development activities and changing environment on demogenetic composition of human populations of Garhwal, U.P.;
- Ecological impact of biotic factors on large scale mortality of sal trees in Madhya Pradesh;
- Ecological studies on grazing lands with special reference to stone quarries and sand-mine areas at Shankargarh, Dist. Allahabad;
- Eco-development of arid lands with non-agricultural economic plants;
- Conservation of historic town—case study of Ayodhya;
- Development of conservation and management of Black Buck in Andhra Pradesh;
- Effect of pesticides on Rhizobium-legume association;
- Studies on the environment biology of Himalayan orchids;
- An ethno-biological survey of the Boro tribes of Assam;
- Environment, human settlement and human activities in Jammu and Kashmir with special reference to Ladakh; and
- Studies on the upper lake of Bhopal for hygienic and economic management.

The following 4 research projects were completed during the year:

- Assessment of soil deterioration due to irrigation by Saryu Canal project and to find methods of control;
- Structure and functioning of natural and modified grassland ecosystem of Western Garhwal Himalayas;
- Study of vegetation and flora in marshy areas of

Dudhwa National Park, Lakhimpur Kheri (Distt. U.P.); and

- Impact of human activities on the organic productivity of grasslands from arid zone to moist humid areas.

1.3.1 Integrated Research Programmes

1.3.1.1 Air Pollution and Plants

The Department has initiated an integrated project to study plant responses to air pollutants with special reference to SO₂ and particulate air pollutants in urban and industrial areas. The basic theme is to use plants for indicating, monitoring and controlling pollution.

The detailed objectives include:

- Standardization for phytomonitoring of air pollutants in urban-industrial areas;
- Study of impact of SO₂ and particulate matter of urban industrial origin on plants;
- Assessment of the efficiency of plant canopies to remove air pollutants from ambient air;
- Study of tree canopy types with reference to air pollutants;
- Identification of resistant and sensitive plant species on the basis of visual symptoms;
- Biomonitoring of SO₂, hydrocarbons, fluorides and certain heavy metals;
- Studies of the effects of pollutant deposition on soil productivity;
- Study of pollution sink efficiency, growth response and productivity patterns of plants with respect to SO₂ and fly ash; and
- Study of the effect of fly-ash and cement dust on physiological and biochemical aspects of plants and evaluation of plants for their responses to continuous exposures to low level pollutants.

The Centres participating in this project are:

- Banaras Hindu University, Varanasi;
- Institute of Science, Bombay;
- National Environmental Engineering Research Institute, Nagpur;
- Vikram University, Ujjain;
- University of Calcutta;
- Botanical Survey of India, Calcutta;
- Jawaharlal Nehru University, New Delhi; and
- National Botanical Research Institute, Lucknow.

A status report on air pollution and plants has been published.

1.3.1.2 Beas-Sutlej Link Project

The Department launched, in 1983, a comprehensive project in Beas and Sutlej river basins in Himachal Pradesh involving Himachal Pradesh Agricultural University, Indian Council of Agricultural Research, Zoological Survey of India and Botanical Survey of India. The broad objective is to study the ecological impact of dam construction and generating scientific knowledge which could eliminate/minimise adverse ecological effects in constructing such dams in future.

The following six sub-projects have been launched for an indepth study on the impact of construction and completion of Beas Sutlej Link Project (Stages I & II).

- Changes in human lifestyle, agro-economic and socio-economic status;
- Changes in the land-use including agriculture, horticulture, forestry and pasture;
- Changes in climate conditions and hydrology;
- Status of physical edaphology including soil erosion;
- Changes in diseases and insect-pests of crops; and
- Microbial and protozoan infection of wild birds and animals including domesticated animals as well as human beings.

The study area of the Project covers the Beas river catchment falling within the territorial jurisdiction of Himachal Pradesh as well as the link area between Pandoh Dam and Slapper Power Station.

1.3.1.3 All India Coordinated Research Project on Ethnobiology

The aim of this project is to understand the inter-relationships/association of tribal communities with their surrounding environment especially with plants and animals.

The main objectives of the programme are:

- Survey, collection, documentation of folklore knowledge system of the tribals of the country and preparation of an inventory of their biological resource utilisation pattern;
- Conservation/preservation of the rare wild plants cultivated/used by the tribals;

- Study of the impact of tribal activities on vegetation and wildlife; and
- Scientific investigations on phytochemical, nutritional and pharmacological aspects of the plants used by tribals for basic needs.

About 50% of the tribal areas have so far been covered.

Inventories of plants that can be incorporated into the social forestry programmes have been prepared. These have been discussed and finalised in the Annual Workshop held at Coimbatore in November, 1985. Raising of such plants will cater to the daily needs of the tribals. Some herbs, threatened due to indiscriminate exploitation, have been identified and conservation strategies have been drawn up particularly recommending their commercial production. The techniques for their cultivation are being improved.

A compendium of low cost-low energy appropriate technology has been prepared. The technologies suggested for promotion tend to utilize the local resources and are suited to the geographic, climatic, social and economic conditions of the tribal and poor people in various parts of the country.

A study of the local herbs used in traditional folk medicine has yielded significant results.

A high lecithin-containing wild relative of *Vigna* has been discovered in Kashmir. Lecithin, an important chemical for the food and pharmaceutical industry, is presently being imported to meet the local demand.

Phytochemical and pharmacological screening of over 700 wild plants has led to the isolation of an active compound against rheumatoid arthritis and inflammation from four plants. Detailed pharmacological and clinical studies are now being conducted to develop an effective drug.

1.3.1.4 All India Coordinated Research Programmes—Conservation of Endangered Plant Species—Seed Biology and Tissue Culture Programme

The project envisages investigations on 62 plant species of high herbal/medicinal and ornamental importance with a view to develop strategies of conservation in their natural habitats as also development and standardisation of tissue culture techniques for mass multiplication and cultivation.

During the year, investigations on 28 species have been initiated at the following centres:

- Department of Botany, University of Delhi, Delhi;
- High Altitude Plant Physiology Research Centre, Department of Botany, Garhwal University, Srinagar (UP);
- Regional Research Laboratory, Jammu;
- National Chemical Laboratory, Pune;
- Department of Botany, North Eastern Hill University, Shillong;
- Centre for Advanced Study, Department of Botany, Punjab University, Chandigarh;
- Department of Botany, University of Calcutta, Calcutta; and
- Central Institute of Medicinal and Aromatic Plants, Lucknow.

1.4 Integrated Action-Oriented Eco-Development Research Programme

1.4.1 Western Ghats

The main objective of the programme is to generate scientific and technical know-how which will be applied to action projects on the ground for preservation of ecological balance and to bring the benefits of development to the people of Western Ghats especially, the weaker sections of the society. So far, under the programme, 74 projects have been undertaken on various priority areas as land use in relation to land capability aspects, interaction of human beings with forests, development of fuel, fodder and water resources, industrial development and its consequences, conservation and development of biological resources, human settlements and tribal welfare, environmental awareness and participation.

Thirty-three proposals were considered by the Working Group, out of which the following three projects were approved for funding:

- Eco-development of selected micro-catchments in the Bedthi-Aghanashini River Basins of the Uttara Kannada District of Karnataka State;
- Response of plant species to the mining sites situated at Pale and Sirigao; and
- A Pilot Project to restore the biological diversity in one of the critical areas of Western Ghats, with a view to improve the quality of vegetation, check erosion and consequent silting up of an irrigation reservoir and also to demonstrate to local people usefulness and benefits of horticulture and forestry.

The following seven research projects were completed during the year:—

- River metamorphosis due to human intervention;
- A comparative ecological study of soil, climate, micro-organisms, epiphytes and weeds of deforested and afforested areas of Dakshina Kannada area of Western Ghats region;
- A study of economic and ecological impact of development project induced deforestation in Ambi river valley (Pune District);
- Impact of selection of felling in forest ecosystem in Kerala;
- Restoration of degraded environment in Chembaked Tribal Colony area;
- Floristic studies on sacred groves in Western Ghats region of Maharashtra; and
- Impact of development projects on the forest dependent population—a case study of Wynad district in Kerala.

1.4.2 Eastern Ghats

A programme to generate reliable scientific data for management of natural resources on sustainable basis and to arrest continuing degradation of the environment in the area has been initiated with the following objectives:

- Natural Resources Data Management System;
- Dynamics of soil management, particularly dealing with grazing lands ecosystem, soil fertility management, cropping etc;
- Water resources management at micro watershed level in the Eastern Ghats;
- Impact of mineral wastes on ecogenetic system—flora and fauna in the Eastern Ghats;
- Lake and estuarine systems and wetlands of Eastern Ghats;
- Man and ecosystem dealing with man and environment taking into cognizance the human interference and the balanced development of forest dwelling communities to preserve and promote the ecosystem;
- Energy resource eco-development in the Eastern Ghats;
- Forest and vegetative cover including ethnobiology;
- Survey and ecology of plant and animal germ-plasm to bridge gaps in knowledge pertaining to quality and quantity of these living resources; and
- Conservation of beaches and offshore wetlands.

16 research projects at a total cost of about Rs. 80 lakhs were initiated.

1.4.3 Himalayan Region

The Programme was initiated by the Planning Commission during 1981-82 and transferred to this Department during 1983. The programme envisages conservation of natural resources and solving of local problems through field action projects for sustained economic development and social well being of the local people. The major thrust areas under the programme are:

- Creation of nurseries and seedling banks;
- Identifying alternate use of land through demonstration and action programmes;
- Watershed management;
- Zoning of landslide hazard areas and suggesting measures for stabilisation of slopes, prevention of landslides, and evolving early warning systems;
- Study of ecosystems;
- Suggesting measures for conservation of water resources;
- Survey and analysis of socio-economic problems and suggesting measures for optimal utilization of local resources; and
- Environmental awareness and student participation.

So far, 71 projects have been sponsored, out of which work on 18 have been completed during the year. 34 projects have been received and considered, out of which 10 have been recommended by the expert committee and are being considered for financial support. A two-day workshop has been held at Shimla to review the progress of work under various projects.

1.4.4 River Ganga

This programme at present is being conducted in thirteen Universities and one College, and 44 projects are in progress. A meeting has been held to review the progress of the projects and also ways to coordinate the results achieved in these projects with the Ganga Action Plan.

A Workshop has been held in Bhagalpur in September, 1986 to consider the overall progress of the individual projects and to chalk out a future course of action.

Two manuals, one each for chemical and biological analysis of the projects have been prepared for circulation to all the Principal Investigators.

Programmes of two Universities for the middle

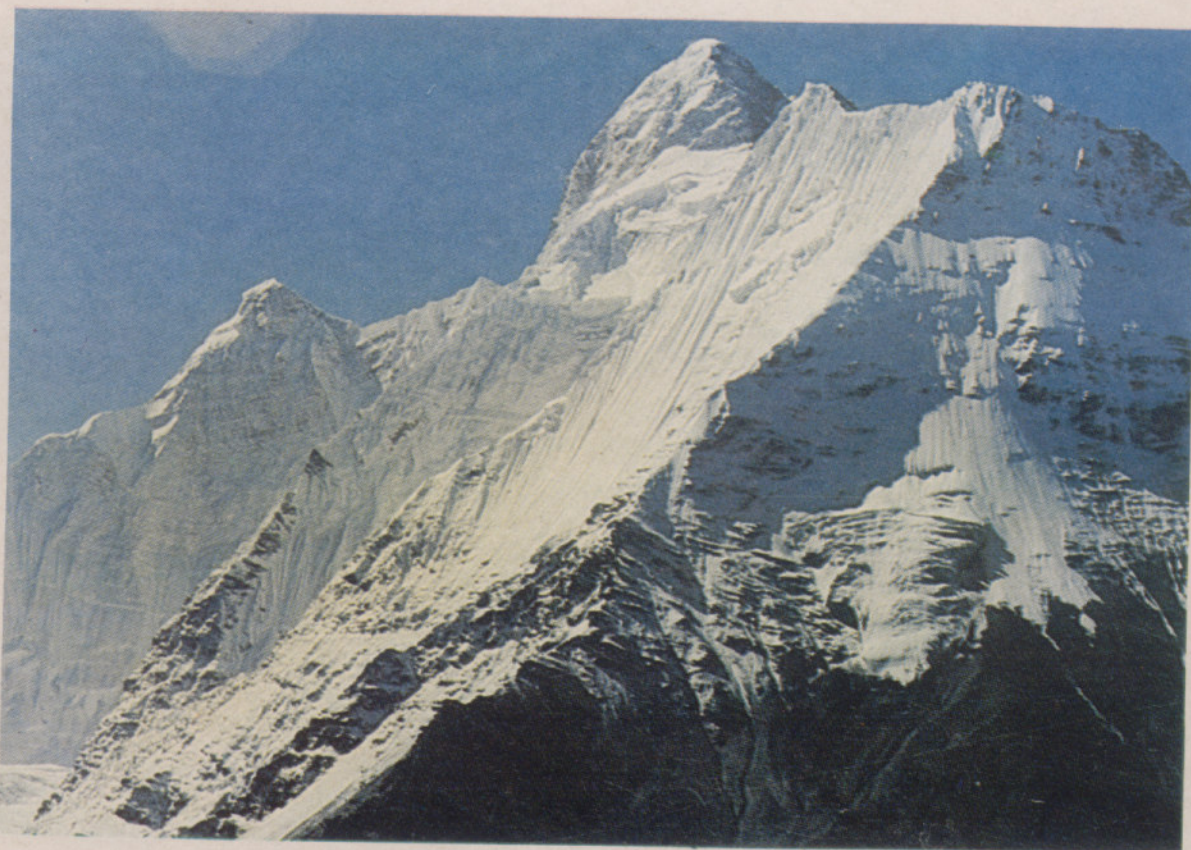


Fig. 13 Nanda Devi Peak—A view

stretch of the river have been approved and an expert committee has been constituted to identify, formulate and initiate research projects to achieve the objectives of Ganga Action Plan.

1.5 Biosphere Reserves

With the concurrence of the State Governments of Karnataka, Kerala and Tamil Nadu, the Nilgiri Biosphere Reserve has come into existence with effect from the 1st September, 1986. The Governments of Karnataka and Kerala have appointed the Directors for the Biosphere Reserve area falling in their States. Integrated action and management plans and identification of priority areas for research is being taken up in consultation with the State Governments. Funds will be released to the State Governments for approved items for expenditure on the basis of action plans.

Project document for Nanda Devi Biosphere Reserve will be taken up with the Government of 'U.P., while certain issues connected with Namdapha and

Nokrek Reserve remain to be sorted out. The project document for Uttarkhand Biosphere Reserve is being finalised. Preparation of project document for other identified areas are being taken up.

In order to facilitate the scientific management of Biosphere Reserves and help in the preparation of viable action plans for Nilgiri and other Biosphere Reserve areas to be set up in future, a National Symposium on Biosphere Reserves has been held in September, 1986 at Udhagamandalam, Tamil Nadu.

The main purpose was to obtain expert suggestions, ideas and proposals from scientists, conservationists, academicians, forest officials and administrators from the State, and Central Government on various aspects covering management, education, research, eco-restoration and systematic utilisation of resources of the Biosphere Reserves. 80 participants took part in the deliberations. A total of 28 papers were presented and discussed in detail. Some delegates from foreign countries where the Biosphere Reserves have been in existence for some years, i.e.

Mexico, France, U.S.S.R. and U.S.A. attended and explained their experience on the management of Biosphere Reserves.

Valuable recommendations have been made on management and manpower development, Environmental Education, Research Priorities, Eco-regeneration and Systematic Reserve Utilisation. In particular, the Conference has emphasised that the Biosphere Reserve should be managed with reference to people's needs, through ecologically sound development and people's participation for achieving sustainable yield of natural resources. Proceedings of the Symposium including papers presented are being published.

1.6 All-India Co-ordinated Research Programme on Wetlands and Mangroves

1.6.1 Wetlands:

With a view to identifying priority areas for conservation, management and research, a new prog-

ramme of Wetland Management has been launched during the year. A Committee has been constituted for laying down policy guidelines and monitoring the programme. The All-India Survey to bring out a computerised inventory of the Wetlands is still in progress.

1.6.2 Mangroves:

Work on preparation of a state of the art report on Mangroves, guidelines for research and formulation of a scheme for an All India Coordinated project on Mangroves research is progressing under the guidance of the re-constituted National Mangroves Committee. Studies on Mangroves of Godavari Delta Complex and Mangroves Soils of Sunderbans Ecosystem have been taken on hand.

The Second Phase of the UNDP Project on Research and Training Pilot Programme on Mangrove Ecosystems in Asia and Oceania instituted to develop capabilities on conservation and use of Mangroves has commenced.



Fig. 14 A Snake bird (darter) in the Rangantithoo Lake, Mysore



Fig 15 Aerial roots (Pneumatophores) in the Sunderbans Mangroves

2. FORESTRY RESEARCH

Forestry Research is mainly the responsibility of the Forest Research Institute and Colleges (FRI&C), Dehradun and its regional stations. The existing set up of the Forest Research Institute and Colleges, Dehradun and the research programmes have been reviewed during the year. As a result of this in-depth study, research priorities have been clearly defined to make best use of scientific and technological inputs to achieve the twin objectives of forest management viz. conservation of natural forests and optimisation of production. Pursuant to the review, it has been decided to separate forestry research, education and training to strengthen each of these. The Indian Council of Forestry Research and Education has been set up to look after the forestry research. Education in forestry will be imparted by the State Agricultural Universities whereas in-service training would be the responsibility of the administrative department. There will however, be adequate linkages to ensure proper coordination. New sets of research priorities grouped appropriately under basic research, technology and

application have been identified. It has also been decided to revamp research set up by upgrading existing Regional Research Centres into full-fledged Forestry Research Institutes to cater to needs of different eco-geographic regions of the country. The Indian Council of Forestry Research and Education will oversee forestry research activities in these institutes and liaise with other Institutes/ Universities, industries etc. At the Forest Research Institute, Dehradun and its regional stations, following activities relating to research have been conducted:

2.1 Silviculture

- Storage of seeds of *Terminalia myriocarpa*, *Pinus roxburghii*, *Azadirachta indica*, *Hosoptelia integrifolia* and *Michelia champaca*;
- Nursery techniques of *Acadia albida*, *A. Catechu*, *Albizia falcataria*, *A. lebbek*, *A. procera*, *Acacia nilotica*, *Dendrocalamus strictus* and *Dalbergia sissoo*;
- Pre-sowing seed treatment of *Cinnamomum Camphora* and *Rhus parviflora*; and

- preparation of a bamboo identification guide, for which 36 species were studied.

2.2 Management

In the area of Management, diverse tables were prepared relating to

- Growth of *Shorea robusta* for Angul Division, Orissa;
- Volume of *Eucalyptus camallulensis*;
- Taper of *Terminalia tomentosa*; and
- Preparation of bark percentages of *Anogeissus latifolia*, *Boswellia serrata*, *Casurina equisetifolia*, *Pterocarpus marsupium*, and *Terminalia tomentosa* have been taken up.

2.3 Genetics

- Clonal multiplication of *Tectona grandis*, *Populus species*, *Eucalyptus species* and *Leucaena leucocephala* were taken up;
- A beginning was made in tissue culture of tree species, including Sandal; and
- Mutation breeding has also been taken up.

2.4 Forestry Soils

- Study of soils in relation to tree mortality was taken up in Haryana;
- Site indices were prepared for Eucalyptus plantations in Terai areas of Uttar Pradesh and Teak plantations of Kalimpong Division of West Bengal; and
- Litter studies on *Pinus roxburghii* and *P. wallichiana* were conducted.

2.5 Minor Forest Produce

- Comparative economy of resin tapping on *Pinus roxburghii* and *P. wallichiana*;
- Gum tapping techniques of *Acacia nilotica*, *Prosopis juliflora* and *Leucaena leucocephala*;
- Yield studies on oxalic acid from the bark of *Anogeissus latifolia*; and
- Investigations on drying of sal seed using solar energy were studied.

2.6 Forest Protection

- Defoliation of *Betula alroides* (bhojpatra) and

- control measures were recommended;
- Study and cataloguing of incidence of insect attack on seeds of 17 species;
- Study of Control of damping off of seedlings in nurseries through use of solar heaters;
- Monitoring of insect and fungal pests in different areas of the country; and
- Selection of trees having natural immunity to spike disease and their propagation.

2.7 Wood Sciences

- Studies on woods of 29 species of Fagaceae and 20 species of Euphorbiaceae were completed for preparation of Volume VI of the treatise on "Indian Woods";
- Studies for compilation of hand books on 12 species from Tamil Nadu, 4 from West Coast and 9 species from Bihar and Orissa were completed;
- Fibre structure of 17 plant raw materials for assessment of their suitability for paper manufacture was completed;
- 7159 specimens received from Government Departments, trade and industries were identified and reports furnished;
- Physical properties of timber of 10 species of trees and bamboos were evaluated;
- Studies on development of wire bound fruit boxes of wastewood were conducted; and
- Preservative formulations and their permeability in different timbers, engineering designs of timber structures, peeling qualities of four species and process parameters for high yield pulp from subabul were optimised.

3. WILDLIFE RESEARCH

3.1 Wildlife Institute of India

Research projects involving habitat evaluation, elephant movement, ecology of gharials and turtles, status of endangered species, animal behaviour, animal health and other ecological status are under way in different parts of the country. New projects concerning the ecology and status of endangered species like lion and snow leopard have also been initiated. The Universities have also been encouraged to take up such research projects coordinated by the Institute. Many scientific reports and 55 scientific papers have been published by the Institute during the year.

1. INTRODUCTION

Spread of environmental education, creation of awareness and dissemination of information are very crucial to protect environment effectively. There is an imperative need to give new dimension to various programmes on environmental education to have the greatest possible impact on all age groups of the country's population and concerned institutions through training programmes, seminars/symposia/workshops, exhibitions and eco-development camps etc. An Empowered Committee consisting of experts from all over the country has been constituted to guide the activities of the Department on environmental education and awareness. The Committee also considers various proposals received by the Department on environmental education as well as those received under the National Environment Awareness Campaign. The information needs of scientists, engineers, decision makers, policy makers etc. are being met by the Department's Environmental Information System (ENVIS) which consists of specialised Information Centres on diverse areas of environment all over the country with the focal point at the Department.

2. NATIONAL ENVIRONMENTAL AWARENESS CAMPAIGN (NEAC)

The Department launched a National Environmental Awareness Campaign in the middle of July 1986 with the objective of creating environmental awareness at all levels. The primary focus of the Campaign has been on the students, teachers and the general public. Other key target groups have been the people's elected representatives, professionals (engineers, corporators, managers, lawyers, etc.) and media personnel especially journalists. Several universities, voluntary agencies, non-governmental organisations/professional associations and societies, nature clubs, community action groups etc. from virtually every State and Union Territory have been involved in organising various environmentally related programmes. These programmes relate to seminars/symposia/workshops, training programmes, film/slide shows, essay competitions, rallies/performing arts etc. All possible media and target groups are being involved in the Campaign. Fortnightly TV programmes on environment are being telecast through Doordarshan since August, 1986. The emphasis during 1986 has mainly been on creating awareness on general aspects of environment.

2.1 National Environment Month as a part of the NEAC

As part of the NEAC, a National Environment Month was also organised during November 19 to December 18, 1986. Over 120 Non-Governmental organisations/voluntary agencies, cultural organisations/professional associations, Universities and other professional bodies were provided financial assistance for several activities as mentioned under NEAC to create environmental awareness. During the Environmental Month, the Centre for Environmental Education, Ahmedabad, a grants-in-aid organisation of the Department organised 46 workshops all over the country to create environmental awareness. An Empowered Committee of experts was constituted by the Department to examine/scrutinise various proposals received for the National Environment Month (NEM). The Committee constituted for NEM has now been expanded with more experts to guide the Department for the NEAC. The committee will also consider proposals received on environmental education.

3. ENVIRONMENTAL EDUCATION PROGRAMMES

During the year, the Department considered several proposals on environmental education and provided financial assistance to various organisations for the following projects.

- A State level training course on environmental education in Orissa;
- An environment & development programme with the rural poor in Karnataka;
- A training course on environmental education in the context of disasters in Orissa;
- An orientation programme on environmental science and management in Goa;
- Environmental Management Training Programmes at Administrative Staff College of India, Hyderabad;
- An environmental awareness programme at Visvabharati, Shantiniketan;
- Setting up of 50 eco-clubs in selected educational institutions in Madras city;
- 20 Environment Clubs in various schools of Andhra Pradesh;
- An All India Photographic Competition and Exhibition on Man and Environment;
- A bicycle powered one-man campaign for nature awareness in village and small town communities in Karnataka;

- An environmental training programme for teachers at Srinagar; and
- The 11th International Film Festival on Wildlife Films.

4. ENVIRONMENT FELLOWSHIPS/AWARDS

4.1 Pitambar Pant National Environment Fellowship Award.

In order to encourage and recognise excellence in every branch of research related to environmental science, the Department had instituted the Pitambar Pant National Environment Fellowship Award in 1978. During the year Prof. P. S. Ramakrishnan of Jawaharlal Nehru University was awarded the Fellowship for the year 1985 for work on ecology of shifting agriculture.

4.2 Indira Gandhi Paryavaran Puraskar

The Department has constituted during the year another National Award entitled 'Indira Gandhi Paryavaran Puraskar'. The Award is of the value of Rs. 1 lakh and will be awarded annually to any citizen of India or organisation for significant contribution in the field of environment. The Award will be given with effect from the year 1987 onwards.

5. CENTRE FOR EXCELLENCE FOR ENVIRONMENTAL EDUCATION

In order to strengthen research/training groups in Universities/institutes working in priority areas of environmental science and management, the Department has set up the following two Centres of Excellence:

1. Ecological Research and Training Centre at the Indian Institute of Science, Bangalore.
2. Centre for Environmental Education, Ahmedabad.

5.1 Ecological Research and Training Centre, Indian Institute of Science, Bangalore.

This Centre was set up in 1982 with the objective of conducting basic and applied research in ecological sciences of Western Ghats as well as on study programmes focussing training and development of educational material with special reference to air and water pollution. The Centre is conducting an ecosystem audit in Uttara Kannada District mainly on

biomass and demands for its various components. The Centre, on a pilot basis, is looking at the biological resource use by different households in the village of Masur. Resource use patterns of landless as well as the small farmers are being investigated. An ecodevelopment strategy is being worked out for the district. Special studies have been initiated on the requirements of fuel efficiencies of various fuel burning devices in Uttara Kannada Workshops have been organised on Nilgiri Biosphere Reserve and Management of Livestock Resources of Western Ghats. A National School on Conservation Biology has been organised in November, 1986. A slide/audio-visual show on Western Ghats has been prepared.

5.2 Centre for Environmental Education, Ahmedabad

This Centre has been established in 1984 to meet the country's need for creating high quality educational material and for propagating awareness among the children and urban/rural communities. The educational material developed by the Centre includes guide books and documents on the country's natural resources. The Centre has developed educational modules on 'pollution', 'exploring a tree', and 'exploring a pond' as teaching aids for school teachers. The Centre has published a hand-book on environmental education activities entitled 'Joy of Learning'. In addition, the Centre is bringing out a weekly 'Environmental News and Feature Service' articles from which are quite often published in various newspapers and magazines in a number of languages. The Centre continued to develop interpretative programme for the Kanha National Park in Madhya Pradesh and the National Zoological Park, Delhi. Besides, the Centre has also developed considerable material for a mobile exhibition aimed at rural audiences.

Under a joint Indo-US effort, the Centre has started work relating to environment education in various schools in India by development and use of television programming. Drawing on the available U.S. expertise in environmental education, series of TV programmes and related teaching materials are proposed to be developed under this collaborative venture.

6. NATIONAL MUSEUM OF NATURAL HISTORY, NEW DELHI (NMNH)

6.1 Exhibitions

- An exhibition entitled 'TIGER TIGER BURNING

BRIGHT—an Indian Wildlife Portfolio" at the Los Angeles County Museum, USA, and the New Mexico Museum of Natural History, Albuquerque, USA was organised as a part of the Festival of India exhibition in U.S.A.;

- A special exhibition highlighting the programmes, activities and achievements of the Department and emphasising present day environmental issues was organised for the benefit of the members of Parliament from 15.4.1986 to 20.4.1986; and
- Another special exhibition was organised at the Parliament House Annexe by the Department of Science and Technology of the Government of India on the occasion of a Seminar conducted by the Parliamentary Forum on Environment. The exhibition dealt with the importance of wildlife conservation along with screening of films and audio-visual programmes relevant to the theme.

6.2 New Galleries at the NMNH

Considerable progress was made in organising a new gallery on 'Conservation' and setting up an 'Activity

Room' for pre-school children. The museum also acquired the exhibits put up at the Teen Murti House on New Biology by the Department of Biotechnology. Work of setting up a permanent exhibition dealing with the Cell as the basic unit of life and emphasising the unity and diversity of living organism is in progress.

6.3 Museum of Natural History, Mysore

The NMNH has acquired 5-1/4 acres of land in Mysore for setting up a branch museum to promote environmental education. A project report has been drawn up and is being finalised. The work on this is expected to commence next year.

6.4 Education/Awareness Programmes

- The NMNH observed the World Environment Day and celebrated the 8th Anniversary of the Museum on 5th June, 1986. A special lecture on 'Larger Meaning of Environmental Consciousness' by the Chairman, University Grants Commission was



Fig. 16 Interactive Session with blind children at discovery room at the National Museum of Natural History

arranged. A month long summer programme launched on that day included 'Know Your Environment' for teenagers and nature painting and animal modelling for children. A booklet on the NMNH in braille for blind children prepared by the Museum was released by the Hon'ble Minister of State for Environment and Forests.

- “Wildlife Week” was observed from 1st to 7th October 1986. A nature painting contest was organised in which nearly 800 children participated. Special film shows on wildlife were also arranged along with other educational programmes.
- The School Loan Kit project of the Museum continued to provide curriculum oriented exhibit kits on biology and environment related topics to several schools to enrich class room teaching. A set of 45 more kits were added to the project.
- The Museum continued to offer monthly programmes for the handicapped children. These included programmes for the blind, deaf, dumb and physically handicapped children. A special week for the handicapped was also organised and a Braille Guide for blind children was prepared.
- A number of publications were brought out by the Museum including Nature Study Kit, Worksheets for children, Activity Guide for visitors to nature parks and Conservation Guides.
- The NMNH concluded its second training programme in Museology offering three different courses.
- The Museum attracted over 1,50,000 visitors during the year, which included a large number of school children and family groups.

7. FORESTRY EDUCATION

Prior to the year 1985-86 Degree Courses in Forestry were available only at the Birla Agricultural University, Ranchi. In 1985-86, these courses were introduced in five new State Agricultural Universities (SAU) with the Indian Council of Agricultural Research (ICAR) as the nodal agency. Introduction of B.Sc. (Forestry) courses in fourteen State Agricultural Universities is envisaged. Inclusion of forestry as an optional subject in nine SAUs is also envisaged. The Department has made provision for providing financial support to this education programme.

7.1 Forestry Training

Training of the Indian Forest Service (IFS) probationers and the State Forest Service (SFS) Officers is arranged by the Government of India through the Forest Research Institute and Colleges (FRI&C), Dehra Dun. The Colleges are run by the State Forest Departments. The Government, however, reviewed the existing forestry training system and have decided to transfer the Rangers Training Colleges run by the FRI&C to the State governments.

7.2 Training of Officers

The IFS probationers undergo a two years professional training in forestry subjects in the Indian Forest College, Dehradun. During the year, 153 IFS officers passed out of the IFC. 308 officers and 14 Foreign trainees are undergoing training. Training to State Forest Service officers is imparted in 3 SFS Colleges at Burnihat, Coimbatore and Dehradun. During the year, 154 SFS officers passed out of these training colleges and another 309 are undergoing training.

The existing forestry training set up has been reviewed during the year. It has been decided to upgrade the IFC, Dehradun as the National Forest Academy of India. The faculty is also to be strengthened considerably with induction of permanent staff. Similarly composition of the faculties in the SFS Colleges is to be modified in the light of new objectives set for training.

7.3 Training of Forest Rangers

There are four Ranger's training Colleges run by the Forest Research Institute and Colleges at Balaghat, Coimbatore, Chandrapur and Kurseong. 241 Forest Rangers passed out of these four Colleges; another 299 trainees and 4 foreign nationals are undergoing training. Forest Rangers are also trained in four Colleges run by the State Governments.

7.4 Training in Social Forestry

A six months in-service Social Forestry Diploma Course was conducted for 10 officers. In addition, 12 officers are undergoing training.

7.5 Orientation Training Programme

During the year, 16 IFS officers between 11 and 13 years of service, were given intensive orientation training for a period of about 2 months. Short duration

training for a period of one week was also imparted to 225 IFS officers of varying seniority.

7.6 Training of Forestry Personnel and Workers in Logging Development Institute

In order to minimise wastage of timber in the process of harvesting, training in logging practices and use of modern logging tools/equipments is imparted by the Logging Development Institute (LDI). LDI also continued its efforts to standardise logging tools and equipments. Training is arranged for forestry supervisors as well as forest workers. LDI continued the training activities in various centres in collaboration with the State Forest Departments and the Forest Corporations. About 3500 forest workers and 150 forest supervisors are likely to be trained in various skills during the year.

After a review of the working of the Institute, it has been decided to merge Logging Development Institute with the Forest Research Institute, Dehradun.

8. WILDLIFE EDUCATION AND TRAINING

8.1 Training at the Wildlife Institute of India

The Wildlife Institute of India (WII) became an autonomous institution with effect from 1st April, 1986 and appointments to the faculty have mostly been done. The Institute is at present conducting every year one Post Graduate Diploma Course of 9 months duration in Wildlife Management for officers and two Certificate Courses for Rangers each of 3 months duration. The Institute also conducted workshops, seminars and symposia on Chemical Immobilisation and Radio Telemetry, Role of Army in Wildlife Conservation, Remote Sensing Techniques in Wildlife management, and the role of Universities in Wildlife teaching. The fifth International Snow Leopard Symposium was held in October, 1986 in Srinagar under the aegis of the WII.

8.2 International Film Festival, New Delhi-Wildlife Filmfestival

For the first time, the Directorate of Film Festival of India has a Wildlife Section which is being sponsored by the Department. About 30 entries in this section were received. Out of these there were 5 Indian entries. The best film was awarded the Sangai Award "Golden Antler".

9. ENVIRONMENTAL INFORMATION SYSTEM (ENVIS)

Environmental Information System (ENVIS), a Plan Programme of the Department, during the year continued its activities pertaining to collection, collation, storage, retrieval and dissemination of scientific and technical information on environment and related areas to all concerned.

The ENVIS Network with the Department as its Focal Point, presently consists of 10 ENVIS Centres on diverse areas of environment such as pollution control, toxic chemicals, environmentally sound and appropriate technology, coastal and offshore ecology, energy and environment, biodegradation of wastes etc. These ENVIS Centres have been set up in specialised and reputed institutions in the country.

9.1 Activities at the ENVIS Focal Point

The ENVIS Focal Point brought out the following publications:

(i) Annual Report of the Department for the year 1985-86.

(ii) Paryavaran Abstracts—A quarterly journal reporting Indian research information on environment and related areas.

In addition to the above, the following information activities were undertaken:

—Query-Answer Service was provided to National/International users. The ENVIS Focal Point also continued to act as the National Focal Point for the INFOTERRA (Global Information Network) of the United Nations Environment Programme (UNEP). Under the INFOTERRA Programme as well as under the ENVIS Programme, over 200 National/International queries were attended to and in response to these, substantive information (bibliographies and photo-copies of the relevant articles/research papers etc.) was provided in majority of cases.

—A Management Information system for the R&D Projects sponsored and funded by the Department was developed with the assistance of the National Informatics Centre, Electronics Commission.

—Updation of computerised bibliographic data bases on environment.

—Collection and updation of environmental statistics.

—Updation of Experts list on Environment.

—Press Clippings Service.

9.2 Activities at the ENVIS Centres

The ENVIS Centres continued to provide information on environment in the respective areas of specialisation to their user groups. These Centres also provided information/publications to the ENVIS Focal Point in the Department. Some of the major publications brought out by the ENVIS Centres are as follows:

—An updated Directory of Non-Governmental Organisations engaged in the area of environment was published by the ENVIS Centre at the Environmental Services Group (ESG), New Delhi;

—Wetlands Status and Management in India: An Overview was published by the ENVIS Centre at the ESG, New Delhi;

—Environmental Abstracts on Eco-toxicology and Biodegradation of Wastes were published by the ENVIS Centre at Anna University, Madras;

—An Information System for the Birds of Western Ghats developed by the ENVIS Centre at the Indian Institute of Science, Bangalore;

—Energy Environment Monitor—a bi-annual journal providing information on environmental health and safety aspects of various energy cycles with special reference to developing countries, was brought out by the ENVIS Centre at Tata Energy Research Institute, New Delhi; and

—A Bibliography on Remote Sensing has been brought out by the ENVIS Centre at the Institute of Coastal and Off-Shore Research, Visakhapatnam.

9.3 Review of ENVIS Centres

The ENVIS Focal Point in the Department reviewed the functioning of the existing ENVIS Centres. The working of the ENVIS Centres were reported to be satisfactory. The Review Document was also placed before the ENVIS Advisory Committee meeting held on December 10, 1986.

9.4 ENVIS Advisory Committee Meeting

The Fourth Meeting of the ENVIS Advisory Committee was held on 30th December 1986. The Committee constituted a sub-committee for preparation of a paper laying down the guidelines for the functioning of ENVIS, opening of new Centres on priority areas and identification of possible institutions for the proposed ENVIS Centres. It would also cover aspects such as the number of science professionals required by the ENVIS Centres, the type of equipment needed and such other suitable measures for expansion and strengthening of the system as a whole thereby making the ENVIS network comprehensive with a balanced geographical and subject-wise distribution in next five to ten years.

9.5 Designation of ENVIS as the Regional Service Centre for South Asia Sub-Region under the INFOTERRA of UNEP

The ENVIS Focal Point in the Department has also been designated as the 'Regional Service Centre for South Asia Sub-Region under the INFOTERRA (Global Information Network) Programme of the UNEP.

1. INTRODUCTION

The Ministry of Environment & Forests functions 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 programmes and projects connected with these organisations are taken up for implementation.

2. BILATERAL AND MULTILATERAL PROJECTS

—Under the Cultural Exchange and Science and Technology Programmes, bilateral programmes on environment with France and Norway are evolved. Proposals for a Memorandum of Understanding with Royal Netherlands Government are under process.

—An agreement between India and Sweden has been signed during the year relating to the SIDA (Swedish International Development Authority) support to the Logging Development Institute, Dehradun till 30th June, 1987 with an assistance of SEK 6.5 million.

—The third phase viz. the handing over phase of the Erosion Control Dhauladhar Range Project (which is being implemented with the assistance from Federal Republic of Germany) is under consideration of the Government of India. This phase will be based on the recommendations of the State Government of Himachal Pradesh consequent upon the acceptance of final Report of the joint evaluation undertaken.

—In order to strengthen the cooperation between India and Sweden progressing for the last nine years, Her Excellency Mrs. Lena Hjelm Wallen, Swedish Minister of State for Development Cooperation had visited India in August, 1986 and had discussions with the Minister of State (Environment & Forests) and other dignitaries.

—Regional Wood Energy Development Programme (Phase I)—an FAO project is under implementation and India is one of the participating countries in it. The phase I of the project is to stimulate the exchange of information, materials and expertise through TCDC and envisages extensive study tours.

Under this project, a senior official of the Department was deputed to tour Nepal and Thailand.

—Under the bilateral Science and Technology Exchange Programme, a six-member Chinese Delegation had visited India in March, 1986 for studying cultivation of bamboo techniques and its utilisation in this country. They visited the Forest Research Institute and Colleges, Dehradun besides other institutions to keep themselves abreast with the bamboo cultivation techniques in the country. Several officers of the State and Central Government have been recommended for training abroad in different aspects of Forestry as well as for attending international meetings, undertaking study tours etc.

—A Technical Service Agreement (TSA) has been signed between the Department and the World Health Organisation, under which a sum of US \$ 12,000 have been earmarked for India to be made available to the participating institutions for purchase of equipment and expendable items for strengthening/augmenting infrastructural facilities connected with the monitoring and assessment of human exposures.

—The Environmental Information System (ENVIS) of the Department has been designated as the 'Regional Service Centre for South Asia' Sub-Region under INFOTERRA (Global Information Network) Programme of UNEP. An agreement between the Department and UNEP has been signed under which UNEP has offered a sum upto US \$ 5,000 per year towards meeting actual costs of information services rendered by the Department to INFOTERRA users.

—India continued to play an active role in the implementation of major conventions/treaties in the field of wildlife conservation. These are:

—Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);

—Convention for the Regulation of Whaling;

—Convention for the Protection of Migratory Species of Animals;

—Convention for the Protection of Wastelands specially of Water Fowl Habitats; and

—Convention on Protection of Migratory Birds between India and U.S.S.R.

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- India chaired the meeting of the Standing Committee of CITES held in October 1986 at Ottawa, Canada.
 - The Convention on Protection of Migratory Birds between India and U.S.S.R. has been ratified by both the countries and came into force on 21st August, 1986.
 - Under the World Heritage Convention, UNESCO, Paris, the Department has proposed three natural sites viz. Gir National Park, Gujarat; Sunderbans Tiger Reserve, West Bengal and Nanda Devi National Park, U.P. for incorporation in the list of World Heritage Sites.
 - The 3rd Governing Council Meeting of South Asia Cooperative Environment Programme (SACEP) was held at New Delhi in January 1987. A workshop on environmental legislation sponsored by SACEP was hosted at Delhi in January 1987.
 - General issues affecting the ozone layer were discussed and scientific and technical information exchanged with an American delegation to the Department. A national workshop on the subject of ozone layer is proposed.
 - An Indian delegation visited Norway to study pollution aspects of aluminium industry.
 - Another delegation visited Norway to participate in a workshop on environmental protection and development held in August-September 1986.
 - Indian experts also participated in a workshop on chlorofluro carbons held in USA in September 1986, in connection with protection of the ozone layer.
 - Indian experts participated in a workshop on integrated mosquito control in Colombo.
 - A delegation of German Parliamentarians visited the Department for discussions.

ADMINISTRATION

1. STAFF STRENGTH

The total strength of the Department at the headquarters is 684 (Group A: 134; Group B: 213; Group C: 198; and Group D: 139).

2. RESERVATION IN SERVICES FOR SCHEDULED CASTES AND SCHEDULED TRIBES

The implementation of the Government rules/regulations and orders regarding reservations in services for Scheduled Castes and Scheduled Tribes is done by the SC & ST Cell in the Department. This Cell works under the control of Deputy Secretary (Admn.) who has been nominated as the Liaison Officer of the Department for this purpose. The Cell looks into complaints, if any, received from members belonging to Scheduled Caste/Scheduled Tribe. It also carefully scrutinises proposals for de-reservation of vacancies received from the Department and its subordinate offices from time to time.

A statement showing representation of Scheduled Castes and Scheduled Tribes in the Department proper as on 15.11.1986 is given in Table 13.

3. USE OF HINDI

- Hindi Section is charged with the following functions of ensuring the implementation of directives issued by the Department of Official Language (Ministry of Home Affairs) in connection with use of Hindi and translation activities.
- Three meetings of Official Language (Implementation) Committee were held. The progress achieved in the implementation of instructions of

the Government in regard to progressive use of Hindi was reviewed in the meetings. Future programmes for accelerating use of Hindi were also chalked out.

- A separate Hindi Salahakar Samiti has been constituted for the Ministry of Environment & Forests. Its first meeting took place on 28.11.86 and second meeting on 12.2.87.
- During the year, the Parliamentary Committee on Official Language proposes to inspect an office of this Department. The Hindi Officer has inspected one Regional Office during this period.
- Entries are being made in Hindi in the Service Books of Groups 'C' and 'D' employees.
- During the year a number of pay bills were prepared in Hindi.
- Story books, novels, dictionaries, etc. in Hindi have been purchased during the year. In addition, a number of magazines and newspapers have been purchased and circulated among the staff.
- A cash prize scheme has been introduced for the staff to encourage original noting/drafting in Hindi under the Hindi Promotion Scheme.
- Seven employees were nominated for training in Hindi in January session and five were nominated in July session under the Hindi Teaching Scheme. During the year, one employee was declared successful in Pragma Examination whereas one passed the Hindi typewriting test. Efforts are being made to nominate more employees.

TABLE 13
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 15.11.86)

Group	Sanctioned strength	Number in position	Scheduled Castes	% to total number of employees	Scheduled Tribes	% to total number of employees
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Group 'A'	134	75	6	8.00	—	—
Group 'B'	213	130	17	13.07	1	0.76
Group 'C'	198	136	11	8.08	5	3.67
Group 'D' (excluding Safaiwala)	130	68	28	41.17	5	7.35
Group 'D' (Safaiwala)	9	7	7	100.00	—	—
Total	684	416	69	16.58	11	2.64

—A glossary of environmental terms from the letters A to I has been compiled in Hindi and is being vetted by the Commission on Scientific and Technical Terminology.

—The Hindi Section translated the Annual Report, Performance Budget, Parliament Questions, materials for seminars/conferences and various other documents including 22 forms widely in use in the Ministry.

—Several brochures/publications relating to environmental issues have been brought out by the Ministry in Hindi.

4. IFS CADRE MANAGEMENT

The Ministry of Environment and Forests is the cadre controlling authority for the Indian Forest Service. 153

candidates recruited on the basis of the IFS Examination, 1985 conducted by the Union Public Service Commission were appointed to the service during the year and deputed for training at the Forest Research Institute and Colleges, Dehradun. 145 candidates recruited on the basis of the IFS Examination 1983 joined the various State cadres on completion of their training.

The revised strength and composition of a number of State cadres such as Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Uttar Pradesh, Himachal Pradesh, Nagaland and West Bengal were notified during the year. Cadre reviews of more States were carried out during the year. The total authorised strength of the IFS cadre as on 1.12.86 was 2243. More than 100 officers of the Indian Forest Service are presently on deputation to technical research and teaching posts under the Central Government.

ANNEXURE

ORGANISATIONAL CHART OF THE MINISTRY OF ENVIRONMENT & FORESTS (DEPARTMENT OF ENVIRONMENT, FORESTS & WILDLIFE)

