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NATIONAL ENVIRONMENTAL ACTION PLAN

Environment Action Programme

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ENVIRONMENT ACTION PROGRAMME

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Ministry of Environment and Forests
Government of India
1993

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मंत्री
पर्यावरण एवं वन
भारत
MINISTER
ENVIRONMENT & FORESTS
INDIA

PREFACE

A year and a half after the historic Earth Summit on Environment and Development and the formulation of India's National Conservation Strategy and Policy Statement on Environment and Development, we have now drawn up an Environment Action Programme, the first document of its kind. It attempts to integrate our concerns for conservation, sustainable development and human welfare with our quest for a dynamic economy exemplified in the on-going process of economic reforms.

This complex document is the product of an equally detailed and complex preparatory process. The task of drawing up a blueprint for incorporating environmental considerations into our rapidly expanding development programmes involved wide-ranging intra-governmental discussions, spirited public debates and deep introspection and self-assessment. As the document mentions, the task of the Action Programme is to provide quality environmental services to the citizens of India, particularly those struggling to come above the poverty level.

The document identifies popular participation as the means for giving a sharper and discernible focus to our existing programmes in the areas of conservation and environmental protection. The process of drawing up the Environment Action Programme was itself participatory and transparent. At the same time this document does not lay claim to being a final product, either infallible or immutable. The Environment Action Programme is a dynamic document which will evolve with time. As India moves into a trajectory of high economic growth, the task of protecting the country's environment would be increasingly facilitated by local and regional level actions and interventions. It is my firm belief that the document will serve to internalise sustainable development practices through enlightened policy and decision making and positive local and regional level interventions to conserve India's rich natural heritage.

(KAMAL NATH)

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CONTENTS

1	INTRODUCTION	1 - 19
2	STATUS OF THE ENVIRONMENT	20 - 28
3	NATURAL RESOURCES	29 - 42
4	INDIA'S LEGAL AND ORGANISATIONAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT	43 - 54
5	CURRENT PROGRAMMES	55 - 89
6	DIAGNOSIS	90 - 116
7	PRIORITIES	117 - 127
8	STRATEGY	128 - 141
9	PROGRAMMES	142 - 160
	FIGURES AND TABLES	161 - 181

APPENDIX

I	INSTITUTIONAL STRUCTURES AND ENVIRONMENTAL MANAGEMENT	182 - 184
II	CLEANER TECHNOLOGIES IN INDUSTRIAL PRODUCTION	185 - 189
III	MANAGEMENT OF WATER QUALITY	190 - 191
IV	NATURAL RESOURCES ACCOUNTING	192 - 194
V	CONSERVATION OF WETLANDS	195 - 197
VI	FORESTRY	198 - 199
VII	ENVIRONMENTAL EDUCATION	200 - 202
VIII	URBAN ENVIRONMENTAL MANAGEMENT	203 - 207
IX	ALTERNATIVE ENERGY ACTION PLAN	208 - 209
X	CHANGING CONSUMPTION PATTERN OF ENERGY IN INDIA	210 - 212
XI	ENVIRONMENTAL IMPACT ASSESSMENT IN INDIA	213 - 214
XII	ORGANISATION CHART OF THE MINISTRY OF ENVIRONMENT & FORESTS	215
	ACRONYMS	216 - 218
	REFERENCES	219 - 220

BOXES FIGURES AND TABLES

BOXES

- PEOPLE'S INVOLVEMENT IN REGENERATION OF DEGRADED FOREST LANDS
- INDUSTRIAL POLLUTION CONTROL PROJECT OF INDIA
- NATIONAL RIVER ACTION PLAN
- AFFORESTATION PROGRAMMES : APPRAISAL OF PROGRESS IN SEVENTH FIVE YEAR PLAN
- NATIONAL FORESTRY ACTION PROGRAMME
- SUSTAINABLE CITIES PROGRAMME
- PERFORMANCE OF ELECTRICITY UTILITIES IN INDIA AND PRIORITIES IN THE EIGHTH FIVE YEAR PLAN
- DROUGHT PROOFING
- POLLUTION ABATEMENT PROGRAMMES IN INDIA - PRESENT EFFORTS AND FUTURE DIRECTIONS
- ECONOMIC INSTRUMENTS FOR ENVIRONMENTAL PROTECTION
- ENVIRONMENTAL STATEMENT FOR ENVIRONMENTAL AUDIT IN INDIA

FIGURES

1 STATUS OF AIR POLLUTION CONTROL. IN ENVIRONMENTALLY SENSITIVE INDUSTRIES.

2 STATUS OF WATER POLLUTION CONTROL IN ENVIRONMENTALLY SENSITIVE INDUSTRIES.

3 PROGRESS OF POLLUTION CONTROL IN 17 CATEGORIES OF INDUSTRIES.

TABLES

1 STATE OF AMBIENT AIR QUALITY IN 15 MAJOR CITIES OF INDIA IN 1989; INFORMATION ON NATIONAL AMBIENT AIR QUALITY MONITORING STATIONS

2 STATEWISE POSITION OF WATER SUPPLY WASTEWATER GENERATION, COLLECTION AND TREATMENT IN CLASS II TOWNS

3 LIST OF POLLUTED RIVER STRETCHES

4 LIST OF NAAQM LOCATIONS IN DESCENDING ORDER OF CONCENTRATIONS (ug/cub.m) BASED ON 1990 DATA FOR 16 OR MORE HOURS MONITORED DAYS

5 AMBIENT AIR QUALITY STATUS IN 32 RESIDENTIAL AREAS OF MONITORED CITIES DURING 1990

INTRODUCTION

1 INTRODUCTION

1.01 Environmental protection and the conservation of natural resources emerged as key national priorities in India in the wake of the 1972 Stockholm Conference on Human Environment. Between the Stockholm Conference and the Rio Summit, India has been able to develop a stable organisational structure for environment protection in the country. Legislation, policies and programmes also evolved during the same period, geared to the task of protection of the environment. Despite these achievements, there has been for some time, a felt need to clearly establish our priorities in the environment and forest sectors and design a programme of action for sustainable management of the environment in the country. This need has arisen on account of the changing economic structure of India on the one hand, and the national, if not, universal consensus for integrating environmental considerations into development programmes and projects, for harmonising environment and development for a sustainable development route to progress. Sustainable development, which has evolved as the goal for human welfare in the aftermath of the 1992 United Nations Conference on Environment and Development, is however, rooted in country - specific programmes of action for channelling investment resources (both domestic and external) into ecologically compatible projects and programmes.

People's participation at the grass-root, local and regional levels holds the key to the success of such a concrete programme of action. The objectives of the Environment Action Programme for India have been conceived against the backdrop of these aspects.

Objectives of the Environment Action Programme (EAP)

1.02 The goal of the Environment Action Programme are to improve the provisioning of environmental services in India and to facilitate integration of environmental considerations into development programmes. Keeping in view these goals, the following objectives of the Environment Action Programme (EAP) are laid down which are as under :-

a. assess the environment scene in India against the backdrop of the changing economic policies and programmes;

b. review the current policies and programmes which address the various environmental problems of the country;

c. identify the future direction and thrust of these policies and programmes to establish priorities and outline a strategy for the implementation of those priorities;

d. identify programmes and projects for a sustained flow of investment resources for improved provisioning of environmental services for

targetted to ensure their realisation of these concerns. Environmental issues which have been for a long time part of Indian thought and social processes are reflected in the Constitution of the Republic of India adopted in 1950. The Directive Principles of State Policy, an integral and significant element of our democratic order contain provisions which reflect the commitment of the State to protect the environment with regard to forests and wildlife. The Directive Principles of State Policy enjoin upon the citizens of India, the special responsibility to protect and improve the environment. The roots of the growing trend towards popular participation in our conservation and natural resource development programme lie in this constitutional requirement. The foundations of the present day organisational framework for environmental programmes in India, go back to the 1970s with the establishment of the National Committee of Environmental Planning and Coordination by Smt. Indira Gandhi, former Prime Minister almost immediately after the historic Stockholm Conference on Environment held in 1972. The Committee was graduallly to evolve into a Department of Environment in 1980 and five years later to a fulfledged Ministry of Environment and Forests (MOEF) of the Government of India (GOI). The State Governments also followed this example by establishing their own Departments of Environment to address the rapidly increasing policy initiatives and programmes in the environment and forests sectors.

1.05 The Ministry of Environment and Forests, India has wide ranging responsibilities as the apex body within the Government responsible for the subjects of environment, forests and wildlife. Apart from addressing the issues of natural resources degradation induced by the growing phenomenon of land, water and air pollution, the Ministry also undertakes activities in the realm of conservation of natural resources through programmes for the conservation and survey of flora and fauna, afforestation and regeneration of degraded areas, impact assessment, forest conservation, and research and environmental education and information. The organisation chart at Appendix XII provides details of the structure of this apex Ministry.

Policy Initiatives in Environment:

1.06 The Government has enunciated its policy in the form of policy statements on Forestry, on Abatement of Pollution, and also through the comprehensive National Conservation Strategy and Policy Statement on Conservation and Development. In addition, there are laws for the protection of environment, the most well-known being the Wild Life (Protection) Act, 1972, the Forest (Conservation) Act, 1980, and the Environment (Protection) Act, 1986. Significant amendments have been made in 1991 to the Wild Life (Protection) Act, which include a provision

by which hunting of all species of wildlife for commerce or for pleasure has been banned.

1.07 The Environment (Protection) Act sets out the parameters under which the Ministry operates to formulate and carry out environment policy at the national level. Underlying the policy statements is the recognition of the principle that effective management and control of natural resources requires the support and participation of the local people.

1.08 The National Forest Policy, 1988, emphasizes the need to restore the ecological balance and the conservation of the country's natural heritage by preserving the remaining natural forests. This objective is sought to be achieved through the prevention of soil erosion and denudation in the catchment areas, the restriction of the growth of desert areas, and the evolution of a system to meet the requirements of fuelwood, fodder, nonwood forest products and small timber of the rural and tribal population. The mandate of the National Afforestation and Ecodevelopment Board for restoring green cover for ecological security and provisioning of fuel and fodder resources, is a major programme designed to achieve the aforesaid objective of the National Forest Policy.

1.09 The network of sanctuaries, national parks, biosphere reserves

and other protected areas has been extended to cover about 4% of the total land area of the country. The National Wildlife Action Plan lays down the strategy and action programmes for wildlife conservation. Further, the application of the Forest (Conservation) Act, 1980, ensures that the diversion of forest land for non-forest use is subject to the strictest scrutiny.

1.10 The National Conservation Strategy and Policy Statement of Environment and Development, adopted in June, 1992, provides the basis for the integration and internalisation of environmental considerations in the policies and programmes of different sectors. It also emphasises sustainable life styles and the proper management and conservation of resources.

1.11 The Policy Statement of the Abatement of Pollution, 1992, states the Government's commitment to prevent further deterioration of the environment. The policy elements seek to shift the emphasis from defining the objectives for each problem area towards the actual implementation, and the focus is on the long term. The Statement recognizes that pollution particularly affects the poor, the complexities are considerable given the number of industries, organisations and government bodies involved. To achieve the objectives, maximum use

would be made of a mix of instruments including legislation and regulation, fiscal incentives, voluntary agreements, educational programmes and information campaigns.

1.12 The Government's National Housing Policy, 1988, the National Water Policy, 1987 and the National Landuse Policy, 1988, recognise the importance of maintaining the ecological balance. The Ministry of Urban Development have approved 52 recommendations for an Urban Water Supply & Sanitation Programme. These policy recommendations underline, the principle of sustainability of water use and investments for development of water resources. The prevalence of such perspectives rooted in the concept of sustainable development in other wings of the Government is important to be taken note of.

The Eighth Five Year Plan and Sustainable Development:-

1.13 It is significant that the Eighth Five Year Plan was launched in 1992, the year which witnessed the historic Earth Summit held in Rio de Janeiro. The goal of sustainable development is implicit in the Eighth Plan Document which underlines the significance of ensuring coordinated and integrated Governmental action for conserving nature and ensuring sustainable use of natural resources through a participatory process. The actual task of sustainable development hinges on the evolving economic structure of India.

1.14 Unlike its predecessors, the Eighth Five Year Plan of India has been framed against the back-drop of the economic problems induced by fiscal imbalances and balance of payment difficulties. A structural adjustment process has been under way to correct the fiscal distortions and to bring down the balance of payment deficit on the current account. All the same, the Eighth Five Year Plan has the benefit of the positive outcome of the Sixth and Seventh Five Year Plans which took the average GNP growth rate from 3.5 % per annum to 5.5 % per annum, with growing agricultural incomes, rising pe. capita consumption of food grains and other essential commodities and declining capital-output ratios and of populations under the poverty line. Taking a cue from these positive features, the Eighth Five Year Plan has adopted an approach of setting free the forces of growth and modernisation by judiciously harnessing market mechanisms and limiting public investment to socially critical areas. Accordingly, a process of economic liberalisation has been initiated in the last two years. Industrial licencing has been abolished except for a select group of 18 industries, the Monopolies and Restrictive Trade Practices Act (MRTPA) has been amended to relax entry control on large industries, the scope of foreign equity participation has been increased, a new trade policy with accent on a liberalised trade regime based on negative list of imports/exports is in place, the stock markets

have also been galvanised mainly by a relaxed capital issues regime and finally a programme of financial sector reforms is also under way to de-regulate the banking and financial services sector for effective service, improved profitability and capital adequacy.

1.15 These changes in industrial and trade policies have fundamental implications on the environment. The Eighth Five Year Plan lays emphasis on the manufacturing sector as the fulcrum of industrial growth. The process of industrial/trade de-regulation initiated in the plan period is bound to promote rapid growth of infrastructure and industries such as power and coal, and services like transport and communications besides other capital goods and consumer based industrial units, having high market linkage - domestic or overseas. The impact on pollution and generation of wastes would be considerable as the process of industrialisation accelerates. Another facet of the new economic policy is the growing significance of exports for the Indian economy in the coming decade. Engineering goods, leather, textiles and select group of chemical industries are bound to assume significance on account of their strong export linkage. At the same time, the ability of these industries to penetrate the developed export markets of the General Currency Area (GCA) will depend upon the quality standards prescribed for these markets under ISO 9000, etc. Quality standards on merchandise are

closely related to environmental factors, since products imported by these markets ought to be environmentally friendly both in terms of processes and end use. Therefore, environmental programmes would necessitate qualitatively different interventions for pollution control and prevention.

1.16 While the market forces are being encouraged through such a programme of economic liberalisation, the focus of Government programmes and public investments would entirely be in the social sector with human development as the ultimate goal. A mass movement to contain population growth is to be generated. Simultaneously, in order to give further impetus to the poverty alleviation programme, the Eighth Five Year Plan proposes to undertake a substantial employment generation effort through programmes and projects for diversification of agriculture, wasteland development, forestry, rural non-farm sector, rural infrastructure and housing and services. It is apparent that the Eighth Plan strategy of employment generation is based predominantly on natural resource development programmes and herein lies the environmental significance of this strategy for poverty alleviation.

1.17 While the Eighth Five Year Plan seeks to increase irrigation and power facilities in the country and promote agriculture on a commercial

basis, by extending the coverage of high yielding varieties of cash and food crops, the paucity of public investment resources necessitates measures for energy conservation and irrigation efficiency. This would mean that conservation programmes in the sectors of soil and water need further emphasis. The proposed National Health Programme to be undertaken in the Eighth Five Year Plan has significant spinoffs. A programme of health care delivery based on popular participation with focus on disease prevention and health promotion is envisaged, in order to realise the overall goal of "Health for All" by 2000 A.D. A concomitant of this strategy is the provision of clean drinking water and sanitation facilities under the Rajiv Gandhi Drinking Water Mission which is to be strengthened further to cover the no source problem villages numbering 2824 and the partially covered villages/hamlets. This programme for providing clean drinking water cannot be successful without complementary efforts to conserve moisture through watershed development, catchment area treatment, and integrated schemes for wasteland development including afforestation etc. The other facet of the National Health Programme namely, the emphasis on traditional systems of preventive medicine in the National Health Plan makes it all the more necessary to focus attention on conservation of fragile and critical ecosystem including forests, mangroves, wetlands, coral reefs and

mountain ecosystems which have been sites of unique biodiversity and have been supply sources of traditional biomaterials used for medicinal purposes.

1.18 The preventive strategy for health which is the third plank of the National Health Programme necessitates tackling urban environmental issues on a war-footing and remediation and safe disposal of hazardous wastes which are injurious to human health. The social priorities envisaged in the eighth Five Year Plan have a different implication on our environmental programmes. The fact that the Eighth Five Year Plan proposes people's involvement in the process of nation building and a participatory planning framework and a decentralised approach to planning through a system of Panchayati Raj and Nagar-Palika (local self-Governments of urban cities/towns) institutions given national priority in the wake of the recent 73rd and 74th amendments to the Constitution of India necessitates a systematic effort for developing human resources at the grassroot level in the direction of sustainable development.

1.19 It is against the backdrop of the situation described above that the following top priority areas are being focussed upon in the Environment Action Programme:-

a. conservation and sustainable utilization of biodiversity in selected

eco-systems including forests, mangroves, wetlands, coral reefs, mountain ecosystems;

b. afforestation, waste lands development and conservation of soil and moisture and ensuring that water sources are not polluted;

c. control of industrial and related pollution with an accent on the reduction and/or management of wastes, particularly hazardous wastes;

d. improving access to clean technologies;

e. tackling urban environmental issues;

f. strengthening scientific understanding of environmental issues, as well as structures for training at different levels, orientation and creating environmental awareness, resources assessment, water management problems etc.; and

g. an alternative energy plan.

Participation and ownership of India's Environment Action Programme (EAP)

1.20 In line with the Government of India's thinking on the issue of popular participation for conservation and sustainable development, the

Environment Action Programme process adopted a decentralised system of generating information and perspectives. Consistent with the open approach of the EAP, the Ministry of Environment and Forests, the nodal agency for conducting the EAP exercise, constituted an EAP Implementation Committee comprising the Ministries and Departments of the Government of India concerned with the different sectoral issues to be addressed in the proposed Environment Action Programme. The task of drawing up sectoral reports was also decentralised and assigned to non-governmental institutes of academic excellence. The research institutions involved and the topics assigned to them are as under :-

Name of Institute		Sector
Bombay Natural History Society, Bombay	-	Conservation of wetlands, coral reefs, mangroves.
Indian Institute of Forest Management, Bhopal.	-	Forestry.
Indian Institute of Public Administration, New Delhi.	-	Institutional Structures for Environmental Management
	-	Environment Education
	-	Biodiversity/Wildlife Conservation.
Indian Institute of Technology, Bombay.	-	Environment Impact Assessment.
Indira Gandhi Institute of Development Research, Bombay.	-	Natural Resources Accounting.
Madras Institute of Development Studies, Madras.	-	Urban Environmental Management.
	-	Strategy for Improvement of Tank Irrigation.
National Environmental Engineering Research Institute, Nagpur.	-	Clean Technologies.
	-	Water Quality.
Tata Energy Research Institute, New Delhi.	-	Alternative Energy Action Plan.

1.21 In the meetings of the EAP Implementation Committee, these research institutions were also invited to participate, in order to sensitise them to policies and programmes of the Government of India in the various sectors. The terms of reference for conducting various sectoral studies were also drawn up on a mutually agreed basis. Based on the first phase of sectoral reports, prepared by these institutions, a draft interim EAP document was prepared in May, 1992, circulated to the different Ministries of the Government of India (GOI) and others and finalised by November, 1992. The interim document gave an overview of the Environmental Policies and Programmes and briefly summed up the critical issues in the areas of Environment Impact Assessment, Natural Resources Accounting, Cleaner Technologies for Industrial Production, Energy Action Plan, Management of Water Quality, Human Resource Development, Environmental Education, Forestry besides the specific concerns of urban enviro-mental management and conservation of wetlands.

1.22 Further processes were on, to refine the sectoral reports and clearly prioritise areas for intensive focus in the coming decade. Discussions with the concerned sectoral Ministries and the research institutions involved in the exercise resulted in the identification of the seven critical areas mentioned at the outset. A National Workshop on Environment Action Programme was convened in New Delhi on 28-29

September, 1993 to discuss the EAP process in India in the light of the exercises already conducted. This Workshop was attended by nearly 35 non-governmental voluntary organisations and experts whose views have now been considered and incorporated in this document. It is noteworthy that the seven broad priority areas have been endorsed by the participants of this Workshop, though, some of them had recorded their views on the manner in which these priority areas have to be addressed. A draft Environment Action Programme (EAP) document was subsequently drawn up and submitted for Inter-Ministerial discussions. This document has been finalised also after incorporating inter-ministerial suggestions and modifications.

1.23 The EAP is a continuing process. Hence, the areas identified in this document are not final or comprehensive. It does not take care of all the forward and backward linkages in many developmental sectors, including the socio-economic networks which result in poverty alleviation and better human resources development as these are better covered in the Eighth Five Year Plan Document itself. As the programmes identified in this document get underway, newer and more complex problems may arise which require attention. The global environmental issues of climate change, biodiversity, desertification, international waters and the protection of the ozone layer will also be systematically incorporated as

the present set of priority areas get implemented. With the growing emphasis on participatory systems of natural resources management, structures for decentralised management of natural resources would be operationalised drawing strength from the 73rd and 74th Amendment to the Indian Constitution for establishing Panchayati Raj and Nagar Palika Institutions as also the successful initiative of the Ministry of Environment and Forests for establishing Joint Forest Management Structures for conservation, development and management of forest lands in various States and Union Territories of India.

Future Course of Development

1.24 The Environment Action Programme being a dynamic process would necessitate careful and concerted direction and continuing investigations and research into sectoral areas which have been prioritised or require to be so. The national institutes which were commissioned to do sectoral studies as mentioned earlier, have offered valuable insights on the nature of problems in the sectoral areas. However these insights need to be extended and refined further as the EAP process evolves.. Appendices I to IX and XI, which are extracts of the sectoral studies conducted by these institutes, provide a glimpse of the various problems in different sectors which need further analysis and consideration from

the point of view of the seven priority areas identified in this document. The EAP Implementation Committee already set up for drawing up the programme will continue to operate though for new functions of guiding further studies by the institutes mentioned and for monitoring and direction of programmes and projects. The identified institutes would continue with their research with special focus on improving upon the existing data base, natural resource accounting system, and structures for strengthening environment impact assessment and information. This will be in addition to providing evaluation reports on the progress of the EAP. The EAP being coterminus with the Eighth Five Year Plan of India would be comprehensively reviewed both on a Governmental and Non-Governmental fora in 1996, a year before the Eighth Five Year Plan concludes. The perspectives/results of these review would be significant for internalising the Environment Action Programme in the forthcoming and future Five Year Plans.

STATUS OF THE ENVIRONMENT

2 STATUS OF THE ENVIRONMENT

2.01 The establishment of a diversified industrial structure, based on a unique combination of heavy and small-scale industries and the growing urban and rural population in India has produced its pressures on air, water and land resources. These pressures are reflected in the growing incidence of air and water pollution. The fact that the Factories Act of 1948 with its accent on occupational and civic safety had to be supplemented by the more specialised Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution Act (1981) and much later the Environment (Protection) Act of 1986 is an unmistakable sign of the impact of pollution on air and water resources. The Central Pollution Control Board (CPCB) constituted under the Water (Prevention and Control of Pollution) Act, 1974 in September, 1974 has inventorised the pollution sources, and assessed the air and water pollution potential on terms of industries, river basins and geographical areas.

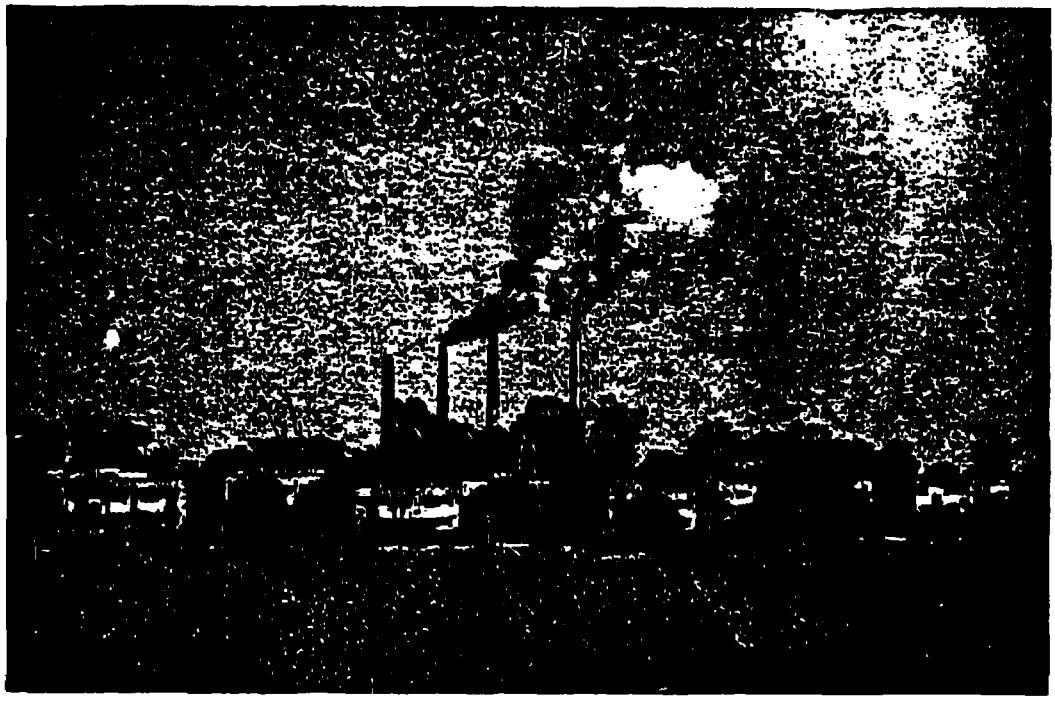
2.02 Coming to the scenario of air and water quality in India it is seen that the pollution load in respect of air is of a relatively high order in the metropolitan cities of Delhi, Bombay, Calcutta and Madras. The CPCB which conducted ambient air quality monitoring of Delhi has observed

relatively high frequency of suspended particulate matter, SO_2, NO_2 and heavy metals in particulate matter in the air in Delhi. The CPCB studies also indicate that the periods of April to June and from mid-October to March are environmentally critical for Delhi from the point of view of air pollution. The state of ambient air quality in the 15 major cities of India including Delhi during the year 1990, is summed up in Table 1.

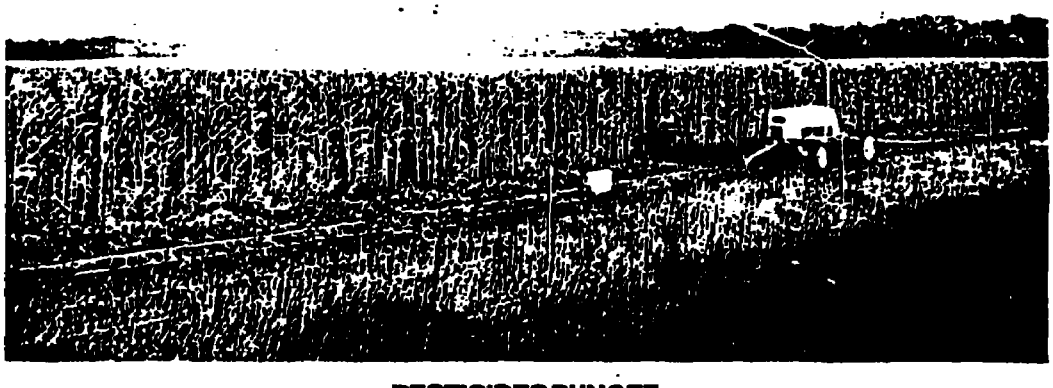
2.03 In non-metropolitan areas, the CPCB has identified 22 problem zones in India which are most prone to industrial pollution in the country. These are Korba in Madhya Pradesh, Talcher in Orissa, Visakapatanam in Andhra Pradesh, Manali in Tamil Nadu, Udyogamandalam in Kerala, Chembur in Maharashtra and Najafgarh in Delhi, Dhanbad in Bihar and Durgapur in West Bengal.

2.04 The pollution problems of small towns in India basically relate to water. A survey undertaken by the CPCB in respect of 241 Class II Towns in 17 States of India indicates that on an average, 90% of the water supplied is polluted. Only 1.6% of the 'polluted', wastewater gets treated.Table 2 sums up the salient findings in this regard.

2.05 Rivers in India are also faced with increasing water quality deterioration. The details of the grossly polluted stretches of six major rivers in India have been captured on Table 3 along with the sources,



INDUSTRIES-AIR POLLUTION



PESTICIDES RUNOFF

nature and load pollution. It is however worthy of note from Table 3 that while the Godavari, Krishna and Indus rivers owe their pollution load predominantly to industrial activities, the other rivers have both municipal/ domestic and industrial wastes as pollution sources. Indeed, according to the study of water pollution in the Ganga basin (which forms the focus of the major Ganga Action Plan of India) it is estimated that 3/4th by volume of the waste water generated is from Municipal sources, 88% of the municipal sewage being from Class I cities.

2.06 In respect of different industries, air and water pollution problems are critical in respect of fertilisers, paper and pulp, sugar and thermal power plants/industries. The status of air and water pollution by selected highly polluting categories of Industries in India in 1989-90 are depicted in Fig 1 and 2 respectively. As can be seen, while the fertilizer industries were defaulters in meeting air pollution standards, sugar and pulp and paper formed the major defaulters in the matter of non-compliance with minimum in water/liquid effluent standards. This picture is changing with the enforcement of standards and increasing adoption of pollution control technologies by industrial units coming under the critically poliuting categories.

2.07 The incidence of noise pollution has been on the rise especially in

big cities of India such as Delhi. Ambient noise levels in 25 different locations comprising sensitive, residential, commercial, and traffic areas of Delhi during May-June, 1989 were far in excess of the permissible standards laid down for noise levels. The noise levels for industrial units were well below the standards of 75 dB.

2.08 The rapid growth of chemical, petro-chemicals, fertilizer and engineering industries in India from the Second Five Year Plan has increased the incidence of use of toxic, flammable and explosive chemicals in India. The Bhopal Gas tragedy has brought out the significance of scientific safe and regulated manufacture, storage and import of hazardous/toxic chemicals. The Hazardous Wastes (Management and Handling) Rules, 1989 notified in 1989 cover 18 types of hazardous wastes while the Manufacture, storage and import of Hazardous Chemical Rules, 1989 list 434 toxic flammable and explosive chemicals for careful regulation. Yet there have been instances of industrial accidents such as the explosion at the IPCL Nagathone gas cracker. Of the 21 petrochemicals (other than polymers and synthetic fibres) identified for vigorous growth by 2000 A.D. Ethylene Oxide, Phenol, Acetone, Benzene and Toluene are listed as hazardous chemicals in Part II of Schedule I of the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989.

The task of regulating these chemicals is formidable. There is also bound to be a spurt in the use of Hydrogen Cyanide, Carbon di Sulphide, Thionyl Chloride, Phosgene, Ammonia, Chlorine, Oleum and Hydrogen Fluoride.

2.09 Flyash, phospho-gypsum, and iron and steel slags are the principal forms of solid wastes generated in India. It is estimated that 35 to 40 million tonnes of flyash is generated annually by India's thermal power plants of which only 2% to 3% is now being utilized. The growing capacity of the fertilizer, iron and steel industries has also progressively increased the output of phospo-gypsum and slag wastes.

2.10 The description of the various forms and sources of air and water pollution and solid waste generation all indicate the somewhat precarious environmental health of the country not conforming with ambient air/ noise and water quality standards. There are also effects on land and soil due to the increase in inorganic compounds and leaching and which also has effects on grcund water resources. In general the following observations emerge regarding fresh water, coastal water and air quality in India:

Fresh Water Quality in Rivers

2.11 An analysis of the data collected from the 450 surface and groundwater quality sampling locations during the year 1990 were analysed. Observations emerging from the analyses are as follows :-

- water quality data monitored under the Ganga Action Plan denotes total coliform as the critical parameter at all of the four locations in West Bengal. In Bihar, the same observation held for Patna and Buxar. In Uttar Pradesh, total coliform was observed to be critical at Kannauj, Kanpur, Allahabad and at Rasulabad and Varanasi;

- Bio-chemical Oxygen Demand (BOD) was observed to be critical at the Kanpur, Allahabad and Varanasi stretches of the Ganga river;

- total coliform was found to be critical in select segments of the Narmada, Mahi and Tapti rivers;

- total coliform was found to be critical at all locations of the Subarnarekha, Tambiraparani and Damanganga rivers;

- high levels of BOD were observed at Ludhiana and Jalandhar in Satluj (Punjab), downstream of Panposh in Brahmani, downstream of Nasik in Godavari. and at Sirumugai in Cauvery. However, DO at all locations was above 4 mg/1; and

  there is an increased concentration of nitrate in the ground water in the vicinity of urban centres which renders it unfit for drinking. Also because of over pumping of ground water,the water levels in the sub-soil have diminished.

Coastal Water Quality

2.12 Coastal and estuarine water resources in India depict the following quality characterstics:-

- an exceptionally high concentration of lead and cadmium, 820 ug/1 and 336 ug/1 respectively, were observed in Thane creek of Bombay coast, while the mercury concentration is 0778 ug/1. The high levels of pollution particularly in Thane creek and Mahim creek are caused by the discharge of huge quantities domestic and industrial wastes. A major portion of the waste is released in Ulhas river and Bassein creek also. Sediment along the creeks and near-the-shore stations showed significant concentration of lead;

- the Cochin region of the Kerala coast (South West Coastal Zones of India) is found to be most affected by petroleum hydrocarbons. During the pre-monsoon period, a concentration of 162 ug/1 was recorded in the estuarine area, while in the coastal area, the concentration recorded was 49 ug/1. This has been mainly due to the operation of oil tankers as well as the movement of mechanised fishing vessels. Further, it was also observed that the concentration of nutrients is high in the estuarine part, and that in the coastal & offshore regions being in descending order except for a few observations; and

- along the coasts of West Bengal & Orissa, the coastal water quality remains almost stable. However, the Dissolved Oxygen (DO) was found near critical level in some localised area. Lead, cadmium and mercury were found in very low concentrations in the ambient water. The sediment samples were rich in metals, particularly lead.

Air Quality Data Analysis

2.13 Statistical analyses of air quality data pertaining to 1990 for various cities/towns covered by the National Ambient Air Quality Monitoring Stations (NAAQM) as presented in Tables 4 & 5 and the following are the major observations:

- except for the NAAQM location at Naskarpara Pump House, Howrah, the sulphur dioxide concentration at all other locations were within the stipulated air quality standards;

- except for the NAAQM location at Veterinary Hospital, Kota, the nitrogen dioxide concentration at all other locations were within the stipulated air quality standard;

- for sulphus dioxide, at 11 NAAQM locations in Ahmedabad, Bombay, Madras, Gajraula and Howrah, the violations over the 24-hourly

average standards were in the range of 5 percent. At locations in Madras, Calcutta and Howrah, the range of violations were 5-10 percent. Only Naskarpara Pump House in Howrah is the location where Sulphur Dioxide (19%) violated the 24-hourly average standard by more than 10%; and

the air component of the environment is degraded in very few locations. In metropoliton cities, exhaust from automobiles cause pollution in high-traffic density areas. To counter this problem, it is considered that strict standards for exhausts need to be laid down. Accordingly, such standards for 1995 and 2000 AD have been evolved. Emissions from industries are sought to be countered in a manner similar to wastewater discharge. Viewed in relative terms, there has been a qualitative improvement in water quality in the River Ganga, particularly in certain stretches. There are also reasons to suppose that the present status of air and water quality represents an improvement compared to the situation two years ago. For instance, the pollution control status of firms drawn from 17 categories of industries in 21 States and Union Territories indicate that for all categories there has been a discernible rise in the number of units complying with the MINAS (Minimum National Standards) for water/air pollution, December, 1991 and February, 1993 mainly due to effective implementation of the existing regulatory and fiscal regimes (Fig. 3).

NATURAL RESOURCES

3 NATURAL RESOURCES

3.01 With a geographical area, spanning 329 million hectares, India is the seventh largest country in the world in terms of landmass. The systems and types of land use have been conditioned by climatic conditions, primarily expressed in terms of precipitation/rainfall received in various parts of the country. Rainfall in India is unequally distributed in space. The mean annual rainfall ranges from less than 100 mm in parts of the Rajasthan desert to more than 4000 mm in the Western Ghats portions of South West India and the North eastern parts of the country. The intra-annual distribution of precipitation is also uncertain and seasonally skewed. The bulk of rainfall is received during the South-west monsoon season (from June to September) . However, even during this season there are periodic dry spells/droughts which are frequent in the arid and semi-arid zones of the country covering the States of Rajasthan, Gujarat, portions of Madhya Pradesh and the States of Maharashtra, Karnataka and Andhra Pradesh located in the Deccan area. Consequently, the crop yields of the rainfed sorghum-millet belt of arid and semi-arid India are subjected to periodic fluctuations.

3.02 The spatial diference in availability of precipitation is reflected in

the relative differences in the amounts of unit area runoffs from the various river basins of India both in intra and inter annual terms. The Central Water Commission (1988) places the average annual natural runoff available to India at 1880 billion cubic metres. The water storage structures created or under construction are able to store only 13.5% of the mean annual runnoff. Coming to groundwater resources, the estimate is that the replenishable groundwater resource in India(excluding the North-East) is 420 BCM/year of which 35-7 BCM/year is utilisable for irrigation against actual utilisation of only 106 BCM/year.

3.03 The unequal distribution of precipitation and water resources have conditioned agricultural cropping systems and systems of farming, though 'irrigation' has successfully transformed the water-short areas of Punjab, Haryana and Western Uttar Pradesh into the food bowls of India. Indeed there are sufficient indications that the agriculture frontier has stopped expanding. This is evident from the fact of net areas sown having increased from 119 million ha. in 1950-51 to 140 million ha. and stabilised at that level. (Table 6) In any case, an expanding agricultural frontier was not essentially environmentally conducive, since extension of cultivation to marginal lands had produced in its wake, problems of soil and water erosion. When this fact is related to the increase that has occured in the agricultural area subjected to double/multiple cropping (the area of

agricultural land sown more than once increased from 25,524000 ha.in 1971 to 36,770000 ha. in 1986-87), and the increase in food grain production by nearly 42 million tonnes in the period 1970-71 to 1985-86, it can be concluded that agriculture production in India is now based on the intensive margin i.e. modern technologies of production initiated during the Green Revolution of the late 1960s. But the spatial width of the intensive agricultural operations is narrow since, the Green Revolution has been evident mainly in the north-western portions of India and portions of Andhra Pradesh and Tamil Nadu in south India.

3.04 India is also endowed with large areas of non-agricultural/non-forest land. These include common grass lands and pastures, lands occupied by inland water regimes and fallow lands. These lands have been the sources of fuelwood and fodder for the large population of people and livestock in India.

Forests

3.05 India has a very diverse forest vegetation ranging from the temperate vegetation in the Himalayas to the moist Evergreen forests in North East, the Western Coast and the Andaman & Nicobar Islands. The forest cover of the country, as per the lastest assessment of the Forest Survey of India is 63.591 m.ha. comprising 19.44 % of India's geographical area. However,

the areas recorded as forests are higher and stand at 75.18 m. ha. The forests of India can be divided into 16 major groups comprising 221 types. tropical deciduous forests form the major percentage of forest cover in India (37% of total forest cover) followed by tropical dry deciduous forest (28.6%). The unique tropical wet evergreen forests comprise only 8% of the total forest cover. Of the total area of 63.91 million ha., dense forests (crown density above 40%) account for only 38.50 m. ha. There is no tree cover over 11.27 m.ha. officially recorded as forest areas, while another 25.4 mha of forests are understocked. About 52.8% of forests do not have adequate regeneration. The per capita forest area has decreased from 0.20 ha. in 1951 to 0.11 ha. in 1981. India's forest wealth as with the case of other natural resources varies both in quantitative and qualitative forms.

3.06 Apart from natural forests, man-made forests are also expanding due to the afforestation programmes initiated by the Government. The land areas afforested increased from 0.52 lakh ha. in the First Five Year Plan to 177.77 lakh ha. in 1970-71. Despite this progress in afforestation, the target of attaining 33 % land area under forest cover as laid down in the National Forest Policy 1988, appears to be a remote goal at the moment. The reasons are the tendency towards the deforestation and diversion of forest land for non-forestry purposes,the rising demands for

fuelwood and fodder , the increasing incidence of illicit felling, and forest fires. According to an estimate, the total fuelwood removal from forest, both authorised, and unauthorised is more than 235 million cu. ms. as against the sustainable level of production of only 48 million cu.m., which is incidentally placed as the annual fuelwood demand in India. Similarly, the incidence of grazing in forests for meeting the fodder needs of the large livestock population in India is another crucial problem. According to the Forest Survey of India, forest area affected by fire range from 33% in West Bengal to 99% in Manipur. Only 14 States have been covered in these estimates.

3.07 On the positive side had the regulatory regime and legal framework for forest conservation in India not been in place, the trend of deforestation would have been more severe by now. With the passage of the Forest Conservation Act, 1980, the annual rate of diversion of forest land for non-forestry purposes has come down to 16000 ha. annually as compared to 0.15 m.ha. in the pre-1980 period. On the other hand the increase in tree cover through development of forest plantations and natural regeneration programmes under wasteland development schemes in the last decade, has increased the green cover roughly at about 1.8 million hectares per annum, a process which needs to be accelerated.

Biodiversity

3.08 India is uniquely rich in all aspects of bio-diversity including ecosystem, species and genetic bio-diversity. For any one country in the world, it has perhaps the largest array of environmental situations by virtue of its tropical location, varied physical features and climatic types. India has the widest variety of biomes, an attribute further enhanced by the meeting of three major biogeographic realms, namely Indo-Malaya (the richest in the world), the Eurasian and the Afro-tropical. India owes its unique biodiversity to this unmatched interspersion of biogeographic and environmental values. It is estimated that over 75,000 species of fauna and 45,000 of flora are found in India.

3.09 According to a recent classification done by the Wildlife Institute of India, the country has 10 biogeographic zones i.e. Trans-Himalayan; Himalayan; Indian Desert; Semi-arid; Western Ghats; Deccan Peninsula; Gangetic Plain; North-east India; Islands; Coasts.

3.10 The trans-himalayan region with its sparse vegetation has the richest wild sheep and goat community in the world. The snow leopard (Panthera uncia) is found here, as is the migratory Blacknecked Crane (Grus nigricollis). The Himalaya, the highest mountain range in the

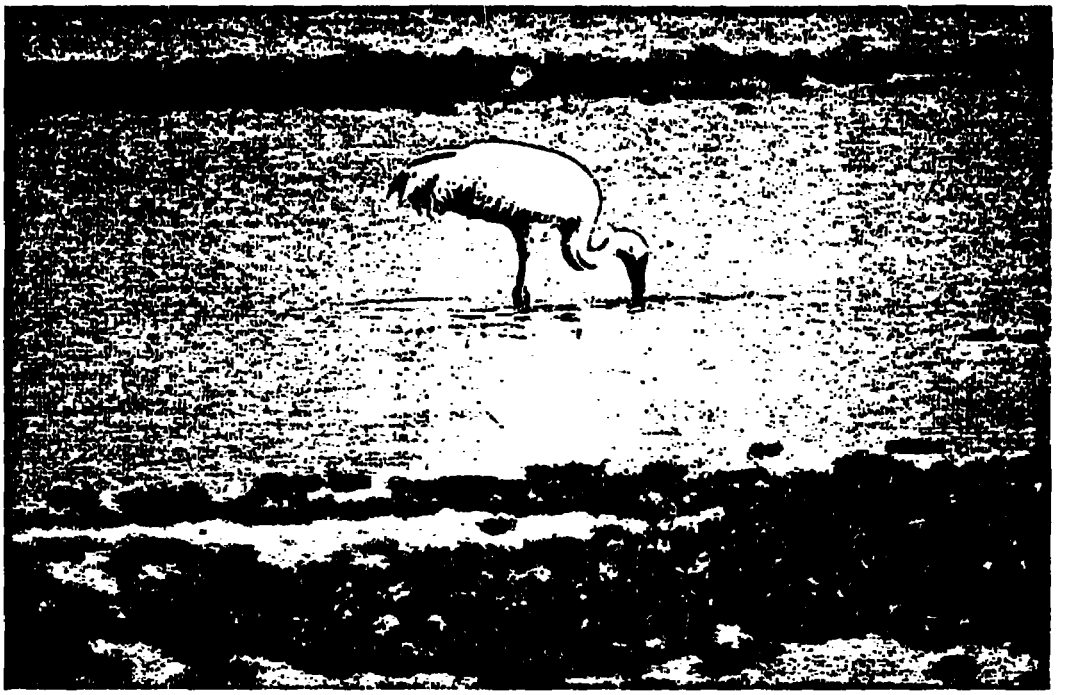
world, is located at the boundary of many biogeographical regions and is therefore one of the richest areas of India in terms of habitat and species diversity. In the north-west is the desert region with extensive grasslands. The Great Indian Bustard (Ardeotis nigriceps), a highly endangered bird, is found here. Adjoining the desert is the semi-arid region, a transitional zone between the desert and the denser forests of the Western Ghats. Beyond the Ghats is the Deccan plateau, which is also a semi-arid region lying in the rain shadow of the Western Ghats.

3.11 In the north is the Gangetic plain extending up to the Himalayan foothills. North-east India is one of the richest regions of biodiversity in the country. It has several species of orchids, bamboos, ferns and other plants. This region is also one of the early centres of domestication of cultivated plants such as banana, mango, citrus and jute.

3.12 India has two major groups of islands, Lakshadweep in the Arabian Sea, and Andaman and Nicobar Islands in the Bay of Bengal. The Andaman and Nicobar Islands have some of the best-preserved evergreen forests of India. Several species of plants and animals are endemic to these Islands. India has a very long coastline extending over 5,500 kms. Mangrove vegetation is characteristic of the estuarine tracts along the coast which sustain rich biological diversity. The total area of mangroves

in India is approximately 6700 sq. kms. which comprises about 7% of the world's total mangrove area and harbours 59 species of 41 general belonging to different countries. India is also rich in coral reefs. Major reef formations in Indian seas occur at the Gulf of Mannar, Palk Bay, Gulf of Kutch, the Andaman and Nicobar Islands and the Lakshadweep. With the exception of the Lakshadweep reefs which are atolls, others are of the fringing type. Submerged banks with coral growth are also known from the Arabian sea. The threat to mangroves and coral reefs assume the form of biotic pressures such as fishing, landuse changes in surrounding areas and pollution of waters etc.

3.13 Indian wetlands which represent various geographical regions dot the cold arid zones of Ladakh, warm arid zones of Rajasthan, tropical monsoonic Central India, wet north eastern region, wet southern Peninsula and the coastal wetlands. There are around 17 million hectares of wetlands in the country excluding paddy fields. In India the area under natural wetlands is 1450871 ha. and under man-made wetlands is around 2589266 ha. which is increasing every year. According to estimates, only 28% of the area of 93 important wetlands in India is under total protection which amounts to 53 sites out of the 93 sites. This number does not include a vast number of small, scattered aquatic habitats throughout the country. These include city tanks, rural irrigation water bodies, lagoons,



SIBERIAN CRANE FEEDING IN BHARATPUR WETLAND

THE SUNDERBANS MANGROVES

coastline habitats and other sensitive wetland habitats of biodiversity importance. Out of the 85 wetland sites of international importance in the country, 45% are subjected to moderate or high threat.

3.14 The problems faced by Indian wetlands relate to weed infestation, siltation, pressures of agriculture and encroachments of wetlands, chemical and organic pollution and eutrophication besides, conversion of wetlands for industrialisation, urbanisation and habitation.

Species Diversity

3.15 The Zoological Survey of India, the Botanical Survey of India and the Forest Survey of India study and document the plant and animal diversity of the country. Of the estimated 45,000 plant species, about 15,000 species of flowering plants have been described. Estimates of other plant taxa include 5,000 species of algae, 1,600 of lichens, 20,000 of fungi, 2,700 of bryophytes and 600 of pteridophytes. There are about 75,000 species of animals including 50,000 insects, 4,000 molluscs, 2,000 fishes, 140 amphibians, 420 reptiles, 1,200 birds and 340 mammals, and other invertebrates. A very large number of the species described are endemic to India. Among the larger animals 79 species of mammals, 44 of birds, 15 of reptiles, and three of amphibians are threatened. Nearly 1,500 plant species are considered endangered.

3.16 The main strategy for the conservation of species is the protection of viable habitats in representative ecosystems. In addition, specific measures have been taken to prevent poaching and trade in wildlife products. Special steps to check illegal trade in ivory, rhino horns, furs, skins, musk and peacock feathers have also been taken. India is also a signatory to the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).

3.17 Certain species have been identified as needing a concerted and specifically directed protection effort. Projects have been initiated such as Project Tiger, 'Save the Barasingha' campaign, and more recently a project on the Asiatic Elephant. A citrus sanctuary has been set up in Meghalaya. These programmes, though focussed on single species, have a wider impact as they conserve habitats and a variety of other species.

3.18 *Ex situ* conservation is another thrust in conservation efforts. The Indian Botanical Garden in Howrah (West Bengal) is over 200 years old. Other important botanical gardens include those in Bangalore and Lucknow. Whereas zoological parks have been looked upon essentially as centres for education and recreation, they have also played an important role in the conservation of species such as the Manipur Thamin Deer (Cerus eldi eldi) and the Whitewinged Wood Duck (Cairina scutulata). Notable

THE INDIAN ONE HORNED RHINO

examples of successful captive breeding are those of Gangetic Gharian (Gavialis gangeticus), turtles and the white tiger.

Genetic Diversity

3.19 A great amount of research needs to be undertaken on the conservation of genetic diversity in India. Sanctuaries and national parks have isolated populations of wild animals thereby decreasing chances of one group breeding with another. Experiments are under way in creating corridors between parks and integrating different parks into larger protected zones in order to broaden the genetic base.

3.20 India has a long tradition of breeding domestic animals for specific qualities. These include cattle, goats, pigs and sheep, as well as horses and pigeons for sport. With the focus on increasing milk yields though cross-breeding, some of the original cattle breeds are in danger of becoming extinct. Efforts for the maintenance of pure breeds of native animals needs to be considerably strengthened. A good deal of attention has been paid to the genetic conservation of domesticated plants. Both *in situ* and *ex situ* conservation methods have been put into practice. However, as in the case of cattle, hybrid varieties of crops are rapidly replacing the land races. Out of an estimated 50,000 varieties of rice in India, the country may be dependent on just 300 in the next decade.

3.21 Numerous locally adapted varieties which performed well under low or no input conditions are being replaced by a few high yielding strains dependent on large quantities of inputs. Such replacement, in large contiguous areas, presents the danger of the spread of serious diseases which can wipe out entire crops.

3.22 *Ex situ* collection and preservation of genetic resources is done through the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, for wild relatives of crop plants, the National Bureau of Animal Genetic Resources at Karnal in Haryana, for domesticated animals, and the National Bureau of Fish Genetic Resources, Lucknow. The NBPGR is the nodal agency for providing germplasm on request to scientific and research insitutions both within and outside India. India is also a signatory to the Global convention for conservation of bio-diversity. There is a need to intensify *in-situ* and *ex-situ* conservation of biodiversity and for codifying ethnoknowledge.

Degraded Lands

3.23 One of the major problems confronting India is the problem of land degradation which has affected 174 m.ha. comprising agricultural, non-agricultural lands and forests. Since the establishment of the National Wastelands Development Board in 1985, it has been possible to ensure

ROYAL BENGAL TIGER

WILD ASS

treatment for 40 m.ha of degraded lands in the country affected by water logging (8.53 m.ha.) ravine and gullied lands (3.97 m.ha.) saline and sodic lands (9 m.ha.).

Marine Resources

3.24 The country is rich in marine food resources including fish. It is estimated that the continental shelf alone has an area of 0.44 m.sq.kms. with an estimated production potential of 4.5 m. tonnes of marine produce per year. The present harvest of marine resources from depths up to 40 fathoms is around 1.75 m. tonnes.

Minerals and Energy Resources

3.25 India is rich in both renewable and non-renewable mineral resources and there have been sustained efforts for their discovery and exploration. From an economic point of view iron ore, copper, lead, zinc and gold are the principal minerals. Iron Ore is a major foreign exchange earner for India. also India has gradually evolved as an exporter of aluminium and has achieved near self-sufficiency in zinc. The entire requirement of nickel is presently being imported. There are certain constraints with regard to mineral resources in India - such as low quality copper deposits. The present production of coal in India is 229 million tonnes (1991-92). A target of 308 m.tonnes has been fixed for 1996-97. Indian coal also

suffers from quality problems mainly because of the high ash content of coking coal (22% as against a stipulated 17% for steel plants), oversized coal and presence of extraneous matter in supplies to power plants and inadequate availability of high grade coal for industries.

3.26 In respect of energy sources, hydro carbons have developed a major energy source in recent years. India has about 0.04% of the world's proven resources of hydro carbons. However, the established geological reserves amount to 5.32 billion tonnes only. With the current level of oil production which fell from a peak level of 34.09 million tone in 1990 to 28.46 m. tones in 1992-93, India's efforts for attaining self sufficiency in hydro carbons suffered a set back. Though our natural gas potential was 59.65 billion cu. mt. during the 7th Five Year Plan, actual utilisation was only 40.41 billion cu. mt. due to the balance being flared. It is estimated that the loss to the economy on account of flaring of natural gas is Rupees 1500 crores per year.

INDIA'S LEGAL AND ORGANISATIONAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

4 INDIA'S LEGAL AND ORGANISATIONAL FRAMEWORK FOR ENVIRONMENT MANAGEMENT

4.01 The Directive Principles of State Policy of the Indian Constitution, provides in clear and unambigous terms, the State's commitment to protect the environment. Article 48-A of the Directive Principles states:

> "The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country."

4.02 Environmental protection is also enshrined as a Fundamental Duty of the Citizen of India. Article 51-A (g) mentions that it shall be the duty of every citizen of India "to protect and improve the natural environment, including, forests, lakes, rivers and wildlife, and to have compassion for living creatures:" The Constitution 73rd Amendment Act of 1992 on Panchayats which adds a Eleventh Schedule to the Constitution has 8 entries (viz. 2,3,6,7,11,12,15 & 29) which are linked to environmental protection and conservation. The functions assigned to Panchayats include soil conservation, water management, watershed development, social and farm forestry, drinking water, fuel and fodder, non-conventional energy sources and maintenance of community assets which are significant from the environmental management point of view. Entry 8 of the 12th

Schedule added to the Constitution by the 74th Amendment Act, 1992 for constitution of Urban Local-Bodies assigns the function of "Protection of Environment and Promotion of Ecological Effects" to urban local bodies.

4.03 These Constitutional provisions have been given effect through the "regulatory" environmental protection laws in India exemplified in the umbrella Environment (Protection) Act, 1986 and the more specific Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 to specifically regulate the problem of air and water pollution. Among the specific natural resources protection acts are the Forest (Conservation) Act, 1980 and Wildlife (Prevention) Act, 1972 extended to cover Biosphere Resourcces and the Hazardous Wastes (Management & Handling) Rules, 1989, Manufacture, Storage & Import of Hazardous Chemical Rules, 1989, Manufacture, Use, Import, Export and Storage of Hazardous Micro-Organisms and Genetically Engineered Organism or Cell Rules, 1989 to regulate storage, use, trade, transport and disposal of hazardous wastes.

4.04 A fairly detailed "promotional", policy framework is in place. The policy framework comprises the National Forest Policy, 1988, the National Conservation Strategy and Policy Statement on Environment and Development, 1992 and the Policy Statement for Abatement of Pollution,

1992. These policy statements complement the National Water Policy, the Factory Act, 1948 and other related legislation having a bearing on natural resources and economic activities. The contours of the legal and policy framework have already been brought out in the Foreword.

4.05 The "promotional" framework of policies has impingned India's environment scene economically and institutionally. The numerous schemes of financial assistance and fiscal incentives in the area of forestry, wildlife and pollution control will be detailed in the subsequent Chapter. The institutional impact of the policy framework lie in the scheme of decentralised community-based management systems for management of degraded forests, initiated by the Government of India through a Government circular of June, 1990 for decentralised management of forests and sharing of usufructs. As on date, 13 State Governments in India have issued usufruct sharing orders in respect of forest lands.

People's Involvement in Regeneration of Degraded Forest Lands

The National Forest Policy, 1988 envisages people's involvement in the development and protection of forests. The requirements of fuelwood, fodder and small timber such as house-building material, of the tribals and other villagers living in and near the forests, are to be treated as first charge on forest produce. The Policy document envisages it as one of the essentials of forest management that the forest communities should be motivated to identify themselves with the development and protection of forests from which they derive benefits.

Committed voluntary agencies/NGOs, with proven track record, may prove particularly well suited for motivating and organising village communities for protection, afforestation and development of degraded forest land, especially in the vicinity of habitations. The State Forest

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Departments/Social Forestry Organisations ought to take full advantage of their expertise and experience in this respect for building up meaningful people's participation in protection and development of degraded forest lands. The voluntary agencies/NGOs may be associated as interface between State Forest Departments and the local village communities for revival, restoration and development of degraded forests in the manner suggested below:

(i) *The programme should be implemented under an arrangement between the Voluntary Agency/NGO, the village community (beneficiaries) and the State Forest Department.*

(ii) *No ownership or lease rights over the forest land should be given to the beneficiaries or to the Voluntary Agency/NGO. Nor should the forest land be assigned in contravention of the provisions contained in the Forest (Conservation) Act, 1980.*

(iii) *The beneficiaries should be entitled to a share in usufructs to the extent and subject to the conditions prescribed by the State Government in this behalf. The Voluntary Agency/ NGO should not be entitled to usufructory benefits.*

(iv) *Access to forest land and usufructory benefits should be only to the beneficiaries who get organised into a village institution, specifically for forest regeneration and protection. This could be the Panchayat or the Cooperative of the village, with no restriction on membership. It could also be Village Forest Committee. In no case should any access or tree pattas be given to individuals.*

(v) *The beneficiaries should be given usufructs like grasses, lops and tops of branches, and minor forest produce. If they successfully protect the forests, they may be given a portion of the proceeds from the sale of trees when they mature. (The Government of West Bengal has issued orders to given 25% of the sale proceeds to the Village Forest Protection Committees. Similar norms may be adopted by other States).*

(vi) *Areas to be selected for the programme should be free from the claims (including existing rights, privileges, concessions) of any person who is not a beneficiary under the scheme. Alternatively, for a given site the selection of beneficiaries should be done in such a way that any one who has a claim to any forest produce from the seleced site is not left out without being given full opportunity of joining.*

(vii) *The selected site should be worked in accordance with a Working Scheme, duly approved by the State Government. Such scheme may remain in operation for a period of 10 years and revised/renewed after that. The Working Scheme should be prepared in consultation with the beneficiaries. Apart from protection of the site, the said Scheme may prescribe requisite operations, eg. inducement to natural regeneration of existing root stock, seeding, gap filling, and wherever necessary, intensive planting, soil-moisture conservation measures etc. The Working Scheme should also prescribe other operations eg. fire-protection, maintenance of boundaries, weeding, tending, cleaning, thinning etc.*

(viii) *For raising nurseries, preparing land for planting and protecting the trees after planting, the beneficiaries should be paid by the Forest Department from the funds under the social forestry programme. However, the village community may obtain funds from other Government agencies and sources for undertaking these activities.*

(ix) *It should be ensured that there is no grazing at all in the forest land protected by the village*

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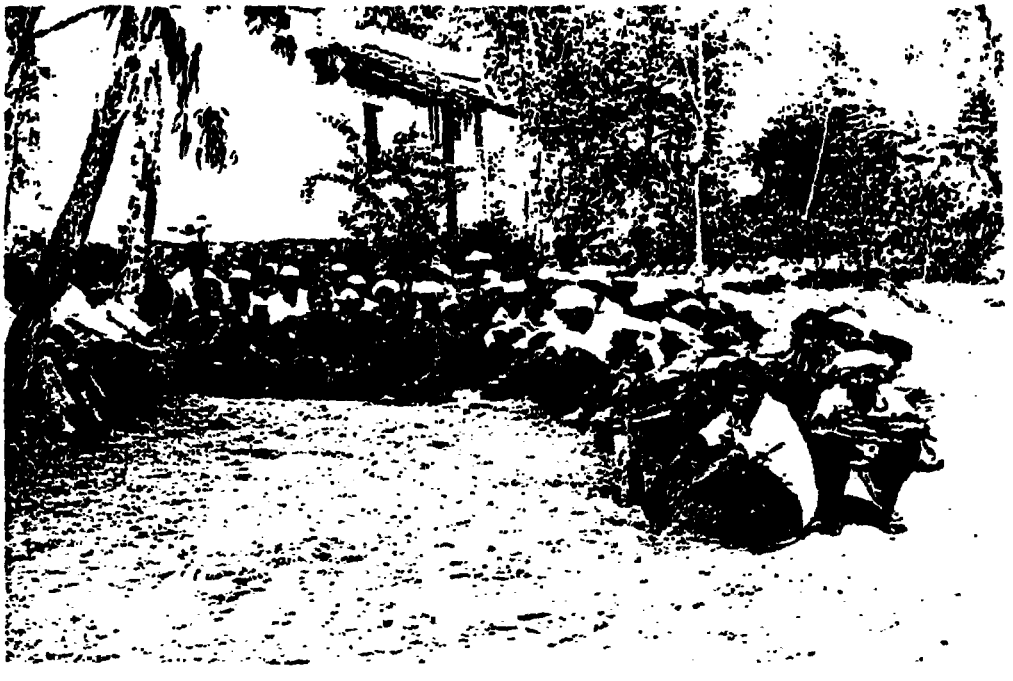

MEMBERS OF THE VILLAGE PROTECTION COMMITTEE AT CHOTA BHANTA BHABRA RANGE - JHABUA FOREST DIVISION DISCUSSING WITH THE FOREST OFFICIALS

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community. Permission to cut and carry grass free of cost should be given so that stall feeding is promoted.

(x) *No agriculture should be permitted on the forest land.*

(xi) *Along with trees for fuel, fodder and timber, the village community may be permitted to plant such fruit trees as would fit in with the overall scheme of afforestation, such as aonla, imli, mango, mahua etc. as well as shrubs, legumes and grasses which would meet local needs, help soil and water conservation, and enrich the degraded soils/ land. Even indigenous medicinal plants may be grown according to the requirement and preference of beneficiaries.*

(xii) *Cutting of trees should not be permitted before they are ripe for harvesting. The forest department also should not cut the trees on the forest land being protected by the village communities except in the manner prescribed in the Working Scheme. In case of emergency needs, the village communities should be taken into confidence.*

(xiii) *The benefit of people's participation should go to the village communities and not to commercial or other interests which may try to derive benefit in their names. The selection of beneficiaries should therefore, be done from only those families which are willing to participate through their personal efforts.*

(xiv) *The Forest Department should closely supervise the works. If the beneficiaries and/or the Voluntary Agency/NGO fail or neglect to protect the area from grazing, encroachment or do not perform the operations prescribed in the Working Scheme in a satisfactory manner, the usufructory benefits should be withdrawn without paying compensation to anyone for any work that might have been done prior to it. Suitable provisions in the Memorandum of Understanding for this purpose should be incorporated.*

Text of the June 1, 1990 guidelines of the Ministry of Environment & Forests, Government of India

Organisational structure for Environment Management in India

4.06 Based on the recommendations of the Reports of the Committee for Recommending Legislative Measures and Administrative Machinery for Ensuring Environmental Protection, a Department of Environment was set up, in 1980, within the Government of India. Over the years this has expanded into a full fledged Ministry of Environment and Forests.

The Ministry has four divisions:-

a. Environment - with the field formation being the CPCB for exercise of promotional and regulatory functions under the Water Air and Environment Protection Acts;

b. Forests and Wildlife - the field formations are the Wildlife Preservation Offices located in different parts of the country for implementing the Wildlife Protection Act , 1972 and the Regional Offices of the Ministry of Environment and Forests for implementing the provisions of the Forest (Conservation) Act, 1980;

c. Ganga Project Directorate - the project is administered by a Steering Committee headed by the Secretary (Environment and Forests), Government of India. The nodal departments in States are the departments of Urban Development in Uttar Pradesh, Bihar and West Bengal and the Uttar Pradesh Jal Nigam and the Bihar Rajya Jal Parishad, and Calcutta Metropolitan Development Authority. This Directorate will supervise the National River Action Plan as and when it is finalised; and

d. National Afforestation and Ecodevelopment Board - Six Regional Centres have been established under the National Social Forestry Project to provide support for project preparation/formulation and for interaction with Government.

4.07 In addition, there are various institutes and bodies under or

working with the Ministry of Environment and Forests, which are categorised in terms of their broad functions below:-

Research & Development:

a) Indian Council for Forestry Research and Education, Dehradun, and its constituent institutions i.e. the Forest Research Institute, Dehradun; the Institute for Wood Science and Technology, Bangalore; the Institute of Forest Genetics, Coimbatore; the Institute of Deciduous Forest, Jabalpur; the Institute of Rain Forest, Jorhat; and the Institute of Arid Zone Forestry Research Institute, Jodhpur.

b. Indian Plywood Industries Research Institute, Bangalore;

c. Centre for Mining Environment, Dhanbad.

d. Indira Gandhi National Forest Academy, Dehradun

e. GB Pant Institute of Himalayan Environment and Development, Almora, with its constituent units at Sikkim, Himachal Pradesh, Garhwal and North East.

f. Centre for Environment Education, Ahmedabad.

g. Ecological Research & Training Centre, Bangalore.

h. C.P.R. Environmental Education Centre, Madras.

i. Salim Ali Centre for Ornithology and Natural History, Coimbatore.

j. Botanical Survey of India, Calcutta.

k. Zoological Survey of India, Calcutta

l. Forest Survey of India, Dehradun.

m. National Museum of Natural History, New Delhi.

n. Indian Institute of Forest Management, Bhopal.

o. Wildlife Institute of India, Dehradun.

4.08 In addition to these institutes, the Ministry works through several Committees and Councils which dealing with specific research problems, carrying capacity studies, clean technologies, waste management, impact assessment, etc. A review of the activities of the Ministry and its institutions and bodies suggests that:

a. Adequate organisational infrastructure exist for the following tasks and strategies: the conservation and regeneration of forests; conservation of wildlife and genetic diversity; environment Impact Assessment; ecodevelopment and Joint Forest Management; research and development in Forestry and Wild Life; monitoring of pollution and of forest canopy cover; waste management; training

in forestry and wildlife conservation; and the prevention and control of air and water pollution.

b. Some, though inadequate, organisational infrastructure exists for the remaining tasks and strategies, except for : conservation of rangelands; protection of diverse and traditional ecological cultures and systems of knowledge; and development and absorption of cleaner technologies.

Other Ministries and Departments of the Government of India

4.09 A large proportion of the environmental tasks and strategies involve Ministries and Departments other than the Ministry of Environment and Forests (MOEF). In fact, in some cases, the major responsibility rests with agencies other than the MOEF.

4.10 A look at the schemes and structures of other concerned Departments suggests that adequate administrative structures seem to exist for:-

a. regeneration of biomass outside recorded forest areas - within the Ministry of Rural Development;

b. energy conservation and development of alternative sources -

within the Ministry of Power, Ministry of Industry and Ministry of Non-Conventional Energy Sources;

c. monitoring of water quality - within the Ministry of Water Resources;

d. EIA for water resource projects - within the Ministry of Water Resources;

e. watershed management - within the Ministry of Water Resources and the Ministry of Agriculture;

f. soil conservation - within the Ministry of Agriculture;

g. protection of forests through control of shifting cultivation - within the Ministry of Agriculture;

h. conservation of domesticated biodiversity - within the Ministry of Agriculture;

i. technical support for *ex-situ* conservation and bio-safety - the Department of Bio-Technology;

j. technology for environment protection - CSIR and its laboratories, industrial R&D laboratories; and

k. solid waste collection and disposal in urban areas - Ministry of Urban Development, Government of India.

4.11 For the other tasks and strategies, partial administrative structures do exist.

Provincial Structures

4.12 All the States and Union Territories have Departments looking after environment and forests, collectively or singly. In addition, most of the States have State Pollution Control Boards. Some of the States also have specialised institutes like the Kerala Forest Research Institute, Kerala, the Madhya Pradesh Forest Research Institute, the Environmental Protection and Co-ordination Agency (EPCO), Madhya Pradesh, Environment Protection and Training Institute, Andhra Pradesh or the State Wastelands Development Board, Maharashtra. The State Pollution Control Boards have a significant role to play in environmental monitoring and pollution control.

4.13 A preliminary assessment of the administrative structures in the States suggest that though adequate structures exist for the conservation and regeneration of forests and wildlife, and for the prevention and control of air and water pollution, almost all other tasks and strategies have none or very inadequate administrative structures. Though specific States have administrative structures in position for one or another of the remaining tasks and strategies, there is no uniformity about this.

International Agreements

4.14 India is signatory to the six important Conventions that have a direct bearing on environment protection and conservation. These are the Convention on International Trade in Endangered Species (CITES), the Convention on Wetlands of International Importance (the Ramsar Convention), the Convention on Climate Change, the Convention for Conservation of Biological Resources and the Vienna Convention/ Montreal Protocol on Substances that Deplete the Ozone Layer. In addition, India was a party to the "Rio Declaration on Environment and Development" and the Agenda 21, the operational programme for sustainable development also adopted at the United Nations Conference on Environment and Development at Rio de Janeiro in June, 1992.

CURRENT PROGRAMMES

5 CURRENT PROGRAMMES

5.01 India's programmes and achievements in the sphere of environment can be broadly categorised into two parts (a) programmes for environmental protection and conservation of the Ministry of Environment and Forestry and (b) programmes having significance for natural resources conservation and protection initiated by other sectoral Ministries/ Department at the Central Government.

5.02 The projects initiated under these programmes can be public investment based (financed by the Central/State Governments) or implemented with assistance from multilateral and bilateral donor agencies. In terms of their basic characteristics current projects in India can be divided into two categories (a) those which are designed for organisational building or strengthening for research, conservation and environmental protection and (b) those which are non-organisational or are operational in nature.

5.03 The main programmes being undertaken by the Ministry of Environment and Forests are as below:

a. survey of natural resources including flora, fauna and survey of forest cover and resources;

b. conservation of natural resources. This includes biosphere resources, wetlands, mangroves and coral reefs, forests and wildlife, besides botanical gardens;

c. environmental impact assessment - assessment and regulation for management;

d. monitoring, control and prevention of pollution;

e. management of hazardous substances;

f. regeneration and development including the Ganga Action Plan and afforestation and eco-development;

g. research on natural resources and ecosystems;

h. education and information in forestry, wildlife and for environmental awareness;

i. legislation and organisational support for environmental management, which has already been discussed; and

j. international cooperation for seeking bilateral and multilateral assistance and for addressing "the global environmental issues."

5.04 The projects undertaken under these programmes are summed up as below.

Survey of Natural Resources

5.05 **Organisational** : Establishment of Environmental Information System, Centre on Animal Ecology in the Zoological Survey of India.

5.06 **Non-Organisational** : Floral/faunal surveys by the Botanical Survey of India/Zoological Survey of India respectively in various parts of India for identifying, cataloguing classifying and critically assessing the characteristics of the species surveyed.

- Environment Impact Assessment Studies on ecology and wildlife by the two organisations; and
- survey by the Forest Survey of India for assessing forest cover in India and drawing up forest resources inventory for various parts of the country.

Conservation of Natural Resources

5.07 **Organisational**

- establishment of a Central Zoo Authority to support, oversee, monitor and coordinate, management of Zoos in the country;
- assistance to State Governments for initiating monitoring and evaluation of Tiger Reserves by independent agencies; and
- assistance for establishing nature interpretation centres at Wildlife national parks and sanctuaries.

5.08 **Non-Organisational:**

- designation of wetlands under the Ramsar Convention on wetlands;
- formulation and approval to management action plans for different wetlands/mangroves and coral reefs in the different parts of India;
- assistance to botanical gardens for augmenting their activities in conservation and protection of plant genetic resources;
- drawing up of an integrated perspective programme for development of forestry sector at national and provincial level under the UNDP/ FAO assisted National Forestry Action Programme;
- assistance to State Governments for supply of modern fire-fighting equipments under the 'Modern Forest Fire Control Project' originally assisted by the UNDP/FAO;
- constitution/enlargement strengthening of protected areas in India, already comprising of 75 National Parks, 421 Wildlife Sanctuaries with an area of 1,40,675.46 sq. kms;
- enlarging and strengthening the area under "Project/Tiger" network, monitoring the implementation of management plans in tiger reserves; and
- assistance to zoological parks.

Environmental Impact Assessment:

5.09 **Organisational**

- training in EIA of the planners, decision makers, bureaucrats and professionals.

5.10 Non-Organisational

- project appraisal for the grant of environmental clearances;

- issue of notifications to regulate developmental activities in fragile ecosystems and areas which are vulnerable to environmental deterioration;

- supporting studies on carrying capacity in environmentally fragile or problematic areas; and

- monitoring the performance of stipulated EIA conditions

Industrial Pollution Control Project of India

To give teeth to our comprehensive environmental protection legislation and in order to operationalise India's Policy Statement for Abatement of Pollution an Industrial Pollution Control Project was initiated with a World Bank line of credit of US$ 155.6 million and counterpart funds of US$ 108 million (to be provided by the Government of India/State Governments/Development Financial Institutes) with the following objectives :

- *to strengthen the monitoring and enforcement abilities of the Pollution Control Boards of the heavily industrialized States in the country, viz. Gujarat, Maharashtra, Tamil Nadu and Uttar Pradesh.*

- *to get individual units install appropriate pollution control devices.*

- *to assist the establishment of Common Effluent Treatment Plants for the combined treatment of effluents from clusters of small scale units.*

- *to introduce clean technologies which would have a minimum generation of wastes through demonstration projects and studies.*

- *to support a training programme of the staff of the Pollution Control Boards and of the financial institutions involved in the Project.*

The three broad components of the Industrial Pollution Control Project are: (i) Institutional Development Component which would finance the acquisition of equipment and other facilities

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by the State Pollution Control Boards concerned, besides providing training to their personnel. (ii) the investment component which would finance sub-loans to industrial units of the large and medium scale for installation of pollution control facilities and provide sub-loans/sub-grants for setting up common effluent treatment plants for cluster of industrial units and establishment of demonstration project on cleaner technologies of industrial production.

As on 30th April, 1992, under the Investment Component the Development Finance Institutes viz. the Industrial Development Bank of India (IDBI) and the Industrial Credit & Investment Corporation of India had sanctioned loans to the tune of US$ 25.805 million for paper & pulp, chemicals, pharmaceuticals, dye and dye-intermediate, fertilizer, steel industrial units and refineries. An amount of Rupees 85.78 lakhs has also been sanctioned for installation of Common Effluent Treatment Plants during 1993-94. It is envisaged to diversify The Industrial Pollution Control Project both in terms of its geographical and sectoral spread.

Monitoring/Prevention and Control of Pollution

5.11 Organisational

- Swedish assistance for strengthening the 'Environmental Protection, Training and Research Institute', Hyderabad and the Pollution Control Research Institute, Hardwar, (Uttar Pradesh) for providing training to policy makers and technicians in environmental management;

- organisation strengthening of Central and State Pollution Control Boards under the World Bank assisted Industrial Pollution Control and Prevention Projects; and

- technical assistance to the Ministry of Environment and Forests for evaluating environmental problems and financial assistance for undertaking feasibility studies for the pollution control.

5.12 Non-Organisational

- monitoring of air and water quality for selected "heavily polluting units" and land/aquatic/river zones of the country;
- measures for controlling non-stationary sources of pollution such as vehicular pollution;
- preparation of action plans for the abatement of pollution in highly polluting industries;
- notifying environmental standards for various industries;
- implementation of World Bank assisted $155.6 million, Industrial Pollution Control Project and the proposed Industrial Pollution Prevention Projects in the States of Gujarat , Maharashtra, Tamil Nadu and Uttar Pradesh;
- scheme for labelling of environmentally friendly products for household and consumer products; and
- scheme on "Adoption of clean technology to the Small Scale Industries and to extend Technical Support" to encourage modernisation of Small Scale Units in India.
- pilot project for biomonitoring of river Yamuna with assistance of the Netherlands for developing a water quality index which is being

tested in other basins of Tungabhadra and Challyar rivers in South India; and

- operation of automatic water quality stations with Dutch (The Netherlands) assistance in the River Ganga for continous monitoring of water quality.

Management of Hazardous Substances

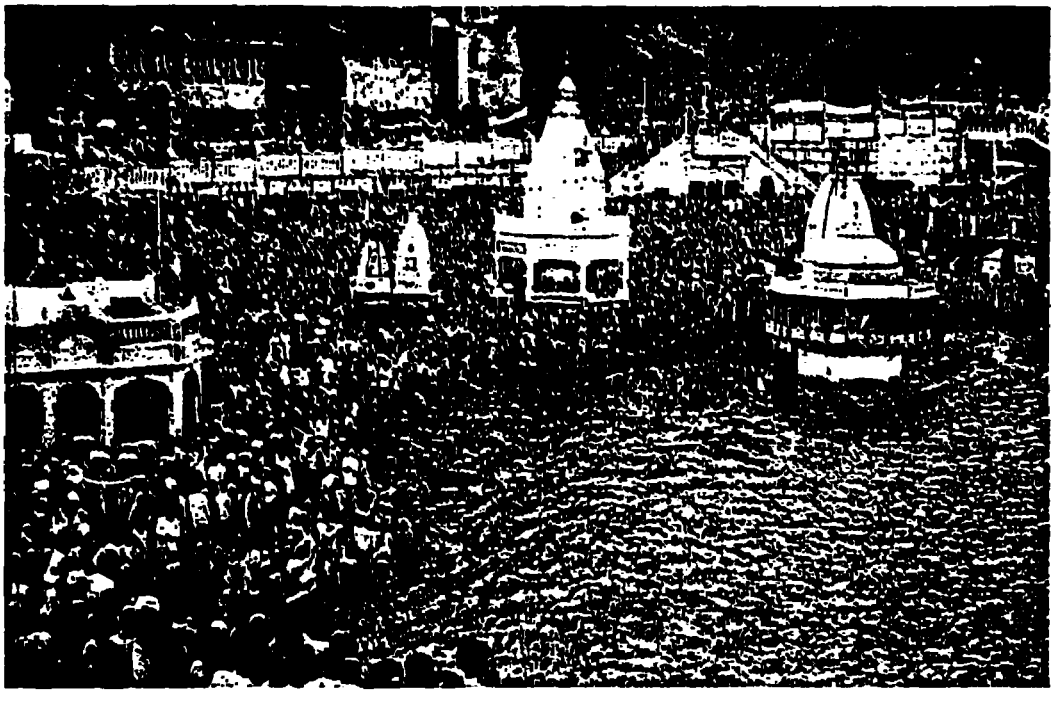
5.13 Organisational

- financial assistance for research projects to develop technologies for the scientific handling and treatment of hazardous wastes;
- training programmes for various categories of personnel in the management of chemical accidents;
- training programmes on household disposal of wastes and environmental sanitation for urban slum dwellers; and
- financial assistance to State Pollution Control Boards for setting up infrastructure for regulating management of hazardous substances.

5.14 Non-Organisational

- financial assistance to States for conducting EIA studies for identification of sites for disposal of hazardous substances.

OXIDATION POND, GANGA ACTION PLAN, WEST BENGAL



HARIDWAR, RIVER GANGA, ONE OF THE FOCUS POINTS OF THE GANGA ACTION PLAN

5.15 Organisational

- public awareness and education programmes involving NGOs, youth, pilgrims and school students.

5.16 Non-Organisational

a. setting up of infrastructure for interception, diversion and treatment of domestic/industrial sewage in 25 Class I towns along the river Ganga;

b. monitoring of 68 grossly polluting industries discharging effluents into the Ganga river and its tributaries;

c. epidemiological studies for study of the Ganga Action Plan on human health diseases;

d. pollution abatement schemes for the Yamuna and Gomti rivers as the Ganga Action Plan Phase II project at a total cost of Rs.421 crores. The project is to be undertaken in 15 towns along the Yamuna river and 3 towns along the Gomti river.

e. a National River Action Plan to support pollution abatement works in other polluted stretches of major rivers in India.

The National River Action Plan

Various scientific studies carried out from the early 1950s to 1970s had revealed the declining trend in water quality of thr river Ganga. The Ganga Action Plan was formulated and launched primarily to arrest this degradation by a comprehensive programme of interception, diversion and treatment of domestic sewage and prevention of toxic and industrial chemical wastes from identified grossly polluting industrial units entering into the river. The evolution of the Ganga Action Plan since its inception in 1986 has had many interesting lessons to offer both in the matter of river basin management and project implementation. Further the Ganga Action Plan has also persuaded government to look into the growing problem of pollution and deteriorating water quality in the other rivers in the country. The National River Action Plan has been conceived as a larger plan to carry out pollution abatement works in fourteen grossly polluted stretches in nine of 17 rivers in India and fourteen less polluted stretches in the remaining eight rivers. About forty four towns would be covered by the National River Action Plan in the first instance for tackling the problem of pollution load in their river stretches. The States covered are Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh. An amount of Rs.900 crores is estimated as the cost of treatment of 1650 million litres of wastewater per day likely to be generated by the forty four towns. The State Governments concerned have shown great enthusiasm for the programme, whose technical and administrative structure is under finalisation.

Afforestation and Eco-Development Board

5.17 Organisational

- support to seven regional centres to support State Governments preparation of projects for afforestation and eco-development with people's participation;
- assistance to the eco-task force to assist and utilise ex-army personnel for the restoration of wastelands and environmentally degraded areas, in Uttar Pradesh, Jammu & Kashmir and Rajasthan.

5.18 Non-Organisational

a. scheme for conservation of non wood forest produce including medicinal plants;

b. development of forest and pasture seeds;

c. scheme for aerial seeding (100% Centrally Sponsored);

d. centrally sponsored Integrated Wastelands Development Project Scheme. This includes the World Bank assisted National Social Forestry Project launched in the States of Rajasthan, Uttar Pradesh, Himachal Pradesh and Gujarat and Kerala and the Swedish International Development Agency - assisted social forestry projects in Tamil Nadu, the European Community - assisted "Greening of Aravallis in Haryana, the Overseas Economic Cooperation Fund (OECF - Japan) assisted projects relating to Afforestation and Pasture Development along the Indira Gandhi Canal and the Afforestation project for Aravalli Hills in Rajasthan;

e. fuelwood and fodder projects scheme (50% Centrally Sponsored);

f. seed development scheme (100% Centrally Sponsored);

g. grants-in-aid to voluntary agencies for afforestation and wasteland development assisted by OECF (Japan);

h. administration of the National Fund for Afforestation;

i. mapping of wastelands and geographical information systems; and

j. forest development projects in the Western Ghats with ODA assistance.

Afforestation Programmes : Appraisal of progress in Seventh Five Year Plan

In the Seventh Plan there was considerable increase in the total area brought under afforestation programme. Block plantations, strip plantations and farm forestry were carried out. Plan funds were made available through Forest Department in the States. These were further supplemented in 15 States with new projects which received external assistance. While the total afforestation during the Sixth Plan period was only 4.65 million ha, the coverage in the Seventh Plan, was 8.87 million ha.

To bring about qualitative changes in this programme, a National Wastelands Development Board (NWDB) was set up in June 1985, with the principal aim of reclaiming wastelands through a massive programme of afforestation with people's participation.

An independent evaluation of Rural Fuelwood Plantation (RFP) scheme was carried out by the National Council for Applied Economic Research at the behest of National Wastelands Development Board (NWDB). The study has revealed certain deficiencies in the scheme namely, low survival of plantation (between 40 to 50 percent) and poor health of the surviving plants; inadequate consolidation of effort and discontinuity; poor maintenance and after care of plantations; predominance of nonfuel species in most States; ambitious targets and bad advance planning leading to poor choice of planting material and lack of people's involvement.

A number of programmes of afforestation were taken up to secure people's participation. Under this scheme, priority was given to

i) establishment of decentralised nurseries and school nurseries;

ii) block plantation specially on community land and lands of Schedule Cast & Schedule Tribes and people living below the poverty line;

iii) pasture development through people's institutions and involvement; and

iv) assistance in the implementation of the Tree Patta Schemes.

The scheme of decentralised people's nurseries was initiated in 1986-87 to encourage seedling production by farmers, especially small and marginal farmers to establish small, dispersed nurseries to cater to local needs of planting material and provide income generating activities to the beneficiaries.

Social forestry projects which were initiated in 1981-82 for periods ranging from five to eight years continued in the Seventh Plan. They envisaged tree planting and afforestation of 19,84,600 ha. of wastelands with a total investment of Rs.911.73 crores. These projects were assisted by several external agencies, including the World Bank, United States Agency for International Development and Overseas Development Agency of United Kingdom.

Seeds for the ongoing programmes of afforestation were mostly collected without determining their quality. For development of quality seeds, a centrally sponsored scheme was introduced by the National Wastelands Development Board (NWDB) in 1988-89.

To ensure an area-specific approach on fuelwood and fodder, a new centrally sponsored

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scheme was initiated from 1988-89. This scheme was to cover the watersheds in the districts included under the National Watershed Development Programme of the Department of Agriculture, so as to ensure integrated development of wastelands in the identified watersheds. The scheme was to be implemented initially, in 52 districts of 11 States.

Aerial seeding holds the potential to cover vast tracts quickly in a cost effective manner, especially in remote, inaccessible areas like ravines and hills. A Centrally-Sponsored Scheme for Aerial Seeding was initiated by the National Wastelands Development Board from 1988-89 to assist a few selected states in systematically carrying out aerial seeding in remote areas and to develop and standardise the steps involved in aerial seeding techniques.

To encourage flow of institutional finance for socially beneficial afforestation and watershed development projects and to encourage afforestation through people's active participation, a margin money scheme was initiated by NWDB in 1987-88. This is a Central Sector Scheme where 25% of the project cost is given as grant, provided an equal matching contribution is given by the eligible Institution/State and at least 50% of the total project cost is financed by a financial institution.

Under the National Rural Employment Programme (NREP)s and Rural Landless Employment (NREP) and Rural Landless Employment Guarantee Programme (RLEGP) carried out by the Department of Rural Development, 25% of the funds were specifically earmarked for the social forestry component, during the first four years of the Seventh Plan. The afforestation component under these programmes was implemented by the State Forest Developments mainly on Government and community lands, road sides and canal embankments. Since the availability of community lands was limited, aforestation was also carried out on degraded forest lands. Bulk of the funds for the forestry sector came from the Rural Employment Schemes under the social forestry component. However, an evaluation carried out by the Programme Evaluation Organisation of the Planning Commission has indicated the people's participation under this programme has been very limited and the trees planted were of species which met the requirement of wood for urban markets rather than the subsistence needs of fuel and fodder of the rural poor.

An appraisal of the various afforestation schemes undertaken above reveal some deficiences. They have no specific plan of action for meeting fuel wood and fodder requirements except for the continuance of the scheme for rural fuel wood plantation, which does not directly address these issues. Fostering of people's movements for afforestation has been done largely through increasing people's interest on farm forestry. Under the social forestry programme, the efforts have largely been departmental. The rural poor and tribals, who depend mostly on public and forest lands for their living, have at best, given restricted access to the areas taken up for development.

The existing wasteland development schemes generally are not based on integrating the control of run-off rain-water for reducing erosion, soil and water conservation and water harvesting. In propagating this technology, there is a need to identify and demonstrate such approaches which have low cost and are less dependant on capital and external inputs.

* *"Eighth Five Year Plan, 1992-97", Vol. II, Planning Commission, Government of India.*

Environmental/Forestry Research/Education and Training

5.19 Organisational

- financial support for institutes coming under the Indian Council for Forestry Research and Education (ICFRE) which include the Institute of Tree Breeding and Genetics, Coimbatore, the Institute of Wood Sciences and Technologies, Bangalore, and the Institute for Arid Zone Research, Jodhpur;

- strengthening of the Ecological Research and Training Centre, Bangalore for research on the Western Ghats eco-systems;

- assistance to the Indian Institute of Forest Management, Bhopal, for research on ecological and socio-economic issues;

- strengthening wildlife research through the Wildlife Institute of India, Dehra Dun, and the Salim Ali Centre for Conservation of Nature (SACON), Coimbatore;

- strengthening of institutes for training forestry personnel in India by assistance to the Indira Gandhi National Forest Academy, Dehra Dun, and State Forest Service Colleges located at Dehradun, Burnihat and Coimbatore;

- strengthening research on mountain development and ecology by

establishment of the G.B. Pant Institute of Himalayan Environment and Development, Almora, Uttar Pradesh;

- strengthening the Indian Institute of Forest Management for training and higher education in Forest Management, with Swedish assistance;

- assistance for "Paryavaran Vahini" (volunteer environmental task force) to involve students, youth and general public in activities related to environmental conservation and protection in 100 environmentally critical districts of India; and

- a scheme of assistance to State Pollution Control Boards for strengthening manpower and procurement of equipment.

National Forestry Action Programme

The Government of India, appreciating the spirit of the global Tropical Forestry Action Programme, has decided to prepare its own national Forestry Action Programme (NFAP) in consonance with its National Forest Policy of 1988. The exercise, to be implemented with technical cooperation of FAO will result in :

(i) a forestry sector review paper covering critical issues affecting forestry development in the country.

(ii) a perspective action programme for the long and mid term for development of forestry sector at National and State level, together with a short term priority action programme for the next five years.

(iii) integration of approaches based on local initiatives, including projects supported by external donors.

While the focus of the NFAP would be the increase in and sustainable management of forests and tree resources contributing to bio-diversity and conservational and climatic needs, this will be harmonised with the national development goals.

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Apart from the Government of India's contribution of Rs.65 lakhs (US$ 200000) to the scheme, US$ 716000 are being provided as UNDP assistance. Project Document has been signed on 21.6.1993 and the formulation of NFAP has become operational from 1.7.1993. The project period is two years.

5.20 Non-Organisational

- financial support for research projects under the Man and Biosphere Programmes, Environmental Research Scheme and the Integrated action-oriented research demonstration and extension programme on the Eastern and Western Ghats;
- financial support for research projects for conservation and management of wetlands, mangroves and Biosphere Reserves; and
- financial support for research on plywood/wood-based substitution.

ENVIRONMENTAL EDUCATION AND AWARENESS

5.21 Organisational

- assistance for CPR Environmental Education Centre, Madras and Centre for Environment Education, Ahmedabad and the National Museum of Natural History, New Delhi for environmental education and creating popular awareness amongst school children and villages and teachers; and

- assistance to several organisations comprising of NGOs, schools, colleges, universities, research organisations, women and youth organisations from all States for environmental awareness under the annually organised "National Environment Awareness Campaign."

INTERNATIONAL COOPERATION

5.22 **Organisational**

- Coordination Committee of the Ministry of Environment & Forests to review externally aided projects in the environment & forest sectors;
- Ozone cell for the implementation of the Montreal Protocol on Substanced depleting the Ozone Layer, 1987; and
- Inter-Ministerial Cell for screening and selecting projects for assistance under Global Environmental Facility.

5.23 **Non Organisational**

- monitoring of bilateral/multilateral assisted projects in environment & forests;
- Project formulation for external assistance;
- global environmental issues, viz. ozone depletion, climate change, bio-diversity conservation and trans-boundary movement of hazardous wastes;

- Agenda 21, Capacity 21 and Global Environmental Facility
- multilateral cooperation through SAARC/SACEP; and
- International Centre for Integrated Mountain Development (ICIMOD), Kathmandu.

5.24 In terms of physical and financial aspects, Table 7 to 9 gives an indication of the types of externally-aided projects and their progress/ achievements. Litigation and relatively poor re-imbursements explain the poor progress of expenditure for certain externally-aided projects, expecially those coming under the Ganga Action Plan. However, the Ganga Action Plan has its positive features, as epidemiological and water quality studies indicate. With the exception of Kanpur, the DO and Chemical Oxygen Demand (COD) meet the permissible limits for bathing. The epidemiological studies also indicate a lessening incidence of bronchial, skin and water-borne diseases in the non-Kanpur segment, of the River Ganga. But problems remain in the form of bacteriological pollution which is on account of discharges from sewage treatment plants in bigger towns and also on account of unhygienic practices of bank side river use such as for defecation, cattle wallowing, cloth washing, carcass and solid waste dumping. To bring down the coliform organisms in the river water, possibility of utilising advanced technologies such as ultra violet irradiation etc. is under examination. As far as general pollution

control is concerned, compliance to air and water standards which was lagging behind appears to have picked up since 1991. The number of firms complying with the pollution control standards have considerably increased in the 17 categories of critically polluting industries in India (Fig. 3). Similarly while the physical and financial progress of afforestation projects is satisfactory, more efforts needed to be devoted in the area of quality seed nurseries and sustained protection to the afforested areas.

Developme[illegible]rogrammes for Natural Resources Conservation and Protection:

5.25 Development programmes focussing on water and soil conservation, cleaner industrial production processes, energy efficiency and alternative energy, have a fundamental environmental purpose. While irrigation and drinking water programmes in urban and rural areas form the water development programmes of environmental concern, watershed development and soil conservation programmes form development projects for integrated conservation of soil and water. Application of biotechnology, waste utilisation production processes and waste reduction resulting in cleaner production, go a long way in reducing the problem of pollution of air and water. Energy efficiency and cleaner and alternative sources of energy are also of significant in maintaining air and water quality. The

programme and projects undertaken by the Ministries of Agriculture, Rural Development, Urban Development, Industrial Development and Power (including Non-Conventional Energy Sources) having a bearing on the five areas are briefly summed up below.

Ministry of Agriculture:

5.26 Organisational

a. Agro-climatic Regional Planning Approach (ACRP) initiated by the Planning Commission in 1988 to formulate Integrated Development plans for agriculture and allied sectors according to agro-climatic conditions. During the eighth Plan, emphasis is on development of resources and their optimum utilisation in an integrated and sustainable manner for 15 broad agro-climatic zones in the country;

b. Strengthening for Agricultural Research and Education This also covers areas such as biotechnology and remote sensing for management of natural resources and agro-metereology;

c. Support for Fisheries Research not only to improve yields but also to study reservoir ecology and management, particularly from the angle of fish diseases to increase fish production to the desired levels;

d. Assistance to Agricultural Colleges and Educational Institutionsfor strengthening and upgrading existing organisational capacity for education in fisheries, watershed management, pulses and fodder development;

e. Small Farmers Agri-Business Consortium which will focus on training programmes in environmentally sound management practices for farmers and fishermen to take up economically efficient programme of agri-business in the areas of agro-forestry besides agriculture;

f. State Land-use Boards : for handling the subject of land resources conservation including environmental and ecological aspects; and

g. Association of Women in Agriculture : whereby special emphasis has been placed for association of women in watershed projects, integrated pest management and agricultural extension.

5.27 **Non-Organisational**

a. Watershed Development Programmefor integrated and sustainable approach for development of natural resources in rainfed and dry land zones of India with 100% finance from Central Government;

b. Rain-fed Agriculture in National Watershed Development Project :

for evolving an integrated approach for adoption of low cost rain water conservation measures such as planting of vegetative barriers on contour lines, contour ploughing, contour cropping etc., are already being promoted in the arable lands. In the non-arable lands various conservation and production measures like pasture development, afforestation, etc., are being adopted. The emphasis is also being given on use of bio-fertilizers and integrated pest management;

c. Western Ghats Development Programme: This aims to undertake activities such as soil conservation, animal husbandry, horticulture and plantations in Western Ghats watersheds;

d. Integrated Pest Management : aiming at promoting non-chemical methods of pest management through manipulation of cultural practices, conservation and augmentation of bio-control agents, adoption of mechanical methods and minimum and need based use of chemical pesticides based on the economic threshold levels of pests; and

e. Balanced and integrated use of nutrients and Promotion of bio-fertilizers : to control adverse effects of the use of chemical fertilizers on soil and ground water and also for ensuring balanced

nutrition to crops by employing organic manures, green manures and biological fertilizers. Field demonstrations through a network of national and regional centres and financial assistance to State Governments, Agro-industries Corporations and Fertilizer and Seed Companies form the strategy for popularising bio-fertilizers in the country.

Ministry of Water Resources

5.28 **Organisational**

a. Strengthening People's Participation in Water Use in Irrigation: This includes the successfully implemented Schemes of Lower Bhavani Project and the Mohini Cooperative System.

b. Organisational Strengthening for Research & Development in Water Resources Planning which is funded through the Scientific and Technological Component in the Irrigation Sector for which the seventh Plan had provided an amount of Rs.110 crores.

5.29 **Non-Organisational**

a. Command Area Development Programmes which commenced in 1974-75 as a Centrally Sponsored Scheme for execution of works for ensuring equitable and timely supply of water to agricultural

holdings falling within the Command Area of Irrigation Projects. The focus of the CADP is being re-oriented for land improvement and development of drainage facilities in the command areas;

b. National Water Management Project: for modernisation and rehabilitation of selected old water structures. Presently this Project cover systems with a Command Area of 0.54 million hectares in different parts of the country; and

c. Flood Control Programmes in Rivers Ganga and Brahmaputra.

MINISTRY OF RURAL DEVELOPMENT

5.30 **Organisational**

- constitutional status to Panchayati Raj Institutions; and
- TRYSEM.

5.31 **Non-Organisational**

a. Jawahar Rozgar Yojana for employment generation in rural areas which also covers soil and water conservation, wasteland development and Social Forestry projects besides rural roads and rural housing;

b. The Drought Prone Area Programme (DPAP) launched in 1973 in arid and semi-arid areas, with poor natural resource endownments.

The focus of the DPAP is on undertaking landshaping and soil conservation, afforestation and pasture development, water resources development and Livestock Development in 615 Blocks of 91 Districts in 13 States. During the seventh Plan an allocation of Rs.46276 lakhs was made out of which an expenditure of Rs.46185.91 lakhs was incurred on land development, water resources and forestry projects in DPAP areas;

c. Integrated Rural Energy Programme for energy development in rural areas with funding provided through Central and State Plans. The focus of this Plan is decentralised Integrated Rural Energy Planning with a least cost mix of various energy options, conventional as well as renewable and non-conventional energy sources at the Block level. During the Seventh Plan around 250 Blocks were covered under the Programme.

d. Rajiv Gandhi National Drinking Water Mission for Rural Water Supply: The objective of the Mission is to provide safe drinking water to rural population in villages at the rate of 40 litres of safe drinking water per capita per day for human beings and 30 litres of water on a per capita daily basis for cattle in the desert districts of India within a distance of 1.6 kms. in the plains and 100 metres in

hilly areas. By safe drinking water is meant water, safe from biological contamination (guinea worm, cholera, typhoid, etc.) and chemical contamination (excess fluoride, brackishness, excess iron, arsenic, nitrates, etc.). During the seventh Plan as against a target of 23922 problem villages 251431 villages were covered which indicates an 112% achievement; and

e. programmes for wasteland development in non-forest areas administered by the National Wastelands Development Board.

These include the following non-organisational projects :

a. The Integrated Wastelands Development Scheme - The basic objective of the scheme is to start pilot projects aimed at integrated land management based on village/micro level watershed plans prepared after taking into account land capability, site conditions and local needs of the people. The scheme also aims at enhancing the content of people's participation in wastelands development programmes.

b. The Investment Promotional Scheme - The principal objectives of the scheme is to facilitate/attract investment from financial

institutes, corporate bodies, other agencies and entrepreneurs for the development of wastelands in non-forest areas.

c. Technology Development and Extension Scheme - The main objectives of the scheme are establishing technical database and providing assistance to projects which are required for filling the gaps in available technologies.

d. Support to Non-government Organisations - The scheme specifically aims at supporting non-government organisations for taking-up wastelands development projects.

e. Scheme for Promotional and Critical Support - The scheme aims at building database on wastelands and establishing a network for dissemination of information regarding wastelands development and providing 'Escort Service' to prospective agencies and entrepreneurs interested in development of wastelands

f. Wastelands Development Task Force - Under the scheme, non-forest wastelands in inaccessible and inhospitable terrains like deserts, mountains, ravines, mined areas, etc will be developed for sustainable use by enlisting the services of a dedicated ex-servicemen.

MINISTRY OF INDUSTRIES

5.32 Non-Organisational

a. Modernisation of Indian Steel Industry in the public and private sectors for the upgradation of technology and reduction of high energy consumption. The steel plants which are covered include Durgapur, Rourkela and the Tata Iron and Steel Plants;

b. National Materials Policy Project for updating technology information, forecasting and assessment to make Indian industries globally competitive;

c. UNDP Assisted Pesticides Development Programme - for developing new formulations of pesticides and upgrading personnel engaged in quality control and hazard management in pesticide industries; and

d. Research & Development Programme for Coir Industry for finding new uses of coir in improving soil stabilisation and erosion control and for cooling buildings.

MINISTRY OF LABOUR

5.33 Organisational

- Rural Workers Education Programme which cover landless

labourers, agricultural workers, marginal farmers, fisheries labour, tribal labour, forest labour and rural artisans on industrial health, safety and environment.

MINISTRY OF ENERGY/COAL

5.34 **Non-Organisational**

a. IDBI assisted credit scheme for financing Energy Conservation Schemes in Industrial Undertakings;

b. Indian Renewable Energy Development Agency-assisted scheme for financing of renewable energy development;

c. assistance for research & development for new and renewable Sources of Energy (NRSE);

d. national project on Bio-gas Development, Improved Chullahs, Solar Photo Voltaics, Wind Energy, Solar Thermal Energy and Micro Hydels;

e. Coal Washing/Benefeciation Programmes;

f. assistance for research & development programme for energy plantation and development of agricultural wastes and non-woody based gasifiers for power production;

g. assistance for research and development and commercialisation of incineration and other waste disposal technologies;

h. assistance for research & development for improving performance of battery powered vehicles;

i. solar energy centre including National Testing Facility for Testing and Calibration of Solar Photo Voltaic Components and other Solar Thermal Devices; and

j. training facilities for environmental management of power projects, including manpower development for rigorous safety standard for nuclear projects and promotion of use of fly-ash.

MINISTRY OF HEALTH AND FAMILY WELFARE

5.35 Organisational

- development of a Centre for Epidemiological Health Intelligence in Eighth Plan.

5.36 Non-Organisational

- clinical research on drugs of various systems and collection, cultivation and propagation of medicinal plants.

Sustainable Cities Programme

The principal goal of SCP is to provide cities with an improved environmental management and planning capacity which is self sustaining once the programme's support ends. The SCP is designed to asist municipal authorities to identify environmental issues at the city level, to establish priorities among these issues and to provide them with tools to address these issues. The programme will facilitate a better understanding of the costs and benefits involved and of the economic costs of environmental neglect. The aim is also to create greater awareness of good practice in planning and management of the urban environment as well as of the potential impacts of city growth on the natural resource base of the surrounding region. The SCP will also help to build a developing country constituency for establishing and updating urban environmental date bases as the creation and updating of such information bases is essential for the management of the urban environment for policy formulation, programme implementation and for monitoring progress. Madras is one of three cities in Asia selected by United Nation Commission on Human Settlement (UNCHS) for a city level project of the Sustainable Cities Programme. The Ministry of Urban Development has recently cleared the project. The project budget is US$ 515,000.

** UNCHS, Sustainable Cities Programme-City Level Project. Project Formulation Framework, December, 1991.*

MINISTRY OF URBAN DEVELOPMENT

5.37 Organisational

a. Building Materials and Technology Promotion Council (BMTPC) to provide platform for technology transfer and application in the shelter sector and promoting commercial production of innovative materials, using fly-ash, red mud, phospho-gypsum and agricultural wastes and for appropriate design of houses both in urban and rural areas; and

b. Low Cost Sanitation and Small Towns Water Supply Schemes for Population Less Than 20,000 In order to provide facilities to the poor and the economically weaker sections of the society, centrally assisted programme for construction of individual and sommunity

latrines has been taken up alongwith the water supply schemes in small towns.

5.38 Non-Organisational

a. Environmental Improvement of Urban Slums introduced in 1974 and which benefitted 10 million slum dwellers during the seventh Plan period;

b. Centrally Sponsored Scheme for Urban Basic Services introduced in 1986 for enhancing survival and development of women and children in low income urban families;

c. Integrated Development of Small and Medium Towns to provide infrastructural support. During the Seventh Plan period, 145 towns were covered;

d. National Capital Region for Delhi aimed at providing infrastructural support to priority towns and for the Region as a whole; and

e. Nehru Rozgar Yojana for Employment for Urban Population living below poverty line.

MINISTRY OF SCIENCE AND TECHNOLOGY

5.39 Organisational

a. establishment of a separate Department of Bio-Technology in 1986 i.e. during the Seventh Plan;

b. establishment of Technology Information, Forecasting and Assessment Council (TIFAC);

c. scientific inputs for National Technology/Societal Missions in the areas of vaccination and immunization of vulnerable populations, drinking water supplies to the villages, wasteland development and livestock upgradation using embryo transfer technologies;

d. establishment of a National Centre for Medium Range Weather Forecasting for development of Agro-metereological services;

e. establishment of a joint sector unit i.e. the Indian Vaccine Corporation Limited (IVCOL) in Gurgaon District in Haryana to produce vaccines for rabies, measles, polio, etc.;

f. establishment of Bic Technology Consortium India Limited (BCIL) with industries and financial institutions collaboration for commercialisation of bio technology in India;

g. human resource development and manpower training to provide skilled manpower for biotechnology programmes.

h. establishment of 11 National infrastructural facilities in various scientific institutions in the country for germ plasm collection, Animal House facilities.

i. the technologies absorption and adoptation scheme for interaction of R&D by companies which have imported the technology and will take advantage of the existing infrastructure; and

j. the transfer and trading in technology scheme which provides for suitable avenues for commercially viable technologies produced indigenously for marketing to other countries.

SPECIAL AREA DEVELOPMENT PROGRAMMES

5.40 **Non-Organisational**

a. Hill Area Development Programme : This programme is in operation in Jammu & Kashmir, Himachal Pradesh, Sikkim, Manipur, Meghalaya, Tripura, Arunachal Pradesh, Nagaland and Mizoram, Assam, Darjeeling District of West Bengal, the Nilgiri District of Tamil Nadu and Uttar Pradesh hills and Western Ghats areas. The project has been launched to over-come the problems of deforestation, soil erosion, drying up of water sources, flash floods and consequenctial problems of poverty and food shortage; and

b. Desert Development Programme : This was initiated in 1977-78 to cover the desert region of Gujarat, Rajasthan and Haryana, besides the cold deserts of Jammu and Kashmir and Himachal Pradesh. The objective of the programme is to control the desertification, mitigate the

effects of drought and restore ecological balance in the affected areas through land development, water resources development, afforestation etc.

5.41 A general review of the aforementioned development programmes implemented by the respective sectoral Ministries indicate that development programmes which have fundamental implications on environment and environmental considerations are being addressed as a part of the development programmes and projects. In future, it may be desirable to allocate a greater portion of investment resources on these programmes for tangible environmental benefits.

DIAGNOSIS

6 DIAGNOSIS

6.01 If one were to consider the criteria mentioned in the World Development Report, 1992 on Environment and Development, environmental problems in the developing world can be categoried as : those arising due to lack of the development and those which arise on account of development. Environmental problems of inadequate sanitation, clean and safe drinking water, land degradation and local pollution arising from the phenomenon of poverty come in the first category. Development related environmental problems include industrial pollution, energy related pollution, hazardous substances, commercial agriculture and over use of natural resources for industrial activities. For a country like India which has been for the last five decades, endeavouring for economic growth and development, it is logical to accord primacy to environmental issues arising from the lack of economic development, to ensure that the pursuit for environmental well-being is symbiotically linked to the development process. This priority, in turn, would mean that the issues of population growth, poverty and unemployment are considered in an integrated manner, to assess their impacts on environment and for devising appropriate programme for remediation. At the same time, it

would also be necessary to assess the impact of development related environmental problems on poverty and adopt programmes for mitigating adverse effects, if any.

ENVIRONMENTAL PROBLEMS ARISING FROM NON-DEVELOPMENT: POPULATION PRESSURE ON NATURAL RESOURCES AND POVERTY

6.02 India is the second largest country in the world in terms of human population. On 2.4% of the world's land area India supports 16% population. The population of India which was 361.1 million in 1951 went up to 846.3 million in 1991. The population of India is increasing by about 17 million every year. The growth in India's population gathered momentum in the last few decades. The average annual exponential growth rate during the decade 1941-51 was only 1.25 per cent. It started showing steadily increasing trends from 1951 onwards reaching a level of 2.22 per cent during the decade 1971-81. The average annual exponential growth rate in the decade 1981-91 came down to 2.14 per cent. The latest available Sample Registration System (SRS) data indicate an annual natural growth rate of 1.9 per cent in 1992. With a death rate of 10 and birth rate of 29 (1992), India is currently in the third stage of demographic transition. Though the decline in birth rate is significant it is not fast enough to offset the decline in death rate. The death rate declined from

22.8 in 1951-61 to 10 in 1992. The IMR, at 79 per thousand live births in 1992, is still high, though it has declined significantly from 110 in 1981.

6.03 Life expectancy at birth has shown a remarkable increase from 32 years during 1941-51 to 58.6 years during 1986-91. The CBR declined from 41.7 in 1951-61 to 29.0 in 1992. The Total Fertility Rate (TFR) is 3.8 (1990 SRS) children per women as against 5.97 in 1951-61. 37 per cent of India's population is in the age group 0-14 years. However, the proportion of children below 15 years of age has fallen from 42 per cent in 1971 to 37 per cent in 1991. The population of India is expected to cross the one billion mark by 2001 as per the projections made by the Standing Committee of Experts on Population Projections. The Committee also estimated that the population of the country would be about 1082 million in 2006.

6.04 The serious implications of the 'number effect' of India's human population has been underlined by the National Conservation Strategy and Policy Statement on Environment and Development, 1992. The following projections of the 2000 A.D. scenario which re-inforce this point as follows :

a. it is estimated that to feed a human population of one billion by 2000 AD, India would need to produce 240 million tones of food

grains and provide for 225 million cubic metres. of fuel (Report of the Working Group on Soil and Water Conservation including Watershed Development for the Formulation of the Eighth Five Year Plan, 1989);

b. similarly, according to the National Land Use Policy Outline, (1986), of the Government of India, the per capita availability of land would deteriorate from 0.89 ha. per head to 0.33 ha. per head while the per capita availability of land for the animal population of the country would decline from 0.51 ha. per head to 0.24 ha. per head. This includes forest lands as well. The link between these tendencies of a declining ratio of natural resource to human and the phenomenon of poverty, must be considered from the point of view of the distribution of land and the differential access to natural resources enjoyed by the various segments of India's population.

6.05 The distribution of land resources is skewed. Only a small percentage of India's population own land whether it is agricultural, non-agricultural and/or urban lands. This fact is coupled with the high rate of unemployment in both the rural and urban areas. According to the National Sample Survey (32nd and 38th rounds), in the year 1983, 78.57% of the labour force (in persons) in India was in urban areas while

21.43% was in urban areas. A large proportion of this population is unemployed, although there are regional variations. The problem of under-employment is also high. It is estimated that the rural sector contributed to 70% of the unemployment in India during 1983 on account of a larger proportion of labour force living in these areas. However, the absolute level of unemployment has been increasing in urban areas partly also to increasing migration of labour force from rural to the urban sector.

6.06 Although, the problems of population growth, landlessness and unemployment do not hold a direct and linear relationship with the phenomenon of poverty, it is well established that there is a positive association between poverty, population growth and the two forms of deprivation mentioned despite differences of opinion regarding a positive statistical association amongst these variables. Poverty in India is distributed both in rural and urban areas. There are 200 million people who live under poverty conditions in rural India. About 41.8 million people are under the poverty line in the urban areas according to the 43rd round of the National Sample Survey of 1987-88. The phenomenon of poverty is reflected in the quality of human population in India, particularly in the matter of infant mortality and life expectancy, while the magnitude

of the poverty problem is also contributed by rapid growth of population in India. Though, the rate of population growth and the percentage of population under poverty line have shown a decline since 1970s, the magnitude of the problems in terms of absolute numbers continued to be formidable.

6.07 Rural and urban poverty in India has environmental effects. This is reflected in the inadequate supply of drinking water and non-availability of sanitation facilities for the people living under the poverty line. Table shows that in 1990, nearly 16% of the urban population in India did not have access to safe drinking water, while the percentage of rural population not having access to this resource was 26%. The problem of adequate sanitation services is even more acute since in 1988, 54% of the urban population and 97% of the rural population did not have the benefit of sanitation services. The inadequate coverage of these basic services is responsible for the growing incidence of water/vector borne diseases such as Malaria, Kala-Azar, Encephalitis, Tuberculosis, Guinea Worm disease and Diarrhoea in various urban and rural zones of the country. These diseases by disabling the rural and urban poor (the most vulnerable group) increase the incidence of unemployment, aggravating their poverty conditions. In addition, mention also needs to be made of the growing incidence of respiratory diseases among the urban and rural

poor due to the use of agro-based fuels such as crop residues, high cellulose fuelwood and cow dung for domestic cooking. It is estimated by the Integrated Rural Energy Planning Report of the Planning Commission that the average annual per capita use of non-commercial fuels range from 129 kgs.(in the upper Gangetic zone) to 710 kgs.(in the Western Himalayan Zone) in respect of firewood, 11.17 kgs. (in the Western dry regions) to 238.40 kgs. (in the middle Gangetic zone) in respect of crop residues and from 47.031 kgs. (in East-Coast Plains and Hills) to 238.92 kgs.(in the Trans-Gangetic Plains) in respect of cow-dung. All these categories of fuels are by nature, polluting ones and cause respiratory disorders.

6.08 The relatively high consumption of health affecting, low efficient non-commercial fuels reflect the magnitude of poverty in India. At the same time, the use of these non-commercial fuels also underlines the pressure that the phenomenon of poverty can bring upon our common lands forests, water and other sensitive ecosystems with high biodiversity potential viz. coral reefs, mangroves, wetlands, and our National Parks, Sanctuaries and other protected areas. The absence of gainful employment oppurtunities and viable cultivation opportunities force the urban and the rural poor to depend upon the forests, National Parks and Sanctuaries for appropriating fuelwood, fodder and small timber not only

for their self consumption needs but also for livelihood means. According to an estimate of the Indian Institute of Forest Management (IIFM), the total fuelwood removal from forests is estimated to be more than 235 million cubic metres. It is also estimated by the IIFM that the minimum requirement of green fodder for livestock in India is 882 million tonnes per year of which harvestable green fodder from pastures, agricultural lands and forests is 434 million tonnes, the substantial remaining gap to be taken up by forests.

6.09 The coral reefs, mangroves and wetlands have also borne the pressures of the subsistence needs of the poor. This is reflected in the growing phenomenon of encroachment of wetlands, over-fishing in mangrove zones and coral reefs. Coming to agriculture, the near poverty conditions of the subsistence farmers of India in the dryland belt of the country (covering States of Rajasthan, Madhya Pradesh, Andhra Pradesh, Karnataka, Gujarat and Maharashtra) also explain to a very large extent the growing incidence of soil and water erosion affecting agricultural and non-agricultural lands. Similarly, the problems faced by the mountain regions of the country is also considerable by way of soil erosion. The extension of cultivation of marginal lands in the Himalayan region combined with the loss of forest cover in the area has accelerated the erosion of top soil and the trend towards land-slides. Both in the dry-land

belts and the mountain regions of the country, the tendency towards increasing soil and water erosion results in low-recharge of aquifers and consequent scarcity of drinking water in the arid districts of Rajasthan. As per the present assessment, 44 Blocks in 11 districts in Rajasthan fall in the category of over exploitation i.e. where the stage of development is more than estimated repenishable ground water resources. Similar instances of over-draft of ground water are reported for 180 Blocks in Punjab, Haryana, Gujarat, Andhra Pradesh, Karnataka and Maharashtra. Over-exploitation of ground water resources and the consequent difficulty in accessing this resource has led to the utilisation of traditional non-drinking surface- water structures such as Nadis in Rajasthan for meeting drinking water requirements of human beings (instead of for livestocks as was the traditional practice) resulting in health hazards primarily in the form of water borne diseases. The eastern zone States of West Bengal, Bihar and Orissa have also been faced with the problems of soil erosion. It is estimated that the total area affected by land-degradation is 14.20 lakh ha. in Bihar, 49.02 lakh ha. in Madhya Pradesh, 45.78 lakh ha. in Orissa and 10.33 lakh ha. in West Bengal. The erosion has resulted in sedimentation of reservoirs in these States such as Maithon, Panchet, Mayurakshi, Hirakud etc.

6.10 Apart from the fact that soil and water erosion have resulted in

scarcity of both surface and ground water resources in the various regions of the country, there is also the related problem of declining water quality in various parts of India, particularly along river stretches, water courses and canals. Of the various sources of water pollution,special mention must be made of the pollution of water courses, streams and river stretches due to absence of adequate sanitation facilities. This is mainly reflected in the high coliform presence in river water as would be seen from in Table 3. Biological contamination of water is also a common problem mainly due to the presence of guinea-worm, cholera, and typhoid bacilli in drinking water. The problem of guinea worm is prevalent in the rural areas of Andhra Pradesh, Gujarat, Maharashtra, Madhya Pradesh, Karnataka and Rajasthan, with Rajasthan and Madhya Pradesh having the maximum problem.

DEVELOPMENT RELATED ENVIRONMENTAL PROBLEMS

6.11 Development oriented programmes produce adverse environmental effects. Industrial pollution, mining, commercial agriculture and large scale irrigation system have also contributed to natural resource degradation and depletion. Pollution of river/canal waters is another major issue.

Environmental Problems of Commercial Agriculture

6.12 The problems of commercial agriculture on the environment is manifest in the forms of increased non-point sources of pollution of water, chemical contamination of drinking water, over exploitation of ground water aquifers, neglect of surface irrigation structures such as tanks, canals and major reservoirs and unbalanced utilisation of irrigation water in the command areas reflected in the growing incidence of water-logging and salinity both of which contribute to soil degradation.

6.13 The principal environmental problems which arise from commercial agriculture and irrigation are numerous. Chemical contamination of drinking water on account of excess flouride, brackishness, iron, arsenic, nitrates, animal wastes and pesticides/fertiliser residues is a reflection of the growing trend of both point (industrial pollution) and non-point sources (fertiliser/pesticide application in commercial agriculture) on surface and ground water resources, which are also used for drinking purposes by human beings and livestock. Water quality assessment studies indicate the incidence of high nitrates in drinking water in rural areas in the States of Bihar, Orissa, Karnataka, Andhra Pradesh, Madhya Pradesh, Maharashtra, Gujarat, Rajasthan, Tamil Nadu and Haryana. Excess fluoride in drinking water is prevalent in the rural areas of 15

States and Delhi, while excess iron which causes corrosion of tube-wells, water supply installations and encourages growth of iron bacteria, are also prevalent in the rural areas of 14 States, and the Union Territory of Pondicherry.

6.14 The development of irrigation in India since Independence has also displayed shifts. The total net irrigated area rose from 20.9 million ha. in 1950-51 to 45.144 million ha. in 1989-90. However this increase was mainly contributed to by the spurt in well irrigation the command area of which rose from 11.8 million ha. in 1970-71 to 19.90 million ha. by 1989-90. This increase clearly testifies to the growing intensity of ground water exploitation for irrigation purposes. Tube-wells along with other wells (open/dug-wells) account for nearly 50% of the net area irrigated in the country. A related fact is that of the declining contribution of tanks in the net area irrigated which fell from 3.6 million ha. in 1950-51 to 3.2 million ha. by 1989-90 which indicates the relative neglect of this traditional irrigation source. Although canal irrigation continues to be the single largest source of irrigation (accounting for 16.3 million ha. out of a total of 45.14 m. ha. in 1989-90), water seepage from unlined canals has reduced the irrigation potential of this source considerably. Siltation of reservoirs, tanks and other surface irrigation sources, have not only reduced irrigation potential but also contributed to lessening of the

ground water recharge potential of these surface water sources. Distribution deficiencies and irrational systems of water use and cropping patterns have caused the canal/reservoir/tank commands to be affected by salinity and water logging. Most of the aforesaid problems have risen due to the inadequate attention paid to operations and maintenance (O&M), and from commercial cropping patterns and increased use of chemicals in the form of fertilisers and pesticides.

Urban Environmental Problems

6.15 The environmental situation in urban areas needs to be carefully assessed on account of the growing urban population in India. According to the 1991 All India Census, 217 million out of the total population of 844 million live in urban areas. It is estimated that by 2000 AD, the urban population will increase to 300 million. Urbanisation has mainly occurred due to the structural transformation of Indian economy from an agricultural one to an industrial/service based one. The *in situ* birth rates in urban areas do not, therefore, account for the large urban population in India since migration from rural areas is considered a major contributor to rural population growth. However, given the decennial rate of growth of popuiation in urban areas, it has declined from 46.1% in 1971-81 to 36.2% in 1981-91. There are 23 cities in India with a population of more

than a million of which the mega-cities of Bombay, Calcutta, Delhi and Madras have populations exceeding 5 million. The number of million plus cities in India has increased dramatically from 12 in 1981 to 23 in 1991 and it is projected to increase to 40 by 2001 AD. The pressure of the increasing urban population (notwithstanding the decreasing growth rate) is bound to increase the gap between demand and supply of infrastructural services such as energy, housing, transport, communication, education and institutions, water supply and sewerage and recreation amenities. The result is the growing trend in the deterioration of air and water quality, the proliferation of slums, illegal constructions and undesirable land-use changes, all of which contribute to urban poverty.

6.16 More specifically the urban environmental problems can be summed up as follows :-

a. high levels of water pollution because of poor waste disposal, inadequate sewerage and drainage and improper disposal of industrial effluents;

b. high levels of air pollution resulting from congested streets, poorly maintained vehicles, fuel burning, and industrial activities;

c. toxic or hazardous industrial and commercial wastes disposed in water bodies and land sites without proper treatment;

d. dumping of solid waste (refuse) in low-lying areas contributing to land and ground water pollution;

e. high levels of noise pollution due to loudspeakers, construction, traffic, industrial operations and aircraft;

f. congested and insanitary dwellings, particularly in slums;

g. loss of fragile ecosystems, such as wetlands, mangroves, agricultural land, and vegetation;

h. congestion along roads and transport corridors due to rapid expansion of transport services in urban cities;

i. growth of slums in and around metropolitan cities of India with its attendant problems of over-crowding, poor sanitary environment and respiratory and water borne diseases such as tuberculosis, meningitis, intestinal parasitic infection, cholera, malaria, bronchitis, dengue and typhoid;

generation of solid wastes in urban cities which include domestic solid wastes from households, restaurants, commercial and

industrial solid wastes of non-hazardous nature, and hazardous wastes from industries, hospitals, research laboratories etc. Most of the solid wastes get dumped in low-line areas which create conditions for run-off and as breeding ground for pests and other disease vector insects;

k. it is estimated that 47% of urban households utilised firewood and coal for cooking while for another 40% of households gas and kerosene are the primary sources. These forms of fuels also serve to breed respiratory diseases particularly among the urban poor who live in slums; and

l. risks arising out of industrial accidents.

INDUSTRIAL POLLUTION

6.17 Industrial pollution needs a separate and detailed consideration mainly because industrial activity in India is getting to be regionally diversified, instead of being concentrated in urban centres. Also industrial capacity is fragmented over a number of small units (informal sector). The increase in the letters of intent and industrial permits to industrially backward areas in the country during the period from 1982-1991 serves to underline this fact. It is apparent that industrial pollution will not be confined to urban centres or to large and medium scale industrial units.

This automatically necessitates a more diversified and decentralised strategy for industrial pollution control in the country.

6.18 The nature of industrial pollution in India can be gauged from the following facts. Industrial pollution has resulted in the relatively high values of carbon mono-oxide nitrogen dioxide, sulphur dioxide and suspended particulate matter in air both in cities as well as in Towns, details of which have been provided in Tables 4 and 5. The low DO (dissolved oxygen), high BOD (bio-chemical oxygen demand), Ammonia and heavy metals along the principal river stretches of India including the Ganga, has already been discussed in Chapter 2. The protection afforded to industry and the emphasis on decentralisation of industrial development, has resulted in the pulp and paper, sugar and distilleries, leather tanning and chemical industry, mostly belonging to the small scale sector, resorting to pollution based and energy guzzling technologies. The conventional end-of-pipe control technologies have not been able to curb pollution to the desired effect, nor able to achieve reduction in energy utilisation per unit of output. The absence of ecological zoning and industrial siting norms has also led to air and water pollution in certain industrial zones exceeding the limits imposed by the carrying capacity. The present pattern of industrial activity has also involved the use and generation of hazardous substances and the generation of non-hazardous

solid wastes such as fly-ash. The storage, dumping and treatment of these solid wastes is emerging as a major problem in industrial areas in the country in addition to contributing to pollution and environmental risks.

ENVIRONMENTAL PROBLEMS OF COMMERCIAL ENERGY,

6.19 Commercial energy sources create environmental problems in two ways - at the stage of extraction/mining and later during utilisation in industries. In the eastern region of India, covered by the States of Bihar, West Bengal and Orissa, considered to be the energy reservoir of the country, open cast mining of coal, limestone and iron-ore over an area of 0.37 million ha. has contributed to the degradation of soil and run-off of water and soil. Environmental problems resulting from the utilisation of commercial sources of energy in industries, agriculture and the services sector are reflected in the increase in use of these sources of energy. Thus, the total energy supply in India both commercial and non-commercial, increased from 82.7 MT.OE in 1950-51 to about 291 MT.OE in 1990-91. This increase was achieved through a substantial increase in the use of commercial fuels, the share of which increased from 26% in 1950-51 to 59% in 1990-91. Within the commercial fuels category, the share of oil and gas has increased during the same period. It has already

been noted that Indian coal suffers from quality problems arising from the high ash content which not only contributes to lower industrial productivity, but also creates pollution problems as the thermal power plants in India denote. The increased use of petroleum as feedstock in Indian industry, has also added to the pollution problems in the country, primarily by way of the emissions of sulfur di-oxide, carbon mono oxide, etc. produced by both stationary (industries, power plants) and non-stationary (public and private transport) sources of pollution. The problem with hydel power projects on the other hand lies in its natural resources depleting effects particularly in bio-diverse areas.

Performance of Electricity Utilities in India and priorities in the Eighth Five Year Plan

"The financial health of electricity utilities is crucial for the successful implementation of the power development programme during the Eighth Plan."

"Under the provisions of the Electricity (Supply) Act, 1948, the State Electricity Boards are required to earn a minimum rate of return of not less than 3% on their fixed assets after fully meeting the fixed and operating costs and interest and tax liabilities. However, most of the SEBs have not been able to comply with this statutory requirement. Many of them have large operating deficits. Apart from operational deficiencies, the tariff structure of many SEBs continues to be irrational involving heavy subsidies which promote inefficient use of electricity. In the case of some State Electricity Boards, despite their good operational performance, their financial performance has deteriorated in recent years as a result of the irrational tariff structure adopted by them."

"It is imperative that the utilities generate adequate resources internally to be able to fully cover the fixed and operating costs including interest and other liabilities and have adequate surplus for funding their future expansion programmes."

Source : Eighth Five Year Plan 1992-97, Volume II, p. 191

6.20 Given the significance of natural resources in urban/rural environmental management, it is imperative that these (natural resources)

are properly accounted for, given their intrinsic value and a legal-cum-programatic framework be formulated. As noted earlier, the legal framework for sustainable management is basically governed by the Environment Protection Act, the Water Act, Air Act, the National Forest Policy, National Conservation Act etc. Though, this framework appears to. have been comprehensive, it is also noted that the following tasks and strategies have separate legislations : Conservation/protection of rangelands, watersheds, ozone layer, climate, culture and systems of knowledge.

6.21 Also, strategies such as environmental impact assessment, integrated planning, fiscal and economic measures, efficient use and recycling of resources, use of alternatives, monitoring, people's participation and environmental awareness, have at present no legal sanction though they have been given full recognition and attention.

INTER-RELATIONSHIP OF ENVIRONMENT AND DEVELOPMENT PROBLEMS

6.22 The foregoing discussion on the different forms and types of environmental problems in India, suggests that while it useful to distinguish development related environmental problems from non-development related environmental problems, it would be equally significant to

understand the linkages between these two sets of environmental problems. While the environmental problems of non-availability of safe drinking water, sanitation, good quality agricultural lands and the depletion of forests, mangroves and other biodiversity regimes are the off-shoot of the central problem of poverty in India, it is equally important to notice that continuing non-availability of these resources can perpetuate, if not, increase the problem of poverty in India, through adverse effects of human health and subsistence. Similarly, the phenomenon of poverty can (through adverse health effects and subsistence conditions) be accentuated by industrial pollution, commercial agriculture, imbalanced urbanisation and increased utilisation of polluting sources of energy.

6.23 *It is obvious that development related environmental problems are essentially inter-related with environmental problems arising from non-development. Urban and rural poverty are not merely economic phenomena arising from low levels of per capita income/nutrition. Poverty is as much induced by environmental factors and is ultimately linked to the larger question of rural and urban environmental problems in India.*

6.24 It is against this background and diagnosis of the physical aspects of the problem that the organisational and financial constraints should be assessed.

ORGANISATIONAL GAPS AND FINANCIAL CONSTRAINTS

6.25 The National Conservation Strategy and Policy Statement on Environment and Development, 1992 has stressed the need to strengthen existing institutions, review and evaluate existing laws and develop enforcement mechanisms to implement the aims and objectives of the Envionmental Policy for sustainable development. The constitutional,legal and organisational framework for tackling environmental problems in India have been already detailed. Though the two sets of environmental issues have been addressed within this framework and through the multiple programmes and projects listed in Chapter 5, there have been certain constraints and organisational gaps. There is no separate legislation for conservation and protection of lands and the environmentally critical ecosystems of wetlands, mangroves, coral reefs, range lands, watersheds, Irrigation command areas. Though, there is a National Water Policy, legislations for regulating exploitations of surface and ground water resources are still to be formulated. The issues of global environmental issues of ozone layer and climate change are also not addressed in terms of concrete legislation. Presently the omnibus Environment (Protection) Act, 1986, addresses these issues within the broad provisions of environmental protection. Although, the policy

statements are comprehensive in their coverage of natural resources, there are four notable exceptions. These are for (a) the conservation/ protection of fossil fuels, (b) conservation of mangroves, and coral reefs, (c) wetlands and other non-forests natural ecosystems, and (d) policies for protection of animal rights. The organisational framework for addressing policy aspects and research in connection with environmental issues, though, comprehensive, needs to be extended in two directions viz. conservation of range lands and protection of diverse and traditional ecological cultures and systems of knowledge or, in short, ethno-ecology. This situation is the same for the State Governments.

6.26 When looking at the organisational structures for programme implementation, it is observed that Panchayats and urban local bodies have not been formally assigned the crucial tasks of conservation and environment protection. However, following the Circular of the Ministry of Environment and Forests in June, 1990, participatory management systems have been established by various State Governments for managing degraded forest lands. There now remains the larger task of integrating these participatory systems to the panchayats/urban local bodies at the local levels, in addition to extending the ambit of popular participation to other natural resources such as mangroves, coral reefs, wetlands, common grazing lands and community sacred groves etc. The

National River Action Plan to be shortly launched in India will also necessitate evolving novel local participatory structures for managing river water quality and maintaining rivers in environmentally sound conditions. The Constitutional status recently accorded to the rural and urban local self Governments have underlined the urgency of these priorities.

6.27 The task of decision making has also been cumbersome particularly on environmental issues. Although, detailed guidelines for environmental impact assessment have been framed by the Ministry of Environment and Forests for various categories of natural resources and development projects, the actual process of decision making has been constrained not only because of perceptions of need for quick development but also for want of environmental data on resources availability, systems of traditional use and values for different categories of natural resources including land, water, biodiversity, marine resources, forests and air. Accounting for the intrinsic value of natural resources is still a process in its infancy. Human resources formations for the scientific management of environmental problems have also been constrained because of inadequate research and development infrastructure, the absence of organisations, which are capable of imparting technical skills for environmental management (such as environment impact assessment) at

the local and regional levels, the limitations of environmental education at higher secondary,university and non-formal levels in generating public awareness, and the insufficient spread of training in environmental sciences/management for policy makers, administrators ,trainers, educators,students, local self-Governments authorities and grassroot voluntary/activist individuals and organisations.

6.28 The process of fiscal consolidation which is taking place in India, has, and already mentioned at the outset, has constricted large scale public investment even in the critical infrastructure sectors such as energy and transport. The task of incorporating environmental considerations in development projects requires even larger levels of investment resources. The scope of public investment being rather limited, there is a need to attract private and external sources of financing for carrying out the crucial tasks of ensuring conservation and sustainable development.

6.29 Programme deficiencies reflected in weak tardy programme implementation is an issue which requires special attention. It should also be noted that environment impact assessment of urban and rural environmental management is constrained by information/data deficiencies which arise because of non-accounting of natural resources

and environmental quality parameters. A further problem comes from the inadequacy of funding of environment activities and the lack of a variety of fiscal instruments to tackle environmental problems. At present, the fiscal tool for environmental protection is the Cess Act and certain fiscal concessions for use of pollution control equipment. There are also deficiencies of nigh quality human resources and organisations to undertake the task of environment protection at the local and regional levels. This is caused by the lack of an environmental education network in the country. Skilled human resources for tackling the problems of industrial pollution, hazardous substances management and for implementing technologies for wastelands management, have to be developed and nurtured.

6.30 The gains from a reduction in the rate of population growth, infant mortality and birth rates can be sustained only if greater efforts are directed to the eradication of the existing scale poverty in the country by ensuring that the poorer sections have better access to land resources and/or employment opportunities. A more effective delivery of social services such as drinking water, sanitation, health facilities and education for the large urban and rural populations in the country will serve to upgrade the quality of life of India's human popuiation. These services will reduce the incidence of diseases and mortality and thereby create

social conditions which would ultimately bring down human fertility rates to the level of replacement. In addition, development has produced its adverse effects on the poor by causing their natural resource base to be eroded or removed, and also affected the poor in rural and urban areas in terms of their health and ability to work.

PRIORITIES

7

PRIORITIES

7.01 The task of integrating environmental concerns in India's quest for economic development is not as complicated as may appear at first sight. Eradication of poverty, stabilisation of the population growth rate and greater employment opportunities by themselves would serve to qualitatively improve India's environment. Access of the urban and rural poor to basic civic amenities such as housing, sanitation and safe drinking water can not be a reality unless they are endowed with sufficient purchasing power on a sustained basis. There is clearly a strong case, as has been made out in the Eighth Five Year Plan Document for further strengthening India's direct intervention programmes for poverty alleviation exemplified in the Integrated Rural Development Programme (IRDP), the National Rural Employment Programme (NREP), the Rural Landless Employment Generation Programme (RLEGP) and the TRYSEM Programme. There is an equally compelling need to further streamline our health care and family welfare schemes to ensure eradication of water/air borne communicable diseases, better health delivery services to the poor to enable them perform labour for a livelihood. The Eighth Five Year Plan also stresses the need to extend the Urban and Rural Drinking

and allied activities, development of biotechnology industries in India, low cost indigenous systems of medicine and treatment hignlighted in the Eighth Five Year Plan and the National Health Policy and finally for the preservation of the traditional lifestyles of tribal population in the country. The All-India Coordinated Research Project on Ethnobiology of the Ministry of Environment and Forests has surveyed and inventorised more than 1000 plant and animal species used by the tribal population in India for medicinal and other consumptive purposes which need carefully conservation. The ongoing programmes of conservation and survey implemented by the Ministry of Environment and Forests need further strenghtening to facilitate tapping of the "option value" of the biodiversity contained in the country's natural forests, protected areas, wetlands, mangroves and coral reefs.

B. **Afforestation, Wasteland Development Conservation of Soil and Moisture and ensuring that water sources are not polluted.**

7.04 Focus on this area would reverse the trends of deforestation and over-grazing imposed by subsistence and industrial pressures on forests, ensure sustainable agricultural and water harvesting practices by small and marginal farmers, in the semi-arid, arid and humid regions of India. The major thrust of area based poverty alleviation programmes such as

Drought Prone Area Programme (DPAP), Desert Development Programme (DDP) and the Afforestation Programmes of the National Afforestation and Ecodevelopment Board and the National Wastelands Development Board, the National Watershed Development Programme for Rainfed Agriculture, the All India Coordinated Project on Rainfed Agriculture, Ravine Reclamation Programmes, Command Area Development Programme, Soil Conservation in Catchments of River Valley Projects Programmes and the Centrally Sponsored Operations 'Soil Watch' Programmes in the Himalayas being on soil and water conservation, these programmes would receive special attention and fine tuning.

Drought Proofing Measures

The drought of 1987 caused by the failure of south-west monsoon over large parts of the country was one of the worst in the century. However, the measures adopted by the Government to tackle the drought were commendable in terms of a number of innovative measures to provide relief to the drought affected areas. Employment generation, provision of drinking water, fodder availability, supply of essential commodities and drought proofing were identified by the Government of India for providing relief to drought effected areas. It is significant to note that special stress was laid down by the Government to ensure that employment generation works result in drought proofing. With this purpose in mind the Government of India laid down the following order of priority for selection of works for drought proofing viz., provision of tube-wells, rehabilitation/restoration/digging of ponds, repairing field channels, promoting soil conservation and water harvesting works and laying of roads where road links did not exist. (The Drought of 1987 - Response and Management, (Introduction), Volume I, Ministry of Agriculture, Government of India - [1989])

7.05 The stress on soil and water conservation in the Environment Action Programme needs also to be evaluated in its significance to drought proofing and management of natural disasters.

Water Missions to the remaining 3000 'no-source', 'hard-core' villages and small towns with population upto 20,000. Drinking water availability in the partially covered villages, also need to be further upgraded. The proposed thrust in the Eighth Plan on total environmental sanitation in rural and urban areas and on effective and scientific mechanisms for the collection, transportation and disposal of solid wastes in metropolitan cities, is also a welcome direction from the environmental point of view.

7.02 While these programmes would be helpful in creating effective demand for and an increase in the supply of basic services for poverty alleviation, the seven priority areas listed in the 'Introductory Chapter' also need to be addressed to (a) improve the efficacy of anti-poverty and other related basic service programmes in the Eighth Five Year Plan and (b) mitigate in the interim, the adverse environmental effects of poverty in rural and urban areas. The raison d'etre for choosing these priority areas are enumerated below:-

A. **Conservation of and sustainable utilization of biodiversity in selected eco-systems including forests, mangroves, wetlands, coral reefs, mountain ecosystems.**

7.03 This is a priority area from the angles of the conservation of genetic, species and ecosystem diversity, for the sustainable agriculture

7.06 Mention also needs to be made of the ongoing schemes for eco restoration of wetlands through Management Action Plans, such as the proposed initiative for rehabilitation of 14 lakes in the country under the National Lakes Conservation Plan and the European Community assisted Tank Modernisation Programme in Tamil Nadu.Besides their ecological and economic significance,these projects also aid in the re-charge of ground water aquifers. Further, a streamlined programme for soil and water conservation can also ensure that beneficiary based poverty alleviation programmes such as the IRDP (particularly livestock based assistance projects) also acquire effectiveness in terms of lower Incremental Capital- Output Ratios (ICOR). The final output would be more biomass for fuel and fodder needs, safe drinking water, augmentation of depleting ground water resources and substantial employment-opportunities for the rural and urban poor.

C. Control of industrial and related pollution with an accent on the reduction and/or management of wastes, particularly hazardous wastes.

7.06 Pollution control strategies through waste minimisation would be a qualitative improvement and would complement the on-going effort for achieving air and water pollution control through better emission/effluent

treatment systems. The World Bank-assisted Industrial Pollution Control and Pollution Prevention Projects need to be suitably extended to cover all the critically polluting industrial sectors in India by covering more regions/States. Utilisation of solid wastes is a top priority in India given the multiplier effects such utilisation processes can ensure in the form of industrial activities and employment. A case in point is fly-ash, which as has been noted, offers potential for self-employment and would provide a major tillip to our housing industry and the ambitious National Housing Plan.

Pollution abatement programme in India - Present efforts & future directions

It is not enough for the Government to notify laws which are to be complied with. A positive attitude on the part of everyone in society is essential for the prevention of pollution and wide consultation has been held with those who will ultimately implement the policy.

A comprehensive approach is taken to integrate environmental and economic aspects in development planning; stress is laid on preventive aspects for pollution abatement and promotion of technological inputs to reduce industrial pollutants; and through reliance upon public cooperation in securing a clean environment to respond to the coming challenges.

The objective is to integrate environmental considerations into decision making at all levels. To achieve this, steps have to be taken to :

- *prevent pollution at source;*
- *encourage, develop and apply the best available practicable technical solutions;*
- *ensure that the polluter pays for the pollution and control arrangements;*
- *focus protection on heavily polluted areas and river stretches; and*
- *involve the public in decision making.*

'India - Policy Statement for Abatement of Pollution - 1992', Government of India, Ministry of Environment & Forests.

D. Improving Access to Clean Technologies.

7.07 Pollution prevention is evolving as a top priority both on account of the growing scarcity of raw materials, and the need to adhere to global environmental norms on products and processes. The growing phenomenon of energy shortages has also impelled a greater accent on clean technologies which are also energy conserving in nature.

E. Tackling urban environmental issues.

7.08 In India ,the urban sector contributed 47% of the Gross Domestic Product (GDP)in 1980-81 and is likely to increase to 60% by 2001 A.D, hence the significance of addressing urban environmental issues. The growing urban population in the country,its concentration in Class 1 and metropolitan cities of the country, the increasing phenomenon of urban poverty, air and water pollution and the rapidly deteriorating urban infrastructure such as transport, electricity, sanitation, health and housing necessitate a broad-based strategy based on multiple policy instruments,including the economic ones of taxation and pricing. New policies for institutionalising citizen participation in environmental protection measures have also to be conceived against the background of the Constitutional establishment of Urban Local Bodies and the increasing interventions for tackling of urban environmental issues. The

ongoing World Bank assisted Metropolitan Environment Improvement Programmes in Madras and Bombay need to be extended to other metropolitan Cities. Special attention also needs to be paid to Class I & Class II Towns, particularly those on the verge of rapid industrialisation. Conserving the vestiges of wetlands, mangroves and other unique habitats in India's cities and upcoming towns is also crucial. Also considering the enormous strain on the available natural resources of water in the country, it is necessary to protect the existing water resources from pollution so that the quality parameters of the natural resources are maintained for the coming generation to the desired degree of its usage.

F. **Strengthening scientific understanding of environmental issues, as well as structures for training at different levels, orientation and creating environmental awareness, resources assessment, water management problems etc.**

7.09 The National Policy on Education (NPE) 1986 as revised in 1992 stipulates that "There is a paramount need to create a consciousness of the environment. It must permeate all ages and all sections of society, beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process". In a recent judgement the Supreme Court of

India has also ordered that every State Government and Education Board should take immediate steps to enforce compulsory education on environment in a gradual way. In keeping with the NPE and the Court order, the National Commission for Education Research & Training (NCERT) and almost all of the State Governments/Boards of Secondary Education have modified and updated their textbooks to include topics on the environment at different levels. The University Grants Commission (UGC) is also examining the possibility of making environment education an integral part of the undergraduate courses as well as starting new courses on environment.

7.10 Apart from environmental education, for sustainable development to be institutionalised, there is a need to develop a strong, legal, administrative, organisational, technical, and popular framework. This would necessitate overcoming the present gaps by nurturing and developing human resources at the scientific, technical, policy/decision making, programme implementation and public levels. The broad programme for human resource development would involve environmental education for awareness amongst the public, environmental training for the policy/decision makers and administrators, imparting of skills in the areas of environmental management and impact assessment to develop technical personnel in these areas in various parts of the country, and the

establishment of research and development, infrastructure for the collection of scientific/statistical data on natural/environmental resources.

G. Alternative Energy Plan

7.11 Commercial fuels such as coal, oil and lignite, suffer from quality deficiencies and also cause air water and other types of pollution. Further, commercial fuels notably oil (hydro-carbons) impose a huge burden in terms of foreign exchange requirements. The agricultural based non-commercial fuels are not energy efficient and further create health problems amongst its users, i.e. the urban and rural poor. The overriding priority for protecting forests also rule out the use of wood fuels on a large scale. There is also the priority programme for reduction of emissions from the non-stationary transport sector, arising from use of leaded petrol. The increasing inefficiency of energy utilisation in the agricultural sector expressed in the form of wasteful use of high-speed diesel and electricity in irrigation operations is another major problem. On the other hand, the inability to cap the flaring of natural gas which is a clean source of fuel is a glaring deficiency which needs to be attended to alongwith programmes for utilisation of alternative energy sources such as improved cooking stoves, coal washing and beneficiation and the utilisation of solar, wind-power and bio-gas. This would be in addition to

the on-going efforts for better and improved utilisation of existing commercial sources of energy such as coal and oil and efforts being made to reduce transmission and distribution losses in our electricity supply systems.

STRATEGY

8

STRATEGY

8.01 It is necessary to lay down an integrated strategy based on economic policies, institutional development and efficient norms of project implementation to ensure that the priority areas identified previously get properly implemented. Economic policies for implementing sustainable development programmes will determine the trajectory of sustainable development. Accordingly, in identifying an economic strategy for implementing the Environmental Action Programme, it will be necessary to assess the economic instruments available under the prevailing macro-economic regime and also delineate the tasks of sustainable development thrown up by the regime.

8.02 The on-going process of economic reforms in India has fundamental implications on the strategy to be adopted for implementing the Environment Action Programme, prioritised in terms of the seven areas mentioned in the previous Chapters. As noted at the outset, the process of industrial deregulation initiated in recent years is bound to accelerate the process of industrialisation, both in the conventional industrial zones of the country, as well as new zones, categorised as industrially

backward areas. This fact coupled with the significance accorded to exports in India's economic reforms, may impact on environment basically in the following manner:

a. the pollution load in air, water and land is bound to increase in the absence of firm pollution control measures;

b. the pressure on forests and other biomes will also intensify in terms of diversion of these eco-systems for industrial projects and infrastructural facilities, such as power plants, mines, etc.;

c. the relatively slow pace at which the power and the oil sectors are expanding, is bound to create demand pressures on energy resources; and

d. environmental standards laid down on exports from India will necessitate that our traditional export industries, such as leather and textiles shift to higher quality and environmentally friendly processes and products.

8.03 It is apparent that the impact of the evolving macro-economic framework will be mixed insofar as our environmental priorities are concerned. The accent should be to ensure that the potential adverse environmental effects of the new economic policy regime are minimised

This can be achieved through the intensification of industrial and non-industrial pollution control measures, while at the same time facilitating a process of switch over by our small scale industries to cleaner production processes and technologies at the least social cost. The use of concessional lines of credit for waste minimisation and for adoption of cleaner production processes as is being done through the World Bank assisted Industrial Pollution Control and Pollution Prevention Projects is another complementary approach.

8.04 The Tax Reform Committee set up by the Government of India has underlined the significance of India's tax system having a broader tax base and a lower tax rate. The present commitment of the Government of India to progressively reduce the rate of corporate tax for the different categories of industries is based on this recommendation. There are already fiscal incentives for environmental protection in the form of an exemption from the corporate tax for undertaking programmes of conservation on natural resources,wood substitution, accelerated depreciation norms for industrial units which have installed devices and systems for minimising environmental pollution and conservation of natural resources. In fact, the Union Budget for the year 1992-93 had

provided 100% depreciation for energy saving devices and renewable energy devices. The reduction of customs duties is also designed to facilitate technology upgradation in export oriented industries, including leather which is an environmentally sensitive industry. As the programme for tax reforms and customs duty reduction are to be implemented over a period of 3 - 4 years from now, it is expected that the process of providing fiscal incentives for environmental protection will be further strengthened to facilitate accessing and absorption of clean technologies in industries. A number of other steps initiated to reduce current expenditure have the potential for positive environmental benefits.

8.05 The use of the tax base for environmental protection in India has to evolve further. Charges are the main source of revenue for environmental protection. The Cess levied on the consumption of water by industries and other local authorities is the best example. The Water Cess which is levied under the Water (Prevention and Control of Pollution) Cess Act, 1977, provides for the levy and collection of a Cess on water consumed by certain industries and other local authorities. The rates of the Cess vary depending on the purpose for which water is consumed. The Water Cess is basically intended to augment the resources of the Central and State Pollution Control Boards which have been constituted

for environmental protection in India under the Water (Prevention and Control of Pollution) Act, 1974. The Cess Act also provides for rebates to any industry/authority which installs any plant for the treatment of sewage or trade effluent. During the year 1991-92, the actual collection of Cess by the 31 State Governments/Union Territories of India was Rs.7.63 crores. The rate structure for the various categories of water use have also been revised upwards.The future strategy will be to (a) improve the rate of Cess collection from all categories of industrial units, rather than confine collections to thermal power stations, integrated steel plants, fertilizer plants, petroleum refineries, etc., and (b) extend the ambit of the Cess to cover more sectors in the rural areas including agriculture after carefully assessing the implications. A broad-based and streamlined system of water charges will complement the programmes to be strengthened or launched under the EAP in the areas of conservation of soil and water resources and water quality. In order to encourage the investments from the community in water supply and sanitation sector, the principle of self-sustainability of the investment has been propagated and with regard to the natural water resources, the principle of sustainability of its quality has been recognised. In this regard, removal of pollution caused by the urban areas require due attention.

Economic Instruments for Environmental Protection

While regulatory measures remain essential for the effectiveness of the policy, new approaches for considering market choices will be introduced. The aim is to give industries and consumers clear signals about the cost of using environmental and natural resources. The expectation is that market-oriented price mechanisms will influence behaviour to avoid excessive use of natural resources.

There are at present several fiscal incentives for installation of pollution control equipment and for shifting polluting industries from congested areas. The items for which excise and customs rebate are allowed will be reviewed. This will stimulate the advancement of abatement technologies and create increased demands for the products.

Economic instruments will be investigated to encourage the shift from curative to preventive measures, internalise the costs of pollution and conserve resources, particularly water. A direct economic signal is offered by an effluent charge based on the nature and volume of releases to the environment. The level will be based on the cost of treatment and the flow discharged, in order to provide an incentive to set-up treatment plants. The scope of the charges will also be extended to emissions and solid waste. Charges provide a continuing incentive towards optimal releases.

These instruments will also have a distributive effect as the revenues will be used for enforcement, collective treatment, facilities, research and promoting new investment.

The precise choice of economic instruments adopted will be determined by the ease with which releases can be measured, as well as prospective changes in technology and market structures. To deal with the range of pollution problems a mix of regulatory and economic measures will be adopted.

Policy Statement on Abatement of Pollution, Government of India.

8.06 As the process of institutionalising sustainable development gets underway consequent to the EAP process, it would be possible to develop a tax base for environmental protection in the country. While the endeavour to broad base revenue sources and increase revenue collections would be taken up in the manner described, there would also be a simultaneous effort to ensure that conservation and natural resources development programmes as prioritised in the previous chapter are achieved even in terms of reduced investment resources targetting of

such resources to management systems and user groups which can ensure better delivery of benefits and/or ensure sustainable consumption norms. As already noted, the task of institutionalising sustainable development is a major one since it would mean attending to the gaps and infirmities in the existing legal, administrative, organisational, technical and popular framework for the development and environmental protection in the country. Setting up more scientific research and development institutions and technical institutes for studies in environmental sciences can substantially raise the volume of human capital having capabilities in environmental impact assessment and management. Training programmes for administrators, policy makers, trainers and scientists can also strengthen environmental management and decision making. Streamlined programmes for environmental awareness could lead to better programme implementation at the local level, in addition to contributing to a better information base on local inventory of natural resources and systems of use, both of which are important for physical and non-market valuation of natural resources. All these programmes for organisational development would entail standardisation of information on environmental matters, including guidelines on environment impact assessment and other technical parameters.

8.07 In other words, the institutional strategy for sustainable development

under this Environment Action Programme has as its chief objective, strengthening the environment impact assessment process by creating the base for drawing up 'Regional' Environmental Impact Assessment profiles based on studies of carrying capacity and regional/local siting plans through a process of popular participation. Environmental statistics and a scientific system of natural resource accounting is likely to become the wherewithal for the regional and local systems of EIA. The broad programme for human resource development would involve environmental research, education and training for developing technical, administrative and practical skills for a regional and local systems of Environment Impact Assessment in the country based on a scientific system of statistical data collection. Since industrial projects are being located in the traditional no-industrial zones, there is also a necessity for compiling information for careful risk analysis and hazard identification through a well identified, decentralised systems of information, collection and generation at the site level.

8.08 Environment Impact Assessment and Natural Resources Accounting would form the underlying foci for the seven priority areas identified in this Action Programme. All programmes of conservation and development which have been identified in this Document for the seven priority areas will be evaluated and monitored in terms of a comprehensive EIA framework

and a scientific system of Natural Resources Accounting. The performance of the Environment Action Programme (a dynamic process) itself would be assessed, amongst other factors, (such as the success of the different projects and programmes as identified here) in terms of its success in transforming the Environment Impact Assessment into a basic tool of decision making at the national, regional and local levels and in the establishment of systems of Natural Resource Accounting and developing Environmental Statistics for the seven priority areas.

8.09 Trade-related strategies : Apart from considering the environmental issues arising from India's on-going economic reforms, it is imperative to look at the possible fall-out of the impact of global environmental agreements and conventions and national environmental policies on India's exports. A number of countries have adopted trade related environmental measures with implications on product/process standards, packaging and labelling of export merchandise. These measures which have the impact of non-tariff barriers need to be tackled through improved product/process quality. The accent given to clean technologies in the Environment Action Programme and the emphasis given on modernising India's export industries such as leather and textiles stems also from this priority. Focus is necessary on the aspect of development of natural dyes, the existing programmes for phasing out toxic pesticides and

pesticide formulations and the modernisation programmes of the integrated steel plants in India. It would be also important to initiate research and studies in India for evaluating the impact of global environmental agreements, trade related environmental measures and packaging and labelling requirements of developed export markets on India. These measures are significant to ensure the success of the reformed trade policies touched upon at the introductory chapter.

8.10 Refashioned economic instruments and legal, organisational and popular structures combined with effective programme implementation would ensure the realisation of the two fundamental goals of the Environment Action Programme, viz. improved provisioning of environmental services and integration of environmental considerations into the programmes for economic development. Efficient norms for programme implementation would form the basic strategy of the Environment Action Programme.

8.11 In line with the diagnostic exercise which identified the existing sectoral infrastructure both-organisational and non-organisational, the treatment of the subject will be in the strategy through capacity building and strengthening of all the organisations both old and new, and also through a programmatic approach to monitoring and execution of projects

for the conservation of natural resources and environment protection. This process has been initiated from the time when the Departmental/ Ministry for environment and forests was established. A great deal of progress was achieved especially in the last two Five Year Plans periods in building up capacities in scientific institutes and in improving environmental awareness. A substantial amount of investment has also gone into efforts to vegetate areas, protect forests and other eco-systems, check industrial pollution, and study the impact of investments on conservation in these areas. The process continues with greater vigour in the context of the developing thinking on sustainable development. This has resulted in greater interest in such schemes on the international scene. The adoption of Agenda 21 in Rio de Janeiro in 1992 and parallel developments in the Conventions of Biodiversity, Transboundary Boundary of Hazardous Wastes,Forests,Climate Change,the Montreal Protocol on Substances Depleting the Ozone Layer are parts of this effort. This has led to the evolution of schemes in the Government of India both on organisational and non-organisational aspects. A sample of this is in the 29 projects posed for GEF and Capacity 21 of UNDP, which are outlined in the following paragraphs :

8.12 Global Environmental Facility

a. cost effective technologies for limiting Green House Gas (GHG) emissions;

b. demonstration of sustainable alternatives to shifting cultivation;

c. developing of bio energy from industrial municipal and agricultural wastes;

d. mini-hydel development projects for hilly regions;

e. eco-development projects in national parks, sanitations and protected areas;

f. special pilot activity in the field of Environment Education;

g. establishing an International Ocean Institute in India;

i. development of Least cost GHG Emission reduction Plan in Asia.

j. Marine Pollution in Sea around India; and

k. Oil Spill Combatment Training Centre in Institute of Petroleum Study and Environment Management.

8.13 Capacity 21

Potential projects which have been submitted for possible capacity 21 support include :

a. strengthening of Centre for Environment Education, Ahmedabad;

b. strengthening of M.S. Swaminathan Research Foundation, Madras.;

c. strengthening of Uttara Khand Sewa Nidhi, Almora;

d. strengthening of Indira Gandhi Institute of Development Research (IGIDR), Bombay;

e. strengthening of Auroville Foundation, Pondicherry;

f. Centre for Environmental Law, World Wide Fund (WWF) India;

g. strengthening of G.B. Pant Institute of Himalayan Environment and Development, Katarmal, Almora, Uttar Pradesh;

h. strengthening of Centre for Environment Management at the Indian Institute of Management, Calcutta, West Bengal;

i. proposal for the Integrated Forestry and Agricultural Development in Nagaland;

j. strengthening of Animal Welfare Board, Madras, Tamil Nadu;

k. strengthening of Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore, Tamil Nadu;

l. strengthening of Natural History Society (BNHS), Bombay, Maharashtra;

m. establishment of a Centre for Integrated Environmental epidemiological Studies;

n. establishment of a Centre for Training in the Preparation of Environmental Impact Assessment (EIA) reports;

o. strengthening of Capacity in the Forest Sector;

p. strengthening of Bharatiya Adijati Sewak Sangh;

q. strengthening of VIKSAT, Ahmedabad, Gujarat; and

r. strengthening of the Environmental Information System (ENVIS), and the developing of a National Economic - Ecologic Database (NEED).

8.14 While the above strategy and programmes will be followed within our planning framework and keeping in view resources available from the sections, the seven priorities mentioned in the document will be unchanged in the short-term.

PROGRAMMES

9

PROGRAMMES

9.01 The priority action programmes under the Environment Action Programme include not only the programmes and projects listed in Chapter 5, but also certain new thrust items and projects both of organisational and non-organisational nature. These new items and projects, listed below, fall within the framework of the Eighth Five Year Plan.

9.02 In the Alternative Energy Plan area; the priority programmes will be as follows:-

Energy

a. **In the Coal Sector**

- projects for coal beneficiation;
- coal bed methane;
- projects for coal gasification; and
- project to tackle coal mine fires.

b. **Power Sector**

- reduction of transmission and distribution losses in power sector;

- demonstration projects on energy efficient lighting;
- evaluation studies on performance of pollution control measures in Thermal Power Stations; and
- assessment studies of ongoing R&M, uprating and life extension schemes.

c. **Transport Sector:**

- programmes for shifting from road to rail in freight movement;
- promotion of mass rapid transport systems;
- conversion of two-stroke to four-stroke engines in 2 wheeler and 3-wheeler vehicles; and
- introduction of Compressed Natural Gas (CNG) in the transport sector.

d. **Industrial Sector**

- programmes for promotion of energy conservation in industries;
- capacity building for EIA for thermal and hydel power plants*; and
- building natural resources accounting system for commercial fuels.

e. **Alternative Energy Sector**

- strengthening programmes for rapid diffussion, demonstration research and monitoring of new and alternative sources of energy (for reasons adduced in Appendix-X);
- research on the design of energy-efficient electric and diesel pumpsets;
- programme of ccnverting agricultuie waste to fertilizer;
- integrated pest arrangement;
- formulating policy measures and incentives to facilitate wind power generation;
- organisation strengthening for wind power generation*;
- research for indigenisation of wind electric generation system;
- development of power capacity from small hydel projects;
- capacity building for designing and managing decentralised energy plans*;
- formulation of alternative strategy for biogas implementation;
- designing effective Biogas Technology delivery systems;

- evolving design criteria for improved Cookstoves. -capacity building for EIA of energy use in rural areas;

- product development and market research for solar hot water systems ; and

- resource accounting systems for non-commercial energy sources in rural areas.

Urban Environmental Programmes

9.03 The priority programmes for addressing urban environmental issues are :-

- strengthening of 'Building Materials and Technology Promotion Council' to provide a platform for technology transfer and application in the shelter sector, and promoting commercial production of innovative materials, using fly-ash, red mud, phospho-gypsum and agricultural wastes, and for appropriate design of houses both in urban and rural areas*;

- strategies for bringing down the solid waste generation in cities with focus on those which are difficult to dispose of such as tube lights,used battery cells etc.;

- designing fiscal instruments for waste minimisation in respect of

non-biodegradable and non-recyclable packaging materials used for packaging of food products, medicines, soft drinks, machine parts, oils, breakables, etc.;

- development projects for developing biodegradable packaging materials through the Eco-Mark scheme and through fiscal incentives;
- design innovations for improving the refuse vehicles;
- formulation of plans for assessing space requirements for solid waste treatment;
- rehabilitation of ragpickers;
- protection of natural water sources - surface/sub-surface to meet the needs of its water users/usages;
- health services with focus on health education, awareness and health risk assessment;
- managing storm drains in cities;
- progammes for energy efficiency in street lighting;
- alternative energy programmes and energy efficiency in urban areas;

- formulation of pricing policies for promoting energy conservation;

- policies to promote public transport through;

- introducing innovative fiscal instruments to finance the public transport projects to charge the entire range of beneficiaries rather than only the direct-users;.

- improving the financial performance of the State Road Transport Corporations;

- reviewing the provisions in the Motor Vehicles Act, 1988 under which the fare revisions require legislative approvals each time which leads to delays and political;

- improving public distribution system for kerosene;

- increasing the use of coal in urban areas through introduction of methods such as fluidised bed processing or pelletisation for smoke reduction and improving the thermal properties. This programme could be successfully linked to the proposed programme of improved cookstoves;

- preparation of energy audits for each city;

- road pricing practices for overcoming congestion;

- framing enabling housing policy;

- setting up monitoring system for air pollution control;

- protection of urban amenities such as public parks, beaches and wetlands;

- erection and strengthening of urban forests;

- formulation of city level environmental management plans;

- organisation strengthening for NGO participation in urban environmental management*; and

- organisation strengthening for human resource development and capacity building for pollution control, waste management, natural resource accounting, risk assessment and environment impact assessment in urban areas*.

Conservation and sustainable development of bio-diversity in selected eco-systems including forests, mangroves, wetlands, coral reefs and mountain ecosystems.

9.04 The priority programmes and actions in these areas include:-

- research to evaluate ecological importance, biotic potential, conservation value of Wetlands, Mangroves and Coral Reefs;

- survey of protected wetlands (existing and proposed);
- afforestation and wasteland development;
- programmes for sustainable management of man-made water bodies such as reservoirs, urban tanks and village ponds, percolation and irrigation tanks, etc.;
- conservation education on wetlands, mangroves and coral-reefs;
- natural resources accounting studies for coral reefs, forests, mangroves , wetlands , protected areas and biodiversity;
- demand management development projects to improve protection of newly afforested areas/areas undergoing natural regeneration;
- research and development on bio-energy programmes i.e. high-density energy plantations and efficient fuel-wood use systems by organisational strengthening of Indian Council of Forestry Research and Education, Dehra Dun;
- development programmes for pasture regeneration;
- wildlife projects particularly Project Elephant and Project Rhino;
- extension support projects for agro-forestry;
- networking of the Zoological Survey of India (ZSI) and Botanical

Survey of India(BSI) with universities and other non-governmental organisations;

- developing a comprehensive national listing of all phyla, genus, species and sub-species with their location, distribution, description and status;
- develop a detailed listing of fauna of ecologically important locations including protected areas;
- research on cultivation of commercially valuable wild plants;
- establishment of farms for medicinal and other commercially valuable plants;
- research on various species of domesticated animals for conservation of traditional domesticated species, many of which are being replaced by hybrid, modern, breeds; and
- support for *ex-situ* consumed in zoological and botanical gardens.

Control of Industrial and related pollution with accent on reduction and/or management of wastes, particularly hazardous wastes

9.05 The priority actions and programme will be :-

- modernisation for cleaner production in respect of leather, textiles, paper and pulp industries;

- organisation strengthening for research on natural dyes*;

- development of techniques for quantification of pollutants from non-point sources viz. runoff from agricultural fields, waste disposal sites, leaky septic tanks systems, mining and logging activities and construction sites;

- development of physical methods for ascertaining the role hydrology plays in influencing pollutant behaviour; relating landuse to pollutant transport and effects on water bodies; addressing spatial (single catchment, multiple catchments) and temporal (annual, event, based, continuous) variability in pollutant generation, transport and delivery; and relating contaminant concentrations to management practices;

- development of decision-oriented methods to help make reliable and cost effective decision about nonpoint sources of pollution control methods and their cost and relating contaminant concentration to management practices;

- development of technologies for control of non-point pollution as a result of past land use practices;

- development and demonstration of cost-effective water treatment technologies particularly for removal of nitrates, pesticides and heavy metals from drinking water, desalination of brackish water and providing solution to taste and odour problems;

- demonstration and dissemination of wastewater treatment recycling and reuse technologies for water conservation; and

- projects for least hazardous methods of mining, control of erosion in mining areas, proper storage of minerals, and proper disposal of mineral wastes in mined areas, prevention and control of pollution from roads in mining areas, prevention and control of pollution in post-mining period, water diversion to prevent contamination of water and environmental rehabilitation of mined areas.

Environmental Statement for Environmental Audit in India

A gazette notification on environmental audit had been issued by the Ministry of Environment & Forests on 3th March, 1992 (amended vide notification GSR 386 (E) dated 22 April, 1993). This notification applies to every person carrying on an industry, operation or process requiring consent to operate under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) or under section 211 of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981), or both, or, authorization under the Hazardous Wastes (Management and Handling) Rules, 1989, issued under the Environment (Protection) Act, 1986 (29 of 1986). The notification requires that an Environmental Statement for the financial year ending the 31st March be submitted to the concerned State Pollution Control Board, on or before the 30th September of the same year.

In the Environmental Statement, every industry will provide information on the water and raw material consumption, pollution generated, information on hazardous wastes and solid wastes along with the disposal practices. The industries are also

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required to specify the impact of pollution control measures on conservation of natural resources.

This information will assist the industry in determining the cost of production and additional investment for environmental protection including abatement of pollution. To maintain confidentiality of certain inputs, a provision for coding has been made.

'India : Environmental Statement (As part of Environmental Audit)', Government of India, 1993.

Access to Clean Technologies

9.06 In order to increase access to clean technologies, the following programmes would be given priority :-

- organisation strengthening for research and technology development under the National Materials Initiatives under Industrial development programme for raw material upgradation, performance improvement in conventional materials, energy substitution and conservation and environmental sustainability under the Science & Technology Programme under the Industrial Sector*;

- launching of a Technology Mission on Cleaner Production to coordinate activities for promoting cleaner technologies in India through government policies, strengthening of R&D Institutions, industry associations, financial institutions and regulatory agencies.

- formulation of industry specific task forces for selection of demonstration and development projects;
- identification of cleaner technologies developed in research laboratories/industrial units in India and abroad and facilitating transfer and adaptation of such technologies in India;
- establishing centres for cleaner technologies in various parts of the country for developing a centralised data base and providing information to industries*;
- capacity building for environmental audit for pollution prevention*.
- capacity building for developing indigenous design engineering capability for absorption, adaptation and improvement of imported technology*;
- formulation of standards in terms of waste discharge per unit quantity of raw material;
- formulation of legal and economic measures to ensure absorption of clean technologies; and
- capacity building for assessment of environment impact of clean technologies*.

Environmental Impact Assessment

9.07 Action would be taken to :

- establish of a National Centre for Long term Training in EIA*; and
- evolve a network of Regional Centres in various Institutes for training in the preparation of EIA reports, including Disaster Management Plans*.

Strengthening Scientific Understanding of environmental issues as also structures for training at different levels, orientation and creating environmental awareness, resources assessment,etc.

9.08 Priority programmes in the area are as follows :-

- evolve structures to strengthen the training, research and education activities through existing government and non-government organisations and institutions at different levels, and strengthen and support them*;
- assistance to NGOs to set up district and village training centres and provide funds for them;
- programme for training of trainers at all levels needs to be taken up urgently. The Government can identify agencies and institutions which could take up this work;

- a scheme to allow practitioners, activitists, professionals, civil servants and others to participate in regeneration activities;

- training facilities for civil servants, especially those belonging to the Central and All India Services, through the environmental training activities of their induction institutions, which also require significant strengthening;

- environmental training programmes for students and the general public, especially in townships located in or around areas of special ecological significance;

- regular and sustained environment education (EE) programmes for professionals, decision-makers and local-self government authorities in EIA;

- environment-related subjects should be infused with larger social concerns;

- new environmental courses, interdisciplinary in nature and accessible to student of all backgrounds, should be initiated;

- development of a wide range of EE materials for mass distribution including modules and workbooks for teachers, low-cost environmental kits for students and audio-visual materials;

- environmental education programmes for the newly constituted Paryavaran Vahini (voluntary environmental task forces);

- capacity building for collection and analysis of environmental statistics for Natural Resource Accounting*; and

- environmental education of local policy makers, voluntary agencies, technical departments of State Governments and local body authorities in urban environmental issues.

Conservation of soil and moisture and ensuring that water sources do not get polluted

9.09 The programmes which would be given priority in this area are as follows:-

- programmes for rehabilitation and catchment area treatment for major and medium irrigation works;

- formulation of water management plan based on detailed soil surveys and landuse capability for major and medium irrigation works; .

- organisation strengthening for encouraging user participation in major and medium irrigation projects from the planning stage onwards*;

- developing networking with Government Departments with Research Institutions and experts for research, design and evaluation of irrigation projects;

- developing data base for post evaluation studies for periodic monitoring of actual crop patterns, water use pattern and productivity in all irrigation commands;

- review of command area development programmes in each State for streamlining the programme for better returns from irrigated agriculture and for optimum use of water;

- rehabilitation of system and non-system irrigation tanks;

- framing of legislative measures, fiscal measures and credit delivery schemes for ensuring proper exploitation of ground water;

- promotion of programmes and projects for conjunctive use of surface and ground water resources;

- rehabilitation and utilisation of public tubewells;

- organisation strengthening for better O&M systems for irrigation works*;

- projects for small surface water storage structures in rainfall short areas;

- dissemination and extension of low-cost rainfed, agronomic and soil conservation technologies to small and marginal farmers in rainfed cultivation zones;

- a mission mode project on development, demonstration and promotion of bio-fertilizers, which is under the consideration of the Ministry of Agriculture;

- survey for information generation on water-logging, saline soils, flood hazards, etc.;

- capacity building for formulation of Flood Control Master Plans for major river basins and for undertaking post-facto evaluation of flood control works*;

- capacity building through organisational strengthening of State Land Use Boards for the tasks of soil and water conservation;

- capacity building for developing natural resource/agricultural statistics in respect of dry-land agriculture, irrigation and hydrological data for better crop planning, optimum application of water and flood mapping, and Environment Impact Assessesment for river valley and agricultural development projects*;

- schemes to involve women for implementation of national

programmes in agriculture including watershed development and soil conservation schemes; and

- formulation of a region-wise water pricing policy.

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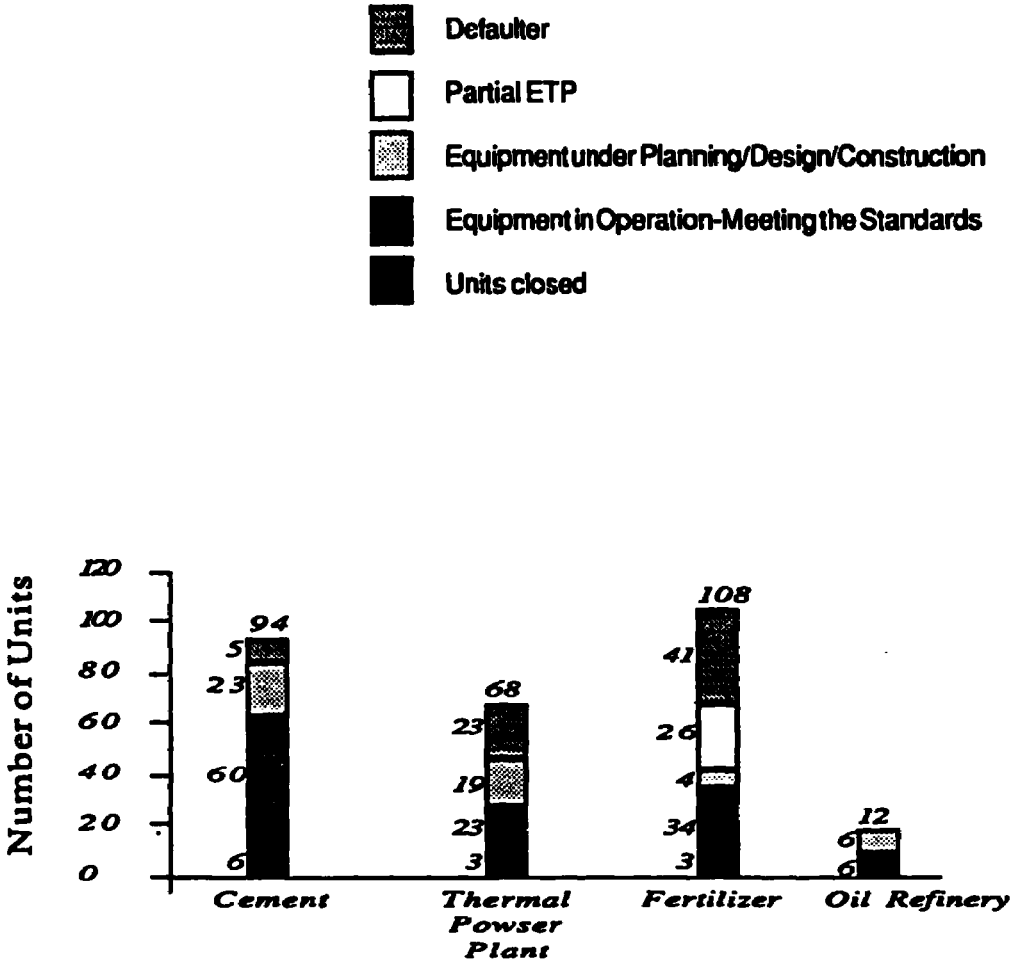
* Organisation strengthening projects.

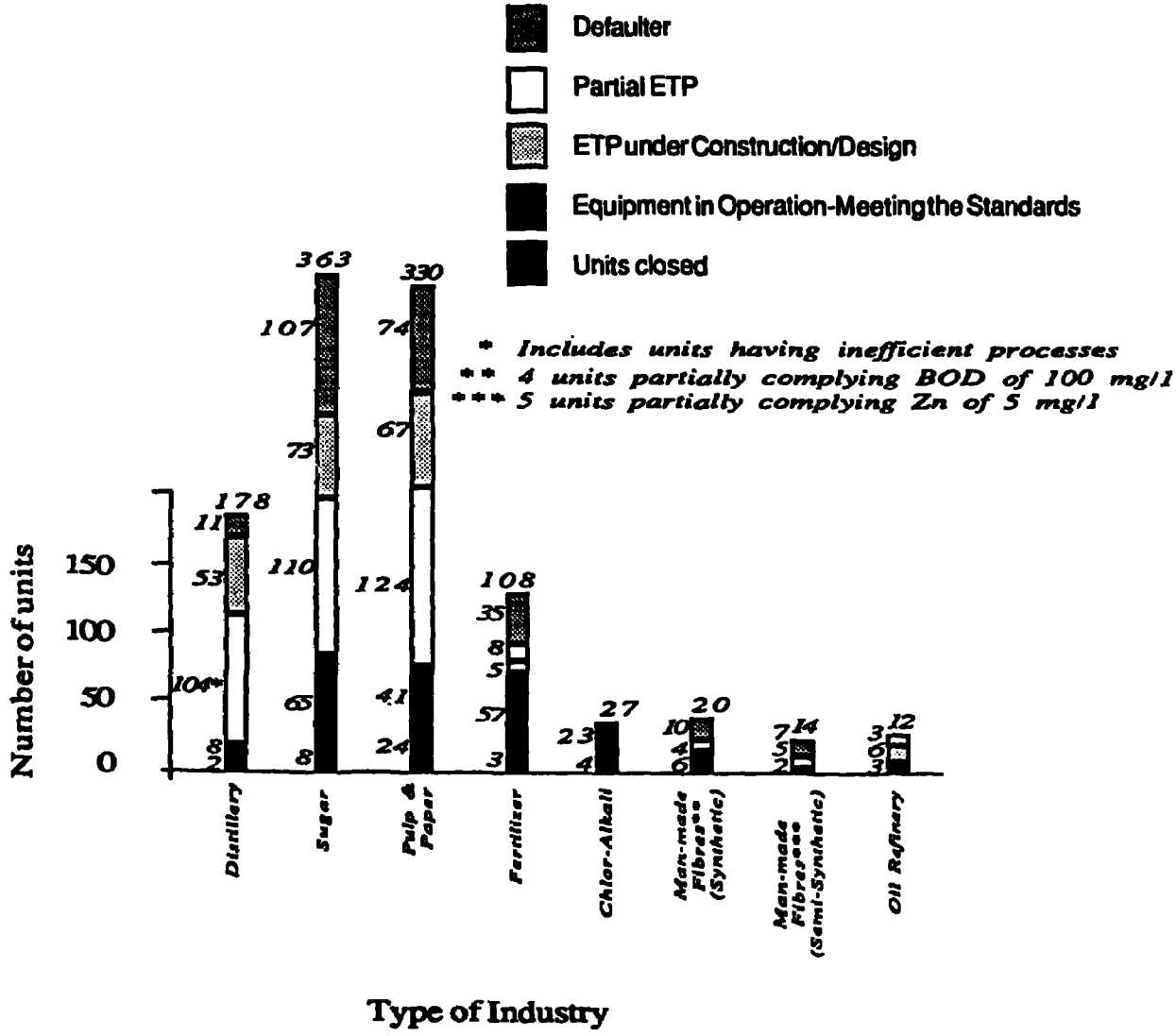
FIGURES AND TABLES

Fig. 1 : Status of Air Pollution Control in Environmentally Sensitive Industries.



Source : *Central Pollution Control Board - 1990-91*

Fig. 2 : Status of Water Pollution Control in Environmentally Sensitive Industries



Source : *Central Pollution Control Board - 1990-91.*

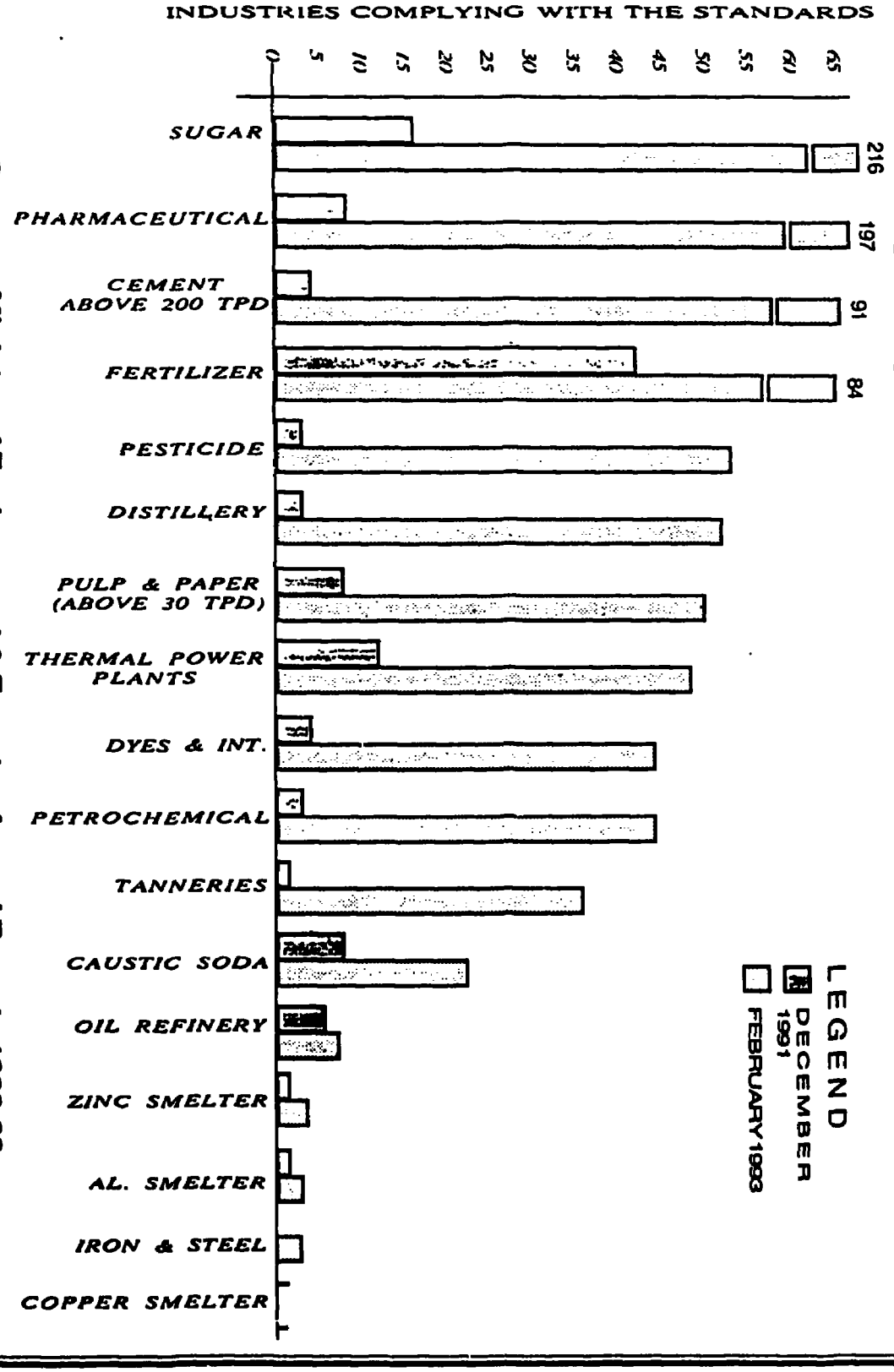


Fig. 3 : Progress of Pollution Control in 17 Categories of Industries

Source : *Ministry of Environment & Forests - Annual Report - 1992-93*

Table 1 : State of Ambient Air Quality in 15 Major Cities of India in 1989
Information on National Ambient Air Quality Monitoring Stations
(All values are based on 24-hourly averages only)

	All values in Micrograms per cubicmetre								
	Sulphur Dioxide			Nitrogen Dioxide			S.P.M.		
	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.
** City : AGRA									
* Location : Taj Mahal	19.7	3.3	64.0	10.3	3.2	21.0	438	170	2016
* Location : Jaipur House	10.2	3.0	30.8	5.8	3.0	18.0	355	145	725
* Location : Agra University	10.4	3.0	30.5	5.2	3.0	13.3	360	135	662
* Location : E.S.I. Hospital	9.8	3.0	26.7	5.1	3.0	11.0	330	83	614
** City : ANAPARA									
* Location : Anapara Colony	45.3	5.7	161.4	34.1	6.1	60 1	236	81	607
* Location : Renusagar Colony	50.7	8.8	95.1	36.5	7.9	63 4	345	101	1331
** City : BARODA									
* Location : Nyaya Mandir	17.8	4.5	142.5	16 4	1.9	145.8	424	50	1780
* Location : Bapod	14.9	2.3	109.8	11.6	1.9	59.6	350	46	1363
* Location : Makarpura	22.3	3.5	207.2	15.0	3.3	82.4	300	31	902
* Location : Gujarat Pollution Control Board Office	16.9	1.3	138.1	11.6	1.8	90 1	299	26	74
** City : COCHIN									
* Location : Kalamassery	3.2	0.5	39.8	17.0	1.4	131.1	105	27	433
* Location : Tripunithura	3.8	0.5	16.7	17.9	1.2	137.3	110	31	360
* Location : Kadavanthra	5.5	0.2	27.8	27.8	4.5	136.3	136	62	281
* Location : Eroor	10 5	0.5	57 5	25.9	1 5	110 6	125	30	317
* Location : Irrupannam	3 6	0 5	28 1	18.5	0.5	225.0	112	31	305
** City : HALDIA									
* Location : WBIDC	4.7	0.0	46.4	17.5	0.5	64.8	151	50	280
* Location : Super Market	12.4	0.5	105.6	23.2	0.5	110.2	406	80	1091
** City : HOWRAH									
* Location : Municipal Corporation	87.5	4.7	229.8	108.2	33.1	362.7	552	41	1093
* Location Bandhaghat	29.4	4.1	147.2	95.3	23.0	310.7	275	71	628
* Location : Naskarpara Pump House	74.9	3.5	350.5	91.8	12.0	185.1	349	130	619
* Location : Bator Power House	22.9	2.2	97.0	73.1	17.3	259.5	256	80	615
** City : JHARIA & DHANBAD									
* Location : R.O. Dhanbad	22.6	9.6	37.8	24.4	5.6	41.3	268	53	694

	All values in Micrograms per coubicmetre								
	Sulphur Dioxide			Nitrogen Dioxide			S.P.M.		
	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.
* Location : R.S.P. College Jharia	27.2	12.2	53.7	31.1	16.7	50.8	387	262	510
** City : KOTA									
* Location : Aksigarh (R.O.)	26.9	3.6	65.5	75.2	24.8	358.1	269	128	598
* Location : Anantapura	27.6	4.5	71.2	99.1	21.3	292.3	208	80	471
* Location : Borkhera	15.8	4.6	48.1	60.8	20.3	165.6	137	50	309
* Location : Raipura	26.5	3.3	114.3	116.8	18.3	460.3	262	75	607
* Location : Veterinary Hospital	24.1	3.6	64.0	91.7	32.8	265.9	227	108	580
** City : MADRAS									
* Location : Kathivakam	26.3	0.5	160.6	22.2	2.0	81.1	180	55	384
** City : MYSORE									
* Location : Institute of Education, Saraswathipuram	11.9	1.4	29.2	5.9	0.0	23.5	66	8	193
* Location : K.R. Circle Visweseraiya Bldg.	13.6	2.0	43.2	8.8	0.0	45.8	136	19	532
* Location : KAID Building Metagull	11.2	1.9	45.9	17.8	1.3	101.7	66	10	238
** City : SHIMLA									
* Location : Tekka Bench, Ridge	3.7	0.4	28.4	15.4	1.2	48.1	180	11	563
* Location : Bus Stand	3.1	0.5	16.3	18.6	2.9	44.5	348	45	934
** City : SINDRI									
* Location : FCI Main Hospital	29.4	12.8	51.1	30.4	15.0	68.3	287	56	1052
** City : SURAT									
* Location : SVR Engg. College	11.5	4.3	62.2	41.9	9.8	166.65	120	6	406
* Location : BRC Udhana	28.4	4.0	88.2	38.9	8.7	148.5	161	43	526
* Location : A.I.R. Building	18.9	4.0	100.7	33.4	8.8	89.0	378	68	792
** City : VASCO									
* Location : Vasco	4.4	1.0	10.3	12.8	4.0	29.5	144	12	408
** City : FARIDABAD									
* Location : R.C. Lothi No.63 Sector 9	31.3	16.7	39.5	12.6	6.8	20.0	275	139	425
* Location : Escort Medical Centre	30.8	17.2	39.3	12.4	4.7	26.8	281	157	415

Source : *Central Pollution Control Board - 1990-91*

Table 2 : Statewise Position of Water Supply Wastewater Generation, Collection and Treatment in Class II Towns

Sl. No.	State/Union Territory	Total No. of towns	Population 1981 Census	Total Water Supply (MLD)	Per Capita Water Supply (LPT)	Wastewater (MLD)	Wastewater treatment capacity (MLD)		
						Gene-rated	Collec-ted	Primary only	Primary and Secondary
1.	Andhra Pradesh	26	1713475	111.03	49	88.46	1.00	0.00	0.00
2.	Bihar	10	648643	43.11	49	34.46	0.00	0.00	0.00
3.	Gujarat	23	1542683	151.56	79	121.23	8.65	4.50	20.25
4.	Goa	2	122760	13.00	82	10.60	1.00	0.00	0.00
5.	Himachal Pradesh	1	70504	23.61	282	18.88	0.00	0.00	-
6.	Haryana	6	395243	39.74	77	31.78	9.37	0.00	0.00
7.	Karnataka	9	808375	64.37	62	51.49	0.00	0.00	0.00
8.	Kerala	7	456275	88.74	182	70.98	0.00	0.00	0.00
9.	Maharashtra	22	1491042	191.82	101	153.46	10.00	-	1.40
10	Madhya Pradesh	23	1553516	162.84	82	130.27	5.82	0.00	0.00
11.	Mizoram	1	74493	2.17	16	1.74	0.00	0.00	0.00
12.	Orissa	5	320383	35.09	73	28.07	0.00	0.00	0.00
13.	Punjab	10	665318	112.49	129	90.01	16.33	0.00	0.00
14.	Rajasthan	10	660790	44.80	51	35.87	0.00	0.00	0.00
15.	Tamil Nadu	39	2611397	200.91	64	160.74	3.20	-	0.00
16.	Uttar Pradesh	27	1891631	239.73	99	191.75	6.60	0.00	0.00
17.	West Bengal	17	1306780	97.14	64	77.73	0.00	0.00	0.00
Total		241	16333408	1622.15	(78)	1297.52	61.97	4.50	21.65

Figures in parenthesis shall not be read as total.

Source : *Central Pollution Control Board - 1990-91*

Table 3 : List of Polluted River Stretches

Sl. No.	River	Polluted stretch	Desired Class	Existing Class	Critical Parameters	Possible Sources of Pollution
1.	Sabarmati	(i) Immediate upstream of Ahmedabad city upto Sabarmati Ashram	B	E	DO, BOD, Coliforms	Domeestic and Industrial waste from Ahmedabad
		(ii) Sabarmati Ashram to Vautha	D	E	-do-	-do-
2.	Subernarekha	Hatia Dam to Baharagora	C	Partly D and Partly E	DO, Coliforms, BDO	Domestic and Industrial waste from Ranchi and Jamshedpur
3.	Godawari	(i) D/S of Nasik to Nanded	C	Partly D and Partly E	BOD	Waste from Sugar, Distillery and Food processing industries
		(ii) City limit of Nasik and Nanded	B	-do-	-do-	-do-
4.	Krishna	Karad to Sangli	C	Partly D and Partly E	BOD	Waste from Sugar and Distillery Industries
5.	Indus (Tributaries, Sutlej)	D/S of Ludhiana to Harike	C	Partly D and Partly E	DO, BOD	Industrial waste from Hosieries, Tanneries, Electroplating and Engg. Industries and domestic waste from Ludhiana and Jullundur.
		D/S of Nangal to Anandpur	C	E	Ammonia	Wate of Fertiliser, Chlor Alkali and paper mills from Nangal
6.	Ganga (Tributaries)					
	(i) Yamuna	(i) Delhi to Confluence with Chambal	C	Partly D and Partly E	DO, BOD, Coliforms	Domestic and Industrial waste from Delhi, Mathura and Agra
		(ii) In the city limits of Delhi Mathura & Agra	B	-do-	-do-	-do-
	Hindon	Saharanpur to Confluence with Yamuna	D	E	DO, BOD, Toxic	Industrial and domestic waste from Saharanpur and Ghaziabad
	Chambal	D/S of Nagda and D/S of Kota (app. 15 kms at both the places)	C	Partly D and Partly E	BOD, DO	Domestic and Industrial waste from Nagda and Kota respectively
	(ii) Damodar	D/S of Dhanbad of Haldia	C	Partly D and Partly E	BOD, Toxic	Industrial waste from Dhanbad, Durgapur, Assansol, Haldia and Burnpur.
	(iii) Gomti	Lucknow to Confluence with Ganga	C	Partly D and Partly E	DO, BOD, Coliforms	Industrial waste from Distilleries and domestic waste from Lucknow
	(iv) Kali	D/S Modinagar to Confluence with Ganga	C	Partly D and Partly E	BOD, Coliforms	Industrial and domestic waste from Modnagar

Source : *Central Pollution Control Board - 1990-91*

Table 4 : List of NAAQM Locations in Desending Order of Concentrations (ug/cub.m) based on 1990 Data for 16 or more Hours Monitored Days

S.No.	Area Class-Industrial			Area Class-Commercial			Area Class-Residential		
	Sulphur Dioxide	Nitrogen Dioxide	SPM	Sulphur Dioxide	Nitrogen Dioxide	SPM	Sulphur Dioxide	Nitrogen Dioxide	SPM
1.	Naskarpara Pump House, Howrah (81.8)	Naskarpara Pump House, Howrah (90.8)	Raipur Road, Dehradun (837)	Eye Hospital, Jamshedpur (55.9)	Town Hall, Delhi (51.5)	Hamida Road, Bhopal (594)	Jugshali, Jamshedpur (78.2)	Veterinary Hospital, Kota (101.2)	Deputy Ka Parao, Kanpur (566)
2.	Municipal Corp., Howrah (70.0)	Municipal Corp. Howrah (75.7)	Municipal Corp. Howrah (560)	LalBazar Calcutta (38.5)	Bank-More, Bihar (44.4)	Town Hall, Delhi (568)	Indra Chowk, Gajroula (48.4)	Raipura, Kota (97.2)	Jaipur House, Agra (502)
3.	Parel, Bombay (56.7)	Bandhaghat, Howrah (58.3)	Najafgarh, Delhi (527)	Bank-More, Bihar (31.8)	LalBazar, Calcutta (42.0)	Clock-Tower, Dehradun (506)	Visak Hostel, Bihar (37.7)	Akelgarh Kota (85.3)	ESI Hospital Agra (445)
4.	Raunao Ltd., Gajroula (56.2)	Super Market, Haldia (58.2)	Rita Sewing Mach., Ludhiana (516)	Town Hall, Delhi (30.6)	Vehicular, Traffic, Pune (42.2)	Tripolia Bazar, Jaipur (502)	Civil Lines, Satna (33.0)	Anantpura, Kota (70.4)	Air India Bldg., Surat (416)
5.	Golauri, Jamshedpur (52.7)	Bator, Howrah (52.8)	Agra Univ., Agra (478)	Kalbadevi, Bombay (27.2)	Hamida Road, Bhopal (31.7)	Kotwali, Kanpur (382)	Cadila Narol, Ahmedabad (33.4)	Barkhera, Kota (68.1)	Netaji Nagar, P.O., Delhi (383)
6.	Manali P.S., Madras (54.1)	Raunao Ltd., Gajraula (50.4)	Indus. Area, Satna (449)	Clock Tower, Dehradun (26.0)	Kalbadevi, Bombay (30.7)	Kothan Mkt., Indore (358)	(Sec.-9, Faridabad (30.7)	Indra Chowk, Gajroula (53.4)	Cadila Narol, Ahmedabad (357)
7.	Adityapur R.O., Jamshedpur (46.1)	Milk Plant, Ludiana (46.4)	Shahzada Bagh, Delhi (447)	Hamida Road Bhopal (24.7)	MRD Bank, G.Path, Nagpur (28.9)	Kotwali, Kanpur (328)	R.O., Dhanbad, (29.5)	SVR Engg., College, Surat (40.9)	Nyaya Mandir, Baroda (357)
8.	Industrial Area, Satna (43.7)	Alandi Road, Pune (46.3)	Hero Cycle, G.T., Road, Ludiana (428)	RCH School, Ahmedabad (20.3)	Eye Hospital, Jamshedpur (28.2)	Bank-More, Bihar (291)	Bandra, Bombay (28.2)	R/O, Dhanbad, (39.8)	PHED Gandhi, Nagar, Jaipur (357)
9.	Dhundhera Vil, Bhilai (41.5)	Rita Sewing, Mach., Ludhiana (43.6)	RSP College, Jharia (415)	Anand Rao, Cir., Bangalore (17.9)	Clock Tower, Dehradun (23.2)	Lal Bazar, Calcutta (274)	Air India, Bldg., Surat (21.1)	Air India, Bldg., Surat (37.7)	Bapod, Baroda (339)
10.	Anpara Colony, Anpara (36.4)	Shardaben Hosp., Ahmedabad (42.8)	Raunao Ltd., Gajraula (378)	Vehicular Traf., Traffic, Pune (13.6)	Parry's Corpn., Madras (20.6)	Vehicular Traf., Pune (273)	CESE M.G., Calcutta (19.5)	Cadila Narol, Ahmedabad (36.6)	Visak Hostel, Bhilai (329)

Note . SPM - Suspended Particulate Matter

Source : *Central Pollution Control Board - Annual Report - 1991-92*

Table 5 : Ambient Air Quality Status in 32 Residential Areas of Monitored Cities during 1990

Code Location	Sulphur di oxide				Nitrogen di oxide				Suspended Particulate Matter			
	Min	Mean	Max	n	Min.	Mean	Max.	n	Min	Mean	Max	n
STATE Andhra Pradesh												
CITY/TOWN Hyderabad												
150 Tarnaka	3 0	5 8	28 0	78	3 0	12.5	52.0	78	52	163	407	52
STATE Bihar												
CITY/TOWN Dhanbad												
44 R.O. Dhanbad	7 9	29 5	62 1	92	10.9	39.8	73.4	94	98	301	699	95
Jamshedpur												
173 Jugshali (Gurudwara)	65 5	78 2	122.7	7	14 5	28.8	36 2	7	29	104	129	8
UNION TERRITORY Chandigarh												
107 Environment Society	0 9	2.6	15 0	112	2 7	11.0	55.2	112	50	174	663	121
UNION TERRITORY Delhi												
59 Janakpuri	3 0	6 5	14 2	90	5.8	25 8	44.5	90	119	317	831	96
60 Siri Fort	3 0	8 7	19 2	80	3 0	21 1	34.2	80	26	317	723	84
144 Netaji Nagar, Post Office	2.0	15.3	62 3	60	4 0	35 2	81.8	60	91	383	1480	60
UNION TERRITORY Daman-Diu & Dadra-Nagar Haveli												
115 PWD Office, Sil Vassa	1.2	4.2	22.5	154	1.2	4.5	11.8	154	15	102	253	154
166 PWD Office, Daman	1 0	3.8	21.2	151	1.2	3 7	11.5	151	1	98	273	152
STATE Gujarat												
CITY/TOWN Ahmedabad												
102 Cadilla Narol	4 2	33 4	20.5	152	10.7	36 6	195 8	152	1	357	1069	154
103 L.D. Engg. College	2.0	6 3	25 8	132	6.7	33 4	163 8	132	35	204	542	134
CITY/TOWN Baroda												
50 Gujarat Pollution Control Board	2.5	7.1	40.9	148	3.0	7.3	19 6	148	45	241	711	152
48 Bapod	4 3	7.8	32.0	137	2.8	13 8	87.7	137	57	339	871	140
47 Nyaymandir	4.3	8.1	165.4	286	4.2	13 4	65.4	286	90	357	911	291

Code Location	Sulphur di-oxide				Nitrogen di-oxide				Suspended Particulate Matter			
	Min	Mean	Max.	n	Min.	Mean	Max.	n	Min	Mean	Max	n
CITY/TOWN Surat												
23 Air India Bldg.	5.8	21.1	71.8	144	11.7	37.7	69.7	143	65	416	776	145
21 SVR Engg. College	5.9	15.5	65.5	143	7.5	40.9	119.2	143	8	119	651	145
STATE Himachal Pradesh												
CITY/TOWN Parwanoo												
132 Regional Office	0.9	2.9	13.9	100	1.8	14.5	48.3	135	35	149	781	141
STATE Haryana												
CITY/TOWN Banglalore												
42 Kothi No. 63, Sec. - 9	19.7	30.7	44.0	166	6.0	10.0	18.3	166	214	315	482	166
STATE Karnataka												
CITY/TOWN Bangalore												
81 Jayanagar Police Station	1.7	16.4	48.1	47	5.0	11.3	20.1	46	19	49	136	48
CITY/TOWN Mysore												
39 Institute of Education	7.8	17.8	26.3	10	3.3	10.5	38.6	10	23	70	142	11
STATE Kerala												
CITY/TOWN Cochin												
148 PHED	6.0	6.7	21.5	115	3.0	4.4	19.2	115	11	76	204	57
STATE Maharashtra												
CITY/TOWN Bombay												
168 Bandra	6.0	28.2	87.5	73	7.3	24.5	65.2	72	64	228	474	69
CITY/TOWN Nagpur												
94 Regional Office, MCD Board	2.2	8.9	33.7	49	7.2	30.2	71.8	49	55	241	499	43
167 NEERI	6.0	8.4	37.0	117	3.0	12.0	31.0	119	29	130	267	101
CITY/TOWN Pune												
138 University	4.0	10.6	42.5	78	5.8	24.7	70.2	76	30	159	316	81
STATE Madhya Pradesh												
CITY/TOWN Bhilai												
67-5/32 Banglow Office Building	-1.0	-1.0	-1.0	0	9.7	21.7	33.0	55	94	261	518	55
65 Visak Hostel Sector 4	13.0	37.7	57.3	54	11.7	24.0	41.8	54	104	329	707	54
CITY/TOWN Bhopal												

Code	Location	Sulphur di-oxide Min	Mean	Max.	n	Nitrogen di-oxide Min.	Mean	Max.	n	Suspended Particulate Matter Min	Mean	Max	n
	125 Environmental Complex	0.0	6.4	12.0	12	4.9	18.0	42.9	11	52	132	288	14
	124 South T.T. Nagar	0.5	17.6	34.1	7	4.5	30.6	49.5	8	77	198	454	13
CITY/TOWN	Indore												
	131 Telephone Nagar	6.8	9.0	12.9	26	9.1	13.0	30.6	26	95	329	928	26
CITY/TOWN	Nagda												
	83 Grasim Labour Club	2.7	9.4	51.7	111	3.5	17.8	73.4	111	80	218	423	111
	84 BCI Labour Club	2.2	7.2	20.6	108	3.4	16.0	62.4	108	78	282	713	109
CITY/TOWN	Satna												
	129 Civil Lines	26.2	33.0	38.7	14	11.4	12.7	13.4	14	114	258	455	24
STATE	Orissa												
CITY/TOWN	Angul												
	70 Angul Township NALCO	1.0	8.1	75.5	99	2.4	4.9	7.6	19	11	126	581	149
STATE	Punjab												
CITY/TOWN	Ludhiana												
	62 Near Clock Tower	0.0	13.0	53.2	51	2.8	39.9	78.5	73	78	258	859	114
UNION TERRITORY	Pondicherry												
CITY/TOWN	Pondicherry												
	64 Sectional Office Upstairs	0.0	4.8	28.2	129	2.1	14.9	43.7	129	47	107	194	129
STATE	Rajasthan												
CITY/TOWN	Jaipur												
	157 PHED, Gandhi Nagar	5.0	5.0	5.3	96	5.0	12.3	44.3	96	102	357	1329	53
CITY/TOWN	Kota												
	16 Akelgarh (Regional Office)	3.6	14.3	35.8	88	39.6	85.3	281.9	88	22	230	649	93
	20 Veterinary HOspital	3.6	15.7	40.2	81	40.1	101.2	232.8	81	102	228	535	83
STATE	Tamil Nadu												
CITY	Madras												
	74 Puvaswakkam	0.5	10.4	94.9	122	3.9	29.5	118.9	122	38	136	306	126
	160 Santhome	6.0	8.7	27.3	108	3.0	11.7	48.0	108	27	78	172	111
CITY/TOWN	Tuticorin												
	75 Tuticorin	4.7	19.2	47.9	133	2.6	8.6	20.4	133	10	44	1118	134

Code Location	Sulphur di-oxide				Nitrogen di-oxide				Suspended Particulate Matter			
	Min	Mean	Max.	n	Min.	Mean	Max.	n	Min	Mean	Max	n
STATE Uttar Pradesh												
CITY/TOWN Agra												
2 Jaipur House	5.8	19.8	43.8	55	4.2	11.1	20.8	55	230	502	942	57
4 E.S.I. Hospital	11.8	19.1	25.5	9	8.8	10.6	15.0	9	120	445	631	10
CITY/TOWN Gajroula												
139 Indra Chowk	18.0	48.8	128.8	46	7.5	53.4	137.6	46	162	237	422	46
CITY/TOWN Kanpur												
85 JK Apartment	2.8	7.3	14.8	56	4.8	9.9	19.9	56	44	204	744	60
98 Deputy Ka Parao	6.1	9.8	13.9	63	6.7	13.3	19.3	63	78	566	4541	63
141 Agriculture University	3.0	4.3	198	95	3.0	9.0	42.2	95	46	253	892	95
STATE West Bengal												
CITY/TOWN Calcutta												
164 CESE, Mandovile Garden (Gariahat)	6.0	19.5	81.3	40	3.0	18.0	41.2	40	39	136	601	40

(N.A.-Data not available/inadequate, units in ug/cub.m)
n-Number of >=16 hours monitored days

Source : Central Pollution Control Board - Annual Report - 1991-92

Table 6 : Land Use Classification in India

(MILLION HECTARES)

HEADING	1950-51	1960-61	1970-71 (P)	1980-81 (P)	1985-86 (P)	1986-87 (P)	1987-88 (P)	1988-89	1989-90	% OF TOTAL REPORTING AREA (89-90)
I. GEOGRAPHICAL AREA					328.73					
II. REPORTING AREA FOR LAND UTILISATION STATISTICS (1 TO 5)	284.32	298.46	303.76	304.15	304.66	305.02	304.84	304.82	304 87	100 0
1. FORESTS	40.48	54.05	63.91	67.04	67.04	66 75	67.00	67.08	67.76	22 2
2. NOT AVAILABLE FOR CULTIVATION (A+B)	47.52	50.75	44.64	39.62	40.71	41 11	41.29	41.25	41.04	13 5
(A) AREA UNDER NON-AGRICULTURAL USES	9.36	14.84	16.48	19.66	20.54	20.84	20.99	24.26	21.24	7.0
(B) BARREN AND UN-CULTURABLE LAND	38.16	35.91	28.16	19.96	20.17	20.27	20.30	19.99	19.80	6.5
3. OTHER UNCULTIVATED LAND EXCLUDING FALLOW LAND (A+B+C)	49.45	37.64	35.06	32.31	31.11	31.02	30.96	30.48	30.21	9.9
(A) PERMANANT PASTURES AND OTHER GRAZING LANDS	6.68	13.97	13.26	11.97	11.97	11.88	11.83	11 80	11.60	3 8
(B) LAND UNDER MISCELLANEOUS TREE CROPS AND GROVES NOT INCLUDED IN NET AREA SOWN	19.63	4.46	4.30	3.60	3.45	3 64	3.52	3.47	3.57	1.2
(C) CULTURABLE WASTE	22.94	19.21	17.50	16.74	15.69	15.50	15.61	15.21	15 04	409
4. FALLOW LANDS (A+B)	28.12	22.82	19.88	24.75	24.88	26.12	29.36	26.44	26.34	8 6
(A) FALLOW LAND OTHER THAN CURRENT FALLOWS	17.44	11.18	8.76	9.92	10.02	10.57	11.03	10.44	10.62	3.5
(B) CURRENT FALLOWS	10.68	11.64	11.12	14.83	14.86	15 55	18.33	16.00	15.72	5.1
5. NET AREA SOWN (6-7)	118.75	133.20	140.27	140.00	140.92	140.02	136.23	139.57	139.52	45 8
6. TOTAL CROPPED AREA (GROSS CROPPED AREA)	131.89	152.77	165.79	172.63	178.83	176 66	171.81	181.08	181.14	
7. AREA SOWN MORE THAN ONCE	13.14	19.57	25.52	32.63	37.91	36.64	35.58	41.51	41.62	
8. CROPPING INTENSITY *	111.10	114.70	118.20	123.30	126.90	126.17	126.12	129.74	129.83	
III. NET IRRIGATED AREA	20.85	24.66	31.10	38.72	42.08	42.49	43.05	44.85	45.14	
IV. GROSS IRRIGATED AREA	22.56	27.98	38.19	49.78	54.65	55.69	56.23	59.05	59.64	

PROVISIONAL

* CROPPING INTENSITY IS OBTAINED BY DIVIDING THE GROSS CROPPED AREA BY THE NET AREA SOWN

Source : *Agricultural Statistics at a Glance, Ministry of Agriculture, Government of India.*

Table 7 : Physical Achievement at the End of the Seventh Plan (1985-90) and Two Annual Plans (1990-92)

Population in Million

Sl.No.Sub-Sector	Population covered as on 31.3.1985		Population covererd as on 31.3.1990		Anticipated Population coverage as on 31.3.1992	
	Population	% $	Population	% $	Population	% $
1.Rural Water Supply	3.3.86	56.26	444.65	73.87	486.11	78.40
2 Rural Sanitation	4.03	0.72	14.79	2.45	16.96	2.73
3 Urban Water Supply	127.20	72.90	162.00	83.80	165.67	84.90
4 Urban Sanitation	49.60	28.40	99.70	45.93	104.76	47.90

Percentage is with respect to total Rural/Urban population on the date.

Source : Eight Five Year Plan, 1992-97, Vol II, Planning Commission, Government of India.

Table 8 : Ongoing Externally Aided Projects in Environment and Forests

Pollution Control

Sl.No.	Donor Agency	Project & Place of Implementation	Duration	Assistance from Donor Agency	Expenditure till Aug. 1993
1.	Sweden	Environmental Protection & Training Research Institute, Hyderabad	January 92 to January 96	15 mill SEK	7.0 mill. SOK
2.	Norway	Training Programme on modelling & surveillance of dispersion & movement of pollutants	May 92 to December 93	10.5 Lakhs NOK	6.6 Lakh NOK
3	Norway Orissa Environmental Programme	April 92 to April 96	40 Mill NOK	7.3 Mill NOK	
4	Denmark	Environmental Master Plan Study, Karnataka	January 93 to January 96	Rs. 12 Crores	Rs.3.46 Crores
5	The Netherlands	Bio-monitoring of River Yamuna, Chaliyar & Tungabhadra Rivers	March 93 to March 94	2.6 Lakhs DFL	2.4 Lakhs DFL

Environment Impact Assessment

Sl.No.	Name and Duration of the Project	Donor Agency	Outlay/Expenditure Reimbursement	Progress of Reimbursement of Expenditure
1.	Indo-US programme on "Conceptual Environmental Management Plan for Coal Mines in India (Initiated in June 89 for a three year term with a provision for extension of two years)	United States Department of the Interior, Office of Surface Mining	Rs.15,00,000/- in US held Rupee fund	Rs 1,20,000/- (for the workshop only)

Global Environmental Problems

Sl.No.	Project Title	Project Period	Project Cost	Aid Agency
1	India : Country Study on Climate change	12 months w.e.f. Sept. 1992	US$ 99628/	Asian Development Bank

Research and Training in Forestry

Sl.No.	Name & Duration	Donor Agency	Outlay/Exp. Reimb.	Progress of Reim. of Exp.	Remarks
1	Strengthening & developing Indian Council for Forestry Research & Education (ICFRE) with duration 1992-97	UNDP	2.56 million US $	Project became operational w.e.f. 4.9.92 & no claim has been preferred by ICFRE so far.	Project being implemented with Grant.

Table 9 : Progress under the Ongoing Externally Aided Afforestation Projects

Sl.No.	Name of the Project	Aid Agency	Project Period	Project Cost in Rs. Crores	Project upto 3/93 Expenditure (Rs. in Cr.)	Project upto 3/93 Physical Targets Achi. (in '000 ha)	Aid Currency	Aid Component (in Million) Foreign Exchange	Aid utilised (in Million) Foreign Exchange	Exchange (Col. 9-10)
1.	Forestry Development Project, West Bengal	World Bank	1992-93 to 1996-97	114.70	6.84	44	29	US $	34 00	5 58
2.	Forestry Sector Project, Maharashtra	World Bank	1992-93 to 1997-98	431.51	4.17	12	8	US $	124 00	6 99
3.	Social Forestry Project, Tamil Nadu	SIDA*	1988-89 to 1992-93	85.40	91.59	84	86	SEK	313 00	197.60
4.	Social Forestry Project, Orissa	SIDA*	1988-89 to 1992-93	78.34	94.67	125	127	SEK	263.00	189.00
5.	Dungarpur Integrated Wastelands Development Project, Rajasthan	SIDA*	1992-93 to 1996-97	28.14	0.52	-	-	SEK	80.00	4.20
6.	Aravalli Hils Afforestation, Haryana	EC**	1990-91 to 1997-98	48.15	22.07	11	11	ECU	23.20	2.32
7.	Afforestation Along IGCP***** Rajasthan	OECF*** Japan	1990-91 to 1994-95	107.50	20.08	11	15	YEN	7869.00	472.80
8.	Afforestation of Aravalli Hills, Rajasthan	OECF*** Japan	1992-93 to 1996-97	166.90	4.14	20	4	YEN	8095.00	278.50
9.	Western Ghats Forestry and Environment Project, Karnataka	ODA**** (U.K.)	1992-93 to 1996-97	84.20	0.61	-	-	U.K. Pound	23.19	0.00

* SIDA - Swedish International Development Agency
** EC - European Community
*** OECF - Overseas Economic Cooperation Fund
**** ODA - Overseas Development Agency
***** IGCP - Indira Gandhi Canal Project

Rupees in Crores. .

Table 10 : Externally Assisted Ongoing Projects under Ganga Action Plan

(as on September, 1993)

Sl.No.	Name of Project	Lending Agency	Total Value (Present)	International Component	Loan Grant	Duration	Physical Progress %	Financial Progress %	
1.	Integrated sanitation project Jajmau, Kanpur (11 schemes)	The Netherlands	21.99	21.59	Grant	Apr. 87 to Dec. 93	93%	76%	
2.	Integrated Sanitation Project Mirzapur, Uttar Pradesh (U.P.) (9 schemes)	The Netherlands	15.75	13.89	Grant	Apr. 87 to Dec. 93	70%	73%	
3.	Pollution control works, U.P. (3 schemes of sewage treatment plant at Haridwar, Kanpur & Allahabad	World Bank	35.63	30.53	Loan	Dec. 87 to Mar. 96	46%	70%	
	Pollution Control works in West Bengal (13 schemes of pumping stations)	World Bank	34.55	12.27	Loan	Dec. 87 to Mar. 96	75%	79%	
5.	Pollution abatement works for River Hamuna (15 towns-6 in Haryana, 8 in U.P. besides Delhi)	OECF, Japan	357.00	401.00 (YEN 17.77 billion)	Loan	Apr. 93 to Mr. 99	75%	0.6%	
6.	Technical Assistance for Ganga Action Plan	ODA, U.K.	-	-	-	1987 to 1992	-	-	

Table 11 : Programmes of the Ministry of Environment & Forests

AREAS OF EMPHASIS	ORGANIZATIONAL	NON-ORGANISATIONAL
SURVEY OF NATURAL RESOURCES	- EIS for ZSI	- Floral/faunal surveys by BSI/ZSI - EIA on Ecology & wildlife - Forest survey by FSI
CONSERVATION OF NATURAL RESOURCES	- Central Zoo Authority - Assistance for Tiger Reserves Monitoring/evaluation - Nature interpretation centres for education on wildlife	- Designation of Wetlands under Ramsar Convention - MAP for Wetlands/Corel reefs/ Mangroves - Assistance to Botanical Gardens - NFAP for Forestry - Forest fire control - Protected area network - Project Tiger - Assistance to Zoological Parks
ENVIRONMENTAL IMPACT ASSESSMENT	- Training in EIA	- Environmental clearances - Regulatory notifications for fragile areas - Carrying capacity studies - Monitoring of EIA conditions
MONITORING/PREVENTION AND CONTROL OF POLLUTION	- Strengthening EPTRI/PCRI - Strengthening CPCB/SPCBs - Assistance to MOEF for evaluating environmental problems of pollution	- Monitoring Air/water quality - Vehicular pollution control - Environmental standards - Action plans for polluting industries - World Bank assisted industrial pollution control project - Eco-labelling - Clean technology for SSI - Bio-monitoring of river Yamuna - Monitoring water quality of Ganga
MANAGEMENT OF HAZARDOUS SUBSTANCES	- Assistance for Research Projects for handling/treatment of HSM - Training for household disposal of wastes/sanitation of urban slum dwellers - Assistance to SPCBs for managing HSM	- Assistance to States for EIA studies in respect of HSM sites
GANGA ACTION PLAN	- Public awareness/education	- Infrastructure for sewage/effluent treatment in towns - Monitoring of industries along Ganga river - Epidemiological studies - Pollution abatement in Yamuna/ Gomti - NRAP
AFFORESTATION AND ECO-DEVELOPMENT	- Support to regional centres for project evaluation - Assistance to eco-task force	- Conservation of non-wood forest produce - Development of forest/pasture seeds - Aerial seeding

AREAS OF EMPHASIS	ORGANIZATIONAL	NON-ORGANISATIONAL
		- Integrated wasteland development project - World Bank assisted NSFP - Afforestation schemes in Rajasthan/Haryana with Japanese/ EC assistance - Fuel wood/fodder development projects - Seed development - Assistance for NGO projects for afforestation - Mapping of wastelands and GIS - Western Ghats forestry projects with U.K. assistance - National fund for afforestation
RESEARCH ON NATURAL RESOURCES	- Support to ICFRE institutions, ERTC/IIFM/WLI/SACOAN/ IGNFA/SFSC - Assistance to GB Pant Instt. of Himalayan environment & development	- Support for research projects under MAB/Eastern & Western Ghats projects - Research projects for conservation and management of wetlands/ mangroves/biosphere - Support for plywood research and wood substitution programmes
ENVIRONMENTAL EDUCATION AND AWARENESS	- Paryavaran Vahini - Assistance to CPR environmental education centre, CEE & NMNH - Assistance to SPCBs for strengthening manpower	- National Environment Awareness Campaign
INTERNATIONAL COOPERATION	- Coordination Committee on externally aided projects - Ozone Cell for implementing the Montreal Protocol on Substances depleting the Ozone Layer - Inter-Ministerial Group for Global Environmental Facility	- Bilateral/Multilateral assisted projects in environment & forests - Global environmental issues, viz. ozone depletion, climate change, bio-diversity conservation and trans-boundary movement of hazardous wastes - Agenda 21, Capacity 21 and Global Enviromental Facility - Multilateral cooperation through SAARC/SACEP - International Centre for Integrated Mountain Development (ICIMOD), Kathmandu

Table 12 : Programme of Other Ministeries and Departments of Government of India

MINISTRY/DEPARTMENTS	ORGANIZATIONAL	NON-ORGANISATIONAL
AGRICULTURE	- ACRP - Agricultural Research & Education - Fisheries Research Support - Support to Agricultural Colleges/Educational Institutions - Small Farmers Agri-business consortium - Schemes for women participation in agriculture - State Land Use Boards	- Watershed Development Programme - Rainfed agriculture in National Watershed Development Project - Western Ghats Development Project - Soil conservation - Bio-fertilizers - Integrated Pest Management
WATER RESOURCES	- People's participation in irrigation - R&D in Water resources planning	- CADP - NWMP - Flood Control Programmes
RURAL DEVELOPMENT	- Constitutional status for Panchayati Raj Institutions - TRYSEM	- Jawahar Rozgar Yojana - DPAP - IREP - Rajiv Gandhi National Drinking Water Mission for rural water supply - Waste land development projects of NWDB
INDUSTRIES		- Modernisation of Steel Industry - National Material Policy Project - UNDP assisted pesticides development project - R&D programme for coir industry
LABOUR	- Rural Workers Education Programme	
ENERGY/COAL	- Solar Energy Centre - Training for Enviromental Management of Power Projects	- IDBI scheme for energy conservation in industries - IREDA - NRSE - Biogas/solar/wind/micro hydel - Coal washing/beneficiation - R&D for energy plantations and agricultural waste utilisation - R&D for commercialisation of waste disposal - R&D for battery powered vehicles
HEALTH AND FAMILY WELFARE	Centre for Epidemiological Health Intelligence	- Clinical Research on Drugs
URBAN DEVELOPMENT	- Constitutional status to urban local bodies	- Environment improvement of Urban Slums

MINISTRY/DEPARTMENTS	ORGANIZATIONAL	NON-ORGANISATIONAL
	- Buliding materials and technology promotion council	- Urban basic services - Integrated development of small and medium towns - NCR for Delhi - Nehru Rozgar Yojana - Low cost sanitation & small towns water supply schemes
SCIENCE AND TECHNOLOGY	- Establishment of Department of Bio-Technology - Technology information, forecasting and assessment council - Assistance for National Technology/Societal Mission in vaccination/immunization/ drinking water supply/ wasteland development/ livestock improvement - National Centre for Medium Range Weather Forecasting - Indian Vaccine Corporation Ltd. - Bio-Technology Consortium Ltd. - Training/HRD in Bio-Technology - National facilities for germ plasm collection - Technologies absorption/ adoption scheme - Transfer and trading in technology scheme	
SPECIAL AREA DEVELOPMENT/ REGIONAL PROGRAMMES		- Hill area development programme - DDP

APPENDIX 1

"INSTITUTIONAL STRUCTURES AND ENVIRONMENTAL MANAGEMENT" *

With rising consciousness about the environment and the dangers involved in allowing it to degenerate, there is an urgent need to build methods of protecting and preserving our natural resources. However, considering that these form the bedrock for economic growth and development, and also support the basic needs of much of the population, they must be put to optional use. This involves integrating environmental concerns with all aspects of economic activity, and the making of correct choices and trade-offs.

To ensure that the best choices are being made and that the value of protecting the environment is not being ignored, adequate human re source development, especially through properly designed training programmes, needs to be promoted. A country like India, which prides itself on having a large force of trained humanpower,is currently deficient in experts and trained professionals in the field of environment. There are also a large body of professionals and administrators who have never been exposed to environmental issues. There seems, therefore, a need to develop a comprehensive training programme which ensures that all interest and concerned persons have access to effective training opportunities.

Training Needs in Environment

The distinction between training and education is not always clear. Training, can :

a. impart information

b. change attitudes

c. develop skills

1. <u>The categories of persons that need to be trained</u>

In so far as training is the imparting of specific skills, it involves those categories of persons who are either expected, as a part of their work, to perform certain tasks which require skills, or those who would like to, as citizens or as members of voluntary groups, perform such tasks. Broadly they can be classified as follows :

1.1 Civil Servants : who are required to assist in the formulation of policiesand plans, and to carry out development projects and activities.

1.2 Professionals both technical (engineers, scientists, lawyers,judges, etc.), and social scientists and managers, both within and outside the Government, are involved in designing, assessing and managing projects and activities have potential or actual impact on the environment.

1.3 Educators and trainers who educate and train other people and, therefore, need to be initially trained themsleves.

1.4 Environmental activists who are involved in fighting for the environment, often against government or corporate interests, and thereby need the skills to effectively carry on this fight.

1.5 Students and the general public who might want to develop certain skills which would empower them to act effectively in the protection and regeneration of the environment.

Training is required across levels and at different stages of work and career.

2. <u>The types of training that each category needs</u>

Different categories of people need training to better perform the tasks related to the conservation, protection and regeneration of the environment, and to use one or more of the available strategies. Some of the tasks and strategies for which training needs to be imparted are :

- conservation and regeneration of forests
- conservation of wildlife and biological diversity
- protection of air, water, and land, from pollution
- conservation and regeneration of ecologically sensitive areas
- protection of areas with special environment problems
- conservation of natural resources
- protection from hazards
- use of legal processes
- environmental impact assessment methodology
- environmental management
- environmental planning
- ecodevelopment and joint forest management
- technological development and application
- research methods
- monitoring methods and technologies
- education and awareness methods

- special attention should to be paid to training in environmental impact assessment (EIA) The need for sustainable development involves, among other things, the ability to assess the impact of development activities and projects on the environment. This enables the making of correct choices, so that only those projects that are environmentally viable are given the green signal, and even their environmental impact is minimised. The EIA also gives a direction for the development of new processes and techologies, help in determining the real social costs of products and services, and highlights the need for conserving resources and finding or developing substitutes for scarce ones.

- The rapid rate of economic growth in India means that there are, at any given time, a large number of development projects in the planning or implementation stage. Unfortunately, adequate expertise and institutional structures are not yet available in India to speedily and comprehensively assess their environmental impact. This has often led to delays in the clearance of projects or, worse, the clearing of projects which were not properly assessed and consequently not environmentally viable.

There is, therefore, a need to build trained human power in EIA, especially among independent institutions, and within the government.

Summary of Findings

- of the 43 organisations who completed our questionnaire, 24 were NGOs. Most of the organisations (79%) were working in the rural areas, especially at district level, under their training programme.

- general environment was the major thrust area covered by most of the organisations (62.7%). 39.5% of the organisations specified their thrust area as Forestry.

- urban environment, rehabilitation, wildlife and biodiversity conservation, project formualtion and environmental economics were some areas which were barely covered by the organisations. 32.5% of the organisations were involved in training government officials, and they were trained in almost in all thrust areas (92.8%). Farmers and Non Government professionals were the other trainees to cover 85% of the thrust areas. Politicians were the only trainees who were not covered by any organisation for any thrust areas.

- participatory rural appraisal and planting trees were the major skills imparted by various organisations, whereas wildlife management and veterinary practices were most poorly covered by the organisations.

- 328 courses wee organised by the various organisation, and the number of trainees ranged from 2 to 6330 per course. The duration of the courses also varied from 1 to 105 days with 50.6% of them being held for between 1 and 3 days.

*** Extracts from study conducted by Singh, Shekar, et al (1993); Indian Institute of Public Administration, New Delhi.**

APPENDIX-II

"CLEANER TECHNOLOGIES IN INDUSTRIAL PRODUCTION"*

1. Status of Pollution Control in India

Since independence, India has established a well diversified industrial structure with a sizable capacity in basic and heavy industry. The share of value added to the GDP by the manufacturing sector is expected to rise to 20 percent by the year 2000 AD with an average annual growth rate of 8 percent.

Over the years the country has achieved substantial measure of self reliance, as a result of policies initiated from Second Plan onwards. The country now produces the entire quantum of coal, tractors and other agricultural equipments, some 80 to 95 percent of steel, industrial machinery and machine tools, power generation and transmission equipment, mining and earth moving machinery, vehicles, nitrogenous fertilizers, drugs and drug intermediates, and more than two thirds of zinc, paper and news print and variety of other industrial products.

The expansion in industry sector, however, has been towards capital and energy intensive sectors which are also the most polluting. Also, nearly 50 percent of the total industrial output in monetary terms is contributed by over 2 million small scale industries which also account for 60 to 65 percent of the total industrial pollution. Also, the use of toxic chemicals in industry has grown phenomenally.

Endeavour on environmental protection, so far, in India, have relied on strict regulatory measures. There are some two hundred enactments that have a bearing on environment. Those most relevant to industry are the Factories Act (1948), Water (Prevention and Control of Pollution) Act (1974), Forest Conservation Act (1980), Air (Prevention and Control of Pollution) Act (1981), Environment (Protection) Act (1986), and the Public Liability Insurance Act (1991).

As per MOEF requirements, industial units are required to obtain from the concerned State Pollution Control Board a consent to operate the unit. Such consent is subject to the unit complying with the standards prescribed by the Board. A provisional consent is given if the unit has an acceptable programme for installing necessary measures for controlling pollution. Failure in complying with the prescribed standards or conditions renders the unit liable for prosecution. By mid-1991, 4500 prosecutions have been made by the central and state pollution control boards of which 1133 (about 25%) have been decided.

Despite legal mechanism for environment for environmental management, only about 50 percent of the large/medium scale industries have provided complete/partial emission/effluent control systems and many of these do not achieve stipulated standards. Further, the small-scale industries (SSIs) have not yet been subjected to rigorous pollution control.

MOEF in 1991 has formulated a 15-Point Action Plan under which actions have been initiated to

control pollution inthe 17 categories of major polluting industries and directed State Pollution Control Boards to ensure the compliance of Standards in these industries. Pollution Control Status of 17 categories of industries in 23 status/Union Territories including all major industrial estates have been collected, collated and compiled. Defaulting units have been identified and action is being taken against them.

2. Environment - Industry Policy Linkages

The basic structure of Industrial Policy in India has been guided by the Industrial Policy Resolution of 1956. From time to time, Industry Policy has been modified through statements in 1973, 1977, 1980 and recently in 1991.

The objectives and goals of industrial policy in India are rapid expansion of opportunities for gainful employment, progressive reduction of social and economic dispartities, removal of poverty and attainment of self reliance. Promotion of small scale industry on one hand and restriction of size of large industries through Monopolies and Restricted Trade Practices Act have been the tools for achieving these objectives.

Till recently, industrial license was required for establishing new unit, expansion of existing units, change in the products as also change of location. As per Industrial Policy Statement of 1991 industrial licensing has been abolished for all projects except for industries related to security and strategic concerns, social reasons, hazardous chemicals, highly polluting industries an items of elitist consumption.

In the industry sector, the major environmental implications arise from small-scale industrial (SSI) units. The Government of India has a policy of promoting steady growth of the SSI sector and has accordingly introduced a large number of fiscal incentives and other measures. Though the labour and capital productivity of this sector is comparable to that of medium and large industries, its matrial productivity is usually lower, thereby resulting in more pollution per unit of output.

Some of the problems related to obsolete technology associated with higher levels of pollution employed by Indian industries relate, in addition to inadequate infrastructure for implementation of legislation, to concessions given to small scale industries and policy of administered prices for large industries such as steel, fertilizer, cement, power generation, alcohol and drug industries thereby failing to introduce competition. Chemicals already banned or obsolete in other industrialised countries are still being produced in India. In other cases, relatively dirty industries or processes which find themeselves under considerable economic and environmental pressure in developed nations, have been installed in India, exacerbating the environmental problems associated with industrial sources.

The protection offered to industry and emphasis on decentralization of industrial development have resulted in adoption of sub-optimal scales of production, most notably, for some sectors such as pulp and paper, sugar and distilleries, leather tanning and chemical industry. India's chemical plants are tiny by international standards. In case of many products, the capacity of a

single plant in developed countries is higher than the entire installed capacity of the product in India, which itself is distributed in large number of units. Adoption of small production scale frequently increases the cost of production and cost of pollution control, making it financially difficult for small companies to meet emission standards.

Technology employed in Indian industry lags behind that of Newly Industrialised Countries due to relatively low level of indigenous technology which is, in turn, due to low level of R & D undertaken and stringent control and regulation of direct foreign investment and technology agreements till recently. Though technology was imported in certain cases gap exists in all important industries.

3. Pollution Prevention versus Control

The options for environment management in industry sector include, on the hand, reactive control measures such as end-of-the-pipe treatment technologies and media-specific regulations for waste discharges, and on the other, anticipative and preventive strategies such as adoption of cleaner technologies of production and integrated planning based on considerations of regional carrying capacity.

Environmental policy for industry in India, till recently, had focussed mainly on pollution control through end-of-the-pipe treatment which allow the wasteful use of resources and then consume further resources to solve the environmental problems in a particular medium. Also, end-of-the-pipe control technologies, more often than not, transfer pollutants from one environmental medium to another and consume resouces out of proportion to the accrued benefits.

Future raw material and energy scenarios, the impact that the industry and its products have on the natural resource base and environmental quality, and the necessary thrust being given to industrial growth in our country, warrant a comprehensive strategy to deal with environmental and economic problems of the industry.

As new industries come up to meet developmental imperatives, it will be necessary to impose more stringent emission standards progressively to maintain acceptable levels of environmental quality. If the option of more intensive pollution control is to be avoided in the future, then it is necessary to adopt a strategy of pollution preention based on pollution, and reuse wastes as secondary resources to the extent possible.

4. Concept of Cleaner Production

Cleaner production has been defined by UNEP as the conceptual and procedural approach to production that demands that all phases of the life cycle of a product should be addressed with the objective of prevention or minimization of short and long term risks to humans and to the environment.

The goal of cleaner production is essentially that of sustainable development; production

processes.product cycles, and consumption patterns which allow for human development, and the provision of basic needs without degrading or disrupting the ecosystems in which human development production philosophy are that the measure should be preventive and integrative.

5. Cleaner Technologies of Industrial Production

Cleaner Technology is the practical application of knowledge, methods and means so as, within the needs of man, to provide the most rational use of natural resources and energy and to protect the environment.

Clean Technology is based on improved manufacturing methods that require less raw materials and energy to obtain equitable levels of outpur of identical or better quality.

Clean Technology also make greater, if not full, use of wastes and recyclable materials and are dependent upon innovation and high level of cooperation between different industries, particularly when exchange of certain wastes are involved.

There are three broad elements of cleaner technologies, viz.

* Resource conservation technologies aiming at waste minimization at source through product change (substitution/conservation/composition); production process changes involving raw material changes, technology changes and better house keeping.

* End-of-pipe treatment technologies designed to recover raw materials, energy, water and by-products

* Waste utilization technologies for reclamation and utilization of wastes as secondary raw materials

The concept of cleaner technologies is being advocated in different parts of the world under various names such as low and non-waste technologies, environmentally sound technologies, waste recycling, residue utilization, and resource recovery technologies.

The ultimate cleaner technology will be based on renewable resources as raw material & energy, and transformaton through highly efficient bio:echnology to produce environmentally benign products.

6. Major Issues in Promotion of Cleaner Technologies in India

One of the major constraints to technology transfer is lack of information regarding local markets such as availability of trained manpower. This may result in over/under estimation of capital and operational costs.

There is a certain perceived risk that discourages entrepreneurs from adoption the

relatively new concept of cleaner technologies. A combination of informational, financial, economic and legal measures, therefore, need to be devised in order to promote waste minimzation through cleaner technologies.

The major problem in promotion of cleaner technologies in India relate to lack of appropriate information and resulting misconceptions. e.g. certain process technologies may need continuous inputs and may break down if batch process is being used. However, in case of small scale industries, batch feeding rather than continuous feeding is a more realistic possibility. Also, the quality of raw material may be substantially different from the one for which cleaner technology has been developed e.g. raw material used in Inian pulp and paper industry.

Industrial design parameters are crucial for cleaner technologies. Many a times imported technologies are often not adaptable to local conditions, infrastructure and environment.

Promotion of the cleaner technologies is often impeded because "polluting" technologies have a price advantage, current financial resources are insufficient to cover the incremental costs involved, and additional financial resources are not available. The cost difference between traditional and the cleaner technologies is aggravated by failure to implement legal measures for pollution control.

There is also lack of coordination and direction in R & D efforts and inadequate thrust for technology transfer from lab-to commercial scale. These problems arise mainly due to insufficient mission oriented approach of laboratories; inadequacy of funds for pilotscale demonstration of technology transfer by scientific and technological personnel engaged in R&D work.

*** Extracts from study for the EAP conducted by National Environmental Engineering Research Institute (NEERI), Nagpur.**

"MANAGEMENT OF WATER QUALITY"*

Quantity and Quality of water Resources

The planning and development of water resource need to be governed by national perspective. The drinking water needs of people and livestock have to be met in both urban and rural areas. Domestic and industrial water need have largely been concentrated in or near principal cities, but the demand of rural society is expected to increase sharply as the development programme improve economic conditions. The demand of water for hydro and thermal power generation and for the industrial uses is also expected to increase substantially. As a result water, a scarce resource, will become even more scare in future. This underscores the need for the utmost efficiency in water utilization.

Water quality is another important aspect that deserves attention. It is basically a determined by the bacterial and the physico-chemical parameters. Water may be termed unfit for drinking purposes because of excessive salinity, brackishness, fluorides, sulphates, hardness, nitrates, iron, manganese and pesticides.

Point and Nonpoint Sources of Pollution

While it is easy to understand point sources of pollution involving wastes flushed into city;s sewers or discharged directly by an industry, nonpoint sources of pollution poses a challenge as there are no easy means to accurately measure it. In fact, nonpoint source pollution is contaminating the surface and groundwater supplies to a considerable extent. Contamination of these water bodies affect drinking water supplies, fishing areas, recreational streams and lakes. Further, any estimate of nonpoint pollution must consider specific area conditions such as topography, climate, and landuse. The specific contribution of each source is extremely difficult to determine at any one location and varies from area to area.

The major sources of non-point pollution are agricultural activites contributing unabsorbed pesticides and fertilizers, deforestation activities contributing sediments, municipal and soild wastes disposal contributing organic and inorgranic pollutants through leaching, mine spoil dumps contributing minerals through surface runoff and leaching, and congregations at places of piligrimage resulting in significant quantities of human and animal wastes.

Backlog in Water Quality Management

Water quality management in India has essentially involved regulatory measures as provided in the Water Act 1974. Despite the existence of Central and State Pollution Control Boards for one and half half decades, only about 50 percent of the large/medium scale industries have provided complete/partial emission/effluent control systems and many of these still do not achieve stipulated standards. Further, the small-scale industries have not yet been subjected to rigorous pollution control. Very few cities have municipal wastewater treatment facilities. The efforts so far are directed towards control of pollution from point sources while pollution due to nonpoint sources

is totally overlooked. Unfortunately, only half of the pollutants come from pipes, the rest come from nonpoint sources. No documented information on sources of pollution is available except for inventory published by the Central Pollution Control Board in 1985.

The notable activities for improvement of water quality taken up by the Government include National Drinking Water Mission, Ganga Action Plan, Scheme of Common Effluent Treatment Plants, and National River Action Plan.

In the area of techologies, water treatment technologies are well established for the removal of turbidity, suspended solids and coliforms. Water emission technologies have been developed and demonstrated for defluoridation and iron removal. Package treatment plants are indigenously available for meeting industrial water quality requirements. However, available technologies for community water supply fail to eliminate excessive salinity, pesticides and nitrates. Also, substantial efforts are required to develop package water treatment plants for small communities.

The technologies practiced in the area of wastewater treatment, with a few exceptions suffer from drawbacks such as high initial and operational costs and land requirements. In the recent past technologies have been developed and demonstrated for bio-methanation of industrial and domestic wastewater. Technologies for recycle and reuse of wastewater are also available or most of the industries. Major R&D areas are application of genetic engineering for resource recovery based wastewater treatment.

The difficulty in assessment of impact of programmes such as Ganga Action plan on improvement in water quality relate to non-availability of objective methodology for computation of water quality index.

*** Extracts from study for the EAP conducted by National Environmental Engineering Research Institute (NEERI), Nagpur.**

"NATURAL RESOURCES ACCOUNTING"*

The need for NRA is now widely recognized. Much activity is going on in this area in many countries. However, as yet, a common generally acceptable framework for NRA is not available. The statistical division of UN's department of economic and social development is engaged in the process of evolving a common framework. It may take a long time before one is evolved.

The treatment of environmental issues in the accounting framework was initiated by Profs. Nordhaus and Tobin in the United States and the work on developing a natural resource accounting framework began in Norway in 1974. Whereas the first approach attempted to incorporate environment in national accounts, the latter focussed on developing a separate physical accounting system for national and environmental resources. The Norwegian approach divides the resource in two broad categories : material and environmental. The material resources have been further subdivided as minerals such as hydrocarbons, stone, sand and other minerals; biological resources such as air, water and land; and inflowing resources such as wind, solar radiation, hydrological cycle and ocean currents. Environmental resources were considered as status resources and covered air, water, soil and space. Quality issue has been major factor for the environmental resources and the accounts contain emission records over a geographical region to indicate the state of the environment. These accounts have been used to forecast future use of natural resources and assess related environmental impacts. Energy and land use accounts have also been quite useful. French accounts classification is on similar lines as the Norwegian. The construction of accounts in the case of the French system is more comprehensive and includes some monetary valuation part also. The Japanese system included environmental considerations in their accounts by incorporation of the measure Net National Welfare . This was arrived at after modifying National Income figures for various factors, including environmental factors. The adjusted Net National Welfare measure revealed that Japan's GNP growth between 19555 to 1985 should be considered 5.8 times instead as the traditional GNP accounts would suggest.

The System of National Accounts (SNA) published by UN also includes several features of accounting for natural resources. It considers stocks and flows for tangible assets such as forests, agricultural land and subsoil minerals. The natural resource that can be transacted in the market place are only included, and assets in the public domain such as water, atmosphere etc. are excluded. The valuation of the assets is based on market value. The production of goods and services outside enterprise sector, for example by households is not included in SNA and government sectors' goods and services are valued at factor cost. SNA also does not fully allow for changes in natural asset base as it does not have investment and depreciation of mineral assets. It includes only production activities related to these assets. Since even the existing SNA have not been properly implemented by various countries (i.e. statistics not available in SNA format), UN has considered inclusion of depreciation accounts for natural resources through 'satellite accounts'. Therefore, the economic indicators of growth would remain unchanged and users are free to make their own evaluations based on information in satellite accounts.

System for Integrated Environmental and Economic Accounts (SEEA) which is under

development at U.N. incorporates the changes in SNA to account for natural resources in a comprehensive manner, but without merging the Natural Resources Account with SNA. In SEEA, physical description oof natural environment is extended to include information on the physical flows between the environment and economy in the existing natural resources account and environmental statistics, including material and energy balances. Monetary valuation of natural resources is also included in the natural resources accounts of SEEA, which are integrated as satellite accounts with the main income accounts. The proposed system (SEEA) also considers disaggregation of parts of SNA, that are of special relevance to environmental aspects. It would also include non-market valuation of economic use of the environmental in monetary terms. Physical data on the flow from natural environment to the economy and flow of the residuals of the economic activities back to the environment is also included. SEEA will also have a description of the natural environment to facilitate analysis of impacts of economic use.

World Resources Institute (WRI) developed a methodology for natural resource accounts and initiated a few country studies using their methodology. Results for a few countries viz. Indonesia, Costa Rica & Philippines have been published by WRI. Physical accounts are set up for natural resources and changes in stock are recorded for the accounting period. Procedure to determine stock for Oil and Natural gas and other minerals, sub-soil deposits of waters, timber resources, forests, agricultural land and biological resources has been discussed. The valuation is done on the principle of economic rent in WRI methodology. The rent is roughly equivalent to the profit earned from a natural resource stock. Finally the income accounts for natural resources are integrated with the national accounts.

Need for a Special Approach to NRA for India

Even if a well-developed framework for NRA were to be available, we would want to examine it for its appropriateness to India. India being :

- a large, populous, poor country that needs economic development;
- a country where agriculture is dominant;
- a country in which much economy activity is in small and informal sector;
- a country in which hundreds of millions of poor depend on natural resources for their subsistence;
- a country where bio-mass dependence is high for energy needs in rural and urban areas;
- a country with a large cultural diversity;
- a country with a large ecological diversity;
- a country whose traditions recognize and respect rights of non-human beings;

- a country which has still preserved many of its virgin forests and bio-diversity;

The resources we emphasize and the priorities we give in preparing NRA would have to reflect these characteristics.

Once a broad schematic frame work for NRA has been devised, it will need to be applied to major areas such as soil resources, air resources, water resources and forest resources and bio-diversity. Variations of the techniques used will be necessary between sectors. The non-market sector including environmental impact, employment opportunities, unaccounted activities, etc. would also need to be taken into account. Similar adjustments would need to be made for resources which are depletable but recoverable. Essentially the action plans that are required in the areas of natural resource accounting are the establishment of a frame work, intensive data collection and an application of the framework in environmental planning. It is essential that detailed studies be commenced.

*** Extracts from study for the EAP conducted by Parikh, Kirit, et al (1993); Indira Gandhi Institute of Development Research, Bombay.**

APPENDIX - V

"CONSERVATION OF WETLANDS"*

The Indian sub-continent, due to its vast landmass, diverse climatic conditions, geology and topography, represents a great diversity of wetlands habitats which supports unique biodiversity and large human populations.

The present knowledge about these wetlands is scanty except from a few wellknown wetlands which have been studied and are being conserved to some extent. There is also a rapid increase in man-made water bodies which need to be adquately documented. A systematic assessment is required of the degradation of older welands owing to abiotic and biotic factors.

There is tremendous potential within the wetlands in the country for the conservation of biodiversity as well as their continuation as life support systems. The proper management of wetlands for the sustainable development of the rural population is an integral component of a resource utilisation strategy for developing countries like India. This can only be achieved by a knowledge of the structure and function of the wetlands and human dependence on them for sustenance.

The are under wetlands in India is estimated to be : (1) natural wetlands 1,450,871 ha and (2) man-made wetlands 2,589,266 ha. The Indian coastline is over 7500 km with diverse wetland habitats like mangroves, lagoons, salt marshes, mudflats, etc.

Indian wetlands can be broadly classified into the following:

(1) Himalayan wetlands, which include high altitude wetlands, and those of the sub-Himalayan region.

(2) Indo-Gangetic wetlands which constitute the largest wetland regime in the country comprising the major river systems such as those of the Ganga, Brahmaputra, Narmada, Tapti, Godavari, Krishna, and Cauvery.

(3) Coastal wetlands which stretch all along the long coastline of the Indian peninsula and associated islands.

The major problems faced by Indian wetlands in general are :

(a) <u>Siltation</u>

Deforestation and land-use practices in the catchment areas of the wetlands have accelerated soil erosion resulting in sedimentation of most of the wetlands.

(b) Weed infestation

Uncontrolled growth of weeds and aquatic vegetation due to nutrient enrichment of wetlands is leading to eutrophication of small and large water bodies. This results in diminished ecological efficiency and could end in the death of the wetland.

(c) Encroachment

As a result of increased human needs due to the population explosion in the country, shallow wetlands have been subjected to constantly increasing pressure from agriculture, urban expansion, and development projects. The shrinkage of wetland habitat and their alteration is an increasing threat to wetlands.

(d) Pollution

Although organic pollution was known to exist in Indian wetlands for some time, chemical pollution of the waters is an consequence of unplanned industrialization in recent years. Almost all wetlands are subjected to different degrees of point of non-point pollution. This has resulted in the slow poisoning of the aquatic ecosystems at increasing levels.

(e) Anthropogenic activities

Development projects, industrialization, urbanization, over-fishing, hunting, exploitation of mangroves, etc. have seriously affected the quality of wetlands depleting natural resources. In many cases the wetlands are beyond restoration levels and cannot be used sustainably.

Some short-term projects for rapid assessment of wetland resources are essential for working out a long term Management Action Plan for Indian wetlands.

Considering the diverse nature and the large number of wetlands tok be surveyed and the thrust areas of management for which vital information is to be generated, a working action plan is suggested. In this action plan, projects are grouped into four main areas to generate the necessary base-line knowledge about the present status and functioning of the wetlands, linkages, dependence of human populations and the impact of anthropogenic activities on the wetlands. Detailed specific studies can also demonstrate the sustainable use of resources from the wetlands, particularly by local populations and their active participation in conserving biodiversity as well as abiotic resources.

Some of the specific themes to be included in the action plan proposals are mentioned separately.

The projects mentioned below are essentially centrally coordinated collaborative projects. Research and other action programme projects are to be carried out by identified organisations in cooperation with the concerned Central and State government agencies (Irrigation, Forest, Fisheries, etc.) and NGOs. International experts, if necessary, can be involved in the programme.

The proposed action plan takes into account the available scientific data, information from State and Central Government agencies, existing literature and people's experience with regard to wetlands in the country. It also considers the recommendations made by international and national bodies and government committees on wetlands.

The action plans, at various stages, are expected to incorporate areas related to protection, wildlife conservation, siltation control, afforestation, pollution and weed control, reclamation and alteration, legislation, improvement, utilization and management of the aquatic resources, research, environmental education and public awareness. To summarise, the action plans will have an holistic approach towards the management of the diverse wetlands for conservation and for the sustainable use of wetland resource.

*** Extracts from study for the EAP conducted by Bombay Natural History Society, Bombay.**

"FORESTRY"*

The State of Forests Report 1991, being the third assessment of the forest cover of the country, highlights the fact that forest cover in the country is just about 19.44 per cent of the total geographical area. The area under dense forest cover is estimated at 11.71 per cent of the geographical area. Most natural resources in India have been inappropriately used and it is clear that forests in particular have been over-exploited and very badly degraded. This has seriously damaged the capacity of the natural environment to support life-systems on a sustained basis.

Fuel Wood Needs

In India, wood-fuels still account for 30 per cent of the energy consumption. The total fuel-wood removal from forests, both authorised and anauthorised, is estimated to be more than 236 million cubic metres as against sustainable levels of production of no more than 40 million cubic metres. Likewise, as against a current permissible cut from forests of 12 million cubic metres of timber, the annual requirement is over 28 million cubic metres.

The minimum annual requirement of green fodder is estimated at 882 million tonnes, which supports a cattle population of around 400 million. The availability of green fodder from permanent pastures, agricultural lands and forests is estimated at about 50% of the requirements. The absence of adequate grazing lands, or of proper grazing policy has meant destructive over-grazing within forests.

Forests in India are also subject to recurrent fires. It is reported that over 35 million hectares of forest area is annually affected. Long term damage to forest wealth results. Forests are also subject to damage from encroachment, patterns of cultivation and diversion of forest land for non-forest uses.

On the positive side, it must be noted that India's forests are still relatively rich in flora and fauna. There are 47.16 million hectares of tropical forests, 6.76 million hectares sub-tropical forests and 6.42 million hectares of timber forests in addition to alpine and other forests. Considerable portion of the area earmarked as reserved forests are reasonably well preserved and indicate that with adequate resources and well trained man-power committed to the forests, deforestation and degradation can be arrested.

The forest policy has begun to receive considerable attention at the highest levels of Government. The need for involving forest dwellers in the management of forests is now widely recognised. It is accepted that a forest policy cannot be purely commercial in its orientation. It is also realised that forest wealth has not been properly valued. Fire-wood and timber which are illegally removed and numerous and numerous non-timber forest products which are collected and consumed by the rural poor are hardly taken into national income accounting.

There is no serious effort to evaluate the intangible contributions of forests such as soil conservation and the role of integrated watersheds. The environmental costs as a result of the implementation of large developmental projects and the diversion of forest land for non-forests purposes have also not been properly considered. These are all issues which the Environment Action Programme project considers elsewhere in the discussion on natural resources accounting. The importance of this exercise in the forestry sector cannot be neglected.

Forest management needs to address itself to some crucial issues namely :

- to arrest deforestation;
- to ensure regeneration in the forests;
- to check the loss of species, communities and eco-systems;
- to raise forest productivity to meet the basic needs of local population : fire-wood, fodder, small timber and food
- to create gainful employment for forest dwellers in particular and the rural poor in general; and
- to increase the area under forest cover to the stipulated level i.e. 33 per cent of total geographical area.

To achieve these objectives, various assumptions and approaches regarding forest management need to be re-examined. The concept of land use, and alternative and competing uses for land, the integration between agriculture, forests, fisheries and grasslands, the link between forests and the tribal people all need to be looked at in detail. Careful studies and research are needed. A functional classification of forests may perhaps also be necessary.

In addition, the possibilities of increasing forest cover, and the productivity of existing forests, and the need for additional investment for this purpose must be taken in account. A strategy to bring marginal lands and wastelands under permanent tree cover and to better manage the demand for fuel-wood and small timber is necessary. Detailed studies need to be made of non-timber and non-market contributions of forests, and of the impact of forest degradation and consequent loss of biodiversity, on the rural poor and the tribals.

The action programmess needed in the forestry sector are being put together in the National Forestry Action Plan. However, the crucial need is no changing the orientation of forest policy and generating research and studies into hitherto neglected aspects of the forest/human interface.

*** Extracts from study for the EAP conducted by Lal, J.B. et al (1993); Indian Institute of Forest Management, Bhopal.**

"ENVIRONMENTAL EDUCATION"*

Environmental education (EE) haas become an important component of the plans and programmes of both government and citizens' agencies in India. But the efforts to promote it remain scattered and uncoordinated, resulting in duplication on the one hand, and unfilled gaps on the other. There is therefore a need for a national action plan and framework, not as an imposition over existing efforts but with the aim of integrating and supplementing them to overcome their individual and collective shortcomings. This report is an overview of the status of EE in the country, and identifies broad strategies which can help to develop a national action plan.

History and conceptual framework

For the purposes of this report, EE is defined as creating an awareness of and concern for environmental issues, disseminating specific information on environment, and providing general skills to assess and tackle environmental problems. EE came centre-stage of the international arena at the UN Conference on Environment (Stockholm, 1972), Recommendation No.96 of which called for an "internaational programme in EE". The UNESCO-UNEP International Environment Education Programme was initiated subsequently.

To assess the role and performance of EE, the following framework has been found to be useful:

a. Aims and Objectives : As defined at the International Workshop on EE at Belgrade, 1975, EE has five broad objectives : creating awareness, imparting knowledge, generating attitudes, teaching skills, and facilitating participation.

b. Target Groups : Specific groups which need to be addressed include school and college students, other youths, non-literates, women, professionals, government officials, politicians, and other adults.

c. Kinds and Methods : Diverse target groups and environmental situations require a diversity of EE approaches : (i) Formal education attempts to impart EE in a systematised, institutionalised way, ending in a formal certificate or degree. (ii) The non-formal EE involves learning outside this formalised structure. The methods used in EE range from classroom teaching and use of textbooks to audio-visual techniques, exhibits and demonstrations, workshops, field trips, drama, practical work, and print material.

d. Institutional Structures : National level agencies can specify broad guidelines, arrange funding, and monitor activities. Local and regional structures are also needed to plan and monitor EE. While formal EE is handled by schools, universities and other institutions, non-formal EE is best dealt with by citizens' groups (CGs) and communities. Vertical and horizontal integration is critical in the institutional handling of EE.

EE in India

At the government level, the need for EE is expressed in various policy and programme documents since the 1960s. In the case of formal education, the National Council of Educational Research and Training (NCERT) attempted to give an environmental thrust to the school syllabus at the primary and middle levels. At the primary level, the concept of an "integrated" approach, labelled "environmental studies", has been followed. At the secondary level, NCERT favours the "infusion" of environmental concerns into science subjects. Unfortunately, a similar approach is not adopted for social science and arts subjects, and the infusion or integration becomes even less apparent at the higher secondary level. One attempt to make up this shortcoming is the Environmental Orientation to School Education Scheme, which aims to bring local-specific environmental issues within the preview of school teaching, and also to achieve some coordination between CGs, state education departments, and schools.

At the university level, there has been a dramatic rise in environment-related courses, with over 60 universities and institutions offering degrees. However, there is almost no attempt to infuse environmental concerns into the conventional subjects, and the environment-related subjects remain technical in nature, with little social science and arts inputs. Teacher education, so vital to impart an environmental orientation to teaching at all levels, is recently beginning to itself become environmentally sensitive. The Programme of Mass Orientation of School Teachers is one such attempt, and the four regional colleges of teacher education offer innovative courses with an environmental component. However, there still exists no formal EE course. Moreover is a paucity of relevant resource persons for teacher training, a lack of locale-specific information and continuing rigidly in both school and teacher training curricula.

In the case of non-formal education, the scene is far more dynamic. The governmental NFE efforts began in the mid-1960s, with the initiation of Socially Useful Protective Work (recently renamed Work Experience) scheme. The largest attempt has been the Ministry of Environment and Forests' National Environmental Awareness Campaign (NEAC). A very diverse range of activities have been supported. Further efforts by the government in non-formal EE include the sponsoring of two Centres of Excellence, which are supposed to function as nodal agencies for the production of EE material, teacher training, and CG guidance, and the National Museum of Natural History, which has become the focal point of a number of non-formal activities. Unfortunately, the single most glaring shortcoming in all these efforts is the lack of a systematic evaluation, which would assess their effectiveness and suggest improvements. Besides, most schools still do not appear to consider environment as a "socially useful" subject. Also deficient in this respect has been the widespread School Science Clubs Programme, started in 1957, but given some sort of environmental orientation in the 1980s.

It is the efforts of CGs in non-formal EE which are noteworthy. A huge number of citizens' and community groups are involved, ranging from grassroots mass movements such as Chipko (using traditional drama forms like the Bhagvad Katha to impart the message of forest conservation) and Namada Bachao Andolan (using tribal theme songs to spread their anti-dam message), to tiny urban-based groups who communicate on highly localised issues, to popular science and literacy movements which include an environmental message into their awareness programmes.

Our empirical survey of 140 CGs (of which about 60 responded) revealed a number of interesting facts about the range of approaches, activities, methods, and target groups involved in EE programmes by CGs. While the diversity was great, somewhat disturbing was the finding that most CGs seemed to greatly prefer conventional methods like lectures, ignoring more effective methods like audio-visuals and field trips. Also of concern was that a vast majority addressed youth as a target group, and few dealt with adults and non-literates. A large number expressed a paucity of EE material and equipment as a major handicap, and many also felt the need for greater access to information than was provided by government agencies.

Major Findings

To rephrase the major critical findings in terms of the EE framework presented above, and for the moment leaving aside the substantial gains achieved over the past few decades:

a. Aims and Objectives : Development of attitudes, imparting of skills, and encouraging participation has logged behind the imparting of awareness and information. The need to infuse environmental concerns into all teaching remains largely unfulfilled, especially at the higher secondary and university levels of formal education.

b. Target Groups : Adults in general, and women, non-literates, professionals, and government officials specifically, are still inadequately covered under both formal and non-formal programmes.

c. Kinds and Methods : Formal EE remains somewhat fragmentary, m and has not achieved widespread and in-depth inclusion of non-formal methods which would greatly enliven it.

*** Extracts from study for the EAP conducted by Warier, M and Kothari, A (1992); Indian Institute of Public Administration, Delhi.**

APPENDIX - VIII

"URBAN ENVIRONMENTAL MANAGEMENT"*

India is gradually changing from a predominantly rural society to one with a substantial urban population. According to the 1991 Census, 217 million out of a total population of 844 million now live in urban areas; the urban population is projected to increase to 300 million by the turn of the century.

These demographic changes have occured due to a major structural transformation of the Indian economy. Urbanisation is the result of massive shifts of labour and capital from predominantly rural to predominantly urban activities. Agriculture which accounted for 55.8% of the Gross Domestic Product in 1950-51 has declined to 32.4% in 1990-91. There has been a steady growth in non-agricultural activities in the rural areas that are close to cities and metropolitan centres. Thus, urbanisation is not a transitory phenomenon-it reflects permanent structural changes that have occured since independence.

The decennial rate of growth of the urban population, however, has slackened from 46.1% in 1971-81 to 36.2% in 1981-91, which is in line with the general worldwide pattern of urbanisation. Most of the states, except Himachal Pradesh and Kerala, had a lower rate of growth in 1981-91 compared to the previous decade, indicating a deceleration in the pace of urbanisation. While further research needs to be conducted on the reasons for deceleration, it is clear that the absorptive capacity of the urban areas, particularly of the larger cities is reaching its limits. The quality of life and the levels of poverty in urban areas are as bad if not worse than those of the rural areas. There has been a progressive tightening of urban labour markets, and it is not clear if the urban wage in the informal sector is any higher than the rural wage for agricultural labour. Unemployment and underemployment rates are extremely high in many of the urban areas. But, even with reduced rates of migration, the cities and towns continue to grow due to natural increase.

There are 23 cities with a population of more than a million (metros) of which four are mega cities (Bombay, Calcutta, Delhi and Madras) with population exceeding 5 million. The million plus cities account for half of India's urban population. The number of million plus cities has increased dramatically from 12 in 1981 to 23 in 1991, and is projected to increase to 40 by 2001. The focus is therefore on the environmental problems faced by the metropolitan cities.

The environment of the metropolitan cities has been deteriorating for a number of reasons:

1. The gap between demand and supply of infrastructural services has been continuously widening. Increasing pressure of population, particularly the skewedness of distribution of urban population in mega-cities and metros, and the escalating per capita cost of providing urban services, account for the deterioration of infrastructure services and amenities.

2. The accumulated backlog in urban housing alongwith a rapidly increasing population of the urban poor has resulted in the proliferation of slums and squatter settlements. The high

incidence of marginal employment and urban poverty implies that the poor cannot afford to pay for housing and urban services, with the result that these services have deteriorated further.

3. The weak financial and organisational base of urban local bodies has led to subsidised and inequitable supply of urban land and services, and to haphazard growth. The lack of effective control of changes in land-use has encouraged unplanned and often illegal urban sprawl, while inadequate control of population has led to contamination of the urban environment.

The deterioration of the urban environment can be understood in the following way:

a) inadequate natural resources for human existence and urban economic activities and and

b) wastes generated by households, industries, etc disposed in a manner that is noot environmentally sound.

More specifically, urban environmental problems include :

* high levels of water pollution on account of poor waste disposal, inadequate sewerage and drainage and improper disposal of industrial effluents.

* high levels of air pollution resulting from congested streets, poorly maintained vehicles, fuel burning, and industrial activities.

* toxic or hazardous industrial and commercial wastes disposed in water bodies and land sites without proper treatment.

* dumping of solid waste (refuse) in low-lying areas contributing to land and ground water pollution.

* high levels of noise pollution due to loudspeakers, construction, traffic, industrial operations and aircraft.

* congested and insanitary dwellings, particularly in slums.

* loss of fragile ecosystems, such as mangroves, agricultural land, vegetation, and open space.

Urban Services

The deterioration in the quality of the urban environment in the metropolitan cities is partly a consequence of the inadequate urban services such as wastewater collection and treatment, sanitation, solid waste collection and disposal, and transportation.

Waste Water Collection and Treatment

In 1978 the Central Pollution Control Board conducted a survey of the status of water suuply and wastewater generation, collection and treatment and disposal in respect of the then 212 Class I cities. Treatment capacity was almost non-eixstent outside the metropolitan centres. The study came to the following conclusion:

So long as Class I cities continue to discharge their wastewater untreated into the rivers, lakes, and ponds directly, no improvement of the quality of water courses is possible. The requirement for effective water pollution control is to provide for adequate collection, treatment and disposal of municipal wastwaters.

The situation in Class II and smaller cities is much worse. A sub-group on urban municipal waste management estimated that the investment cost of providing collection and disposal of wastewater in Class I and Class II cities was of the order of Rs.8,000 crores.

Removing and disposing excreta and wastewater is a critical health need. Pools of standing water can convey enteric diseases and provide breeding grounds for mosquitoes which spread filariasis, malaria and other diseases. There is overwhelming evidence that the economic burden of disease and ill health, which is in large part of result of deficiencies in water supply and sanitation, is enormous, particularly for the poor. Unfortunately, there are few studies that have attempted such valuation, particularly for those living in the slums and squatter settlements.

A substantial quantity of wastewater (around 50%) from urban areas is used for irrigation. While the general concept of reusing waste water is sound, it must be pointed out that untreated or raw sewage could be hazardous especialiy if there is human contact. But, if the sewage is treated to remove pathogens, the risk is considerably reduced. Also, as cities grow in terms of land area, the extent of land available for irrigation decreases while the volume of wastewater increases. Reuse of wastewater either for industry or agriculture/horticulture will become a necessity. The economics of treatment and reuse needs to be examined carefully.

Solid Waste

Solid waste collection is a service the importance of which increases as urban population and population density rises; also, when household incomes increase, there is a corresponding increase in the volume of waste material generated. In metropolitan cities, there are three major categories of solid wastes:

1. Domestic solid wastes (refuse) from households, restaurants, marriage-halls etc.

2. Commercial and industrial solid wastes that are bulky but not hazardous.

3. Hazardous wastes from industries, hospitals, research laboratories that need special handling.

In many cities, all these categories of wastes get mixed up causing disposal problems and posing a hazard to sanitary or conservancy workers.

Domestic solid wastes in Indian cities generally have a (a) high organic matter content (b) high water content and (c) low calorific value. Often the silica content is also high. Unlike wstern countries the amount of combustible matter like paper, rags, etc is very low. Consequently, garbage can be disposed by composting or deposited in sanitary landfills, rather than by incineration. However, compost plants have to be located in areas where the compost can be utilised for agricultural purposes with minimum cost to the farmers. Shredding and pelletization may be suitable for certain bulky wastes.

The present practice in many cities of dumping the solid waste in low-lying areas must be stopped because it causes various environmental problems, pollutes the ground water, creates a breading ground for disease vectors such as rats, pigs, and mosquitoes, and emits and offensive odour over a wide area. The solid waste must be disposed either by compositing or deposited in a sanitary landfill.

The collection of garbage has also posed a number of problems to the municipal agencies because households do not separate dry from wet wastes. People are unaware about environmental sanitation and the hazards of exposed garbage. There is a growing recognition that neighbourhood level garbage collection, managed in collaboration with the residents, is often the cheapest and most effective solution. This is particularly true if there is reclamation of the wastes through compositing or other means at the neighbourhood level. Similarly, the rag pickers have an important role to play in recycling wastes. Recycling also helps to separate the dry wastes from the compostable organic matter.

The constituents of domestic wastes that are often recycled include paper for recycled paper; textiles fr paper-making, wipers; metals for re-smelting; glass for recycled glass; rubber for downgraded use; plastics for lower grade products.

A very active secondary market exists for recycling these scrap materials. Further studies need to be conducted on the structure of these markets, and the economics of recycling. The general impression is that recycling is a very lucrative business, but this needs to be investigated.

Housing

The estimates of the number of people living in slums varies considerably because the definition of a slum itself varies. The National Commission on Urbanisation has used the term slum to mean buildings and areas that are environmentally and structurally deficient. Slums include illegal squatter settlements as well as old, decaying inner-city areas. The proportion of people living in slums is estimated to be around 23 percent of the urban population. In the metropolitan cities the percentage is around 31 percent, and higher in the four mega-cities.

The Planning Commission has estimated that about 48.8 million people are living in urban

slums. About 40 per cent of the slum population (i.e. about 20 million) live in the metropolitan cities. Slum improvement and sites-and-services projects have been undertaken in most of the metros with international assistance.

The environmental effects of living in slums are manifold. Diseases like tuberculosis, meningitis and influenza are transmitted easily in crowded, cramped conditions coupled by the fact that resistance is low. Mumps, measles, and gastro-enteric diseases are also prevalent posing a grave risk to infants, children and the aged. The infant mortality rate in the bustees of Delhi was 221 per 1000 live births, which is nearly four times the average rate for India's urban population of 59. Household accidents from fires, stoves and household chemicals are often higher in crowded housing.

The use of interior fuels like wood, waste material, coal and cowdung in small dwellings with inadequate ventilation result in enhanced indoor levels of carbon monoxide, nitrogen dioxide, suspended particulates and hydrocarbons. A study of low-income areas in Bombay showed that there was significantly higher morbidity among those with poor nutrition, particularly in the presence of high levels of pollution.

Transport

The increase in population in the metropolitan cities has also placed a severe burden on transport facilities. Public transport systems-road and rail-are fairly good in the megacities but they have become saturated, with the result that there has been an explosive growth in private vehicles, particularly two wheelers.

It has been the experience in many cities that the provision of public transport to outlying towns and suburdan areas spurs rapid growth along the transport corridors. Complementarity between road and rail transport, and proper pricing are policy measures that have bearing on the extent of use of different modes of transport.

The pollution from motorized vehicles-in terms of both air and noise is reaching crisis proportions in the megacities. Delhi and Bombay now require emission testing of vehicles. Other metropolitan cities must also follow their example.

Extracts from study for the EAP conducted by Madras Institute of Development Studies, Madras.

"ALTERNATIVE ENERGY ACTION PLAN"*

The energy sector in India has grown rapidly. By the end of the Seventh Plan, the per capita energy consumption was equivalent to around 225 Kg. of oil. Consider other indicators. The generating capacity by the end of Seventh Plan was 69082 MW. The total electricity generation in 1991-92 was about 312 billion kwh. The production of coal in 1991 1-92 was about 229 million tonnes. The production of crude oil in 1991-92 was 30.34 million tonnes and import was 24.00 million tonnes. The current production of natural gas is about 16 billion m^3 per year.

During the Eighth Plan the major concern is to reduce the gap between the supply and demand. Energy will continue to be in the public sector. Private sector participation in power generation is welcome but is not the primary goal. While there is a clear target for hydel, (40 per cent of installed capacity) the policies of encouraging renewables, energy conservation, etc. do not get translated into specific goals. Concepts like sustainable development, do not yet form the basis of planning for want of techniques, methods and operational definitions of the concept. The enormous strain under which the expansion has been taking place recently, has not permitted energy sector organizations to attain levels of efficiency that might bring about optimal use of resources at their command. The main issues in the energy sector are an absence of an integrated long-term energy policy for the country, lack of rational pricing of energy supply, increasing foreign exchange outflows, low levels of useful energy availability, increasing energy demand, and low efficiencies of utilization. Some of the specific concerns are briefly mentioned below:

- The losses of the State Electricity Boards have been mounting year after year, with the result that they continue to burden the state exchequer to an increasing degree.

- Given an excessive control of tariffs and tariff setting by the Government, electricity prices continue to remain irrational, and therefore do not provide economic incentives for efficiency improvements.

- A growing scarcity of capital resources and the dominant role of the public sector has made it difficult for the energy sector to receive the benefits of private financing or innovative managerial skills. It appears obvious at this stage that a continuation of past trends in this regard may not be satisfactory.

- Increasing oil imports result in greater foreign exchange outflows. Alternative strategies for sustainable development do exist, however, in principle. These depend heavily on energy conservation and renewable energy utilization. The potential for these is also significant. There is scope for reducing 20-30 percent in energy consumption in industries, agricultural pumpsets, domestic appliances etc. Hence, it is apparent that by suitable utilization of energy conservation methods and renewable energy technologies, it should be possible to achieve the goals of sustainable development, viz. reduction of energy consumption and reduction in emissions all around. The major constraints for implementing such policies are (i) availability of technology (ii) availability of capital (iii) institutional constraints and (iv) pricing constraints.

Strategies

The effects of the following two strategies on the energy situation in the country are examined:

1. Improving the efficiency of energy production, conversion and use; management of energy demand and encouraging technology/process changes;

2. Moving towards more environmentally benign energy forms i.e. the greater use of renewable energy resources.

These strategies are mutually exclusive. The measures for improving the efficiency of energy use and greater use of renewable energy resources are summarized in the following sections. The costs associated with various development strategies to the year 2009/10 include:

- direct economic costs associated with the production and supply of various energy sources;

- direct measures; and

- environmental costs associated with energy supply and demand management.

In evaluating the current government strategy, demand side investments are used as reference level and only supply side investments are considered. For the alternative strategies, incremental investment requirements for supply and energy demand measures over the current government strategy are taken into account.

Programmes and Projects

Broadly, these represent either studies needed to develop larger programmes, strengthening on-going programmes or new programmes. One study that is needed is an evaluation of the policy instruments available with the government to bring about improvements in energy efficiency and to move towards the national objectives of sustainable development.

This would be a futuristic study within the framework of sustainable development for the country's large population. It would involve an examination of lifestyles and resource needs in the context of the large population. Such an exercise would lead to the development of a long term energy policy and will provide a framework for evaluating the policy instruments. Important among these would be the impact of current energy pricing on energy efficiency, energy demand and energy mix. Such a study could propose a rational pricing of energy supply and examine the implications such a policy would have on different sectors of the economy. The constraints int he implementation of these measures need to be addressed to see the efficacy of available policy instruments.

Extracts from study for the EAP conducted by the Tata Energy Research Institute, New Delhi.

CHANGING CONSUMPTION PATTERNS OF ENERGY IN INDIA

Deterioration of the environment is attributed to the unsustainable pattern of consumption and production. Environmental stress can be best reduced through patterns of consumption which while meeting the needs of humanity will ensure that ecological balances will not be irretrievably damaged and environment seriously impaired. Environmental quality and sustainable development will require efficiency in production and changes in consumption patterns in order to emphasize optimisation of resource use and minimisation of waste. Significant changes in consumption and production patterns will occur only when the stimulus of prices and market signals would make it clear to producers and consumers the environmental costs of the consumption of energy, materials and natural resources and the generation of wastes. The combined efforts of the government, consumers and producers will be able to achieve this objective.

Some schools of thought in India have stressed the need for a system of lifestyle which blends harmoniously with Nature. In this, they have argued against the consumeristic lifestyle and have sought to limit the resource use to the bare minimum and have advocated action militating against generation of waste. Nevertheless, as a society, the lifestyles in India are not completely different to other societies. There has to be increasing consciousness in deciding on consumption pattern which should inform every segment of the society that a non-moderated consumption pattern can have enormous environmental costs.

It is not as though that the consumption patterns prevalent of those with low per capita income levels could in the long run be considered compatible with environment conservation and preservation. However, economic policies should support consumption of environmental friendly materials. The Government of India has been, in several ways, creating an awareness for moderation of demand and adoption of a consumption pattern which would not leave deleterious impact on the environment. This is in conformity with the stress that Mahatma Gandhi had laid on the kind of society that this country should build.

In India the expenditure elasticity of fuel and light has been observed to be 1.25 for the non-poor-middle group in urban areas. For the poor it is in the range of 0.80 to 0.87. But if price corrections are made for the subsidies given for electricity and kerosene, the expenditure elasticity of the poor for fuel and light will be more than one. Thus, the process of development is raising sharply the consumption of household energy.

It is imperative that importance is given to develop non-conventional or renewable sources of energy for sustaining the development process. Sun, wind, water and bio-mass are renewable, perennial, dependable and widely available sources of energy. Generation and utilisation of energy from renewable energy sources is non-polluting and environmentally benign. Non-conventional sources of energy have got tremendous potential. According to available statistical data our country is supposed to accumulate every year 300 million tonnes of agro residues. On a conservative assessment wind power potential in the country is around 20,000 M.W. The total wave power potential from Ocean energy along India's 1600 km coastal line is 40,000 M.W.

The major programmes for new and renewable sources of energy which were developed and enlarged during the Seventh Plan included the national project on bio-gas development, national programme of improved chulhas, solar, thermal energy utilisation, Solar Photo Voltaics, wind energy and conversion of bio-mass into energy, energy plantation and bio-mass gasifers.

The Ministry of Non-Conventional Energy Sources are undertaking a large number of programmes to accelerate socio-economic development, social welfare, environmental upgradation and conservation and overall improvement in the quality of life. Its activities are targetted to achieve transfer of technology to benefit the rural and urban masses and also to provide linkages with commerce and industry. The estimated potential of various types of renewable sources of energy in India is given below :

SOURCE	POTENTIAL
Biogas Plants	12 Million
Biomass	17000 M.W.
Improved Chulhas	120 Million
Solar Energy	5 x 1015 KW hr/year
Mini-Micro Hydro	5000 M.W.
Wind Energy	20,000 M.W.

To tap the above potential the Ministry of Non-Conventional Energy Sources popularises various programmes such as biogas, solar water heaters both for domestic and industrial purposes, wind farms, improved chulhas etc. and provides financial assistance and subsidies in varying degrees and fiscal concessions in the form of tax rebate, duty exemption etc.

Significant progress was achieved in the generation of electric power from Solar Photo Voltaics for lighting and pumping systems, micro-hydel schemes, gassifers based on wood and agricultural waste and wind generation, including wind farms and 'stand alone' wind turbines. The contribution of renewable energy in meeting the total energy needs of the country has been marginal. A beginning has been made in the production of power from decentralised energy sources particularly wind energy and Solar Photo Voltaics, although their overall contribution in the total power supply is minimal. The wind energy programme is still dependent on imported technology. Efforts have to be intensified to develop indigenous capabilities in this area. Despite enormous potential and obvious advantages in remote, hilly areas, little progress has been made in area of micro-hydel power supply. This source can supply cheap energy to rural areas.

Concerted efforts have to be made in the coming years to overcome the above mentioned problems in the New Renewable Sources of Energy (NRSE) programme particularly in the area of technology development, intensification of R&D and the commercial exploitation and promotion of the viable technologies.

An estimated amount of Rs. 1000 crores will be required to give a thrust to the following programmes for new and renewable sources of energy :

- rapid diffusion of technology that have already matured through successful stages of development with a particular emphasis on application to rural areas;

- demonstration of the usefulness of technology which has reached a stage of technical readiness awaiting further cost-reduction especially through volume production and market penetration;

- promotion of research on promising technologies that are likely to become successful for large scale use in the long term;

- intensive monitoring and evaluation, both departmentally and through outside agencies, of the operational programmes and adapting improvement and corrective measures as required.

"ENVIRONMENT IMPACT ASSESSMENT"*

The concept of Environmental Impact Assessment (EIA) was introduced in the developed countries when it was realized that developmental activities can cause serious degradation of the environment. EIA as a tool establishes the changes in the physical, ecological and socio-economic components of the environment before, during and after a proposed developmental project, so that the undesirable effects, if any, can be mitigated.

In India, EIA was made mandatory, relatively, as compared to other countries. However, since its initiation several hundreds of EIA documents have been produced and processed. Obviously, the subject will grow rapidly in the future, there is an urgent need now for an in-depth study of the EIA process, policies and methodologies so that it can be implemented effectively.

Problem Areas

Some of the problems associated with EIA which emerged from the study of the IIT, Bombay, are as follows :

* Information and Baseline Data :

A reliable and comprehensive environmental data base in the country does not exist. Transfer of the data to the user is also a serious problem.

* Predictive Techniques :

Development, validation, standardization and training in environmental prediction models is required.

* Evaluation Techniques :

These involve enormous subjectivity and are not satisfactorily developed.

* Time factor in EIA

One of the major limitation of EIA is extensive time and data requirements, and these have to be reduced.

* Post Project Monitoring :

Currently, EIA is considered only as a procedural requirement to get clearance. Subsequent surveillance is seldom conducted.

* Education, Training and Research :

There is a lack of appropriate interdisciplinary expertise in EIA and training is needed at various levels and sectors.

* Public Participation .

This has to be effectively incorporated in the EIA process so that constructive contributions can be made.

Policy Directives

It is well recognized that EIA should be made mandatory to achieve sustainable growth. The environmental implications in the development process have to be linked at the national, regional and individual projects level. The policy directives in order to achieve this effectively are as follows :

* Standardization of Methodology

* Guidelines for EIA Developmental Projects

* Review Process at State and National Levels

* National Environmental Plan

Action Plans and Projects for Assistance

The study that there are major limitations in the planning, as well as technical and implementation procedures for EIA. The action plans identified to meet the future needs are as follows :

* Compilation of EIA Documents

* Training and Development Projects

* Institutional Building and Strengthening

*** Extracts from study for the Environment Action Programme conducted by the Centre for Environmental Sciences and Engineering, IIT, Bombay.**

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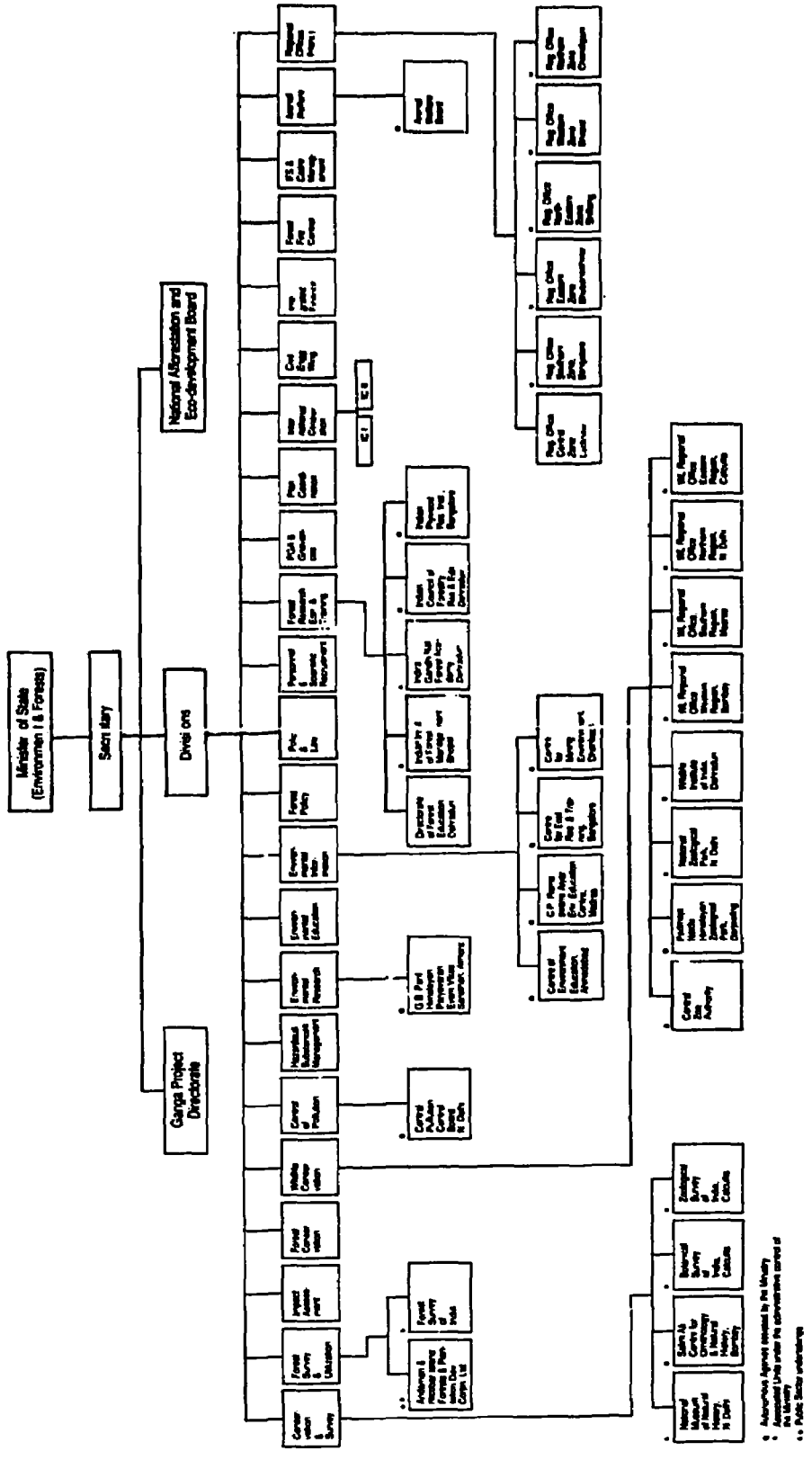

ACRONYMS

ACRONYMS

ACRP	AGRO-CLIMATIC REGIONAL PLANNING APPROACH
AL	ALUMINIUM
BCIL	BIO-TECHNOLOGY CONSORTIUM INDIA LIMITED
BMTPC	BUILDING MATERIALS AND TECHNOLOGY PROMOTION COUNCIL
BNHS	BOMBAY NATURAL HISTORY SOCIETY
BOD	BIO-CHEMICAL OXYGEN DEMAND
BSI	BOTANICAL SURVEY OF INDIA
CADP	COMMAND AREA DEVELOPMENT PROGRAMME
CBR	CRUDE BIRTH RATES
CEE	CENTRE FOR ENVIRONMENT EDUCATION
CGs	CITIZEN'S GROUPS
CITES	CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
CO	CARBON MONOXIDE
COD	CHEMICAL OXYGEN DEMAND
CPCB	CENTRAL POLLUTION CONTROL BOARD
CPR ENVIRONMENT EDUCATION CENTRE	C.P. RAMASWAMY AIYER ENVIRONMENT EDUCATION CENTRE
CNG	COMPRESSED NATURAL GAS
CSIR	COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
DDP	DESERT DEVELOPMENT PROGRAMME
DFL	CURRENCY OF THE NETHERLANDS
DO	DISSOLVED OXYGEN
DPAP	DROUGHT PRONE AREA PROGRAMME
EAP	ENVIRONMENT ACTION PROGRAMME
EC	EUROPEAN COMMUNITY
EE	ENVIRONMENT EDUCATION
EIA	ENVIRONMENT IMPACT ASSESSMENT
EIS	ENVIRONMENTAL INFORMATION SYSTEM
EPCO	ENVIRONMENTAL PROTECTION & COORDINATION AGENCY
EPTRI	ENVIRONMENTAL PROTECTION & TRAINING RESEARCH INSTITUTE
ETP	EFFLUENT TREATMENT PLANTS
FAO	FOOD & AGRICULTURAL ORGANISATION
FSI	FOREST SURVEY OF INDIA
G.B.PANT INST. FOR HIMALAYAN ENVIRONMENT & DEVELOPMENT	GOVIND BALLABH PANT INSTITUTE FOR ENVIRONMENT & DEVELOPMENT
GCA	GENERAL CURRENCY AREA
GEF	GLOBAL ENVIRONMENTAL FACILITY
GHG	GREEN HOUSE GASES
GIS	GEOGRAPHICAL INFORMATION SYSTEMS
GNP	GROSS NATIONAL PRODUCT
GOI	GOVERNMENT OF INDIA
ha	HECTARES
HC	HYDRO CARBONS
HRD	HUMAN RESOURCES DEVELOPMENT
HSM	HAZARDOUS SUBSTANCES MANAGEMENT
ICFRE	INDIAN COUNCIL FOR FORESTRY RESEARCH & EDUCATION
ICIMOD	INTERNATIONAL CENTRE FOR INTEGRATED MOUNTAIN DEVELOPMENT
ICOR	INCREMENTAL CAPITAL-OUTPUT RATIO
IDBI	INDUSTRIAL DEVELOPMENT BANK OF INDIA

IGCP	INDIRA GANDHI CANAL PROJECT
IGIDR	INDIRA GANDHI INSTITUTE FOR DEVELOPMENT RESEARCH
IGNFA	INDIRA GANDHI NATIONAL FOREST ACADEMY
IIFM	INDIAN INSTITUTE OF FOREST MANAGEMENT
IIPA	INDIAN INSTITUTE OF PUBLIC ADMINISTRATION
IIT	INDIAN INSTITUTE OF TECHNOLOGY
IMR	INFANT MORTALITY RATE
INT.	INTERMEDIATES
IPCL	INDIAN PETRO-CHEMICAL LIMITED
IRDP	INTEGRATED RURAL DEVELOPMENT PROGRAMME
IREP	INTEGRATED RURAL ENERGY PROGRAMME
IVCOL	INDIAN VACCINE CORPORATION LIMITED
MAB	MAN AND BIO-SPHERE
MAP	MANAGEMENT ACTION PLAN
MIDS	MADRAS INSTITUTE OF DEVELOPMENT STUDIES
MINAS	MINIMAL NATIONAL STANDARDS
MLD	MILLION LITRES PER DAY
MOEF	MINISTRY OF ENVIRONMENT & FORESTS
MRTPA	MONOPOLIES & RESTRICTIVE TRADE PRACTICES ACT
MT.OE.	MILLION TONNES OF OIL EQUIVALENT
NAAQM	NATIONAL AMBIENT AIR QUALITY MONITORING
NAEB	NATIONAL AFFORESTATION AND ECO-DEVELOPMENT BOARD
NCERT	NATIONAL COMMISSION ON EDUCATION, RESEARCH & TRAINING
NCR	NATIONAL CAPITAL REGION
NEED	NATIONAL ECONOMIC-ECOLOGY DATA BASE
NEERI	NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE
NFAP	NATIONAL FORESTRY ACTION PROGRAMME
NGOs	NON-GOVERNMENTAL ORGANISATIONS
NMNH	NATIONAL MUSEUM FOR NATURAL HISTORY
NO	OXIDES OF NITROGEN
NO_2	NITROGEN DI-OXIDE
NOK	CURRENCY OF NORWAY
NPE	NATIONAL POLICY ON EDUCATION
NRA	NATURAL RESOURCES ACCOUNTING
NRAP	NATIONAL RIVER ACTION PROGRAMME
NREP	NATIONAL RURAL EMPLOYMENT PROGRAMME
NRSE	NEW & RENEWABLE SOURCES OF ENERGY
NSFP	NATIONAL SOCIAL FORESTRY PROJECT
NWDB	NATIONAL WASTELANDS DEVELOPMENT BOARD
NWMP	NATIONAL WATERSHED MANAGEMENT PROJECT
OECF	OVERSEAS ECONOMIC COOPRATION FUND
ODA	OVERSEAS DEVELOPMENT AGENCY
O&M	OPERATIONS & MAINTENANCE
R&D	RESEARCH & DEVELOPMENT
R&M	RESEARCH & MANAGEMENT
RLEGP	RURAL LANDLESS EMPLOYMENT GENERATION PROGRAMME
PCRI	POLLUTION CONTROL RESEARCH INSTITUTE
SAARC	SOUTH ASIAN ASSOCIATION FOR REGIONAL COOPERATION
SACEP	SOUTH ASIAN COOPERATION FOR ENVIRONMENT PROGRAMME
SACON	SALIM ALI CENTRE FOR ORNITHOLOGY & NATURAL HISTORY
SCP	SUSTAINABLE CITIES PROGRAMME
SEB	STATE ELECTRICITY BOARDS
SEEA	SYSTEM FOR INTEGRATED ENVIRONMENTAL & ECONOMIC ACCOUNTING
SEK	CURRENCY OF SWEDEN
SIDA	SWEDISH INTERNATIONAL DEVELOPMENT AGENCY
SFS COLLEGES	STATE FOREST SERVICES COLLEGES
SNA	SYSTEM OF NATIONAL ACCOUNTS
SO_2	SULPHUR DI-OXIDE

SPCB	STATE POLLUTION CONTROL BOARDS
SPM	SUSPENDED PARTICULATE MATTER
SSI	SMALL SCALE INDUSTRIES
SRS	SAMPLE REGISTRATION SYSTEM
TERI	TATA ENERGY RESEARCH INSTITUTE
TFR	TOTAL FERTILITY RATE
TIFAC	TECHNOLOGY INFORMATION, FORECASTING AND ASSESSEMENT COUNCIL
TPD	TONNES PER DAY
TRYSEM	TRAINING OF RURAL YOUTH FOR SELF EMPLOYMENT
UGC	UNIVERSITY GRANTS COMMISSION
U.K.	UNITED KINGDOM
UN	UNITED NATIONS
UNCED	UNITED NATIONS CONFERENCE ON ENVIRONMENT & DEVELOPMENT
UNCHS	UNITED NATIONS COMMISSION ON HUMAN SETTLEMENTS
UNDP	UNITED NATIONS DEVELOPMENT PROGRAMME
UNEP	UNITED NATIONS ENVIRONMENT PROGRAMME
U.S.	UNITED STATES
VIKSAT	VIKRAM SARABHAI CENTRE FOR DEVELOPMENT INTERACTION
WLI	WILDLIFE INSTITUTE OF INDIA
WQ	WATER QUALITY
WRI	WORLD RESOURCES INSTITUTE
ZSI	ZOOLOGICAL SURVEY OF INDIA

REFERENCES

REFERENCES

Agrawal, G.D. (1993) : "Short-term Study on Water-Cess Collection from Industries in India", New Delhi.

Bombay Natural History Society (1993), "Conservation of Wetlands", Study for the EAP, Bombay.

Central Pollution Control Board (1990); Annual Report 1989-90, CPCB, Delhi.

Central Pollution Control Board (1992); Annual Report 1991-92, CPCB, Delhi.

Centre for Science and Environment (--); 'India's Fact Sheet : Land', New Delhi.

Government of India (1985), Fiscal Incentives for Environmental Protection, Department of Environment, United Printing Press, New Delhi.

Government of India (1989,a); The Drought of 1987 - Response and Management, Volume I, Ministry of Agriculture, New Delhi.

Government of India (1989,b); Report of the Working Group on Environment & Ecology for the Eighth Five Year Plan, (1990-95), Ministry of Environment & Forests, New Delhi.

Government of India (1989,c); Report of the Working Group on Soil and Water Conservation including Watershed Development for Formulation of Eighth Five Year Plan, Ministry of Agriculture, New Delhi.

Government of India (1989,d); The Report of the Working Group on Forests and Wildlife for Eighth Five Year Plan (1990-95), Ministry of Environment and Forests, New Delhi.

Government of India (1991); Guidelines for Management & Handling of Hazardous Wastes, Ministry of Environment & Forests, New Delhi.

Government of India (1992,a), Eighth Five Year Plan 1992-97, 2 Vols., Planning Commission, Government of India, GOI Press, Faridabad.

Government of India (1992,b); Environment Action Programmes - India (Interim Document), Ministry of Environment and Forests, New Delhi.

Government of India (1992,c); Environment and Development - Traditions, Concerns and Efforts in India, National Report to UNCED, CEE, Ahmedabad.

Government of India (1992,d), Forest (Conservation) Act, 1980 - Rules and Guidelines, Ministry of Environment and Forests, New Delhi.

Government of India (1992,e), Handbook of Industrial Statistics, 1992, Ministry of Industry, New Delhi.

Government of India (1992,f); Initiatives on Conservation of Forests, Ministry of Environment & Forests, New Delhi.

Government of India (1992,g), National Conservation Strategy and Policy Statement on Environment and Development, 1992, Ministry of Environment & Forests, New Delhi.

Government of India (1992,h), New Export & Import Policies - Highlights, Directorate of Advertising and Visual Publicity, New Delhi.

Government of India (1992,i); People-Oriented Strategies for Regenerating India's Wastelands, Ministry of Environment & Forests, New Delhi.

Government of India (--); 'Rajiv Gandhi National Drinking Water Mission - Rural Water Supply - An Overview', Ministry of Rural Development, New Delhi.

Government of India (1993,a); Agricultural Statistics at a Glance, Ministry of Agriculture, New Delhi.

Government of India (1993,b); Annual Report, 1992-93, Ministry of Environment & Forests, New Delhi.

Government of India (1993,c); India : Environmental Statement, Ministry of Environment and Forests, New Delhi.

Indian Institute of Public Administration (1993,a); Biodiversity Conservation in India, New Delhi.

Indian Institute of Public Administration (1993,b); "Wildlife Management in India", New Delhi.

Indian Institute of Technology (1993); "Environmental Impact Assessment - Study under Environment Action Programme", Centre for Environmental Sciences and Engineering, Bombay.

Lal, J.B. et al (1993); "National Environment Action Programme - Forests", IIFM, Bhopal.

Madras Institute of Development Studies (1993,a); "Strategy for Tank Irrigation in India", Study for EAP, Madras.

Madras Institute of Development Studies (1993,b); "Urban Environmental Management in India : An Assessment", Study for EAP, Madras.

National Environmental Engineering Research Institute (1993,a); 'Cleaner Technologies in Industrial Production', Study conducted for EAP, Nagpur.

National Environmental Engineering Research Institute (1993,b); 'Management of Water Quality', Study conducted for EAP, Nagpur.

National Wasteland Development Board (1990); Developing India's Wastelands, Ministry of Environment & Forests, New Delhi.

Parikh, Kirit, S. et al (1993); "Natural Resources Accounting : A Framework for India", Study for EAP, IGIDR, Bombay.

Planning Commission, Government of India (1993); "Changing Consumption Patterns of Energy in India", Official Communication on EAP.

Singh, Shekar, Mehta, Raman and Uppal, Vishaish (1993); "Institutional Structures and Environmental Management", Study for EAP, IIPA, New Delhi.

Tata Energy Research Institute (1993); "Alternative Energy Action Plan", Final Report, New Delhi.

Warrier, Meera and Kothari, Ashish (1992); "Status of Environmental Education in India", Study for EAP, IIPA. New Delhi.

World Bank (1992); "World Development Report : Environment and Development", Oxford, Oxford University Press, New York.