COMPENDIUM OF ENVIRONMENT STATISTICS INDIA 2002

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MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION
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OVERVIEW

The Compendium has been prepared under the broad Framework for Development of Environment Statistics provided by the United Nations Statistics Division and adopted by the Steering Committee on Environment Statistics for the 1997 issue. The same pattern has been followed in the present issue. The five parameters of the framework, namely, biodiversity, atmosphere, land/soil, water, and human settlements have been used in this compendium. There are seven chapters, further divided into sections, the details of which are given below. An attempt has been made, wherever possible, to elaborate the data in the tables with the help of boxes under the table and suitable graphs and charts for easy comprehension.

The first chapter on Environment and Environment degradation gives a general introduction of the concept of environment; development versus environment degradation; impact of development activities on environment; emissions, discharges and their sources; some major pollutants, their sources and related health hazards.

The second chapter on Development of Environment Statistics in India summarises the activities undertaken by the Ministry of Statistics and Programme Implementation for the development of environment statistics.

The third chapter on Biodiversity is divided into three sections: Flora; Forests and Fauna. The section on Flora contains some statistics on plant species found in India, species which are rare, vulnerable, endangered and extinct. It also gives some statistics on preservation measure of flora like Biosphere reserves, Botanical gardens and gene banks in India, including information on agro biodiversity. The section on Forests contains statistics on Indian forests. It gives information on percentage of forest area to total geographic area (state-wise), wastelands and external aids received for social forestry.The section on Fauna gives the major bio-geographic habitats in India, estimated number of species, national parks and wildlife sanctuaries, tiger reserves, livestock population in India, fish production and bovine population affected by drought.

The fourth chapter on Atmosphere is divided into five sections: Air and Transport; Energy; Industry, Greenhouse Gases and Noise. The section on Air and Transport gives the composition of the troposphere; ambient air quality standards and state of ambient air quality in some cities and towns. Ambient air quality in Delhi has also been given. The section on Energy gives information on installed capacity of utilities; electricity generation and actual power supply position, different fuels used for cooking; coal resources in India as well as its production; and renewable energy resources. The section on Greenhouse Gases gives information on the key greenhouse gases and the effect of global warming. The section on Industries gives information on the number of registered industrial establishments in India and the status of pollution control in 17 categories of industries. The section on Noise gives information on the ambient noise standards; average noise levels in various metropolitan cities and effects of noise pollution on human health.

The fifth chapter on Land/Soil is divided into four sections: Land Uses, Agriculture, Natural disasters and mining. The section on Land Uses contains land classification in India, and different land use patterns. The section on Agriculture contains information on area under principal crops; performance of crop production; use of agricultural inputs; consumption of pesticides statewise and their effect on soil. The section on Natural Disasters contains information on frequently occurring natural disasters; recent natural disasters in India; major earthquakes; number of drought-prone districts and damages due to droughts and supercyclonic storm. The section on Mining gives data on number of mines, production of minerals, status of afforestation, mining machinery and consumption of explosives in mining.

The sixth chapter on Water is divided into two sections: Ground Water and Marine Water. The section on Ground Water contains information on rainfall performance during the last 20 years; water flow in streams and ground water resources; water quality criteria and distribution of water monitoring stations. The section on Marine Water contains information on coastline of India; main activities along the coastal zones; industrial and sewage discharges to coastal waters; pollutants and their impacts on marine environment and potential hot spots along the Indian coasts.

The seventh chapter on Human Settlements is divided into three sections: Population and Poverty; Housing, Slums and Basic Facilities; and Waste Management. Human development is adversely affected by the environmental degradation. Safe drinking water and sanitation are closely linked with two of the very important human development indicators viz. infant mortality and life expectancy. Under the section on 'Population and Poverty' information on population totals, infant mortality rate, expectation of life at birth and population below the poverty line have been given. The section on Housing, Slums and Basic Facilities contains estimates of population in India, number of households, their size, number of rooms per housing unit, water supply system and toilet installation by rural/urban, homeless population, urbanization trends in India, slum population, housing shortage projected, percentage of population below poverty line, medical facilities under allopathy and Indian System of Medicine & Homeopathy. Due to rapid growth in urbanization, there is substantial increase in generation of various kinds of solid waste. When these waste are not collected and disposed off properly, they create health hazards. Information on hazardous waste regulatory quantities, total amount of solid waste collected in some towns/ cities and its composition has been given under the section on Waste Management. In this regard, tables have been included on the type and quantities of different types of waste product generated in Delhi. Some tables on plastic wastes have also been included.

Jaini Prakash

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1. Based upon Survey of India Map with the permission of the Surveyor General of India.
2. The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
3. The interstate boundaries between Arunachal Pradesh, Assam and Meghalaya shown on this map are as interpreted from the North-Eastern Areas (recognisation) act, 1971. but have yet to be verified.
4. The administrative head quarters of Chandigarh, Haryana and Punjab are at Chandigarh.
5. The responsibility for the Correctness of internal details rests with the publisher.
6. " The state boundaries between Uttaranchal & Uttar Pradesh, Bihar & Jharkhand and Chhattisgarh & Madhya Pradesh have not been verified by Governments concerned."

CHAPTER ONE

Environment and Environment Degradation

CHAPTER ONE

ENVIRONMENT AND ENVIRONMENT DEGRADATION

1.1 INTRODUCTION

The Environment can be defined as the physical surrounding of man of which he is a part and on which he is dependent for his activities like physiological functioning, production and consumption. His physical environment stretches from air, water and land to natural resources like energy carriers, soil and plants, animals and ecosystems. The relationship between physical environment and the well being of individuals and societies is multi-fold and multi-faceted with a qualitative a well as a quantitative aspect to it. The availability and use of natural resources have bearing on the outcome and the pace of development process. For an urbanized society, a large part of environment is man made. But, even then, the artificial environments (building, roads) and implements (clothes, automobiles) are based on an input of both labour and natural resources. Commonly, the term 'Environment' is restricted to ambient environment. In that view, the indoor environment (home, work place) is regarded as isolated piece of environment to be treated on its own terms.

The indoor environment usually is under the jurisdiction of the Public Health authorities. Health risks are mainly linked to space heating, cooking and lighting: low grade fuels, insufficient ventilation, and low or non-existing chimneys are often the main problems. Additionally, there may be problems connected with moist, light, incidence, hazardous substances from building materials, lacquers and paints. Problems with drinking water, sewage and waste are not linked to the dwelling as such, but rather due to a lack of appropriate infrastructure. Statistics on indoor environment may be regarded as a subset of statistics on human settlements and the urban environment.

1.2 DEVELOPMENT VERSUS ENVIRONMENT DEGRADATION

Development activities are measured in terms of national products, which in turn are defined as production of goods and services during accounting period. However, certain environmental functions, which are crucial for economic performance and generation of human welfare such as provision of natural resources to production and consumption activities, waste absorption by environmental media and environmental services of life support and other human amenities, are taken into account only partly in conventional accounts. The scarcities of natural resources now threaten the sustained productivity of the economy and economic production and consumption activities. These activities impair environmental quality by over loading natural sinks with wastes and pollutants. The environmental consequence of development tends to offset many benefits that may be accruing to individuals and societies on account of rising incomes. There are direct costs on the health of individuals, their longevity and on quality of life on account of deterioration in environmental quality to mention a few. More importantly, the environmental damage can also undermine future attainments and productivity, if the factors of production are adversely affected. Therefore, the private and social costs of the use of the natural resources and the degradation of the environment may be taken into account for the *sustainable development* in the conventional accounts.

1.3 ENVIRONMENTAL INDICATORS

List of environmental and related socio-economic indicators

The United Nations Statistical Division (UNSD) developed a list of environmental indicators in collaboration with the Inter-governmental Working Group on the Advancement of Environment Statistics. The fourth meeting of the Working Group (Stockholm, 6-10 February 1995) agreed on the List of environmental and related socioeconomic indicators given below. The Statistical Commission, at its twenty-eighth session (New York, 27 February-3 March 1995), approved this list for international compilation by UNSD. The indicators that are bolded in the list were intended for short-term compilation directly from national statistical services or from other international organizations or specialized agencies.

	Framework for Development of Environment Statistics (FDES) Information categories			
Agenda 21 Issues (clusters)	**A. Socioeconomic activities, events**	**B. Impacts and effects**	**C. Responses to impacts**	**D. Inventories, stocks, background conditions**
ECONOMIC ISSUES	Real GDP per capita growth rate	EDP/EVA per capita	Environmental protection expenditure as % of GDP	Produced capital stock
	Production and consumption patterns	Capital accumulation (environmentally adjusted)	Environmental taxes and subsidies as % of government revenue	
	Investment share in GDP			
SOCIAL/DEMO-GRAPHIC ISSUES	Population growth rate	% of urban population exposed to concentrations of SO_2, particulates, ozone, CO and Pb		Population living in absolute poverty
	Population density			Adult literacy rate
	Urban/rural migration rate			Combined primary and secondary school enrollment ratio
	Calorie supply per capita	Infant mortality rate		Life expectancy at birth
		Incidence of environmentally related diseases		Females per 100 males in secondary school
AIR/CLIMATE	Emissions of CO_2, SO_2 and NO_x	Ambient concentrations of CO, SO_2, NO_x, O_3 and TSP in urban areas	Expenditure on air pollution abatement	Weather and climate conditions
	Consumption of ozone depleting substances	Air quality index	Reduction in consumption of substances and emissions	
LAND/SOIL	Land use change	Area affected by soil erosion	Protected area as % of total land area	Arable land per capita

Agenda 21 Issues (clusters)	Framework for Development of Environment Statistics (FDES) Information categories			
	A. Socioeconomic activities, events	B. Impacts and effects	C. Responses to impacts	D. Inventories, stocks, background conditions
	Livestock per km² of arid and semi-arid lands	Land affecte by desertification		
	Use of fertilizers	Area affected by salinization and water logging		
	Use of agricultural pesticides			
WATER Fresh water resources	Industrial, agricultural and municipal discharges directly into freshwater bodies	Concentration of lead, cadmium, mercury and pesticides in fresh water	Waste water treatment, total and by type of treatment (% of population bodies served)	Groundwater reserves
	Annual withdrawals of ground and surface water	Concentration of fecal coliform in fresh waterbodies	Access to safe drinking water (% of population served)	
	Domestic consumption of water per capita	Acidification of fresh water bodies		
	Industrial, agricultural water use per GDP	BOD and COD in fresh water bodies		
		Water quality index by fresh water bodies		
Marine water resources	Industrial, agricultural and municipal discharges directly into marine water bodies	Deviation in stock from maximum sustainable yield of marine species		
	Discharges of oil into coastal waters	Loading of N and P in coastal waters		
OTHER NATURAL RESOURCES				
Biological resources	Annual roundwood production	Deforestation rate	Reforestation rate	Forest inventory
	Fuelwood consumption per capita	Threatened, extinct species	Protected forest area as % of total land area	Ecosystems inventory
	Catches of marine species			Fauna and flora
				Fish stocks
Mineral (incl. energy) resources	Annual energy consumption per capita	Depletion of mineral resources (% of proven reserves)		Proven mineral reserves
	Extraction of other mineral resources	Lifetime of proven reserves		Proven energy reserves

Agenda 21 Issues (clusters)	Framework for Development of Environment Statistics (FDES) Information categories			
	A. Socioeconomic activities, events	B. Impacts and effects	C. Responses to impacts	D. Inventories, stocks, background conditions
WASTE	Municipal waste disposal	Area of land contaminated by toxic waste	Expenditure on collection and treatment	
	Generation of hazardous waste			
	Imports and exports of hazardous wastes		Waste recycling waste	
HUMAN SETTLEMENTS	Rate of growth of urban population	Area and population in marginal settlements	Expenditure on low-cost housing	Stock of shelter and infrastructure
	% of population in urban areas	Shelter index		
	Motor vehicles in use per 1000 habitants	% of population with sanitary services		
NATURAL DISASTERS	Frequency of natural disasters	Cost and number of injuries and fatalities related to natural disasters	Expenditure on disaster prevention and mitigation	Human settlements vulnerable to natural disasters

TABLE 1.1: SOME IMPACTS OF DEVELOPMENT ACTIVITIES ON ENVIRONMENT

Development Activities	Major Impacts on Environment
Forest clearing and land resettlements	Extinction of rare species of flora and fauna, creation of condition for mosquito breeding leading to infectious diseases such as malaria, dengue etc.
Shifting cultivation in upland agriculture	Soil erosion in upland areas, soil fertility declines due to shorter cultivation cycle, which is practiced due to population pressure, flooding of low land areas. The problems could be resolved by terraced cultivation.
Agro industries	Air pollution due to burning of bagasse as fuel in sugar mills, large amount of highly polluting organic wastes, surface water pollution.
Introduction of new varieties of cereals	Reduction of genetic diversity of traditional monoculture resulting in instability, danger of multiplication of local strains of fungus, bacteria or virus on new variety
Use of pesticides	Organism develops resistance and new control methods are needed (e.g. in malaria, widespread use of dieldrin as a prophylactic agent against pests of oil palms made the problem worse), creation of complex and widespread environment problems. The pesticides used in agriculture sometimes go into food chain or in water bodies which may result in harmful health hazards.
Timber extraction	Degrades land, destroys surface soil, reduces production potential of future forests.
Urbanisation and productionindustrialization	Concentration of population in urban centers make huge demands on in rural areas and put pressures on land, air and water pollution.
Water resource projects, e.g. Dam, extensive irrigation	Human settlement & resettlement, spread of waterborne diseases, reduction of fisheries, siltation, physical changes e.g. temperature, humidity.

1.4 Emissions, Discharges and their Sources

1.4.1. The environmental stress caused by developmental activities emanating from emissions and discharges of various substances into air, water and soil. These emissions and discharges have not only local effects but regional and global effects too.

TABLE 1.2: LOCAL, REGIONAL AND GLOBAL EFFECTS OF POLLUTION

Local effects	Regional	Over Marine Water and Continents	Global
Heavy metals in air, soil, water and plants, e.g. From industrial emissions and Discharges Noise, Smell, Air pollution.	Eutrophication, Contaminants in the soil & water, Landscape changes due to mining or agriculture.	Eutrophication, Acidification, Environment Contamination due to Radioactivity	Changes the climate due to ozone depletion and the greenhouse effect.

1.4.2 Acidifying emissions

Sulphur dioxide and nitrogen oxides emitted into the air are converted into acids. At their deposition, they have an acidifying effect on soil and water. The emission of ammonia also contributes to the acidification. Main sources of emission of sulphur dioxide in the air are due to burning of Sulphur containing fuel like coal mine, power plants, oil by vehicles, and also due to refining of oils in refineries.

1.4.3 Emissions of volatile organic substances

Volatile organic substances may also effect health. Many of such substances are carcinogenic. In combination with nitrogen oxides and in sunlight, some of them might form ozone and other photochemical oxidants. These are harmful to plants.

1.4.4 Gases affecting the climate

The greenhouse gases (carbon dioxide, methane etc.) prevent some of the heat radiation from the earth into space. The concentration of green house gases is responsible for raising the temperature of the earth in a long term. Eighty percent of the effect of the greenhouse gases scaused by carbon dioxide itself.

1.4.5 Eutrophicating discharges into water

Nutrients, mainly nitrogen and phosphorus, contribute to the eutrophication of lakes, rivers and marine waters. Approximately, half of the nitrogen discharges are estimated to originate from agricultural land. A considerable proportion of the phosphorous discharge derives from waste water not passing through sewage treatment plants. In addition to discharges from human activities, there is a natural leaching from various types of soil. The quantities are estimated to be of about the same

magnitude as those originating from human activities.

1.4.6 Emissions of heavy metals

Discharges and emissions of heavy metals are difficult to estimate. A large proportion of emissions/ discharges of heavy metals into air originates from the iron and steel industry. Vehicular traffic is the main source of lead emissions. Mines and mining wastes account for the major part of the discharges of heavy metals into water. Besides, Cadmium depositions originate from commercial fertilizers containing phosphorus.

TABLE 1.3: SOME MAJOR POLLUTANTS AND THEIR SOURCES

Pollutant	Source
Carbon monoxide	Incomplete fuel combustion (e.g. two/four stroke engines)
Sulphur dioxide Suspended particulate matter	Burning of sulphur containing fuel like coal in Power Plants and emission by vehicles Smoke from domestic, industrial and vehicular sources.
Oxides of nitrogen	Fuel combustion of motor vehicles, emission from power stations and industrial furnaces
Volatile hydrocarbons	Partial combustion of carbonaceous fuels (two stroke engines, industrial processes, disposal of solid wastes).
Oxidants and ozone	Emissions from motor vehicles, photochemical reactions of nitrogen oxides and reactive hydrocarbons
Lead	Emissions from motor vehicles

TABLE 1.4: POLLUTANTS AND THEIR RELATED HEALTH HAZARDS

Pollutants	Health Effects
Carbon Monoxide (from gasoline cars, 2-wheelers, 3-wheelers)	Fatal in case of large dose: aggravates heart disorders; effects central nervous system; impairs oxygen carrying capacity of blood
Nitrogen Oxides (NO_x)(from diesel vehicles)	Irritation of respiratory tract
Ozone	Eye, nose and throat irritation; risk asthmatics, children and those involved in heavy exercise
Lead (from petrol vehicles)	Extremely toxic: effects nervous system and blood; can impair mental development of children, causes hypertension
Hydrocarbons (mainly from 2-wheelers and 3-wheelers)	Drowsiness, eye irritation, coughing
Benzene	Carcinogenic
Aldehydes	Irritation of eyes, nose and throat, sneezing, coughing, nausea, breathing difficulties; carcinogenic in animals
Polycyclic Aromatic Hydrocarbons PAH (from diesel vehicles)	Carcinogenic

1.4.7 Health Aspects of Water Quality

Water borne diseases are single most important factor responsible for nearly 80% of human mortality in India. Children are worst affected, especially in rural areas and urban slums. Typical water born diseases and their causative factors are summarised in the Table I.5

TABLE 1.5: WATER BORN DISEASES AND THEIR CAUSATIVE FACTORS

Name of the Disease	Causative Organism
1. Water-borne diseases Bacterial	
➢ Typhoid	Salmonella typhi
➢ Cholera	Vibrio cholerae
➢ Paratyphoid	Slmondlla parayphi
➢ Gastroenteritis	Enterotoxigenic Escherichia coli
➢ Bacterial dysentery	Variety of Escherichia coli
Viral	
➢ Infectious hepatitis	Hepatitis-A-virus
➢ Pliomycetis	Polio-virus
➢ Diarrhea Diseases	Rota-virus, Norwalk agent, Other virus Echono-
➢ Other symptoms of enteric diseases	virus, Coxsackie-virus
	Entamoeba hystolitica
Protozoan	
➢ Amoebic dysentery	
2. Water-washed diseases	
➢ Scabies	Various skin fungus species
➢ Trachoma	Trachoma infecting eyes
➢ Bacillary dysentery	E. coli
3. Water-based diseases	
➢ Schistosomiasis	Schistosoma sp.
➢ Guinea worm	Guinea worm
4. Infecton through water related insect vectors	
➢ Sleeping sickness	Trapanosoma through testse fly
➢ Malaria	Plasmodium through Anaphelis
5. Infection primarily due to defective sanitation	
➢ Hookworm	Hook worm, Ascaris

CHAPTER TWO

Development of Environment Statistics in India

CHAPTER TWO

DEVELOPMENT OF ENVIRONMENT STATISTICS IN INDIA

2.1 INTRODUCTION

Although the whole world has now at last woken up to realize the threat to their precious environment due to depletion of natural resources and the growing pace of degradation of the environment, it has been well appreciated in India since long. 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 constitution of India, 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 foundation of the present day institutional framework for environmental programmes in India goes back to the 1970s with the establishment of the National Committee of Environmental Planning and Coordination immediately after the historic Stockholm Conference on Environment held in 1972. The Committee was gradually upgraded into a Department of Environment in 1980 and five years later to a full-fledged 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.

Ministry of Environment and Forests has engaged itself in the task of managing country's environment by focussing on the development of important administrative tools and techniques, impact assessment, research and collection and dissemination of environmental information. However, environment being a multi-disciplinary subject involving complex subjects like Bio-diversity, Atmosphere, Water, Land and Soil and Human Settlements, it seemed difficult to collect, analyse and study relationships among them. It, therefore, became necessary to develop an efficient statistical system on environment that could meet the growing demand of data on various aspects of environment by the various governmental agencies, environmentalists and general public.

2.2 SETTING UP OF ENVIRONMENT STATISTICAL UNIT IN CENTRAL STATISTICAL ORGANISATION

Recognising the importance of Environment Statistics as an emerging area, the subject was first discussed in the fifth Conference of Central and State Statistical Organisation (COCSSO) held at New Delhi in 1981. The Conference recommended the need for developing an appropriate environment statistical system in the country. The subject was again discussed in the Sixth and Seventh Conference of Central and State Statistical Organisation. On the recommendation of the Seventh Conference of Central and State Statistical Organisation held in 1985, a multidisciplinary working group comprising Department of Environment, Central

Statistical Organisation (CSO), State Directorate of Economics and Statistics, and other concerned Central and State organisation and research institutions involved in the related subjects, was set up in CSO under the Chairmanship of Director General of Central Statistical Organisation in July, 1986. The Working Group in its Report submitted in 1990 suggested a provisional list of variables for Framework for Development of Environment Statistics. The group also suggested a few variables on which data needed to be collected on priority basis.

During the second half of 1996, a Steering Committee on Environment Statistics under the chairmanship of Director General, Central Statistical organization was constituted. In its first meeting held in January 1997, a draft framework for the development of environment statistics was discussed along with the table formats to be used for preparing the compendium. The data source agencies were identified and it was decided to hold a workshop cum second meeting of the Steering Committee to discuss draft compendium of environment statistics. The workshop cum second meeting was held at Pune in March 1997. As per the recommendations of the second meeting, the said draft compendium was modified and finally got approved in the third meeting of the Steering Committee held in August 1997.

2.3 COMPENDIUM OF ENVIRONMENT STATISTICS

The Central Statistical Organisation brought out five issues of the publication entitled "Compendium of Environment Statistics" for the years 1997, 1998, 1999, 2000 and 2001 presenting available data relating to environment of the country. It is an effort to collect Statistics related to different factors that are affecting our environment. Although, the present coverage of information in the compendium may not be exhaustive with respect to entire domain of Environment, it does however provide a glimpse of the present scenario of the environmental degradation, its causes and the reasons for concern. It provides the necessary base to bring out the magnitude of the problem. The compendium consists of seven chapters, as already stated in oerview. The first two chapters give a general introduction to environment, its degradation through different sources and their impact on human health and the development of environment statistics in India. The remaining five chapters are on Biodiversity, Atmosphere, Land/soil, Water and Human Settlements. Besides, statistical tables depicting environment data, suitable graphs and charts have also been added to make the publication more user friendly.

2.4 NATIONAL WORKSHOP ON ENVIRONMENT STATISTICS

To disseminate information on the development of environment statistics in India and provide a forum for interaction between users and producers, three National Workshops on Environment Statistics have been organised. The first one was organized in Goa in January 1998, the second one was held at Hyderabad during April, 2000, the third one in February, 2001 at Thirurananthapuram and the fourth one was held in April, 2003 at Shillong. All the workshops were attended by academicians, data users, and data producing agencies. The technical sessions focussed on different aspects of the environment such as environment statistics, population and human health, status of databases on different types of pollution, status of data bases on human settlements and impacts on other aspects of the environment;

status of data base on land and soil and degradation; and natural resource accounting. Proceedings of all the National Workshops have been brought out in the form of a book. The workshops made several recommendations some of which are as follows:

i) Conduct of similar workshops at the regional level by involving State departments of environment, forests, pollution control boards and other local level organisation for database development.

ii) Continued publication of the Compendium on Environment Statistics at regular intervals, increased interaction between data producers and users to improve the coverage of the publication and production of similar publications at the State level.

iii) Strengthening of the Environment Statistics Unit and expansion of membership of the Steering Committee on Environment Statistics to include other data source agencies and academic users, and establishment of linkages with the Environmental Information System (ENVIS) of the Ministry of Environment and Forests (MOFF) for database development and maintenance.

iv) Development of sound statistical methodologies for estimation of generic, specific, and ecosystem biodiversities.

v) More frequent interactions (in the form of training courses and seminars/workshops) between statisticians and environmental scientists to clarify concepts and definitions as well as methodologies used in environment statistics and formation of small technical committees within CSO composed of representatives of the offices dealing with environment and statistics to identify new data to be included in the Compendium, standardize concepts and definitions of terms, etc.

vi) Some additional data from the Network of ENVIS may be included in the compendium.

vii) The data on area of wetlands, biosphere reserves, Joint Forest Management Committees set up by various State Governments and Eco Villages and cities and medicinal plants and data about 15 major thrust areas of the Ministry of Environment and Forests may be included in the compendium.

viii) It was decided that a small Committee under the chairmanship of DDG, CSO and the representations of data source agencies as members may be formed to review the contents of the compendium.

ix) Soft copy of the compendium in CDs may be prepared in addition to printing hard copies.

x) State Government may also bring out State Compendium on Environment Statistics on the lines of CSO Compendium.

xi) All the Ministries/Organisations implementing projects, which have impact on environment, should be well equipped with statistical personnel trained in environmental sciences to enable them to carry out impact studies.

xii) More data on pollution load by classification of industries is required to be generated. The data on pollution being collected once by CSO through Annual Survey of Industries should be continued on a regular basis and help of the Ministry of Environment and Forests may be obtained, if necessary.

xiii) There should be linkages between organizations dealing with coastal management and Central Water Commission and All India Soil and Land Use Survey as water shed management plans need to have an over all integrated assessment of carrying capacities.

xiv) There is an urgent need for establishing a system for collection of Solid Waste Data on all India basis especially from towns and cities. The computer programmes developed for disposal of solid wastes, especially, bio-medical wastes, available with Prof. Rama Rao may be used by CSO.

xv) The requirement of well-equipped information system was felt for mitigating suffering of the people affected by the natural disasters. The provision and availability of relief material including the equipment required for convalescing the people trapped inside debris or under water may be ensured with the concerned district and local authorities.

xvi) Various research institutions working in the area of environment should have closer interaction with official data producers for preparing in a uniform environmental data base. Need for development of environmental information system (EIS) at the lowest level of administration was also felt.

xvii) An expert group might be constituted in CSO to look at the various suggestions emerged in the two-day workshop and examine the indicators presently being compiled in the Compendium, to suggest about their periodicity, inclusion or exclusion, spatial level of desegregation, etc. The weakness of the data may be indicated whenever necessary.

xviii) The State DES should be entrusted with the task of computing state NRA. CSO may provide necessary technical and financial assistance for the same.

xix) Need for preparation of Directory of Organisation/ institutions in the country involved in Environmental research /study/training including development of database of Environment Statistics.

xx) The role of remote sensing data may be explored in creation of database of environment statistics

xxi) Organization of workshops/seminars on various specific subjects/ sectors so that subject/sector wise specific guidelines/ standard methodologies may be firmed up.

2.5 TRAINING ON ENVIRONMENT STATISTICS

Environment statistics being a multi disciplinary subject, the Statisticians working both at the Centre as well as State Governments are not fully familiar with the relevant terminologies and concepts. To fulfil this need, the Ministry of Statistcs & PI has organized two week International Training Programme on Environment Statistics with financial support from Asian Development Bank. Twenty-two participants from South and South East Asia, including nine from India, participated in this programme. The second such training programme has been organized at Hyderabad during December, 2000 and the third one again at Hyderabad during April, 2001. The fourth training was organised at Jadavpur University in 2002. Two training programmes on Environment Statistics were organised in the year 2003 at EPTRI, Hyderabad and at NEHU, Shillong. Some short duration training courses of say 1 to 2 weeks are needed to familiarise with the subject and CSO can associate specialised research institutions/universities in this effort. In addition, some specialised courses of medium duration say one to three months duration as well as exposure to international scenario may also be needed to develop expertise in these areas.

2.6 NATURAL RESOURCE ACCOUNTING

The economy draws inputs from the environment. These consist of natural

resources, both non-renewable and renewable including mineral resources, timber and non-timber forest produce, aquatic resources, and also the ecosystem services *viz.* recycling of nutrients and supply of clean air and water necessary for sustaining life. Besides, economy also uses the environment as a sink for dumping unwanted wastes generated in industrial and other anthropogenic activities.

The conventional accounting [System of National Accounting (SNA)] though operates in natural environment, hardly takes into account the environmental components and the goods and services they contribute to the economic development. Rather, it is entirely based on monetary considerations, which if dealt in isolation may prove disastrous, both to the economy as well as to the environment. Hence, links between economy and environment have to be properly understood and appreciated in order to achieve sustainable development of the society. For which, there is an urgent need to generate data on environmental goods and services and their valuation in economic terms, so that information generated can be used for proper policy formulation to achieve overall sustainable development of the society.

As a result, concept of Integrated Environmental and Economic Accounting (IEEA) has emerged on the initiative of the United Nations. The main objectives of integrated environmental accounting are segregation and elaboration of all environmental and economic accounts, linkages of physical resource accounts with monetary environmental accounts and balance sheets, assessments of environmental costs, benefits and accounting for the maintenance of the tangible wealth. It is, thus, a complete accounting procedure for environmental assets. The IEEA later revised and termed by London Group as System for Environment and Economic Accounting (SEEA-2000) takes into consideration the contributions of the environment to the economy or the impacts of the economy on the environment. However, data on environmental components and the goods and services rendered by them, and their valuation in economic terms required for Environmental Accounting are lacking in various areas like Land, Water, Air, Energy, Agriculture, Forest, Mining, Industry etc. At present, in the fast changing environmental and economic scenario, such data pertaining to various natural resources are highly desirable for proper policy formulation for sustainable development.

The field of Environmental Accounting of Natural Resources in India is still in preliminary stage. However, significant work done by different groups on methodology of generating data and adding values to it (Chopra and Kakekodi, 1997; Parikh and Parikh, 1997; Kakekodi, 2002) has given impetus for fast development of the area. The entire process of Environmental Accounting of Natural Resources involves three steps viz. Physical accounting; Monetary valuation; and Integration with national income accounts. Physical accounting determines the state of the resource- types and extent (qualitative and quantitative) in spatial and temporal terms. Once the physical account of resources is available, monetary valuation is done to its all tangible and intangible components. Thereafter, the net change in natural resources in monetary terms is integrated into the Gross Domestic Product in order to reach the value of Green GDP of a nation/state/region. The process does not require any change in the core system of SNA, rather it is achieved by establishing linkages between the two.

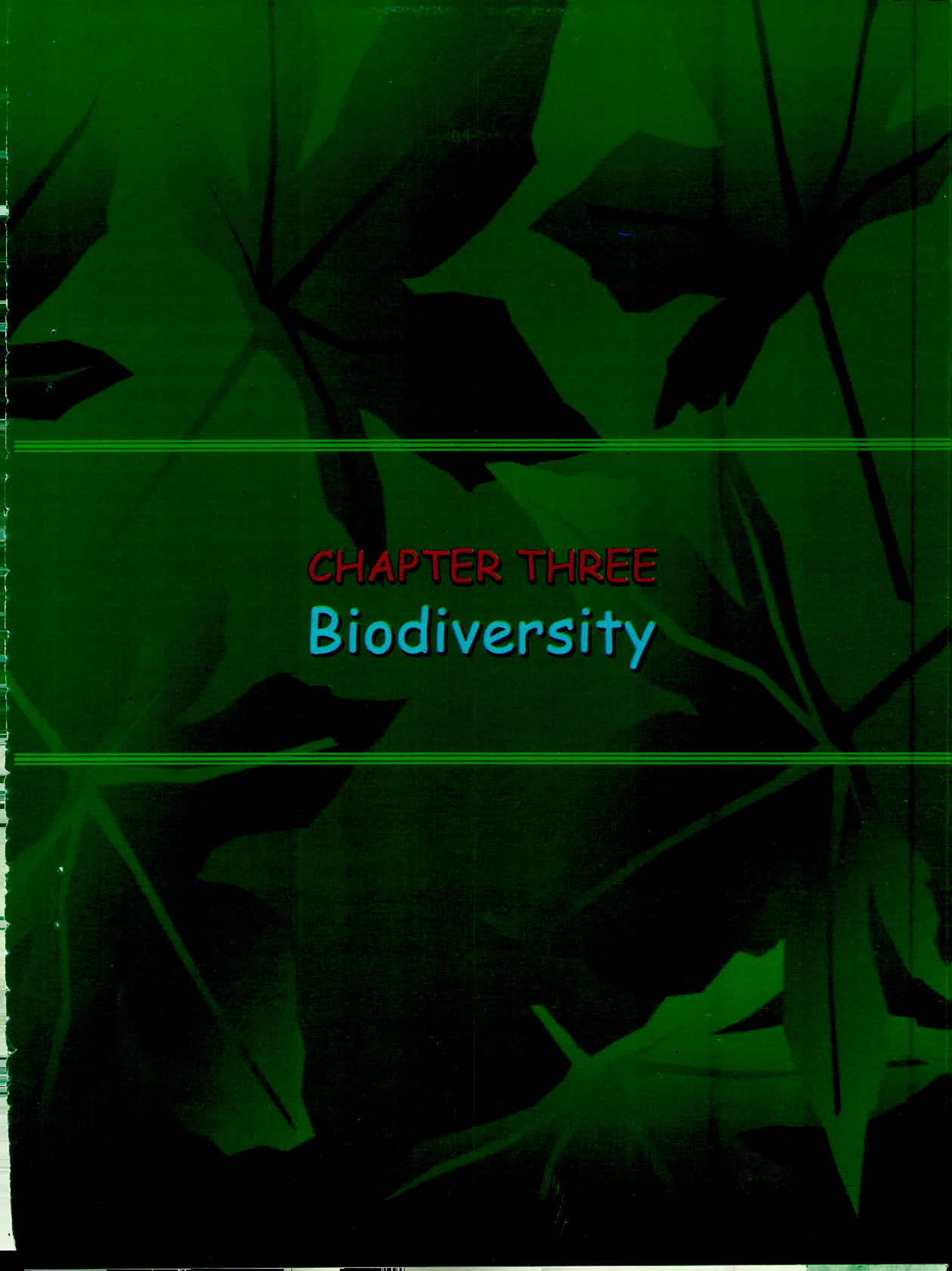
2.7 NATURAL RESOURCE ACCOUNTING IN INDIA

The economic development of a country or region is generally expressed in terms of the growth of its income. The value of the final product excluding the value of inputs used in the process of production is termed as the Gross National Product (GNP). However, these indicators of economic development do not take into account the use and depreciation of the renewable or non-renewable natural assets. But the growing scarcity of these resources has forced the policy-makers to develop the natural resource accounts. Following other countries, India too has given due thought to this phenomenon and initiated a pilot project on Natural Resource Accounting in Goa. After the development of a suitable methodology, it may be extended to other states as well as so as to arrive at an overall estimate for the country. A Technical working Group on Natural Resource Accounting has been constituted in the Ministry of Statistics & Programme Implementation and the first meeting took place in November 1997. Following the deliberations, a concept paper was got developed which was considered by the Technical Working Group in its meeting held in September 1998. The Group has recommended that scope of study would be to cover all sectors of the economy; however, the major emphasis will be given to Forests and Biodiversity, Minerals, Marine Resources, Tourism and Energy. The project is to be implemented in two phases. In the first phase, the Natural Resource Accounting will be attempted with the available secondary data and identify the gaps and requirement of additional primary data to be collected. The first phase was started in April 1999. The project was implemented by TERI under close supervision of Directorate of Planning, Statistics and Evaluation, Government of Goa. TERI had submitted its draft report on the first phase of this project. The report was considered by the sub-group in its meeting held on 25th January, 2001. As it required major revision, TERI was requested to revise the report. The revised report was considered in a meeting held in February, 2002 chaired by Secretary, MOS & PI and accepted with some modifications. The modified version of this Report has now been submitted by TERI. After consideration of this Report by CSO, the proposals for Second Phase of the Project to be undertaken in a few more States will be formulated. The findings of the study generated a lot of discussion in the National Statistical Commission which, inter-alia, recommended replication of the Goa (Phase-I) project in other States also.

Recently, four more projects on NRA were approved in MOS & PI to different institutions, namely, IIFM (Bhopal), IEG (Delhi), TERI Delhi and CMDR (Karnataka) on different sectors like forestry, land, mining, soil, air, etc in order to develop uniform methodology for each sector separately. The progress of these projects is being monitored by the Technical Monitoring Committee constituted for this purpose under the Chairmanship of Prof. Amitabh Kundu of JNU.

Four more projects on NRA, namely, Study on NRA-Revised proposals for land and forestry (excluding mining) sectors in A.P., (EPTRI, Hyderabad), Environment Accounting of land and water in Tamilnadu (Madras School of Economics, (Chennai), NRA for selected States in India (W.B. & Tripura) on air and water (Jadavpur University, Kolkata) and Environment Accounting of Natural Resources of Meghalaya, Phase-I, for sectors land and forest resources (NEHU, Shillong) are in the pipe line.

The Ministry of Statistics & Programme Implementation has initiated action for taking up Goa Phase-II project for sectors other than those covered in Phase-I and in Uttaranchal (all Sectors).



CHAPTER THREE
Biodiversity

3.7 At present, there are 27 Tiger Reserves spreading over in 14 states and covering an area of about 37,761 sq. kms. The population of tigers is estimated through tiger census conducted once in 4 to 6 years. The last such census was conducted in 2001-02.

NATIONAL PARKS AND WILD LIFE SANCTUARIES

The wild life Act provided for setting up National parks and sanctuaries for wild life. The basic idea in trying to encourage wild life .is that human welfare is initially linked with it. The Government of India has pledged for all out efforts to conserve which not only seeks to protect and preserve what remains of wild fauna and flora but also seeks to augment this priceless national heritage.

3.8 Multipronged pressures on forests come from population, cattle grazing, fuel and fodder collection, industry and forest fires, etc. The remaining good forest cover is, therefore, estimated to be just 11% against the desirable 33% of the total land area as per the National Forest Policy. Up to the late seventies, forest land was a prime target for diversion for resettlement, agriculture and industrialization, and this trend was contained only by the Forest (Conservation) Act, 1980.

3.9 A two pronged strategy to increase forest cover essentially comprises of

- Improving canopy cover in the forest land; and
- Undertaking afforestation in non-forest and degraded lands, preferably contiguous to forest blocks.

3.10 Realising the role of forests in controlling soil erosion, moderation of floods, recharging of ground aquifers, as habitat for wildlife, conservation of bio-diversity and gene pool, etc., programmes were launched as early as the Second Five Year Plan for extensive Watershed Management followed later by establishment of a Protected Areas Network, under the Wildlife (Protection) Act, 1972, comprising of Biosphere Reserves, National Parks and Sanctuaries- both terrestrial and aquatic. This Network is comprised of 13 Biosphere Reserves, 87 National Parks, 485 Sanctuaries, along with such dedicated conservation programmes as Project Tiger, Crocodile Rehabilitation and Project Elephant. The Central Zoo Authority caters to the ex-situ conservation of wildlife through 275 zoos, deer parks, safari parks and aquaria, etc. India is a also signatory to several International Conventions like CITES, International Whaling Convention (IWC); Convention on Migratory Species (CMS), World Heritage Convention (WHC), etc. India has recently taken the lead in the formation of the Global Tiger Forum.

Agro Biodiversity

3.11 The National Bureau of Plant Genetic Resources (NBGR) established in 1976 as an institution under Indian Council of Agricultural Research (ICAR) emerged as an important organization dealing with various establishments of plant genetic resources. The organization is entrusted with the vital responsibility of germ plasm, exchange with appropriate quarantine measures, survey exploration, their organization, planning and coordination, comprising evaluation, documentation and conservation of diverse plant genetic resources. The National Gene Bank has also been established within the

complex. Within the new trade related intellectual property rights (TRIPS) within World Trade Organisation related agreements, documentation of our genetic resources is very important. Similarly, the documentation of fish genetic resources is the responsibility of National Bureau of Fish Genetic Resource Lucknow also an institution under ICAR Similarly, the National Bureau of Animal Genetic Resources located at Karnal maintains the germ plasm of Indian Cattle and Buffalo breeds. This organization is also an institution of ICAR umbrella.

TABLE 3.1.1 : NUMBER AND STATUS OF PLANT SPECIES IN INDIA

Sl. No.	Type	No. of Known Species in the World	No. of Known Species in India	Percentage of Occurrence in India	No. of Species Endemic	No. of Species Endangered	No. of Species Extinct
1	2	3	4	5	6	7	8
I	**Flowering Plants**						
1	Gymnosperm	650	48	7.38	8*	7*	Not Known
2	Angiosperm	250000	17672	7.00	5725*	1700*	28
II	**Non-flowering Plants**						
1	Fern & Fernallics	10000	1135	11.35	193*	113*	Not Known
2	Algae	40000	6500	16.25	1100*	120*	Not Known
3	Fungi	70000	14500	20.71	3500*	140*	Not Known
4	Lichens	13500	2021	14.97	417*	400*	Not Known
5	Liverworts	7500	852	11.26	260*	100*	Not Known
6	Mosses	7000	2000	28.6	608*	115	Not Known

Source : *Botanical Survey of India, Kolkata.*
* : *Approximate*

India has a rich heritage of species and genetic strains of flora. Overall about six percent of world species are found in India. It is estimated that India is tenth among the plant rich countries of the world and sixth among the centres of diversity and origin of agrodiversity. Out of the total twelve biodiversity hot-spots in the world, India has two, one is the north east region and other is western ghats (Khoshoo, T.N., 1995). The growing urbanization and industrialization causes the decrease of Natural habitats, which further results in the loss to biological diversity. Biodiversity, once lost cannot be recovered.

TABLE 3.1.2 : RARE AND THREATENED SPECIES (VASCULAR PLANTS)

Sl. No.	Category	Approximate Number
1	2	3
1	Rare	287
2	Vulnerable	167
3	Endangered	1366
4	Possibly Extinct	40
5	Extinct	28

Source: *Botanical Survey of India, Kolkata.*

CHART 1 : RARE AND THREATENED PLANTS SPECIES

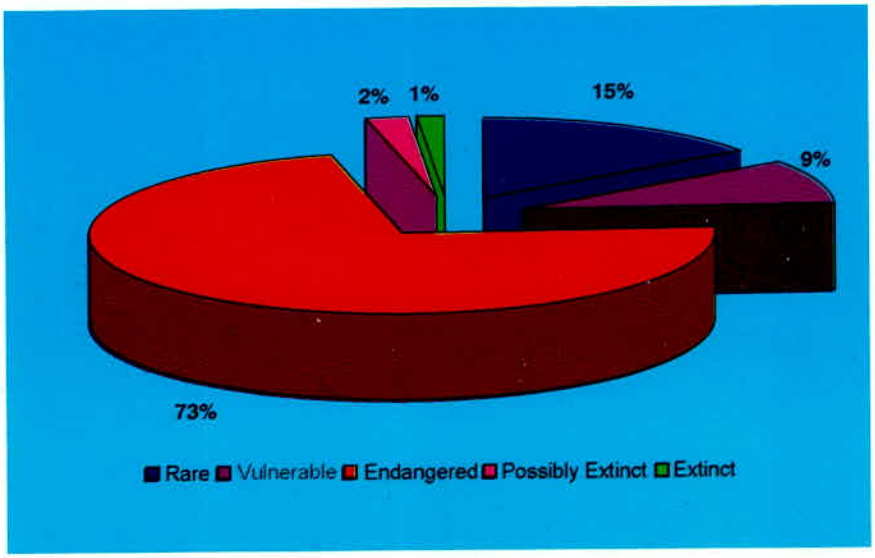


TABLE 3.1.3 : REFERENCE COLLECTIONS OF FLORA

Sl. No.	Category	Total Number	Total Holdings of Collections and Specimens
1	2	3	4
1	Herbarium	51	4594795
2	Museums	18	60100

Source : *Botanical Survey of India, Kolkata.*

TABLE 3.1.4 : CONSERVATION MEASURES

Sl. No.	Category	Number	Total Geographical Area (Sq. Km.)
1	2	3	4
I	**Within Habitats (insitu)**		
1	Biosphere Reserves	13	55550
2	National Parks	87	40631
3	Sanctuaries	485	115374
4	Reserve Forests	NA	416547
5	Protected Forests	19	223321
II	**Outside Habitats (ex situ)**		
1	Botanical Gardens	120	26.24
2	Gene Banks	NA	NA

Source : *Botanical Survey of India, Kolkata.*

TABLE 3.1.5 : BIOSPHERE RESERVES SETUP IN INDIA UPTO MARCH, 2002

Sl. No.	Name of Biosphere Reserve	Area (in sq.km.)	Date of Setting up/Notification	Location (State) and Bio-Geographic Zones
1	2	3	4	5
1	Nilgiri	5520.00	01.08.1986	Part of Wynad, Nagarhole, Bandipur and Mudumalai, Nilambur, Silent Valley and Siruvani hills (Tamil Nadu, Kerala and Karnataka)-Western Ghats
2	Nanda Devi	5860.69	18.01.1988	Part of Chamoli, Pithoragarh & Almora Districts (Uttranchal)-West Himalayas
3	Nokrek	820.00	01.09.1988	Part of Garo Hills (Meghalaya)-East Himalayas
4	Great Nicobar	885.00	06.01.1989	Southern most Islands of Andaman and Nicobar (A & N Islands)-Islands
5	Gulf of Mannar	10500.00	18.02.1989	Indian part of Gulf of Mannar between India and Sri Lanka (Tamil Nadu)-Coasts
6	Manas	2837.00	14.03.1989	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamrup and Darang districts (Assam)-East Himalayas
7	Sunderbans	9630.00	29.03.1989	Part of Delta of Ganges & Barahamaputra river system (West Bengal)-Gigantic Delta
8	Similipal	4374.00	21.06.1994	Part of Mayurbhanj district (Orissa)-Deccan Peninsula
9	Dibru Saikhowa	765.00	28.07.1997	Part of Dibrugarh and Tinsukhia districts (Assam)-East Himalayas
10	Dehang Debang	5112.00	02.09.1998	Part of Siang and Debang valley in Arunachal Pradesh-East Himalayas
11	Pachmarhi	4926.28	03.03.1999	Part of Hoshangabad, Betul and Chindwara districts of Madhya Pradesh-Semi-Arid- Gujarat Rajputana
12	Kanchanjunga	2619.92	07.02.2000	Parts of Kanchanjunga Hills in Sikkim-East Himalayas
13	Agasthyamalai	1701.00	12.11.2001	Neyyar, Peppara and Shenduruny Wildlife Sanctuaries and their adjoining areas in Kerala

Source : *Ministry of Environment and Forests, Annual Report 2002-2003*

TABLE 3.1.6 : STATUS OF EX-SITU CONSERVATION (BASE COLLECTION) OF ORTHODOX SEEDS, AT- 20^0 C

(As on 31st October, 2002)

Sl.No.	Crop Group	Species	Accessions
1	2	3	4
1	Cereals	111	100780
2	Millets & Forages	32	30793
3	Pseudocereals	19	2753
4	Grain Legumes	66	35394
5	Oil seeds	23	29096
6	Fibre Crops	11	7235
7	Vegetables	56	10613
8	Fruits	6	176
9	Medicinal & Aromatic Plants	239	1201
10	Narcotics	2	919
11	Species & Condiments	8	2153
12	Genetic Stocks	50	273
13	Released Varieties	82	1193
14	Duplicate Safety Samples	2	10235
	Total	**707**	**232814**

Source : *National Bureau of Plant Genetic Resources*

TABLE 3.1.7 : STATUS OF IN-VITRO CONSERVATION

(As on 30th Septermber, 2002)

Sl. No.		Crops	Storage Temp. (°C)	Optimum Subculture Interval(Months)	No. of Accessions in Culture
1		2	3	4	5
I		**Fruits**			
	1	Musa spp.	25	8-12	394
	2	Actinidia chinensis	25	8	3
	3	Fragaria spp.	25	8-10	20
	4	Prunus spp.	25	4	2
	5	Rubus spp.	25	8-10	5
	6	Malus spp.	25	3-4	2
	7	Morus sp.	25	6-8	10
II		**Bulbous Crops**			
	1	Allium sativum	25,4	6-12	97
	2	Allium spp.	25,4	4-23	14
III		**Tuber Crops**			
	4	Alocasia spp.	25	10	1
	5	Colocasia esculenta	25	8-10	63
	6	Dioscorea spp.	25	8-12	43
	7	Ipomoea batatas	25	8-12	230
	8	Xanthosoma sagitifolia	25	10	3
IV		**Medicinal and Aromatic Plants**			
	1	Aconitum violaceum	-	-	1
	2	Bacopa monneierii	25	6	6
	3	Coleus forskohlii	25	12	11
	4	Cholorophytum sp.	-	-	1
	5	Digitalis spp.	4	11	6
	6	Eremostachys superba	25	6	2
	7	Gentiana kurroo	4	12	1
	8	Kaempferia spp.	-	-	6
	9	Mentha sp.	25,4	12	22
	10	Picrorhiza kurroa	4	12	4
	11	Plumbago zeylanica	-	-	2
	12	Pogostemon patchouli	25	12	2
	13	Pycnanthemum spp.	25,4	8-12	4
	14	Rauvolfia spp.	25	22	8
	15	Rheum spp.	4	12	3
	16	Saussurea lappa	4	12	3
	17	Swertia chirayta	4	6	3
	18	Tylophora indica	25	12	4
	19	Valeriana wallichii	4	12	4
V		**Spices**			
	1	Curcuma spp.	25	6-10	62
	2	Elettaria spp	25	15	5
	3	Piper spp.	25	10-22	6
	4	Zingiber spp.	25	8-24	173
	5	Vanilla planifolia	25	6	5
VI		**Industrial Plants**			
	1	Humulus lupulus	25	-	8
	2	Simmondsia chinensis	25	6	12
VII		**Others**			
	1	Cicer microphyllum	-	-	1
	2	Gladiolous cv.	-	-	1
		Number of species: 114			
		Total			**1254**

Source : *National Bureau of Plant Genetic Resources*

TABLE 3.1.8 : STATUS OF CRYOPRESERVED GERMPLASM AT NATIONAL CRYOBANK

(As on 30th September 2002)

Sl.No.	Category	No. of Species	No. of Accessions
1	2	3	4
I	**Intermediate & Recalcitrant**		
1	Fruits & Nuts	78	703
2	Spices & Condiments	8	70
3	Plantation Crops	2	20
4	Agroforestry Sp.	14	1575
II	**Orthodox**		
1	Cereals	4	193
2	Millets and Forages	11	212
3	Pseudo-cereals	17	59
4	Grain Legumes	20	444
5	Oilseeds	7	222
6	Fibre Crops	5	28
7	Vegetables	42	271
8	Medicinal & Aromatic Plants	196	618
9	Narcotics	2	30
10	Wild Sp.	49	164
	Total	**455**	**4609**

Source : National Bureau of Plant Genetic Resources

TABLE 3.1.9 : STATUS OF CRYOPRESERVATION OF POLLEN

(As on 31st October 2002)

Sl.No.	Plant Species	No. of Accession
1	2	3
1	Brassica spp. (oleracea, napus, campestris, carinata, juncea, nigra)	43
2	Camellia sinensis	1
3	Cicer microphyllum	1
4	Citrus sp.	4
5	Eruca sativa	2
6	Raphanus sativus	4
7	Sesamum sp.	1
8	Zea mays & allied genera	9
	Total	**65**

Source : *National Bureau of Plant Genetic Resources*

TABLE 3.2.1 : STATE/UT WISE FOREST AREA

(Sq.km)

Sl. No.	State/Uts	Geographic Area	Reserved Forest	Protected Forest	Unclassed Forest	Recorded Forest Cover	% of Forest to Geographic Area
1	2	3	4	5	6	7	8
1	Andhra Pradesh	275069	50479	12365	970	63814	23.20
2	Arunachal Pradesh	83743	19880	0	31660	51540	61.55
3	Assam	78438	18060	0	8958	27018	34.45
4	Bihar	94163	693	5384	1	6078	6.45
5	Chhattisgarh	135191	23966	31107	4212	59285	43.85
6	Delhi	1483	78	7	0	85	5.73
7	Goa	3702	236	0	988	1224	33.07
8	Gujarat	196022	13904	396	4699	18999	9.69
9	Haryana	44212	249	1155	147	1551	3.51
10	Himachal Pradesh	55673	1896	33043	2094	37033	66.52
11	Jammu & Kashmir	222236	20230	0	0	20230	9.10
12	Jharkhand	79714	4387	19185	33	23605	29.61
13	Karnataka	191791	28611	3932	6181	38724	20.19
14	Kerala	38863	11038	183	0	11221	28.87
15	Madhya Pradesh	308245	58734	35587	900	95221	30.89
16	Maharashtra	307713	49217	8196	4526	61939	20.13
17	Manipur	22327	1467	4171	11780	17418	78.01
18	Meghalaya	22429	1112	12	8372	9496	42.34
19	Mizoram	21081	7127	3568	5240	15935	75.59
20	Nagaland	16579	308	508	7813	8629	52.05
21	Orissa	155707	26329	15524	16282	58135	37.34
22	Punjab	50362	44	1112	1903	3059	6.07
23	Rajasthan	342239	11860	17658	2976	32494	9.49
24	Sikkim	7096	5376	285	104	5765	81.24
25	Tamil Nadu	130058	19325	2240	1306	22871	17.59
26	Tripura	10486	3588	509	2196	6293	60.01
27	Uttar Pradesh	240928	11078	2425	3323	16826	6.98
28	Uttaranchal	53483	23827	10673	162	34662	64.81
29	West Bengal	88752	7054	3772	1053	11879	13.38
30	A. & N. Islands	8249	2929	4242	0	7171	86.93
31	Chandigarh	114	31	0	2	32	28.45
32	Dadra & Nagar Haveli	491	198	5	0	203	41.34
33	Daman & Diu	112	0	1	0	1	0.63
34	Lakshadweep	32	0	0	0	0	0.00
35	Pondicherry	480	0	0	0	0	0.00
	Total	**3287263**	**423311**	**217245**	**127881**	**768436**	**23.38**

Source : *State of Forest Report 2001*

India has 76.84 million hectares of recorded forest area in March 1999. This accounts for 23.38% of total geographic area. Per Capita availability of forests in India is 0.08 ha which is much lower than the world average of 0.8 ha.

CHART 2 : FOREST COVER IN DIFFERENT STATES AS COMPARED TO TOTAL GEOGRAPHIC AREA

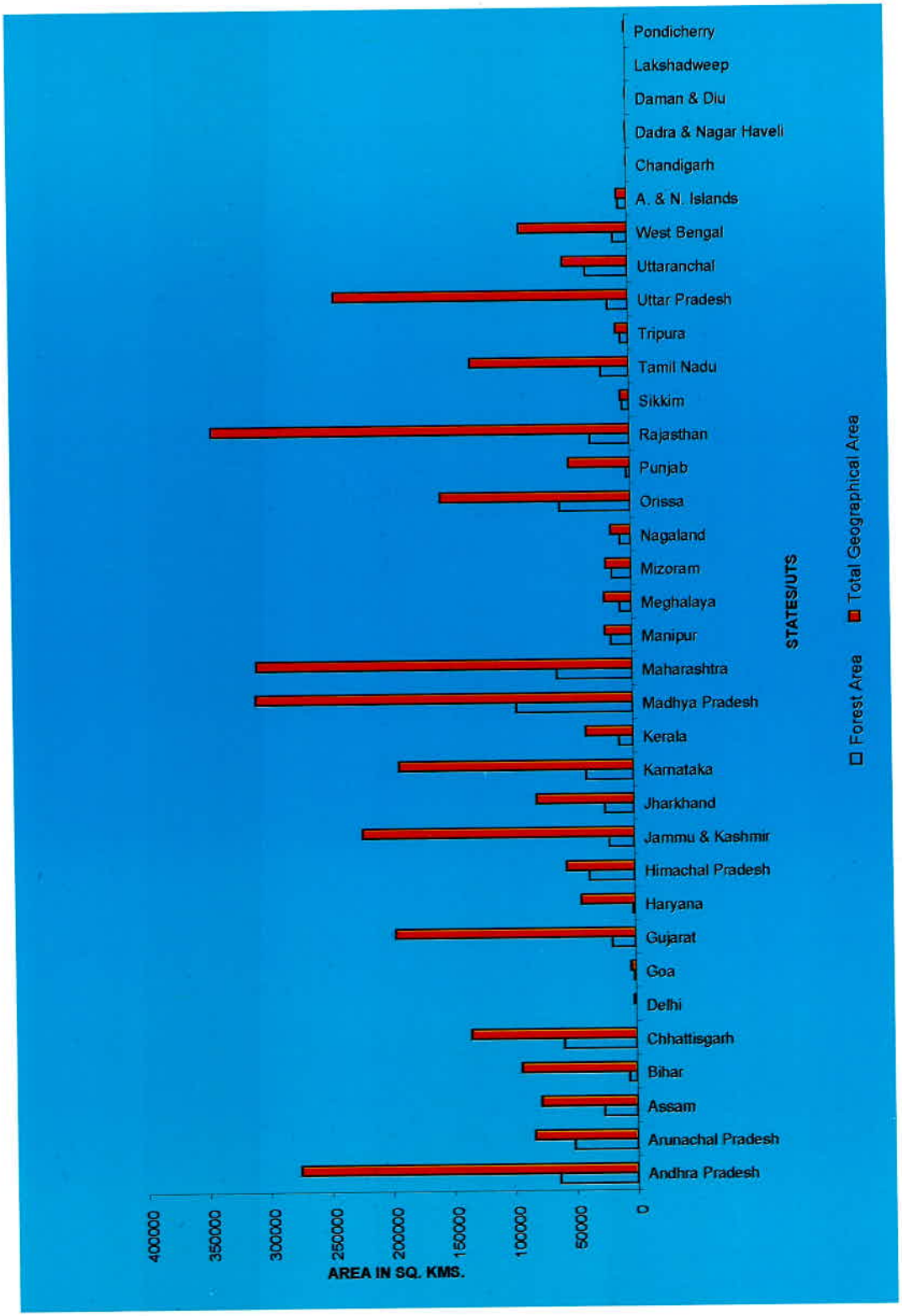


TABLE 3.2.2 : FOREST COVER AS PER 2001 ASSESSMENT

Land Use	Area in Sq. Kms.	Percentage of Geographical Area
1	2	3
Forest Cover		
Dense Forest	416809	12.68
Open Forest	258729	7.87
Total Forest Cover*	**675538**	**20.55**
Non-Forest		
Scrub	47318	1.44
Total Non-Forest **	**2611725**	**79.45**
Total Geographic Area	**3287263**	**100.00**

Source : *State of Forest Report, 2001*

* : *Includes 4482 km² under mangroves (0.14% of country's geographic area)*

** : *Includes Scrub*

TABLE 3.2.3(a) : FOREST AREA BY OWNERSHIP(AS ON 31-3-2000)

(Sq.km)

Sl. No.	State/ Union Territory	Forest Department					Others		
		Reserved	Protected	Unclassed	Total	Area Under Sanctioned Working Plans	Revenue Department	Corporate Bodies Forest/ Forest Community Ownership	Private Forest
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	50479.00	12365.00	975.00	63819.00	Nil	Nil	Nil	Nil
2	Arunachal Pradesh	9552.32	7.80	31771.52	41331.64	9247.84	1544.17	Nil	N.A.
3	Assam	17421.94	2814.63	5893.99	26130.56	N.A.	N.A.	N.A.	N.A.
4	Bihar	5051.43	25019.51	7.09	30078.03	30078.00	12200.00	10160.00	Nil
5	Delhi	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
6	Goa	N.A.	N.A.	319.84	319.84	1224.00	N.A.	N.A.	200.00
7	Gujarat	13741.25	395.62	4641.13	18778.00	14083.58	N.A.	N.A.	N.A.
8	Haryana	249.00	1154.00	21.00	1424.00	427.91	N.A.	N.A.	127.00
9	Himachal Pradesh	1896.00	33043.00	976.00	35915.00	24535.00	N.A.	42.00	1076.00
10	Jammu & Kashmir	N.A.	20230.00	N.A.	20230.00	20194.00	N.A.	N.A.	N.A.
11	Karnataka	28689.96	3930.72	5231.00	37851.68	17102.01	124.20	N.A.	308.42
12	Kerala	9371.30	1752.94	N.A.	11124.23	1028.39	N.A.	N.A.	N.A.
13	Madhya Pradesh	82700.13	66693.79	5112.48	154506.40	1545506.40	N.A.	N.A.	N.A.
14	Maharashtra	43898.00	8025.00	3455	55378.00	41045.00	2422.00	3559.00	558.00
15	Manipur	1467.00	4141.00	11780.00	17418.00	N.A.	N.A.	N.A.	N.A.
16	Meghalaya	712.74	12.39	399.48	1124.61	294.41	N.A.	N.A.	N.A.
17	Mizoram	6798.00	1045.00	N.A.	7843.00	Nil	Nil	2622.00	Nil
18	Nagaland	85.83	507.56	192.47	785.86	Nil	Nil	N.A.	7621.09
19	Orissa	26329.12	15524.46	20.55	41874.13	30281.45	16261.34	N.A.	12.29
20	Punjab	43.36	1111.67	196.55	1351.58	1349.22	N.A.	873.35	831.15
21	Rajasthan	11780.66	17604.03	2924.45	32309.14	N.A.	N.A.	N.A.	N.A.
22	Sikkim	5652.50	N.A.	6760.25	12412.75	N.A.	N.A.	N.A.	N.A.
23	Tripura	35188.18	509.02	2195.47	6292.68	459.60	N.A.	N.A.	N.A.
24	Uttar Pradesh	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
25	West Bengal	7054.00	3772.00	1053.00	11879.00	11381.00	N.A.	N.A.	N.A.
26	A&N Islands	2928.76	4241.93	Nil	7170.69	5628.62	Nil	Nil	Nil
27	D&N Haveli	198.76	4.82	N.A.	209.58	198.76	N.A.	N.A.	N.A.
28	Daman & Diu	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
29	Chandigarh	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
30	Lakshadweep	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
31	Pondicherry	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Total	**361289.24**	**223905.89**	**83926.27**	**669121.40**	**1754065.19**	**32551.71**	**17256.35**	**10733.95**

Source : *Forestry Statistics India, 2001*

TABLE 3.2.3(b) : FOREST AREA BY COMPOSITION (AS ON 31-3-2000)

(sq.km)

Sl. No.	State/ Union Territory	Coniferous forest			Broad Leaved Forest				Mixed Coniferous/ Broad leaved	Total
		Chir	Deodar	Others Conifers	Sal	Teak	Mixed Leaved	Mangrove Fore		
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	Nil	Nil	Nil	47.00	9145.00	54103.00	519.00	N.A.	N.A.
2	Arunachal Pradesh	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
3	Assam	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
4	Bihar	Nil	Nil	Nil	22378.00	8.91	7691.12	Nil	Nil	30078.03
5	Delhi	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
6	Goa	N.A.	N.A.	N.A.	N.A.	92.08	1130.14	1.78	N.A.	1224.00
7	Gujarat	N.A.	N.A.	N.A.	N.A.	N.A.	6430.00	3979.00	N.A.	10409.00
8	Haryana	23.00	N.A.	N.A.	30.00	N.A.	1371.00	N.A.	N.A.	1424.00
9	Himachal Pradesh	1436.00	811.00	6685.00	183.00	N.A.	1079.00	N.A.	5880.00	16074.00
10	Jammu & Kashmir	1825.00	1075.00	5369.00	N.A.	N.A.	1885.00	N.A.	10076.00	20230.00
11	Karnataka	N.A.	N.A.	N.A.	N.A.	N.A.	38224.28	60.00	N.A.	38284.28
12	Kerala	N.A.	N.A.	N.A.	N.A.	4100.00	7024.23	N.A.	N.A.	11124.23
13	Madhya Pradesh	Nil	Nil	Nil	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
14	Maharashtra	N.A.	N.A.	N.A.	N.A.	9161.00	31776.00	108.00	N.A.	41045.00
15	Manipur	Nil	Nil	2442.77	Nil	610.74	9444.00	Nil	4886.49	17384.00
16	Meghalaya	N.A.	N.A.	145.14	N.A.	N.A.	732.94	N.A.	N.A.	878.08
17	Mizoram	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
18	Nagaland	Nil	Nil	277.50	Nil	Nil	2269.00	Nil	Nil	2546.50
19	Orissa	N.A.	N.A.	3.99	16938.25	2030.64	21024.34	215.00	N.A.	40212.22
20	Punjab	121.75	N.A.	N.A.	N.A.	N.A.	2907.74	N.A.	26.59	3056.08
21	Rajasthan	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
22	Sikkim	N.A.	N.A.	903.45	80.57	N.A.	1799.71	N.A.	N.A.	2783.73
23	Tamil Nadu	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	21.00	19294.00	19315.00
24	Tripura	N.A.	N.A.	N.A.	270.31	1510.15	4163.56	N.A.	N.A.	5944.02
25	Uttar Pradesh	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
26	West Bengal	N.A.	N.A.	89.00	N.A.	N.A.	N.A.	2109.00	9681.00	11879.00
27	A&N Islands	N.A.	N.A.	N.A.	N.A.	N.A.	6204.69	966.00	N.A.	7170.69
28	D&N Haveli	N.A.	N.A.	N.A.	N.A.	N.A.	203.58	N.A.	203.58	407.16
29	Daman & Diu	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
30	Chandigarh	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	32.43	32.43
31	Lakshadweep	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
32	Pondicherry	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
	Total	3405.75	1886.00	15915.85	39927.13	26658.52	199463.33	7978.78	50080.09	345315.45

Source : Forestry Statistics India, 2001

TABLE 3.2.4 : CUMULATIVE AREA OF FOREST PLANTATIONS BY ALL AGENCIES IN THE STATES/ UT'S FROM 1951 TO 1999

('000 ha)

Sl. No.	State/UT's	Total Cumulative Plantation Area	Area of Block Plantation	Area Covered from Seedlings Distributed
1	2	3	4	5
1	Andhra Pradesh	2496.56	1260.30	1236.26
2	Arunachal Pradesh	160.95	155.73	5.22
3	Assam	451.78	433.58	18.20
4	Bihar	1326.23	942.12	384.11
5	Delhi	44.05	20.18	23.87
6	Goa	65.60	46.04	19.56
7	Gujarat	2981.08	1293.95	1687.13
8	Haryana	742.74	597.02	145.72
9	Himachal Pradesh	719.44	665.84	53.60
10	Jammu & Kashmir	382.43	323.04	59.39
11	Karnataka	2163.22	1573.19	590.03
12	Kerala	688.12	483.63	204.49
13	Madhya Pradesh	3364.13	2848.52	515.61
14	Maharashtra	2965.07	2130.39	834.68
15	Manipur	154.76	139.69	15.07
16	Meghalaya	164.48	130.67	33.81
17	Mizoram	308.55	255.73	52.82
18	Nagaland	174.20	116.43	57.77
19	Orissa	1827.41	1458.49	368.92
20	Punjab	512.38	417.60	94.78
21	Rajasthan	1410.10	1150.79	259.31
22	Sikkim	119.23	107.53	11.70
23	Tamil Nadu	2268.18	1616.18	652.00
24	Tripura	246.64	215.61	31.03
25	Uttar Pradesh	4185.77	1844.36	2341.41
26	West Bengal	1157.73	610.93	546.80
27	Andaman & Nicobar Islands	88.14	83.13	5.01
28	Chandigarh	10.07	9.85	0.22
29	Dadra & Nagar Haveli	18.36	11.01	7.35
30	Daman & Diu	1.39	0.85	0.54
31	Lakshadweep	2.50	0.57	1.93
32	Pondicherry	7.88	1.91	5.97
	Total	**31209.17**	**20944.86**	**10264.31***

Source : *State of Forest Report, 1999*

* : *The area has been estimated by FSI using 1990-1999 figures of NAEB MOEF where breakup of block plantation and seedlings distributed are available.*

TABLE 3.2.5(a) : COMPARATIVE SITUATION OF FOREST COVER IN INDIA

Sl. No.	States/Uts	2001 Assessment	1999 Assessment	1997 Assessment	Change in 2001 (3-4)	Change in 1999 (4-5)
1	2	3	4	5	6	7
1	Andhra Pradesh	44637	44229	43290	+408	+939
2	Arunachal Pradesh	68045	68847	68602	-802	+245
3	Assam	27714	23688	23824	+4026	-136
4	Bihar	5720	4830	4832	+890	-2
5	Chhatisgarh	56448	56693	56435	-245	+258
6	Delhi	111	88	26	+23	+62
7	Goa	2095	1251	1252	+844	-1
8	Gujarat	15152	12965	12578	+2187	+387
9	Haryana	1754	964	604	+790	+360
10	Himachal Pradesh	14360	13082	12521	+1278	+561
11	Jammu & Kashmir	21237	20441	20440	+796	+1
12	Jharkhand	22637	21644	21692	+993	-48
13	Karnataka	36991	32467	32403	+4524	+64
14	Kerala	15560	10323	10334	+5237	-11
15	Madhya Pradesh	77265	75137	74760	+2128	+377
16	Maharashtra	47482	46672	46143	+810	+529
17	Manipur	16926	17384	17418	-458	-34
18	Meghalaya	15584	15633	15657	-49	-24
19	Mizoram	17494	18338	18775	-844	-437
20	Nagaland	13345	14164	14221	-819	-57
21	Orissa	48838	47033	46941	+1805	+92
22	Punjab	2432	1412	1387	+1020	+25
23	Rajasthan	16367	13871	13353	+2496	+518
24	Sikkim	3193	3118	3129	+75	-11
25	Tamil Nadu	21482	17078	17064	+4404	+14
26	Tripura	7065	5745	5546	+1320	+199
27	Uttar Pradesh	13746	10756	10751	+2990	+5
28	Uttaranchal	23938	23260	23243	+678	+17
29	West Bengal	10693	8362	8349	+2331	+13
30	A. & N. Islands	6930	7606	7613	-676	-7
31	Chandigarh	9	7	7	+2	+0
32	Dadra & Nagar Haveli	219	202	204	+17	-2
33	Daman & Diu	6	3	3	+3	0
34	Lakshadweep	27	0	0	+27	0
35	Pondicherry	36	0	0	+36	0
	Total	**675538**	**637293**	**633397**	**+38245**	**+3896**

Source : *State of Forest Report, 2001*

*: *Including Mangroves*

In the year 2001, as compared to 1999, the total forest cover had increased by 38245 Sq. Kms. The states which have shown significant decrease in the forest covers are Arunachal Pradesh, Chhatisgarh, Meghaleya, Manipur, Mizoram, Nagaland, A & N Islands. Whereas the states of Assam, Bihar, Himachal Pradesh, Karnataka, Tamil Nadu, Gujarat, Maharashtra, Punjab, West Bengal and Rajasthan have shown an increase in forest cover. However, it has increased in 1999 by 3896 Sq. Kms. as compared to 1997.

TABLE 3.2.5(b) : CHANGE IN FOREST COVER OF THE NORTH-EASTERN REGION DURING 1990s

(Sq. Km.)

Sl. No.	State	Forest Cover 1999 Assessment	Change during different assessments			
			1993-95	1995-97	1997-99	1999-2001
1	2	3	5	6	7	8
1	Arunachal Pradesh	68847	-40	-19	+245	-802
2	Assam	23688	-447	-237	-136	+4026
3	Manipur	17384	-63	-140	-34	-458
4	Meghalaya	15633	-55	-57	-24	-49
5	Mizoram	18338	-121	+199	-437	-844
6	Nagaland	14164	-57	-70	-57	-819
7	Tripura	5745	0	+8	+199	+1320
	Total	**163799**	**-783**	**-316**	**-244**	**+2374**

Source : *State of Forest Report, 2001*

The forest cover in the North-Eastern Region (NER) is about 64% of the Geographical Area.

The forest cover decrease in the NER was maximum during the year 1993-95. However, there has been significant increase in the forest cover in 2001 over the year 1999 by 2374 sq. km. mainly due to increase in the forest area cover in Assam and Tripura while other NE States have shown decrease in forest cover in the same period.

TABLE: 3.2.6: FOREST PRODUCTS OF INDIA

('000 cum)

Sl.No.	Forest Produce		1991	1992	1993	1994	1995
1	2		3	4	5	6	7
1	Roundwood	C	10055	10200	10345	10489	10636
		NC	256732	261427	266123	270818	275615
2	Fuelwood	C	7286	7429	7572	7715	7860
		NC	235000	239600	244200	248800	253500
3	Industrial Roundwood	C	2769	2771	2773	2774	2776
		NC	21732	21827	21923	22018	22115
4	Pulp wood	C	145	145	145	145	145
		NC	1063	1063	1063	1063	1063
5	Sawnwood	C	2500	2500	2500	2500	2500
		NC	14960	14960	14960	14960	14960
6	Wood based Pannels		378	357	348	348	348
7	Veneer Sheets		24	18	7	7	7
8	Plywood		250	231	245	245	245
9	Particle Board		59	60	60	60	60
10	Fibre Board		45	48	36	36	36
11	Wood Pulp		986	987	1147	1196	1205
12	News Print		300	320	320	350	400
13	Printing & Writing Paper		990	1060	1085	1112	1150

Source : Forestry Statistics India, 2000
C : Coniferous
NC : Non Coniferous

TABLE 3.2.7 :STATE-WISE PRODUCTION OF FOREST PRODUCE

Sl. No.	State/Uni Territoy	Timber (Cu. Metre)		Poles (Cu. Metre)		Pulp & Matchwood (Cu. Metre)		Fuelwood (Metric Tonne)	
		1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	43663.00	42838.00	N.A.	N.A.	54602.00	61633.00	1000975.00	105099.00
2	Arunachal Pradesh	61586.64	44705.79	27.60	20.39	N.A.	N.A.	11138.00	5292.00
3	Assam								
4	Bihar	17008.00	8034.00	4621.00	2154.00	Nil	Nil	840000.00	392000.00
5	Delhi								
6	Goa	13.32	5.70	2.00	N.A.	N.A.	N.A.	N.A.	23.40
7	Gujarat	34402.00	22654.00	N.A.	N.A.	N.A.	N.A.	19187.00	21775.00
8	Haryana	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
9	Himachal Pradesh	411999.00	N.A.	N.A.	N.A.	N.A.	N.A.	5432.00	N.A.
10	Jammu & Kashmir	217120.00	165030.00	N.A.	N.A.	N.A.	N.A.	1101.00	1306.00
11	Karnataka	65036.00	58705.00	1145.00	2059.00	269031.00	216312.00	1248863.00	1288322.00
12	Kerala	26664.00	44519.26	8252.00	13662.00	162304.00	128094.36	64484.00	49669.00
13	Madhya Pradesh	391517.00	159019.00	N.A.	N.A.	Nil	Nil	781977.00	328979.00
14	Maharashtra	N.A.	75300.00	N.A.	N.A.	N.A.	N.A.	N.A.	749648.00
15	Manipur	3503.97	149.51	N.A.	N.A.	N.A.	N.A.	29780.53	26477.00
16	Meghalaya	607.08	N.A.	Nil	N.A.	Nil	N.A.	Nil	N.A.
17	Mizoram	560.66	661.61	144.00	20.00	Nil	Nil	14193.00	22684.00
18	Nagaland	45924.00	20842.00	N.A.	N.A.	N.A.	N.A.	32766.00	2810.00
19	Orissa	33134.48	N.A.	83.25	N.A.	N.A.	N.A.	17509.58	N.A.
20	Punjab	78592.00	164824.00	N.A.	N.A.	N.A.	N.A.	2119.00	5984.00
21	Rajasthan	574.60	4874.00	Nil	Nil	Nil	Nil	51394.00	37500.00
22	Sikkim	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
23	Tamil Nadu	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
24	Tripura	N.A.	N.A.	N.A.	N.R.	N.A.	N.A.	N.A.	N.A.
25	Uttar Pradesh	476480.00	N.R.	N.A.	N.A.	N.A.	N.R.	38482.50	N.R.
26	West Bengal	43487.00	76875.00	42833.00	67941.00	6917.00	54501.00	512162.00	858470.00
27	A & N Islands	52342.00	42426.00	6637.20	6505.11	10291.00	5208.00	107261.00	81420.50
28	D. & N. Haveli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
29	Chandigarh	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
30	Lakshadweep	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
31	Pondicherry	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
	Total	**2004214.75**	**931462.87**	**63745.05**	**92361.50**	**503145.00**	**465748.36**	**4778824.61**	**3977458.90**

TABLE 3.2.7 :STATE-WISE PRODUCTION OF FOREST PRODUCE —Contd.

Sl. No.	State/Union Territory	Sal Seed (M. Tonne)		Tendu/Kendu/Biddi Leaves (M. Tonne)		Gums (Metric Tonne)		Resin (Metric Tonne)	
		1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000
1	2	11	12	3	4	5	6	7	8
1	Andhra Pradesh	Nil	Nil	50761.92	51246.72	655.61	669.10	Nil	Nil
2	Arunachal Pradesh	N.A.	N.A.	N.A.	N.A.	Nil	Nil	433376 blaze	13851 blaze
3	Assam	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
4	Bihar	7500.00	840.00	52900.00	53500.00	Nil	Nil	Nil	Nil
5	Delhi					N.A.	N.A.	N.A.	N.A.
6	Goa	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
7	Gujarat	N.A.	N.A.	12695.70	12899.15	350.80	190.20	N.A.	N.A.
8	Haryana	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
9	Himachal Pradesh	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	7201.00	N.A.
10	Jammu & Kashmir	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	110.20	107.98
11	Karnataka	N.A.	N.A.	862.00	742.00	11.00	3.00	N.A.	N.A.
12	Kerala	Nil	Nil	Nil	Nil	N.A.	N.A.	Nil	N.A.
13	Madhya Pradesh	44179.00	77635.00	224000.00	246000.00	567.20	808.30	N.A.	N.A.
14	Maharashtra	Nil	Nil	N.A.	33018.00	N.A.	753.10	N.A.	Nil9
5	Manipur	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	9.40	14.40
16	Meghalaya	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
17	Mizoram	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
18	Nagaland	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
19	Orissa	6100.72	N.A.	39000.00	N.A.	395.95	N.A.	N.A.	N.A.
20	Punjab	Nil	Nil	Nil	Nil	Nil	Nil	827.00	819.00
21	Rajasthan	Nil	Nil	2475.00	2835.00	N.A.	N.A.	Nil	Nil
22	Sikkim	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
23	Tamil Nadu	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
24	Tripura	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
25	Uttar Pradesh	N.A.	N.A.	2092.00	N.A.	163.50	N.A.	5766.50	N.A.
26	West Bengal	Nil	264.68	159.00	569.00	Nil	Nil	Nil	Nil
27	A & N Islands	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
28	D. & N. Haveli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
29	Chandigarh	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
30	Lakshadweep	N/A	N/A	N/A	N/A	Nil	Nil	Nil	Nil
31	Pondicherry	N/A	N/A	N/A	N/A	N.A.	N.A.	N.A.	N.A.
	Total	**57779.72**	**78739.68**	**384945.62**	**400809.87**	**2144.06**	**2423.70**	**13914.10**	**941.38**

TABLE 3.2.7 :STATE-WISE PRODUCTION OF FOREST PRODUCE —Concld.

Sl. No.	State/Union Territory	Canes /Rattans		Bamboo		Grass & Fodder (Metric Tonne)		Lac (Metric Tonne)	
		1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000	1998-99	1999-2000
1	2	9	10	11	12	13	14	15	16
1	Andhra Pradesh	Nil	Nil	60042 Mt	65663 Mt	1294.00	1372	Nil	Nil
2	Arunachal Pradesh	20853504 RM	2203704 RM	33165 Nos.	73436 Nos.	Nil	Nil	Nil	Nil
3	Assam	N.A.	N.A.	N.A.	N.A.				
4	Bihar	Nil	Nil	Nil	Nil	Nil	Nil	23.20	10.80
5	Delhi	N.A.	N.A.	N.A.	N.A.				
6	Goa	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
7	Gujarat	1.1 Mt.	1.7 Mt.	114000 Mt	99700 Mt	12434.00	11071	N.A.	N.A.
8	Haryana	N.A.	N.A.	1877615 Nos.	N.A.	N.A.	N.A.	N.A.	N.A.
9	Himachal Pradesh	N.A.	N.A.	N.A.	N.A.	511	N.A.	N.A.	N.A.
10	Jammu & Kashmir	N.A.	N.A.	N.A.	N.A.	2.50	2.05	N.A.	N.A.
11	Karnataka	578891 Nos.	112353 Nos.	83867 Mt	105293 Mt	1400	1673	N.A.	N.A.
12	Kerala	Nil	Nil	208911 Mt	88708 Mt	30.88	N.A.	Nil	N.A.
13	Madhya Pradesh	N.A.	N.A.	201223 N.T.	137797 N.T.	N.A.	N.A.	N.A.	N.A.
14	Maharashtra	N.A.	Nil	N.A.	236725	N.A.	11908.00	—	301.80
15	Manipur	165200 Nos.	212500 Nos.	700222 Nos.	940015 Nos.				
16	Meghalaya	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
17	Mizoram	48664 RM	300 RM	18118613 Nos.	19173928 Nos.	N.A.	N.A.	N.A.	N.A.
18	Nagaland	N.A.	N.A.	5907150 Nos.	256550 Nos.	Nil	Nil	Nil	Nil
19	Orissa	3463086 Nos.	N.A.	134454 N.T.	N.A.	311.90	N.A.	1.42	N.A.
20	Punjab	Nil	Nil	419285	435331	193930.00	197574.00	Nil	Nil
21	Rajasthan	Nil	Nil	2055000 Nos.	2057000Nos.	N.A.	N.A.	N.A.	N.A.
22	Sikkim	Nil	Nil	N.A.	N.A.	Nil	Nil	Nil	Nil
23	Tamil Nadu	Nil	Nil	Nil	Nil	N.A.	N.A.	N.A.	N.A.
24	Tripura	N.A.	N.A.	52600000 Nos.	68900000 Nos.	N.A.	N.A.	N.A.	N.A.
25	Uttar Pradesh	205 Bundle	N.A.	3414520 Nos.	N.A.	3940.30	N.A.	N.A.	N.A.
26	West Bengal	Nil	Nil	2500 Nos.	2750 Nos.	Nil	Nil	Nil	Nil
27	A & N Islands	586410 RM	382254 RM	1200275 Nos.	1243139Nos.	Nil	Nil	Nil	Nil
28	D. & N. Haveli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
29	Chandigarh	Nil	Nil	Nil	Nil	N.A.	N.A.	Nil	Nil
30	Lakshadweep	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
31	Pondicherry	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Source: *Forestry Statistics India 2001*

RM: Running Metre

TABLE 3.2.8 : PHYSIOGRAPHIC ZONE WISE TREE COVER ESTIMATES

Sl. No.	Physiographic Zone	Geographic Area (Km²)	CNFA (Km²)	Trees per ha	Number of Trees (000)	Tree Cover		
						Area (Km²)	% of Geog.	% of CNFA
1	2	3	4	5	6	7	8	9
1	W. Himalayas	338556	94004	14.70	138462	3069	0.91	3.26
2	E. Himalayas	65317	10390	9.80	10224	392	0.60	3.7
3	North East	123138	30013	14.10	42291	642	0.52	2.14
4	Northern Plains	307489	277818	15.60	434517	10098	3.28	3.6
5	Eastern Plains	234215	163730	15.30	250607	8323	3.55	5.0
6	Western Plains	319098	302495	2.60	77821	3875	1.21	1.28
7	Central Highlands	366706	282029	8.00	226749	7077	1.93	2.51
8	North Deccan	355988	260951	9.40	246593	6905	1.94	2.65
9	East Deccan	331525	200006	9.00	179637	9760	2.94	4.88
10	South Deccan	292416	232236	11.40	265327	11468	3.92	4.94
11	Western Ghats	69703	38260	23.50	90078	3957	5.68	10.34
12	Eastern Ghats	191698	129856	5.60	72801	1788	0.93	1.38
13	West Coast	123921	91603	18.20	166406	3699	2.98	4.04
14	East Coast	167493	132042	19.70	260081	10419	6.22	7.89
	Total	**3287263**	**2245431**	**11.0**	**2461593**	**81472**	**2.48**	**3.63**

Source : *State of Forest Report, 2001*

TABLE 3.2.9 : STATE/UT WISE TREE COVER ESTIMATES

Sl. No.	State/UT	Geographic Area (Km^2)	CNFA (Km^2)	Trees per ha	Number of Trees (000)	Tree Cover		
						Area (Km^2)	% of Geog.	% of CNFA
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	275069	205673	11.2	230923	9011	3.28	4.38
2	Arunachal Pradesh	83743	14792	11.1	16432	478	0.57	3.23
3	Assam	78438	40827	15.1	61804	1942	2.48	4.76
4	Bihar	94163	73556	14.8	109004	3693	3.92	5.02
5	Chhattisgarh	135191	73464	8.8	64981	3535	2.62	4.81
6	Delhi	1483	1353	12.5	1688	40	2.69	2.95
7	Goa	3702	1559	18.0	2801	62	1.68	3.98
8	Gujarat	196022	172915	8.1	139396	4036	2.06	2.33
9	Haryana	44212	42049	15.6	65598	1526	3.45	3.63
10	Himachal Pradesh	55673	12091	14.8	17850	397	0.71	3.28
11	Jammu & Kashmir	222236	68258	14.7	100287	2217	1.00	3.25
12	Jharkhand	79714	54339	9.1	49669	2694	3.38	4.96
13	Karnataka	191791	147993	11.8	174997	7446	3.88	5.03
14	Kerala	38863	22731	18.8	42652	1146	2.95	5.04
15	Madhya Pradesh	308245	208981	8.6	179304	5751	1.87	2.75
16	Maharashtra	307713	236441	11.4	269356	8269	2.69	3.50
17	Manipur	22327	4517	14.1	6365	95	0.43	2.11
18	Meghalaya	22429	6756	14.1	9523	140	0.62	2.07
19	Mizoram	21081	3576	14.1	5030	95	0.45	2.66
20	Nagaland	16579	3214	14.1	4529	70	0.42	2.19
21	Orissa	155707	94359	10.5	98873	4364	2.80	4.62
22	Punjab	50362	45204	15.6	70402	1634	3.24	3.61
23	Rajasthan	342239	306523	4.6	140446	5286	1.54	1.72
24	Sikkim	7096	443	14.7	651	14	0.20	3.25
25	Tamil Nadu	130058	103768	15.2	157418	6054	4.65	5.83
26	Tripura	10486	3376	14.1	4759	68	0.65	2.03
27	Uttar Pradesh	240928	216864	14.6	317561	7545	3.13	3.48
28	Uttaranchal	53483	13180	15.0	19798	448	0.84	3.40
29	West Bengal	88752	64690	14.8	95723	3264	3.68	5.05
30	A. & N. Islands	8249	1060	19.7	2092	83	1.01	7.87
31	Chandigarh	114	81	9.4	76	2	1.63	2.29
32	Dadra & Nagar Haveli	491	261	24.2	631	27	5.54	10.42
33	Daman & Diu	112	105	13.4	141	4	3.29	3.50
34	Lakshadweep	32	3	13.5	4	0	0.27	2.76
35	Pondicherry	480	431	19.3	830	35	7.19	8.01
	Total	**3287263**	**2245431**	**11.0**	**2461594**	**81471**	**2.48**	**3.63**

Source : *State of Forest Report, 2001*

TABLE 3.2.10 : ESTIMATES OF GROWING STOCK IN INDIA BASED ON THE FOREST COVER AREA AND INVENTORY RESULTS

Sl. No.	Name of State/UT	Forest Cover Area			Estimated Total Growing Stock				
		Dense Forest (sq.km)	Open Forest (sq.km)	Total Forest (sq.km)	Dense Forest (000cu m)	Open Forest (000cu m)	Total Forest (mill cu m)	Overall Volume%age of Growing Per ha (cu m)	Stock to Total
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	25008	22248	47256	211265	80129	291.39	61.66	6.15
2	Arunachal Pradesh	54510	14151	68661	702969	72156	775.13	112.80	16.35
3	Assam	15998	8510	24508	248057	56366	304.42	124.20	6.42
4	Bihar	13172	13415	26587	65634	31086	96.72	36.38	2.04
5	Goa, Daman & Diu	995	255	1250	12235	409	12.64	101.16	0.27
6	Gujarat	6301	5743	12044	42633	21288	63.92	53.07	1.35
7	Haryana	329	184	513	1266	166	1.43	27.92	0.03
8	Himachal Pradesh	9565	2937	12502	237030	17380	254.41	203.50	5.37
9	Jammu & Kashmir	10953	9490	20443	328543	130386	458.93	224.49	9.68
10	Karnataka	24852	7491	32343	250249	22162	272.41	84.23	5.75
11	Kerala	8421	1915	10336	82082	16801	98.88	95.67	2.08
12	Madhya Pradesh	95537	39859	135396	592931	105251	698.18	51.56	14.73
13	Maharashtra	25680	18179	43859	173740	51814	225.55	51.43	4.76
14	Manipur	5307	12314	17621	59309	36143	95.45	54.10	2.01
15	Meghalaya	3305	12464	15769	51024	53116	104.14	66.00	2.20
16	Mizoram	4238	14459	18697	29487	36525	66.01	35.30	1.39
17	Nagaland	3487	10861	14348	42622	52265	94.89	66.10	2.00
18	Orissa	27151	19994	47145	183737	62413	246.15	52.21	5.19
19	Punjab	481	862	1343	556	394	0.95	7.07	0.02
20	Rajasthan	3581	9518	13099	6107	6785	12.89	9.84	0.27
21	Sikkim	2395	724	3119	35032	4254	39.29	125.90	0.83
22	Tamil Nadu	9422	8304	17726	49283	20319	69.60	39.31	1.47
23	Tripura	1819	3719	5538	6219	9233	15.45	27.90	0.33
24	Uttar Pradesh	22965	10996	33961	300889	37744	338.63	99.71	7.14
25	West Bengal	3362	2705	6067	21257	1602	22.86	37.68	0.48
26	Andaman & Nicobar Island	6567	91	6658	79247	397	79.64	119.62	1.68
27	Chandigarh	4	1	5	NA	NA	NA	NA	NA
28	Dadra & Nagar Haveli	159	47	206	817	54	0.87	42.20	0.02
29	Delhi	12	10	22	NA	NA	NA	NA	NA
30	Lakshadweep	NA	NA	NA	NA	NA	NA	NA	NA
31	Pondicherry	NA	NA	NA	NA	NA	NA	NA	NA
	Total (Excluding Mangrove forests)	**385576**	**251446**	**637022**	**3814220**	**926638**	**4740.86**	**74.42**	**100.00**

Source: *Forest Survey of India: Extent,Composition,Density,Growing Stock and Annual Increment of India's Forests (1995)*

TABLE 3.2.11 : ESTIMATES OF WASTELANDS IN INDIA

(Thousand Sq. Km.)

Sl. No.	States/Uts.	Non Forest Degraded Area	Forest Degraded Area	Total
1	2	3	4	5
1	Andhra Pradesh	76.82	37.34	114.16
2	Assam	9.35	7.95	17.30
3	Bihar	38.96	15.62	54.58
4	Gujarat	71.53	6.83	78.36
5	Haryana	24.04	0.74	24.78
6	Himachal Pradesh	14.24	5.34	19.58
7	Jammu & Kashmir	5.31	10.34	15.65
8	Karnataka	71.22	20.43	91.65
9	Kerala	10.53	2.26	12.79
10	Madhya Pradesh	129.47	71.95	201.42
11	Maharashtra	115.6	28.41	144.01
12	Manipur	0.14	14.24	14.38
13	Meghalaya	8.15	11.03	19.18
14	Nagaland	5.08	8.78	13.86
15	Orissa	31.57	32.27	63.84
16	Punjab	11.51	0.79	12.30
17	Rajasthan	180.01	19.33	199.34
18	Sikkim	1.31	1.5	2.81
19	Tamilnadu	33.92	10.09	44.01
20	Tripura	1.08	8.65	9.73
21	Uttar Pradesh	66.35	14.26	80.61
22	West Bengal	21.77	3.59	25.36
23	UTs	8.89	27.15	36.04
	Total	**936.91**	**358.89**	**1295.80**

Source : *Forestry Statistics India, 2000*

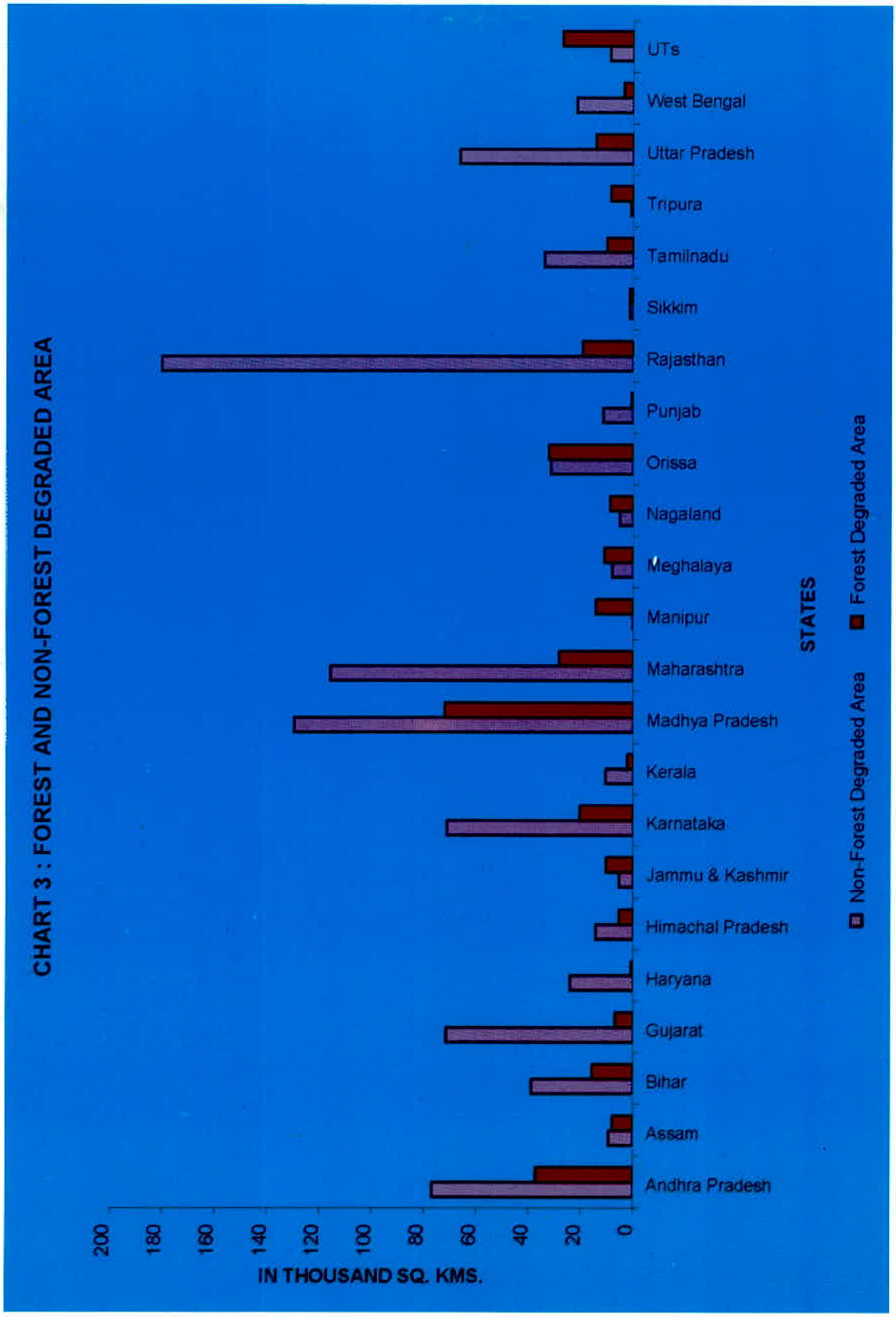


CHART 3 : FOREST AND NON-FOREST DEGRADED AREA
UTs
West Bengal
Uttar Pradesh
Tripura
Tamilnadu
Sikkim
Rajasthan
Punjab
Orissa
Nagaland
Meghalaya
Manipur
Maharashtra
Madhya Pradesh
Kerala
Karnataka
Jammu & Kashmir
Himachal Pradesh
Haryana
Gujarat
Bihar
Assam
Andhra Pradesh
STATES
Non-Forest Degraded Area
Forest Degraded Area
0
20
40
60
80
100
120
140
160
180
200
IN THOUSAND SQ. KMS.

TABLE 3.2.12 : ESTIMATES OF NON-FOREST WASTELANDS IN INDIA

(000' Sq.km)

Sl. No.	States/UTs.	Saline & Alkaline Lands	Wind Eroded Area	Water Eroded Area	Total
1	2	3	4	5	6
1	Andhra Pradesh	2.40	....	....	76.82
2	Assam	....	....	9.35	9.35
3	Bihar	0.04	....	38.92	38.96
4	Gujarat	12.14	7.04	52.35	71.53
5	Haryana	5.26	15.99	2.76	24.01
6	Himachal Pradesh	....	....	14.24	14.24
7	Jammu & Kashmir	....	....	5.31	5.31
8	Karnataka	4.04		67.18	71.22
9	Kerala	0.16	....	10.37	10.53
10	Madhya Pradesh	2.42	....	127.05	129.47
11	Maharashtra	5.34	....	110.26	115.6
12	Manipur	....	....	0.14	0.14
13	Meghalaya	....	....	8.15	8.15
14	Nagaland	....	....	5.08	5.08
15	Orissa	4.04	....	27.53	31.57
16	Punjab	6.88	....	4.63	11.51
17	Rajasthan	7.28	106.23	66.59	180.1
18	Sikkim	....	....	1.31	1.31
19	Tamilnadu	0.04	....	33.88	33.92
20	Tripura	....	....	1.08	1.08
21	Uttar Pradesh	12.95	....	53.4	66.35
22	West Bengal	8.5	....	13.27	21.77
23	Uts	0.16	....	8.73	8.89
	Total	**71.65**	**129.26**	**736**	**936.91**

Source : *Forestry Statistics India, 2000.*

TABLE 3.2.13 : DIVERSION OF FOREST LAND FOR NON FOREST USE SINCE THE ENFORCEMENT OF FOREST CONSERVATION ACT,1980

(Area in ha.)

Sl.No.	Year	Forest Land Diversion
1	2	3
1	1980	Nil
2	1981	2672.04
3	1982	3246.54
4	1983	5702.01
5	1984	7837.59
6	1985	10608.07
7	1986	11963.11
8	1987	72780.05
9	1988	18765.35
10	1989	20365.05
11	1990	138551.38
12	1991	625.21
13	1992	5686.94
14	1993	11785.64
15	1994	13527.69
16	1995	46158.52
17	1996	8764.79
18	1997	16313.20
19	1998	12630.00

Source : *Forestry Statistics India, 2000*

* *1990 data Includes :*

I. 1.83 lakh ha. for regularisation of encroachments in MP

II. 0.12 lakh ha. for field firing range of Indian Army in Sagar

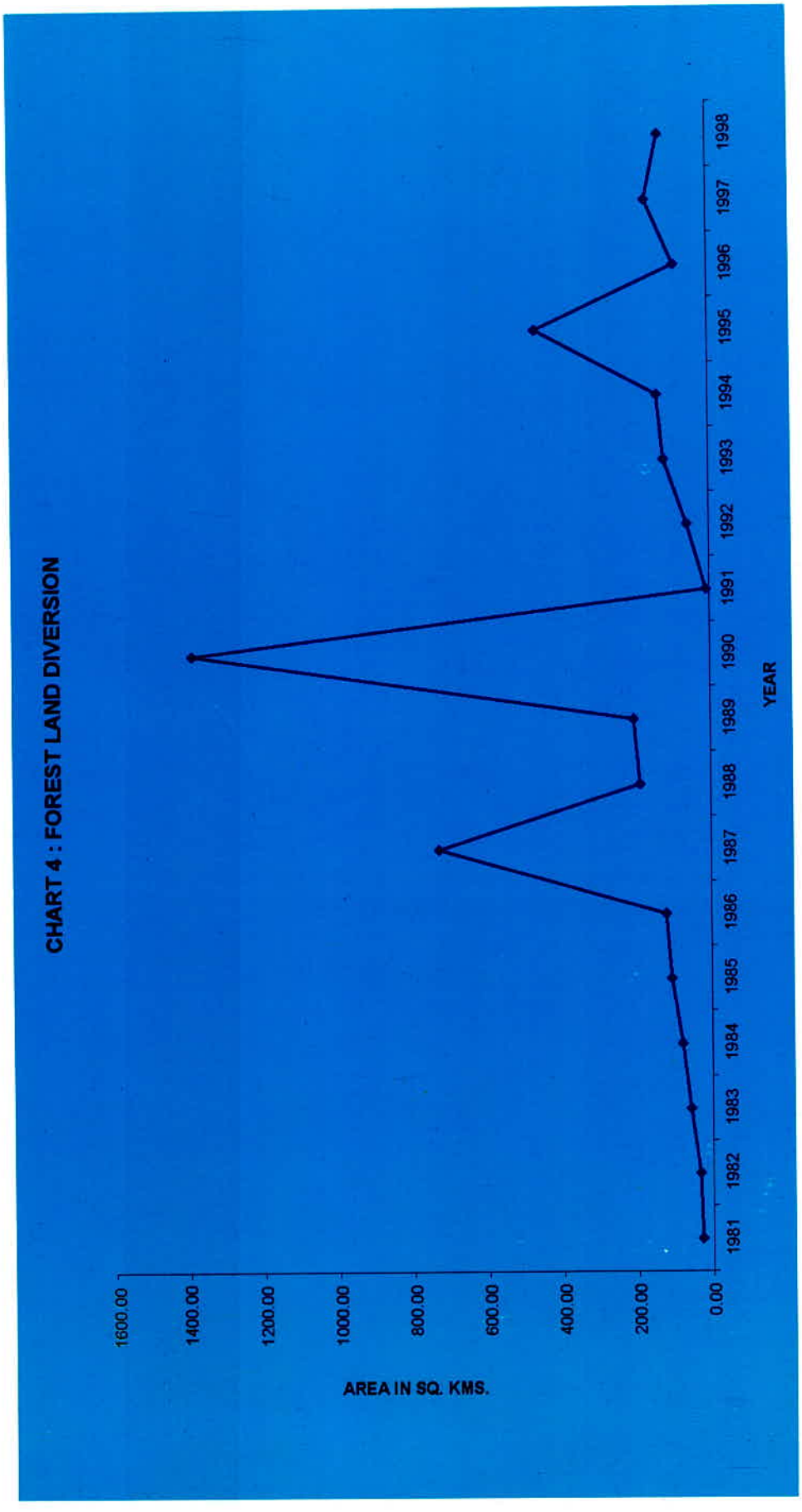


CHART 4 : FOREST LAND DIVERSION
AREA IN SQ. KMS.
1600.00
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
YEAR

TABLE 3.2.14 : AREA UNDER JOINT FOREST MANAGEMENT

Sl. No.	State/Uts	Date of Notification	No. of JFM Committees	Area Under JFM ('000ha)
1	2	3	4	5
1	Andhra Pradesh	28.09.92	6575	1632.19
2	Arunachal Pradesh	03.10.97	10	5.29
3	Assam	10.11.98	101	3.06
4	Bihar	08.11.90	1675	935.08
6	Gujarat	13.03.91	706	91.07
7	Himachal Pradesh	12.05.93	203	62.00
8	Haryana	13.06.90	350	60.73
9	Jammu & Kashmir	19.03.92	1599	79.27
10	Karnataka	12.04.93	1212	12.80
11	Kerala	16.01.98	21	4.00
12	Madhya Pradesh	10.12.91	12038	5800.00
13	Maharashtra	16.03.92	502	94.73
14	Mizoram	18.09.98	103	5.87
15	Nagaland	05.03.97	55	0.65
16	Orissa	3.08.88	3704	419.31
17	Punjab	14.07.93	89	38.99
18	Rajasthan	16.03.91	2705	235.63
19	Sikkim	26.06.98	98	2.19
20	Tamil Nadu	8.08.97	599	224.38
21	Tripura	20.12.91	157	16.23
22	Uttar Pradesh	30.08.97	197	34.59
23	West Bengal	12.07.89	3431	490.58
	Total		**36130**	**10248.64**

Source: *State of Forest Report, 1999*

Participation of people in the protection and management of forests has been emphasised in the National Forest Policy, 1988. Pursuant to this policy, Government of India through its resolution dated 1st June '90 formalised the JFM Programme. The JFM is being practiced through constitution of forest protection committees. The mechanism of sharing differs from state to state. About 36,130 committees are managing a total of 10.25 million ha of forest area under JFM . Details of number of committees and area under their management is given in the table.

TABLE 3.3.2 : ESTIMATED NUMBER OF SPECIES

Sl. No.	Taxonomic Group	No. of Species		% In India
		India	World	
1	2	3	4	5
I	**PROTISTA**	**2577**	**31250**	**8.24**
1	Protozoa	2577	31250	8.24
II	**ANIMALIA**	**86808***	**1196903**	**7.25**
1	Mesozoa	10	71	14.08
2	Porifera	486	4562	10.65
3	Cnidaria	842	9916	8.49
4	Ctenophora	12	100	12.00
5	Platyhelminthes	1622	17500	9.27
6	Nemertinea	—	600	—
7	Rotifera	330	2500	13.20
8	Gastrotricha	100	3000	3.33
9	Kinorhyncha	10	100	10.00
10	Nematoda	2850	30000	9.50
11	Nematomorpha	—	250	—
12	Acanthocephala	229	800	2862.00
13	Sipuncula	35	145	24.14
14	Mollusca	5070	66535	7.62
15	Echiura	43	127	33.86
16	Annelida	840	12700	6.61
17	Onychophora	1	100	1.00
Arthropoda		**68389**	**987949**	**6.90**
1	Crustacea	2934	35534	8.26
2	Insecta	59353	867391	6.83
3	Arachnida	5818	73440	7.90
4	Pycnogonida	16	600	2.67
5	Pauropoda	—	360	—
6	Chilopoda	100	3000	3.33
7	Diplopoda	162	7500	2.16
8	Symphyla	4	120	3.33
9	Merostomata	2	4	50.00
10	Phoronida	3	11	27.27
11	Bryozoa (Ectoprocta)	200	4000	5.00
12	Entoprocta	10	60	16.66
13	Brachiopoda	3	300	1.00
14	Pogonophora	—	80	—
15	Priapulida	—	8	—
16	Pentastomida	—	70	—
17	Chaetognatha	30	111	27.02
18	Tardigrada	30	514	5.83
19	Echinodermata	765	6223	12.29
20	Hemichordata	12	120	10.00

TABLE 3.3.2 : ESTIMATED NUMBER OF SPECIES—Concld.

Sl. No.	Taxonomic Group	No. of Species		% in India
		India	World	
1	2	3	4	5
	Chordata	**4886***	**48451**	**10.07***
1	Protochordata (Cephalochordata+Urochordata)	119	2106	5.65
2	Pisces	2546	21723	11.72
3	Amphibia	209	5150	4.06
4	Reptilia	456	5817	7.84
5	Aves	1166*	9026	12.91*
6	Mammalia	390	4629	8.42
	Grand Total (Protista I + Animalia II)	**89385***	**1228153**	**7.28**

Source : *Faunal Diversity in India (1998) with updated*
(*) figures Zoological Survey of India

TABLE 3.3.3 : RARE AND THREATENED SPECIES (VERTEBRATES)

Sl. No.	Category	Approximate Number				
		Mammalia	Aves	Reptilia	Amphibia	Total
1	2	3	4	5	6	7
1	Rare	—	2	—	—	2
2	Vulnerable	28	22	4	—	54
3	Endangered	29	21	16	1	67
4	Critical*	3	8	—	—	11
5	Extinct**	1	2	—	—	3
6	Insufficiently Known	16	—	—	—	16
	Total	**77**	**55**	**20**	**1**	**153**

Source : *The Red Data Book of Indian Animals (1994), Zoological Survey of India.*

* **Mammal** - Brow - Antlered Deer, Yak, Hispid Hare

Aves - Christmas Island Frigate Bird, Mrs. Hume's Bartailed Pheasant, Burmese Peafowl, Blacknecked Crane, Hooded Crane, Masked Finfoot, Jerdon's Courser, Forest Spotted Owlet.

****Mammal** - Cheetah.

Aves - Pinkheaded Duck, Mountain Quail

A taxon is **Extinct**, when there is no reasonable doubt that the last Individual has died.

A taxon is **Critical** when it is facing an extremely high probability of extinction in the wild in the immediate future.

A taxon is **Endangered** when it is not critical but is facing a very high probability of extinction in the wild in the near future.

A taxon is **Vulnerable** when it is not critical or endangered but is facing a high probability of extinction in the wild in the medium-term future.

A taxon is **Rare** when its populations are small and at present not endangered or vulnerable but are at risk .

A taxon is **Insufficiently Known** when an evaluation has been made but the available data are inadequate to assign a category.

TABLE 3.3.4 : ESTIMATED NUMBER/PERCENTAGE OF ENDEMIC SPECIES IN INDIA

Sl. No.	Taxon	Number of Species		Percentage
		Total	Endemic	
1	2	3	4	5
1	**Protozoa**			
I	Free living	1247	90	7.21
II	Parasitic	1330	550	41.33
2	**Mesozoa**	10	10	100.00
3	**Porifera**			
I	Freshwater	31	13	41.93
4	**Cnidaria**	842	10*	—
5	**Platyhelminthes**	1622	1160	71.88
6	**Rotifera**	330	23	7.00
7	**Gastroticha**	100	64	64.00
8	**Kinorhyncha**	10	7	70.00
9	**Nematoda**	2850	400*	—
10	**Acanthocephala**	229	203	88.64
1	**Mollusca**			
I	Terrestrial	1487	498	33.50
II	Freshwater	183	77	41.80
12	**Echiura**	43	12	28.00
13	**Annelida**			
I	Oligochaeta	473	368	77.80
II	Hirudinea	59	25	42.37
14	**Arthropoda**			
I	Crustacea	2934	501	17.07
II	Insecta	59353	20717	34.90
III	Arachnida	5818	2623	45.08
15	**Phoronida**	11	1	9.00
16	**Bryozoa**	4000	12	*—
17	**Entoprocta**	10	1	10.00
18	**Chaetognatha**	111	3	2.70
19	**Chordata**			
I	Pisces	2546	223	8.75
II	Amphibia	209	128	61.24
III	Reptilia	456	214	47.00
IV	Aves	1166**	50**	4.29**
V	Mammalia	390	42**	11.28

Source : Faunal Diversity in India (1998) with updated (**) figures, Zoological Survey of India.
** : Complete data not available, hence percentage not calculated*
*** : Rec. Zool. Survey of India, occasional paper no. 200 (2002)*
Rec. Zool. Survey of India, occasional paper no. 201 (2002)

TABLE 3.3.5 : NATIONAL PARKS AND WILDLIFE SANCTUARIES OF INDIA

(Sq. Km.)

Sl. No.	State	National Parks		Wildlife Sanctuaries		Total
		Number	Area	Number	Area	Area
1	2	3	4	5	6	7
1	Andhra Pradesh	4	3314.50	21	12530.09	15844.59
2	Arunachal Pradesh	2	2468.23	10	7114.45	9582.68
3	Assam	3	1173.71	13	939.88	2113.59
4	Bihar	1	335.65	11	2068.25	2403.90
5	Chhatisgarh	2	1458.00	10	3419.41	4877.41
6	Delhi	0	0.00	1	27.60	27.60
7	Goa	1	107.00	6	647.96	754.96
8	Gujarat	4	479.67	21	16422.71	16902.38
9	Haryana	1	1.43	9	278.32	279.75
10	Himachal Pradesh	2	1429.40	32	5736.85	7166.25
11	Jammu & Kashmir	4	4650.07	16	10172.15	14822.22
12	Jharkhand	1	231.67	10	1822.00	2053.67
13	Karnataka	5	2472.18	20	3930.61	6402.79
14	Kerala	3	536.52	12	2143.36	2679.88
15	Madhya Pradesh	9	5016.69	25	7284.64	12301.33
16	Maharashtra	5	955.93	33	14387.78	15343.71
17	Manipur	2	81.80	1	184.85	266.65
18	Meghalaya	2	267.48	3	34.20	301.68
19	Mizoram	2	250.00	4	634.00	884.00
20	Nagaland	1	202.02	3	24.41	226.43
21	Orissa	2	990.70	18	6971.15	7961.85
22	Punjab	0	0.00	11	317.79	317.79
23	Rajasthan	4	3856.53	24	5712.83	9569.36
24	Sikkim	1	1784.00	5	265.10	2049.10
25	Tamil Nadu	5	307.85	19	2602.07	2909.92
26	Tripura	0	0.00	4	603.62	603.62
27	Uttaranchal	6	4920.82	6	2396.39	7317.21
28	Uttar Pradesh	1	490.00	23	5198.15	5688.15
29	West Bengal	5	1692.65	15	1103.48	2796.13
30	Andaman & Nicobar Islands	9	1157.14	96	372.13	1529.27
31	Chandigarh	0	0.00	1	26.01	26.01
32	Dadra & Nagar Haveli	0	0.00	0	0.00	0.00
33	Daman & Diu	0	0.00	1	2.18	2.18
34	Lakshadweep	0	0.00	0	0.00	0.00
35	Pondicherry	0	0.00	0	0.00	0.00
	Total	**87**	**40631.64**	**485**	**115374.42**	**156006.06**

Source: *Forest Survey of India, State Forest Report, 1999.*

The Wildlife (Protection) Act, 1972 provided for setting up National Parks and Sanctuaries for Wildlife. The basic idea of these National Parks and Sanctuaries is to provide natural habitats for the Wildlife. The aim is not only to protect and preserve what remains of wild fauna and flora but also to augment this price-less national heritage.

In India, at present there are 485 Wildlife Sanctuaries and 87 National Parks, covering an area of 156006.06 Sq. Km.

TABLE 3.3.6 : ALL INDIA TIGER POPULATION

Sl. No.	Name of State	Years						
		1972	1979	1984	1989	1993	1997	2001-02**
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	35	148	164	235	197	171	192
2	Arunachal Pradesh	69	139	219	135	180	*	NR
3	Assam	147	300	376	376	325	458	354
4	Bihar	85	110	138	157	137	103	76
5	Chhattisgarh	—	—	—	—	—	—	227
6	Goa Daman & Diu	—	—	—	2	3	6	5
7	Gujarat	8	7	9	9	5	1	Nil
8	Jharkhand	—	—	—	—	—	—	34
9	Karnataka	102	156	202	257	305	350	401
10	Kerala	60	134	89	45	57	73	71
11	Madhya Pradesh	457	529	786	985	912	927	710
12	Maharashtra	160	174	301	417	276	257	238
13	Manipur	1	10	6	31	—	*	NR
14	Meghalaya	32	35	125	34	53	*	47
15	Mizoram	—	65	33	18	28	12	28
16	Nagaland	80	102	104	104	83	*	23
17	Orissa	142	173	202	243	226	194	173
18	Rajasthan	74	79	96	99	64	58	58
19	Sikkim	—	—	2	4	2	*	NR
20	Tamil Nadu	33	65	97	95	97	62	60
21	Uttar Pradesh	262	487	698	735	465	475	284
22	Uttaranchal	—	—	—	—	—	—	251
23	West Bengal	73	296	352	353	335	361	349
24	Haryana	—	—	1	—	—	—	—
25	Tripura	7	6	5	—	—	*	NR
	Total	**1827**	**3015**	**4005**	**4334**	**3750**	**3508**	**3581**

Source: *Project Tiger, Ministry of Environment & Forests*
N.R. : *Not Reported by States*
* : *Tiger census was not carried out in North Eastern States in 1997.*
** : *under compilation/vetting*

TABLE 3.3.7 : AREA OF TIGER RESERVES IN TIGER RANGE STATES

Sl. No.	Year of Creation	Name of Tiger Reserve	State	Total Area in sq. Kms.
1	2	3	4	5
1	1973-74	Bandipur	Karnataka	866
	1999-2000	Nagarhole (extension)		643
2	1973-74	Corbett	Uttar Pradesh	1316
3	1973-74	Kanha	Madhya pradesh	1945
4	1973-74	Manas	Assam	2840
5	1973-74	Melghat	Maharashtra	1677
6	1973-74	Palamau	Bihar	1026
7	1973-74	Ranthambhore	Rajasthan	1334
8	1973-74	Similipal	Orissa	2750
9	1973-74	Sunderbans	West Bengal	2585
10	1978-79	Periyar	Kerala	777
11	1978-79	Sariska	Rajasthan	866
12	1982-83	Buxa	West Bengal	759
13	1982-83	Indravati	Madhya Pradesh	2799
14	1982-83	Nagarjunsagar	Andhra Pradesh	3568
15	1982-83	Namdapha	Arunachal Pradesh	1985
16	1987-88	Dudhwa	Uttar Pradesh	811
	1999-2000	Katerniaghat (extension)		551
17	1988-89	Kalakad- Mundathurai	Tamil Nadu	800
18	1989-90	Valmiki	Bihar	840
19	1992-93	Pench	Madhya Pradesh	758
20	1993-94	Tadoba-Andheri	Maharashtra	620
21	1993-94	Bandhavgarh	Madhya Pradesh	1162
22	1994-95	Panna	Madhya Pradesh	542
23	1994-95	Dampha	Mizoram	500
24	1998-99	Bhadra	Karnataka	492
25	1998-99	Pench	Maharashtra	257
26	1999-2000	Pakhuri-Nameri	Arunachal Pradesh-Assam	1206
27	1999-2000	Bori, Satpura, Panchmari	Madhya pradesh	1486
		Total		**37761**

Source : *Ministry of Environment and Forests, Annual Report, 2002-2003*

TABLE 3.3.8 : POPULATION OF TIGERS IN TIGER RESERVES

Sl. No.	Name of Tiger Reserve	Year of Creation	State	1979	1984	1989	1993	1995	1997	2001-2002*
1	2	3	4	5	6	7	8	9	10	11
1	Bandhavgarh	1993-94	Madhya Pradesh	—	—	—	41	46	46	56
2	Bandipur	1973-74	Karnataka	39	53	50	66	74	75	82
3	Bhadra		Karnataka	—	—	—	—	—	—	35
4	Bori-Satpura-Pachmari		Madhya Pradesh	—	—	—	—	—	—	35
5	Buxa	1982-83	West Bengal	—	15	33	29	31	32	31
6	Corbett	1973-74	Uttranchal	84	90	91	123	128	138	137
7	Dampha	1994-95	Mizoram	—	—	—	7	4	5	4
8	Dudhwa	1987-88	Uttar Pradesh	—	—	90	94	98	104	76
9	Indravati	1982-83	Madhya Pradesh	—	38	28	18	15	15	29
10	Kalakad	1988-89	Tamilnadu	—	—	22	17	16	28	
11	Kanha	1973-74	Madhya Pradesh	71	109	97	100	97	114	127
12	Manas	1973-74	Assam	69	123	92	81	94	125	65
13	Melghat	1973-74	Maharashtra	63	80	77	72	71	73	73
14	Nagarjunsagar	1982-83	Andhra Pradesh	—	65	94	44	34	39	67
15	Namdhapa	1982-83	Arunachal Pradesh	—	43	47	47	52	57	61
16	Pakhui-Nameri (Nameri)		Arunachal Pradesh	—	—	—	—	—	—	26
17	Palamau	1973-74	Jharkhand	37	62	55	44	47	44	32
18	Panna	1994-95	Madhya Pradesh	—	—	—	25	22	22	31
19	Pench	1992-93	Madhya Pradesh	—	—	—	39	27	29	40
20	Pench		Maharashtra	—	—	—	—	—	—	14
21	Periyar	1978-79	Kerala	34	44	45	30	39	40	36
22	Ranthambhore	1973-74	Rajasthan	25	38	44	36	38	32	35
23	Sariska	1978-79	Rajasthan	19	26	19	24	25	24	22
24	Similipal	1973-74	Orissa	65	71	93	95	97	98	99
25	Sunderbans	1973-74	West Bengal	205	264	269	251	242	263	245
26	Tadoba	1993-94	Maharashtra	—	—	—	34	36	42	38
27	Valmiki	1989-90	Bihar	—	—	81	49	NR	53	53
		Total		**711**	**1121**	**1327**	**1366**	**1333**	**1498**	**1576**

Source: *Project Tiger, Ministry of Environment & Forests*
NR : *Not Reported by States*
* : *Under compilation/vetting*

The tiger reserves are the specially constituted reserves representing different habitat types with the aim of maintenance of available tiger population in India in its natural environment. One of the main achievements of Project tiger launched in 1973 is the excellent recovery of habitat and increase in the population of all species of wildlife in the Reserves. Tiger population in these reserves has increased from 711 in 1979 to 1576 in 2001-02.

TABLE 3.3.9 : INDIA'S LIVESTOCK POPULATION

(In Thousand)

Sl. No.	Livestock	Number of Animals				
		1977	1982	1987	1992	1997
1	2	3	4	5	6	7
1	Cattle	180140	192453	199695	204584	198882
2	Buffaloes	62019	69783	75967	84206	89918
3	Sheep	40907	48765	45703	50783	57494
4	Goats	75620	95255	110207	115279	122721
5	Horses & Ponnies	916	900	797	817	826
6	Pigs	7647	10071	10626	12788	13291
7	Mules	89	131	167	193	220
8	Donkeys	978	1024	958	967	881
9	Camels	1068	1078	1001	1031	911
II	**Other Livestock**					
1	Yaks	132	128	36	58	59
2	Mithuns	129	154	129	154	177
	Total	**369645**	**419742**	**445286**	**470860**	**485379**

Source : *India Live Stock Census, Ministry of Agriculture*

The livestock population in the country increased from 292 million in 1951 to the current estimate of 485 million. Grazing by Livestock puts pressure on grasslands and forests. Because of excessive grazing, natural regeneration is either absent or inadequate in 52.8% of the forests in the country.

An analysis of forests vis-a-vis livestock indicates continued free access to the forest area which has resulted in high rates of growth of livestock population causing land degradation and arresting the development of markets for forage crops. Overgrazing impedes regeneration, retards growth of vegetation, and leads to extinction of good palatable grasses which are replaced by less palatable and inferior grasses. Extensive areas have been invaded by bushes which are not browsed, excessive trampling makes the soil compact and impervious and prevents circulation of air, water, thus exposing the soil to erosion by wind and water. Degradation of the forest and grazing lands may be attributed in a large measure to an increase in the goat population, which rose by 159% from 1951 to 1997.

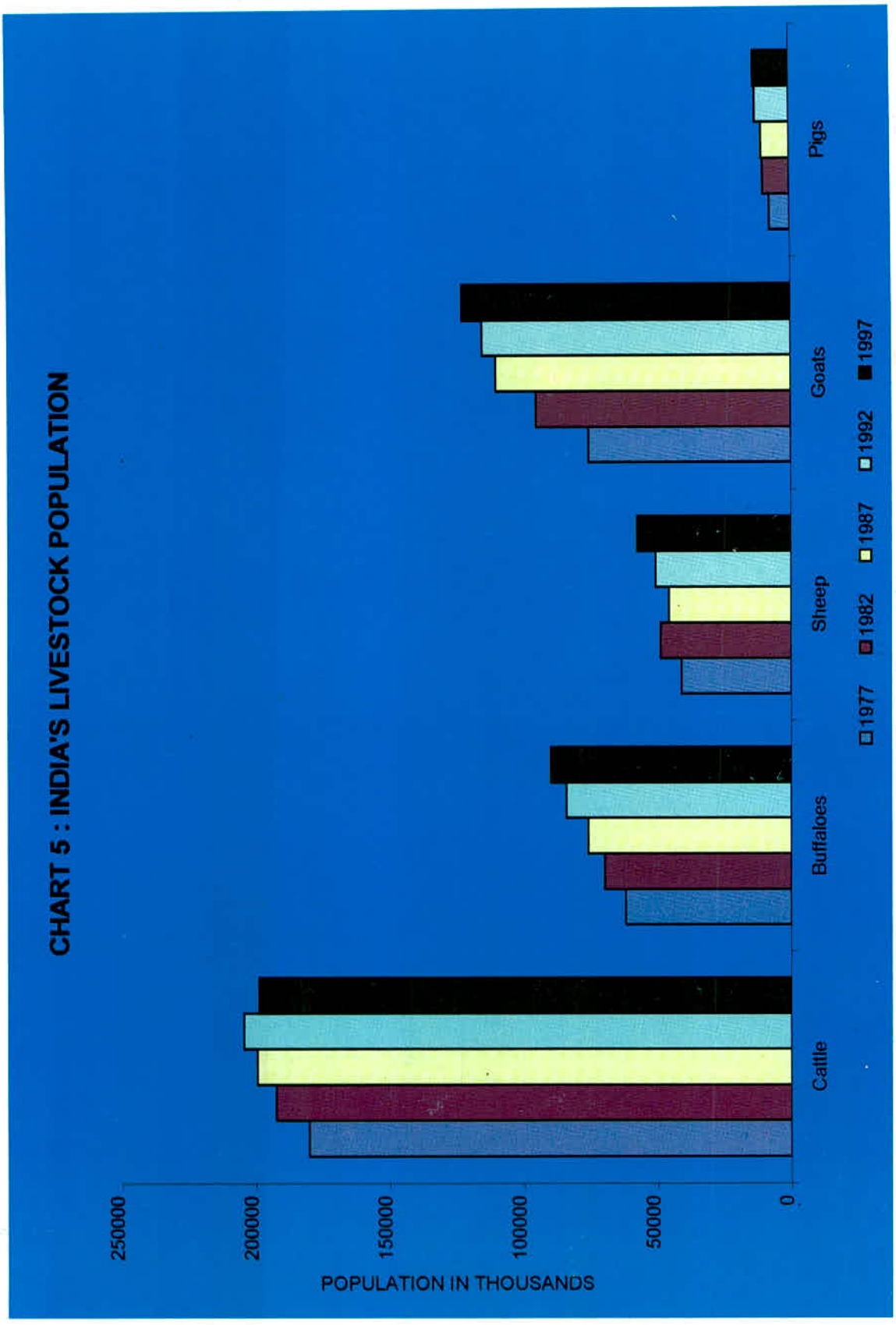


CHART 5 : INDIA'S LIVESTOCK POPULATION
250000
200000
150000
100000
50000
0
POPULATION IN THOUSANDS
Cattle
Buffaloes
Sheep
Goats
Pigs
1977
1982
1987
1992
1997

TABLE 3.3.10 : LIVESTOCK POPULATION AS PER 1997 CENSUS

Sl. No.	State/UTs	Cattle			Buffaloes	Sheep	Goats	Pigs	Horses and ponies	Mules	Donkeys	Camel	Yaks	Mithun	Total Livestock	Total Poultry
		Crossbred	Indigenous	Total												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Andhra Pradesh	751	9851	10602	9658	9743	5213	748	7	1	37	0	0	0	36009	63396
2	Arunachal Pradesh	11	441	451	12	27	154	249	6	0	0	0	14	124	1037	1292
3	Assam	369	7727	8097	728	84	2717	1082	12	0	0	0	0	0	12720	18210
4	Bihar	232	24366	24598	5879	1956	20229	924	120	8	28	0	0	0	53742	19890
5	Chhattisgarh	105	8680	8786	1941	196	2154	456	9	0	1	0	0	0	13543	6771
6	Goa	7	81	88	40	0	13	105	0	0	0	0	0	0	246	790
7	Gujarat	342	6406	6749	6285	2158	4386	198	14	0	74	65	0	0	19930	7236
8	Haryana	848	1552	2401	4823	1275	968	700	49	34	63	99	0	0	10413	9225
9	Himachal Pradesh	368	1805	2174	748	1080	1168	7	13	18	8	0	7	0	5224	865
10	Jammu & Kashmir	1083	2092	3175	787	3170	1864	12	141	21	23	4	33	0	9228	5557
11	Karnataka	1293	9539	10831	4367	8003	4875	405	16	0	28	0	0	0	28526	21399
12	Kerala	1957	533	2491	111	3	1598	88	0	0	0	0	0	0	4292	18397
13	Madhya Pradesh	177	19320	19497	6648	657	6470	375	55	7	49	10	0	0	33768	7261
14	Maharashtra	2457	15615	18072	6073	3368	11434	567	42	1	71	3	0	0	39630	35392
15	Manipur	69	439	508	95	8	33	388	2	0	0	0	0	17	1051	3055
16	Meghalaya	17	738	756	17	17	280	351	2	0	1	0	0	0	1424	2152
17	Mizoram	8	26	33	5	1	15	163	2	0	0	0	0	3	222	1807
18	Nagaland	154	230	383	36	2	161	571	1	0	0	0	0	33	1188	2444
19	Orissa	912	12898	13810	1388	1765	5772	602	0	0	0	0	0	0	23338	18435
20	Punjab	1828	810	2638	6171	436	414	96	34	17	22	30	0	0	9858	11022
21	Rajasthan	211	11931	12141	9770	14585	16971	305	24	3	186	669	0	0	54655	4406
22	Sikkim	52	91	143	2	5	86	27	5	0	0	0	5	0	273	221
23	Tamil Nadu	3506	5541	9046	2741	5259	6416	609	11	0	43	0	0	0	24126	36511
24	Tripura	73	1155	1228	18	6	639	211	2	0	0	0	0	0	2105	3595
25	Uttar Pradesh	2105	17911	20016	18996	1905	11784	3135	216	84	245	31	0	0	56414	12116
26	Uttranchal	103	1927	2031	1094	311	1070	32	23	24	1	0	0	0	4586	971
27	West Bengal	936	16895	17832	1233	1462	15648	805	18	0	0	0	0	0	36998	33309
28	A & N Islands	6	54	60	14	0	71	43	0	0	0	0	0	0	188	801
29	Chandigarh	6	1	7	23	0	1	3	0	0	0	0	0	0	35	304
30	D & N Haveli	1	59	60	4	0	20	0	0	0	0	0	0	0	84	24
31	Daman & Diu	0	5	5	1	0	5	0	0	0	0	0	0	0	11	411
32	Delhi	60	36	96	203	11	25	31	1	1	1	0	0	0	369	647
33	Lakshadweep	1	3	4	0	0	26	0	0	0	0	0	0	0	30	79
34	Pondicherry	50	23	73	4	2	41	1	0	0	0	0	0	0	121	121
	All India	**20099**	**178782**	**198882**	**89918**	**57494**	**122721**	**13291**	**826**	**220**	**881**	**911**	**59**	**176**	**485379**	**347611**

Source : *Department of Animal Husbandry & Dairying, Ministry of Agriculture.*
Note : *For Bihar, Himachal Pradesh, West Bengal and Dadra & Nagar Haveli, projections were used.*

TABLE 3.3.11 : FISH PRODUCTION

(Lakh tonne)

Sl.No.	Year	Marine	Inland	Total
1	2	3	4	5
1	1950-51	5.34	2.18	7.52
2	1960-61	8.80	2.80	11.60
3	1970-71	10.86	6.70	17.56
4	1980-81	15.55	8.87	24.42
5	1981-82	14.45	9.99	24.44
6	1982-83	14.27	9.40	23.67
7	1983-84	15.19	9.87	25.0
8	1984-85	16.98	11.03	28.01
9	1985-86	17.16	11.60	28.76
10	1986-87	17.13	12.29	29.42
11	1987-88	16.58	13.01	29.59
12	1988-89	18.17	13.35	31.52
13	1989-90	22.75	14.02	36.77
14	1990-91	23.00	15.36	38.36
15	1991-92	24.47	17.10	41.57
16	1992-93	25.76	17.89	43.65
17	1993-94	26.49	19.95	46.44
18	1994-95	26.92	20.97	47.89
19	1995-96	27.07	22.42	49.49
20	1996-97	29.67	23.81	53.48
21	1997-98	29.50	24.38	53.88
22	1998-99	26.96	26.02	52.98
23	1999-00	28.52	28.23	56.75
24	2000-01	28.11	28.45	56.56
25	2001-02 P	28.60	31.26	59.86

Source : *Statistics at a glance 2003, Ministry of Agriculture*

P : *Provisional*

TABLE 3.3.12 : MARINE FISHERY RESOURCES OF INDIA

Sl. No.	State/Union Territory	Continental Shelf ('000 Sq Kms.)	Number of Landing Centres	Number of Fishing Villages	App. Length of Coast Line (Kms.)
1	Andhra Pradesh	33	508	508	974
2	Goa	10	88	72	104
3	Gujarat	164	190	190	1600
4	Karnataka	27	29	221	300
5	Kerala (P)	40	226	222	590
6	Maharashtra	112	184	395	720
7	Orissa	24	67	589	480
8	Tamil Nadu	41	362	591	1076
9	West Bengal	17	65	652	158
10	Andaman & Nicobar Islands (P)	35	57	45	1912
11	Daman & Diu (P)	-	7	31	27
12	Lakshadweep (P)	4	11	10	132
13	Pondicherry	1	28	45	45
	TOTAL	**508**	**1822**	**3571**	**8118**

Source: *Annual Report 2002-03, Department of Animal Husbandry and Dairying, Ministry of Agriculture*

(P) - *Provisional*

TABLE 3.3.13 : STATE-WISE FISH PRODUCTION

(Tonnes)

Sl. No.	States/UT's	1999-2000			2000-2001			2001-2002 (P)		
		Marine	Inland	Total	Marine	Inland	Total	Marine	Inland	Total
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	166482	380580	547062	182502	407186	589688	204940	471165	676105
2	Arunachal Pradesh	0	2395	2395	0	2500	2500	0	2600	2600
3	Assam	0	159768	159768	0	158620	158620	0	161450	161450
4	Bihar	0	254740	254740	0	222160	222160	0	240400	240400
5	Goa	62113	3509	65622	67328	4240	71568	66550	3368	69918
6	Gujarat	670951	70328	741279	620474	40261	660735	650829	50774	701603
7	Haryana	0	30000	30000	0	33040	33040	0	34568	34568
8	Himachal Pradesh	0	6995	6995	0	7020	7020	0	7215	7215
9	Jammu & Kashmir	0	19010	19010	0	17510	17510	0	18850	18850
10	Karnataka	165653	126646	292299	175906	127468	303374	128415	121196	249611
11	Kerala	593950	73900	667850	566571	85234	651805	593783	78039	671822
12	Madhya Pradesh	0	127429	127429	0	48844	48844	0	47457	47457
13	Maharashtra	397901	135390	533291	402838	123266	526104	414268	122785	537053
14	Manipur	0	15506	15506	0	16050	16050	0	16450	16450
15	Meghalaya	0	4676	4676	0	6179	6179	0	4968	4968
16	Mizoram	0	2890	2890	0	2860	2860	0	3147	3147
17	Nagaland	0	5000	5000	0	5500	5500	0	5200	5200
18	Orissa	125935	135303	261238	121086	138556	259642	113893	168056	281949
19	Punjab	0	47177	47177	0	52000	52000	0	58000	58000
20	Rajasthan	0	12968	12968	0	12121	12121	0	14269	14269
21	Sikkim	0	140	140	0	140	140	0	140	140
22	Tamil Nadu	363000	112000	475000	367855	113560	481415	370998	114000	484998
23	Tripura	0	29340	29340	0	29420	29420	0	29450	29450
24	Uttar Pradesh	0	192714	192714	0	208286	208286	0	225371	225371
25	West Bengal	180000	865700	1045700	181000	879230	1060230	184300	915800	1100100
26	A & N Islands	28147	56	28203	27618	66	27684	27021	61	27082
27	Chandigarh	0	2	2	0	82	82	0	44	44
28	Dadar & Nagar Haveli	0	29	29	0	43	43	0	55	55
29	Daman & Diu	15946	0	15946	16382	0	16382	21524	0	21524
30	Delhi	0	4300	4300	0	3980	3980	0	3200	3200
31	Lakshadweep	13600	0	13600	12000	0	12000	13650	0	13650
32	Pondicherry	38620	4210	42830	38950	4350	43300	39600	4900	44500
33	Chattisgarh	0	0	0	0	43386	43386**	0	95763	5763
34	Uttranchal	0	0	0	0	9074	9074**	0	622	6422
35	Jharkhand	0	0	0	0	43600	43600**	0	101000	101000
36	Deep Sea Fishing Sector	30000	0	30000	30000	0	30000@	30000	0	30000
	Total	**2852298**	**2822701**	**5674999**	**2810510**	**2845832**	**5656342**	**2859771**	**3126163**	**5985934**

Source : *Department of Animal Husbandary and Dairying, Ministry of Agriculture*

** : *For the period December 2000 to March 2001*

@ : *Estimated*

TABLE 3.3.14 : INLAND FISHERY WATER RESOURCES OF INDIA

Sl. No.	State/UTs	Rivers & Canals (Kms.)	Reservoirs (Lakh Ha)	Tanks & Ponds (Lakh Ha)	Floodplain Lakes & Derelict (Lakh Ha)	Brackish Water Water (Lakh Ha)
1	2	3	4	5	6	7
1	Andhra Pradesh	13,891	2.34	4.63	-	1.5
2	Arunachal Pradesh	2,000	-	2.5	2	-
3	Assam	4,820	0.02	0.26	1.27	-
4	Bihar	2,000	0.06	0.64	0.4	-
5	Chhattisgarh	3,573	0.84	0.63	-	1.47
6	Goa	250	0.03	0.03	-	-
7	Gujarat	3,865	2.43	0.71	0.12	3.76
8	Haryana	5,000	0.09	0.1	-	0.3
9	Himachal Pradesh	3,000	0.42	0.01	-	-
10	Jammu & Kashmir	27,781	0.07	0.25	0.06	-
11	Jharkhand	1,200	0.94	0.29	-	-
12	Karnataka	9,000	2.11	2.9	-	0.08
13	Kerala	3,092	0.3	0.3	2.43	2.43
14	Madhya Pradesh	17,088	2.27	0.6	-	-
15	Maharashtra	16,000	2.79	0.59	-	0.1
16	Manipur	3,360	0.01	0.05	0.04	-
17	Meghalaya	3,194	0.08	0.02	Neg	-
18	Mizoram	1,750	-	0.02	-	-
19	Nagaland	1,600	0.03	0.5	Neg	-
20	Orissa	7,219	1.96	1.16	1.8	4.18
21	Punjab	15,270	Neg	0.07	-	-
22	Rajasthan (P)	6,802	1.2	1.8	-	-
23	Sikkim	900	1.2	-	0.03	-
24	Tamil Nadu	7,420	0.52	2.56	0.07	0.56
25	Tripura	1,200	0.05	0.13	-	-
26	Uttar Pradesh	28,500	1.38	1.61	1.33	-
27	Uttaranchal	2,686	0.2	Neg.	Neg.	-
28	West Bengal	2,526	0.17	2.76	0.42	2.1
29	Andaman & Nicobar Islands	115	0.01	0.03	-	0.37
30	Chandigarh	2	-	Neg	Neg	-
31	Dadra & Nagar Haveli	54	0.05	-	-	-
32	Daman & Diu	12	-	Neg	-	Neg
33	Delhi	150	0.04	-	-	-
34	Lakshadweep	-	-	-	-	-
35	Pondicherry	247	-	Neg	0.01	0.01
	Total	**195,567**	**21.61**	**25.15**	**9.98**	**16.86**

Source: *Annual Report 2002-03, Department of Animal Husbandry and Dairying, Ministry of Agriculture*
(P) - *Provisional*
Neg - *Negligible*

TABLE 3.3.15: INCIDENCE OF LIVESTOCK AND POULTRY DISEASES IN INDIA

(Jan-Dec 2001)

Sl. No.	Disease Name	Species	Number of Outbreak	Attack	Death
1	Foot and mouth disease	Bovine	2661	62522	1291
		Buffalo	19	6807	105
		Ovine/Caprine	21	12583	208
		Swine	28	82	29
		NS	789	11757	28
2	Haemorrhagic septicaemia	Bovine	1157	6280	2873
		Buffalo	380	2399	894
		Ovine/Caprine	11	1460	159
		NS	32	505	39
3	Black quarter	Bovine	846	3019	1282
		Buffalo	11	106	44
		Ovine/Caprine	1	45	41
4	Anthrax	Bovine/	170	720	447
		Buffalo	3	15	13
		Ovine/Caprine	128	456	388
		NS	5	10	7
5	Fascioliasis	Bovine	632	49095	4
		Buffalo	9	24	0
		Ovine/Caprine	117	1802	59
		Swine	2	2	0
		NS	83	9273	368
6	Enterotoxaemia	Ovine/Caprine	421	4340	1694
7	Sheep pox and goat pox	Ovine/Caprine	436	7489	1910
8	Cow pox	Bovine	5	24	0
9	Buffalo pox	Buffalo	1	28	0
10	Bluetongue	Ovine/Caprine	710	17983	1884
11	Contagious caprine pleuropneumonia	Caprine	17	968	197
12	Amphistomiasis	Bovine	231	3993	14
		Buffalo	2	7	0
		Ovine/Caprine	24	307	2
		NS	4	95	0
13	Schistosomiasis	Bovine	63	591	0
		Buffalo	1	2	0
14	Swine fever	Swine	236	13224	1195
15	Salmonellosis	Bovine	1	100	23
		Swine	24	336	6
		Avian	146	205161	5472
16	Ranikhet (New castle)disease	Avian	1395	71652	28084
17	Coccidiosis	Avian	998	191701	12866
		Bovine	104	17840	278
		Buffalo	31	202	0

CHAPTER FOUR

ATMOSPHERE

ATMOSPHERIC POLLUTION–MAIN SOURCES

4.1 The atmosphere consists of a mixture of gases that completely surround the earth. It extends to an altitude of 800 to 1000 kms above the earth's surface, but is deeper at the equator and shallow at the poles. About 99.9% of the mass occurs below 50 Km and 0.0997% between 50 and 100 km altitude. Major polluting gases/ particles are confined to the lowermost layer of atmosphere known as Troposphere that extends between 8 and 16 Kms above the earth surface.

4.2 The **main sources of atmospheric pollution** may be summarized as follows:

a) The combustion of fuels to produce energy for heating and power generation both in the domestic sector as well as in the industrial sector.

b) The exhaust emissions from the transport vehicles that use petrol, diesel oil, etc.

c) Waste gases, dust and heat from many industrial sites including chemical manufacturers, electrical power generating stations, etc.

ENVIRONMENT POLLUTION DUE TO ENERGY USE

4.3 A considerable amount of air pollution results from burning of fossil fuels. Fuels are primarily derived from fossilized plant material and consist mainly of carbon and/or its compounds. The household sector is the largest consumer of energy in India, accounting for 40-50% of the total energy consumption. As per a report of Planning Commission, the share of the household sector in the final use of energy declined although retaining its dominant share at 58.9% in 1987. The most abundantly used fossil fuel for cooking is the wood, which is almost 61% of the total fuel demand for cooking. Burning of traditional fuels introduces large quantities of CO_2 when the combustion is complete, but if there is incomplete combustion and oxidation then Carbon monoxide (CO) is produced, in addition to hydrocarbons. Incomplete combustion of coal produces smoke consisting of particles of soot or carbon, tarry droplets of unburnt hydrocarbons and CO. Fossil fuels also contain 0.5–4.0% of sulphur which is oxidized to SO_2 during combustion.

4.4 The environmental effects of various fuels, namely, coal, oil, nuclear etc. are of growing concern owing to increasing consumption levels. The combustion of these fuels in industries and vehicles has been a major source of pollution. Coal production through opencast mining, its supply to and consumption in power stations, and industrial boilers leads to particulate and gaseous pollution which can cause pneumoconiosis, bronchitis, and respiratory diseases. Another major impact of coal mining is land degradation, especially of forest areas.

4.5 The consumption of petroleum products in vehicles, industries and domestic cooking activities results in the emission of pollutants in large quantities. Radioactive emissions from nuclear power plants are of

grave concern as they can cause serious impact both in terms of spatial and inter-generational concerns. In addition, two key problems are long-term waste disposal and the eventual decommissioning of plants. Due to limited reserves of petroleum, main emphasis needs to be given to non-conventional energy sources such as wind energy, solar energy and ocean energy.

INDUSTRIAL EMISSIONS

4.6 Air borne emissions emitted from various industries are a cause of major concern. These emissions are of two forms, viz. solid particles (SPM) and gaseous emissions (SO_2, NO_x, CO, etc.). Liquid effluents, generated from certain industries, containing organic and toxic pollutants are also a cause of concern. Heavily polluting industries were identified which are included under the 17 categories of highly polluting industries for the purpose of monitoring and regulating pollution from them. The Ministry of Environment and Forests has, over the last two decades, developed standards for regulating emissions from various industries and emission standards for all the polluting industries including thermal power stations, iron and steel plants, cement plants, fertilizer plants, oil refineries, pulp and paper, petrochemicals, sugar, distilleries and tanneries have been prescribed. The industrial units in India are largely located in the States of Gujarat, Maharashtra, Uttar Pradesh, Bihar, West Bengal and Madhya Pradesh. The highest concentration of sulpher dioxide and oxides of nitrogen is, therefore, often found in cities located in these states. Some other industrial estates in Delhi, Punjab, Rajasthan and Andhra Pradesh are also becoming critical.

ROAD TRANSPORT

4.7 Road vehicles are the second major source of pollution. They emit CO, HCs, NO_x, SO_2, and other toxic substances such as TSP and lead. Diesel engines are much less polluting than petrol engines. Both types of engines are not very efficient converters of fuel energy. However, diesel types with a conversion efficiency of around 30% must be more efficient and use less fuel than petrol types with a 15-20% conversion efficiency. Both types of engines have incomplete combustion of fuel, so the major pollutant is CO, amounting to 91% by weight of all vehicle emissions.

4.8 The primary pollutants produced in vehicle emissions undergo a series of complex interrelated chemical reactions in the troposphere and lower stratosphere to form secondary products.

4.9 Four factors make pollution from the vehicles more serious in developing countries.

(i) Poor quality of vehicles creating more particulates and burning fuels inefficiently.

(ii) Lower quality of fuel being used leads to far greater quantities of pollutants.

(iii) Concentration of motor vehicles in a few large cities.

(iv) Exposure of a larger percentage of population that lives and moves in the open.

HARMFUL EFFECTS OF EMISSIONS

4.10 The high concentration of particulates in the atmosphere over large urban and industrial areas can produce a number of

general effects. Smoke and fumes can increase the atmospheric turbidity and reduce the amount of solar radiation reaching the ground. The overall effect of air pollution upon the biosphere and the built environment can be broadly considered under 3 headings: The effect upon-

(i) buildings and materials,

(ii) soil, vegetation, crops and animal life,

(iii) human beings.

i) **Buildings and Materials**: The fabric of buildings that are surrounded by heavily polluted air for years undergo chemical changes. Gradual erosion takes place and this is only too evident when grimy upper surface is removed. A good example is that of the famous historical monument 'Taj Mahal' at Agra, which, on account of reaction of Sulphur-di-oxide, emitted from neighbouring industries, with the limestone has slowly, started turning yellow. As a result, on Court's directives, a number of measures have been taken to protect our national heritage monument, e.g. closure of neighbouring heavy polluting industries, operation of only non-polluting vehicles like battery buses, tonga, in the vicinity of Taj Mahal.

ii) **Soil, vegetation and Animal Life:** The presence of gaseous pollutants in the air and deposition of particulates on to the soil can effect plants. It can effect the cattle and animals too as they have been found to develop breathing difficulties and suffer from low yield of milk, lameness and joint stiffness in a polluted environment.

iii) **Human beings:** Smoke and SO_2 cause the general and most widespread effects of air pollution on people. Atmospheric smoke contains potentially carcinogenic organic compounds similar to those that occur in cigarette tobacco smoke. The CO affects the cardiovascular system, NO_xs affect the respiratory system, Ozone causes increased sensitivity to infections, lung diseases, irritation in eyes, nose and throat, etc.

STEPS TAKEN SO FAR AND THEIR IMPACT

4.11 With the alarming increase in the atmospheric pollution, especially in the big cities, Government has taken some important initiatives in the recent years. To start with, the emphasis and implementation has been primarily in the big cities but gradually to spread throughout the country. These relate to the progressive tightening of the auto-emission norms (1991, 1996, 1998 & 2000) and fuel quality specifications (1996) as recommended by the Central Pollution Control Board (CPCB).

4.12 Till early 1994, ambient air quality standards in India were based on 8 hourly average time only. In April 1994, these standards were revised and 24 hourly standards were also prescribed. National ambient air quality standards are prescribed for three distinct areas, viz. i) industrial, ii) residential, rural and other areas and iii) sensitive areas.

Following steps have been taken so far:

i) **Unleaded Petrol**: With the gradual reduction of lead content in petrol and finally supply of unleaded petrol for all vehicles from Sept. 1998 in the capital city of Delhi, a lethal pollutant from vehicular exhaust has been removed. The lead content in the atmosphere near traffic intersections of Delhi has reduced by more than 60% with this measure.

ii) **Sulphur in diesel**: The sulphur content in

the diesel supplied in Delhi has been reduced from 0.5% in 1996 to 0.25% in 1997 so as to meet the EURO-II norms.

iii) **Tightening of the Vehicular Emission Norms**: From 1995, new passenger cars were allowed to register only if they were fitted with catalytic converters. Emission norms for such cars were tightened by 50 % as compared to 1996 norms. With the recent directions of the Hon'ble Supreme Court, passenger cars (both petrol and diesel) are required to meet atleast EURO-I norms in June 1999 and from Apr. 2000 only such vehicles meeting EURO-III norms will be permitted to register in the NCR of Delhi. CNG operated vehicles are also permitted by the Supreme Court directions.

iv) **2-T Oil for Two stroke engines**: From 1.04.99, on the recommendations of CPCB, the low smoke 2T oil became effective. To prevent the use of 2T oil in excess of the required quantity, premixed 2T oil dispensers have been installed in all the petrol filling stations of Delhi. Sale of loose 2T oil has also been banned from Dec. 1998.

v) **Phasing out of Grossly Polluting Vehicles:** On CPCB's recommendations, initially 20 yr. old vehicles were prohibited from plying from Dec.1998, followed by phasing out of 17 yr. old vehicles from Nov.98 and 15 yr. old from Dec. '98.

IMPACT ON POLLUTION LOAD AND AIR QUALITY IN DELHI

4.13 The major impacts have been observed through the implementation of emission norms and fuel quality specifications effective from 1996, as also phasing out of 15 year old commercial vehicles and leaded petrol in the year 1998 and phasing out of 8 year old commercial vehicles and 15 year old two wheelers from 2000 onwards. The ambient air quality as monitored by CPCB during 1999 shows reduction in levels of various pollutants in ambient air as compared to previous year. The reducing trend was observed with respect to Carbon Monoxide, nitrogen dioxide, and lead in residential areas.

NOISE POLLUTION

4.14 Of late, noise has been recognized as a pollutant which until recently was considered only as a nuisance. The Central Pollution Control Board (CPCB) has notified the ambient noise standards in 1987 under section 20 of the Air (Prevention and Control of Pollution) Act, 1981. The noise standards specify limits as 55dB(A) and 45dB(A) as limits for day and night time, respectively, for residential areas, 75 dB(A) and 70 dB(A) in the day and night time for industrial areas, and 50 dB (A) and 40 dB(A) in the day and night for silence zones. Special campaign for reduction in use of fire crackers in Delhi have resulted in reduced pollution levels during Diwali.

4.2 Green House Gases and Their Effects

4.15 The greenhouse effect plays a crucial role in regulating the heat balance of the earth. It allows the incoming short-wave solar radiation to pass through the atmosphere relatively unimpeded; but the long-wave terrestrial radiation emitted by the earth's surface is partially absorbed and then re-emitted by a number of trace gases in the atmosphere. These gases known as GHGs (greenhouse

gases) are: water vapor, carbon dioxide, methane, nitrous oxide and ozone in the troposphere and in the stratosphere. This natural greenhouse effect warms the lower atmosphere.

4.16 If the atmosphere were transparent to the outgoing long wave radiation emanating from the earth's surface, the equilibrium mean temperature of the earth's surface would be considerably lower and probably below the freezing point of water. Mere incidence of GHG's in the atmosphere, by itself, is no concern. What is more important is that their concentration should stay within reasonable limits so that global ecosystem is not unduly affected. However, by increasing the concentrations of natural GHG's and by adding new GHG's like chloroflouro carbons, the global average and the annual mean surface-air temperature (referred to as the global temperature) can be raised, although the rate at which it will occur is uncertain. This is the enhanced greenhouse effect, which is over and above that occurring due to natural greenhouse concentration. Such a rise in the atmospheric concentration of GHG's has led to an upward trend in global temperature.

4.17 While it is required to follow the general commitments under the Framework Convention on Climate Change, India is not required to adopt any GHG reduction targets. Irrespective of international commitments, it seems prudent to be ready with

- Inventory of sinks and sources of GHG emission
- Predict the cumulative impact of national and international GHG emissions to plan for temperature and sea level rise
- Devise land use plans for the coastal areas likely to be affected
- Devise water and land management strategies especially agricultural sector.

TABLE 4.1.1: AVERAGE GASEOUS COMPOSITION OF DRY AIR IN THE TROPOSPHERE

Sl.No.	Gas	Percent by Volume	Parts Per Million (ppm)
1	2	3	4
1	Nitrogen	78.080000	780840.00
2	Oxygen	20.950000	209500.00
3	Argon	0.930000	4300.00
4	Carbon dioxide	0.034500	345.00
5	Neon	0.001800	18.00
6	Helium	0.000520	5.20
7	Methane	0.000140	1.40
8	Kryton	0.000100	1.00
9	Hydrogen	0.000050	0.50
10	Xenon	0.000009	0.09
11	Ozone	Variable	Variable

Source : *Ministry of Environment & Forests*

TABLE 4.1.2 (a): AMBIENT AIR QUALITY LEVELS IN HIGHLY POLLUTED CITIES 1998

(µg/m³)

Sl. No.	State /Union Territory	*Sulphur Dioxide*		*Oxides of Nitrogen*		*Suspended Particulate Matter*	
		Industrial	Residential	Industrial	Residential	Industrial	Residential
1	**Andhra Pradesh**						
	Hyderabad	38.90	31.80	84.90	100.00	776.00	564.00
	Visakhapatnam	11.40	27.00	16.60	34.80	113.00	332.00
2	**Bihar**						
	Dhanbad	-	65.60	-	57.50	-	38.00
	Jamshedpur	74.10	-	93.90	-	365.00	-
	Jharia	76.40	-	53.70	-	454.00	-
	Patna	-	34.10	-	41.00	-	717.00
	Sindri	64.50	-	58.40	-	177.00	-
3	**Delhi**	85.80	84.80	164.10	112.60	1878.00	1531.00
4	**Goa**						
	Ponda	-	9.80	-	18.30	-	166.00
	Vasco	8.60	-	17.80	-	103.00	-
5	**Himachal Pradesh**						
	Damtal	-	5.80	-	21.50	-	301.00
	Parwanoo	-	1.40	10.30	12.90	118.00	302.00
	Shimla	-	3.60	-	13.60	-	127.00
6	**Haryana**						
	Faridabad	35.70	-	13.30	-	386.00	-
	Yamuna Nagar	32.20	-	23.10	-	232.00	-
7	**Karnataka**						
	Bangalore	40.00	21.00	44.00	31.00	259.00	199.00
	Mysore	72.00	-	64.00	-	209.00	-
8	**Kerala**						
	Kochi	34.10	22.30	21.40	27.10	804.00	183.00
	Thiruvananthapuram	25.80	14.80	19.10	44.10	179.00	299.00
	Kottayam	1.70	-	24.10	-	55.00	-
	Kozhikode	2.30	2.50	7.30	6.60	75.00	73.00
9	**Maharashtra**						
	Mumbai	21.70	32.20	24.90	59.80	226.00	475.00
	Nagpur	16.50	25.60	27.50	76.00	278.00	668.00
	Pune	100.40	48.10	119.20	56.60	748.00	247.00
10	**Madhya Pradesh**						
	Bhilai	31.40	29.60	34.90	63.20	379.00	226.00
	Bhopal	17.50	34.40	26.30	52.30	384.00	574.00
	Indore	16.30	26.20	15.30	27.30	382.00	612.00
	Jabalpur	-	-	-	12.80	-	153.00
	Korba	-	30.20	-	41.10	-	272.00
	Nagda	55.20	84.00	24.60	67.90	141.00	335.00
	Raipur	9.90	8.80	35.30	29.20	273.00	268.00
	Satna	11.70	10.80	14.50	13.00	269.00	198.00
11	**Orissa**						
	Angul	-	17.60	-	19.50	-	254.00
	Rourkela	35.50	32.00	27.60	36.10	154.00	192.00

TABLE 4.1.2 (a): AMBIENT AIR QUALITY LEVELS IN HIGHLY POLLUTED CITIES 1998 Concld.

(µg/m³)

Sl. No.	State/Union Territory	Sulphur Dioxide		Oxides of Nitrogen		Suspended Particulate Matter	
		Industrial	*Residential*	*Industrial*	*Residential*	*Industrial*	*Residential*
12	**Punjab**						
	Jalandhar	-	-	-	-	-	-
	Ludhiana	-	-	-	-	-	-
13	**Rajasthan**						
	Alwar	28.70	13.50	156.60	75.20	208.00	699.00
	Jaipur	26.60	33.80	45.60	83.60	495.00	837.00
	Kola	10.20	9.70	26.20	25.30	300.00	274.00
14	**Tamil Nadu**						
	Coimbatore	13.40	11.00	20.70	29.60	150.00	220.00
	Chennai	31.30	31.50	38.80	44.60	288.00	348.00
	Tuticorin	32.70	11.00	27.80	12.60	98.00	124.00
15	**Uttar Pradesh**						
	Agra	24.80	10.00	20.90	8.90	818.00	482.00
	Anpara	117.00	-	121.70	-	513.00	-
	Dehra Dun	17.20	15.80	14.50	14.30	301.00	307.00
	Gajroula	19.70	15.50	-	-	301.00	247.00
	Kanpur	35.40	66.00	51.70	87.10	882.00	1617.00
	Lucknow	32.50	60.00	34.40	64.20	524.00	895.00
16	**West Bengal**						
	Haldia	87.80	-	115.40	-	395.00	-
	Mowran	-	-	-	-	-	-
17	**Chandigarh**	5.80	4.80	9.80	9.00	331.00	229.00
18	Pondicherry	-	-	-	-	-	-

Source: *TEDDY (TERI Energy Data Directory and Yearbook) 2002-03*

TABLE 4.1.2 (b) : ESTIMATED VEHICULAR POLLUTION EMISSION LOAD IN METROPOLITON CITIES DURING 1994

(Tonnes/day)

Sl.No.	City	Particulates	SO_2	NOx	HC	CO	Total
1	2	3	4	5	6	7	8
1	Delhi	10.30	8.96	126.46	249.57	51.01	**1046.30**
2	Mumbai	5.59	4.03	70.82	108.21	469.92	**658.57**
3	Bangalore	2.62	1.76	26.22	78.51	195.36	**304.47**
4	Calcutta	3.25	3.65	54.69	43.88	188.24	**293.71**
5	Ahmedabad	2.95	2.89	40.00	67.75	179.14	**292.73**
6	Pune	2.39	1.28	16.20	73.20	162.24	**255.31**
7	Chennai	2.34	2.02	28.21	50.46	143.22	**226.25**
8	Hydrabad	1.94	1.56	16.84	56.33	126.17	**202.84**
9	Jaipur	1.98	1.25	15.29	20.99	51.28	**90.79**
10	Kanpur	1.06	1.08	13.37	22.24	48.42	**86.17**
11	Lucknow	1.14	0.95	9.68	22.50	49.22	**83.49**
12	Nagpur	0.55	0.41	5.10	16.32	34.99	**57.37**
	Total	**35.31**	**29.84**	**422.88**	**809.96**	**2299.21**	**3597.20**

Source : *State of the Environment 2001*

TABLE 4.1.2 (C) : PM, NOx, HC, CO EMISSION LOAD IN METROPOLITON CITIES, 2001

(TMT, Annual)

Sl.No.	City	Particulate Matter (PM)	NOx	HC	CO
1	Delhi	14.0	63	113	293
2	Mumbai	6.0	20	54	109
3	Kolkata	5.0	22	16	45
4	Chennai	4.0	17	44	88
5	Bangalore	7.0	27	71	118
6	Hyderabad	6.0	15	73	129
7	Ahemdabad	5.0	22	31	58
8	Kanpur	2.0	6	12	23
9	Varanasi	1.2	17	29	51

Source: *Central Pollution Control Board*

TABLE 4.1.3 : NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Sl. No.	Pollutant	Sulphur Dioxide (SO_2)		Oxides of Nitrogen (NO_2) less than 10 μm)		Suspended Particulate Matter (SPM)		Respirable Particulate Matter (RPM)(size		Lead		Carbon Monoxide (CO)		Ammonia #	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Time Weighted Average	Annual * Average ($\mu g/m^3$)	24 hours** Average ($\mu g/m^3$)	Annual * Average ($\mu g/m^3$)	24 hours** Average ($\mu g/m^3$)	Annual* Average ($\mu g/m^3$)	24 hours** Average ($\mu g/m^3$)	Annual * Average ($\mu g/m^3$)	24 hours** Average ($\mu g/m^3$)	Annual * Average ($\mu g/m^3$)	24 hours** Average ($\mu g/m^3$)	8 hours** Average ($\mu g/m^3$)	1 hours Average ($\mu g/m^3$)	Annual * Average (mg/m^3)	24 hours** Average (mg/m^3)
2	Industrial Area	80	120	80	120	360	500	120	150	1.00	1.50	5.00	10.00	0.10	0.40
3	Residential, Rural and Other Area	60	80	60	80	140	200	60	100	0.75	1.00	2.00	4.00	0.10	0.40
4	Sensitive Area	15	30	15	30	70	100	50	75	0.50	0.75	1.00	2.00	0.10	0.40
5	Methods of Measurement	1. Improved West & Gaeke Method (Na-arsenic) 2. Ultraviolet Fluorescence		1. Jacob & Hochheiser Modified Method 2. Gas phase Chemiluminiscence		High volume sampling (Average flow rate not less than 1.1 m^3/minute)		Respirable particulate matter sampier		AAS Method after sampling using equivalent filter paper		Non- Dispresive infra-red Spectroscopy		———	

Source : *Central Pollution Control Board*

* : *Annual Arithmatic Mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval.*

** : *24-hourly /8 -hourly values should be met 98% of the time in a year. However 2% of time, it may exceed but not on two consecutive days.*

\# : *Included vide notification SO. 955 (E), Air (Prevention & Control of Pollution) Act, 1981 dated October 14, 1998.*

Note :

1. *National Ambient Air Quality Standards : The level of air quality necessary with an adequate margin of safety necessary to protect the public health, vegetation and property*
2. *Whenever and wherever two consecutive values exceed the limits specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigations.*
3. *The standards for H_2S and CS_2 have been notified seqerately vide GSR No. 7, dated December 22, 1998 under Rayon Industry.*

continuous monitoring and further investigations.

The primary aim of the ambient air quality standards is to provide a basis for protecting public health from adverse effects of air pollution and for eliminating or reducing to a minimum, those contaminants of air that are known or likely to be hazardous to human being, animals, vegetation and historical monuments.

TABLE 4.1.4 : AMBIENT AIR QUALITY STATUS IN SOME CITIES/TOWNS, 2001

Pollution Level	Annual Mean Concentration Range (μg/m³) (microgram per cubic meter)			
	Industrial		Residential	
	SO_2 & NO_2	SPM	SO_2 & NO_2	SPM
Low (L)	0-40	0-180	0-30	0-70
Moderate (M)	40-80	180-360	30-60	70-140
High (H)	80-120	360-540	60-90	140-210
Critical (C)	>120	>540	>90	>210

Sl. No.	State/City	Sulphur Dioxide		Nitrogen Dioxide		SPM	
	Area class	I	R	I	R	I	R
1	2	3	4	5	6	7	8
1	**Andhra Pradesh**						
	Hyderabad	L	L	M	M	M	H
	Vishakhapatnam	L	L	L	L	L	H
2	**Assam**						
	Guwahati	—	L	—	L	—	H
3	**Bihar**						
	Patna	—	L	—	L	—	C
4	**Chhattisgarh**						
	Bhilai	L	L	L	M	M	H
	Korba	—	L	—	L	—	M
	Raipur	L	L	M	M	M	H
5	**Delhi**						
	Delhi	L	L	L	H	H	C
6	**Gujarat**						
	Ahmedabad	L	L	M	M	H	C
7	**Goa**						
	Ponda	—	L	—	L	—	M
	Vasco	L	—	L	—	M	—
8	**Himachal Pradesh**						
	Damtal	—	L	—	L	—	—
	Parwanoo	L	L	L	L	—	—
	Paonta Sahib	L	—	L	—	—	—
	Shimla	—	L	—	L	—	—
9	**Haryana**						
	Yamuna Nagar	L	—	L	—	M	—
	Faridabad	L	L	L	L	M	C
10	**Jharkhand**						
	Dhanbad	—	L	—	M	—	C
	Jharia	L	—	L	—	M	—
	Jamshedpur	L	M	M	M	M	C
	Sindri	L	—	L	—	M	—
11	**Karnataka**						
	Bangalore	L	L	L	L	L	H
	Mysore	L	—	L	—	L	—
12	**Kerala**						
	Cochin	L	L	L	L	M	C
	Kottayam	L	L	L	L	—	—
	Kozhikode	L	L	L	L	L	M
	Thiruvananthapuram	L	L	L	L	—	—
	Palakad	L	—	L	—	L	—
13	**Maharashtra**						
	Mumbai	L	L	L	L	M	C
	Chanderpur	L	L	M	M	L	H
	Nagpur	L	L	L	L	M	C
	Nashik	L	M	L	L	M	C
	Pune	L	M	M	C	L	C
	Solapur	L	L	M	M	H	C

TABLE 4.1.4 : AMBIENT AIR QUALITY STATUS IN SOME CITIES/TOWNS — *Concld.*

Sl. No.	State/City	Sulphur Dioxide		Nitrogen Dioxide		SPM	
	Area class	I	R	I	R	I	R
1	2	3	4	5	6	7	8
14	**Madhya Pradesh**						
	Bhopal	L	L	L	L	—	—
	Indore	L	L	L	L	—	—
	Jabalpur	—	—	—	L	—	—
	Nagda	M	M	M	M	—	—
	Satna	L	L	L	L	—	—
15	**Meghalaya**						
	Motinagar	—	L	—	L	—	M
16	**Orissa**						
	Angul	L	L	L	L	M	M
	Rourkela	L	L	L	L	M	H
	Talcher	L	—	L	—	L	—
	Rayagada	L	L	L	L	L	M
17	**Punjab**						
	Gobingarh	L	—	L	—	M	—
	Jalandhar	L	L	L	M	M	C
	Ludhiana	L	L	L	M	—	—
18	**Rajasthan**						
	Alwar	L	L	M	H	H	C
	Jaipur	L	L	L	M	M	C
	Kota	L	L	L	L	M	C
	Udaipur	L	L	—	—	M	H
	Jodhpur	L	L	L	L	H	C
19	**Tamil Nadu**						
	Chennai	L	L	L	L	L	M
	Coimbatore	—	—	—	—	L	L
	Madurai	L	L	L	M	L	C
	Salem	—	L	—	L	—	L
20	**Uttaranchal**						
	Dehradun	L	L	L	L	M	C
21	**Uttar Pradesh**						
	Agra	—	L	—	L	—	C
	Anpara	M	—	M	—	M	—
	Gajraula	L	—	L	—	H	C
	Kanpur	L	L	L	M	H	C
	Lucknow	—	L	—	M	M	C
	Varanasi	—	L	—	L	—	C
	Ghaziabad	—	—	—	—	M	—
22	**West Bengal**						
	Haldia	L	—	M	—	L	—
	Howrah	L	L	M	M	M	H
	Kolkata	L	L	H	H	M	C
23	**Chandigarh**						
	Chandigarh	—	—	—	—	M	H
24	**Pondicherry**						
	Pondicherry	—	L	—	L	L	M

Source :*Central Pollution Control Board*

I : Industrial Area *R : Residential Area* — *: Data not available/Inadepuate*

TABLE 4.1.5 : NUMBER OF MOTOR VEHICLES REGISTERED IN INDIA (TAXED AND TAX-EXEMPTED)

(As on 31st March)

(Number)

Sl. No.	Year/State/UT	Two-Wheelers	Auto-Rickshaws	Jeeps	Cars	Taxis	Buses	Goods Vehicles #	Misce-llaneous##	Total No.of Vehicles
1	2	3	4	5	6	7	8	9	10	11
	1990-91	14199858	617365	443734	2266506	243748	331100	1512884	1759005	21374200
	1991-92	15660801	669538	480922	2461519	262338	358165	1643729	1970401	23507413
	1992-93	17183224	720364	512602	2550286	297941	363962	1752536	2124433	25505348
	1993-94	18898701	771117	552038	2654232	362622	392148	1828117	2200903	27659878
	1994-95	20831428	897383	614567	2875651	350331	423383	1938422	2769990	30294656
	1995-96	23252287	1010344	671682	3150951	381011	448415	2030728	2966042	33911460
	1996-97	25728982	1175283	727965	3527303	417013	484099	2343000	2927887	37331532
	1997-98	28642351	1360151	824525	3829209	484374	537237(b)	2535930	3154263	41368040
	1998-99	31327607	1495200	837700	4201774	516449	539819 (b)	2553689	3403087	44875325
	1999-2000 (P)	33912954	1577463	896270	4574013	571410	558847 (b)	2680932	3621036	48392925
	1999-2000 (P)									
	State:									
1	Andhra Pradesh	2958629	118421	39948	201463	40690	46576	144992	85013	3635732
2	Arunachal Pradesh*	10605	1430	2260	2340	299	665	2878	667	21144
3	Assam	236149	16036	10238	73273	5826	8416	73337	29741	453016
4	Bihar	538337	26009	29498	50376	19067	14493	46636	146943	871359
5	Goa	223115 (&)	7839	(a)	50346	6483	3444	23730	3675	318632
6	Gujarat	3673658	241021	87087	380915	33284	42717	317151	412899	5188732
7	Haryana @	859400	19400	50097	114313	2113	5780	100737	257773	1409613
8	Himachal Pradesh**	78149	2149	7399	14411	9249	5796	24914	8058	150125
9	Jammu & Kashmir *	121227	12608	7599	27377	4586	12623	22083	8514	216617
10	Karnataka	2403683	159589	39073	310985	30577	52512	148906	248232	3393557
11	Kerala	997542	182394	55251	237748	86660	53436	148680	20598	1782309
12	Madhya Pradesh	2619332	42002	38401	131145	52817	25616	129628	417727	3456668
13	Maharashtra	4047156	388037	200955	618959	84015	64256	378873	331272	6113523
14	Manipur	53695	2226	6184	4870	316	2048	5984	1052	76375

TABLE 4.1.5 :NUMBER OF MOTOR VEHICLES REGISTERED IN INDIA (TAXED AND TAX-EXEMPTED)—*Concld.*

(As on 31st March)

(Number)

Sl. No.	Year/State/UT	Two-Wheelers	Auto-Rickshaws	Jeeps	Cars	Taxis	Buses	Goods Vehicles #	Misce-llaneous##	Total No.of Vehicles
1	2	3	4	5	6	7	8	9	10	11
15	Meghalaya	17174	1447	8155	10324	4375	2208	11815	2999	58497
16	Mizoram*	7901	N.A.	5240	1668	1600	634	2921	346	20310
17	Nagaland	32481	9102	29435	28264	2501	4276	34238	4820	145117
18	Orissa	766961	11497	25977	43811	8511	13243	62353	49684	982037
19	Punjab**	1630068	22337	20028	117798	5166	13823	82579	404118	2295917
20	Rajasthan	1837146	47392	106647	128643	18806	46732	136696	389461	2711523
21	Sikkim	3994	N.A.	2205	890	3108	605	1085	14	11901
22	Tamil Nadu	3679525	100892	33544	409479	57337	35308	211629	83448	4611162
23	Tripura	24208	6568	1215	3465	1311	1714	5300	1418	45199
24	Uttar Pradesh	3351113	66695	84651	258902	31192	35655	142774	655470	4626452
25	West Bengal	1036009	N.A.	(a)	366043	41298	22336	189568	34551	1689805
	Union Territory:									
1	A. & N. Islands*	12147	20	699	672	396	317	1179	637	16067
2	Chandigarh**	315113	N.A.	(a)	61242	466	1492	5654	2059	386026
3	D. & N. Haveli *	7483	417	533	2783	159	180	1444	253	13252
4	Daman & Diu	21586	603	(a)	8765	43	246	2657	223	34123
5	Delhi	2184581	86985	(a)	869820	17762	38112	212705	13509	3423474
6	Lakshadweep	2824	217	72	9	N.A.	4	194	466	3786
7	Pondicherry	161963	4130	3879	42914	1397	3584	7612	5396	230875

Source: *Transport Research Wing, Ministry of Surface Transport.*

\# : *Includes trucks three and four wheelers used for carrying goods.*

Data relates to 1996-97

& : *Includes Motocycle on hire also*

@ : *Data relates to 1998-99*

: *Includes tractors and trailers also.*

** : *Data relates to 1997-98*

(a) : Included in Cars

(b) : *Includes Omini Buses*

(P) : *Provisional*

TABLE 4.1.6 : TOTAL REGISTRED MOTOR VEHICLES IN METROPOLITAN CITIES OF INDIA
(as on 31st March, 2002)

(Number)

Sl.	Name of City	Transport					
		Multi-axied/ Articulated Vehicles Trucks & Lorries	Light Motor Vehicles (Goods)	Buses	Taxies	LightMotor Vehicles (Passengers-Auto)	Total Transport
1	2	3	4	5	6	7	8
1	Ahmedabad	8786	9809	14872	4639	40944	79050
2	Bangalore	26482	19722	11287	14850	72210	144551
3	Bhopal	4152	3782	2604	5296	9377	25311
4	Chennai	24296	6254	5765	11122	39027	86464
5	Cochin **	7769	16351	3726	7247	12978	48071
6	Coimbatore	8457	2926	1297	2509	5371	20560
7	Delhi	161650	65289	47578	20628	86985	382130
8	Hyderabad $	20763	16479	2539	3098	45800	88679
9	Indore	24197	6596	4003	11146	9446	55388
10	Jaipur	27705	1876	15027	6148	8509	59265
11	Kanpur	7452	2343	875	311	2430	13411
12	Kolkata *	59576	N.A.	8586	32199	9747	110108
13	Lucknow	7222	4639	2895	5405	7936	28097
14	Ludhiana ***	13252	10190	1425	2095	6421	33383
15	Madurai	6002	2294	1801	2827	6361	19285
16	Mumbai	19134	36278	12768	63679	101829	233688
17	Nagpur	9354	8306	2589	602	10932	31783
18	Patna	15172	2987	3003	2914	15781	39857
19	Pune	19446	13718	7478	3750	44349	88741
20	Surat	2872	5910	785	850	27000	37417
21	Vadodara	6346	10875	2730	4981	25503	50345
22	Varanasi	2888	2262	986	493	4016	10645
23	Visakhapatnam $	974	456	99	288	1543	3360
	Total(P)	**483947**	**249342**	**154718**	**207087**	**594495**	**1689589**

TABLE 4.1.6: TOTAL REGISTRED MOTOR VEHICLES IN METROPOLITAN CITIES OF INDIA-*Concld.*

(as on 31st March, 2002)

(Number)

Sl. No.	Name of City	Non-Transport								
		Two Wheelers	Cars	Jeeps	Omni Buses	Tractors	Trallors	Others	Total Non-Transport	Grand Total (Transport + Non Transport)
1	2	9	10	11	12	13	14	15	16	17
1	Ahmedabad	693421	115524	9426	—	109	171	1645	820296	899346
2	Bangalore	1253408	234888	6931	12971	6847	6183	14499	1535727	1680278
3	Bhopal	268659	23104	3058	—	9278	3436	636	308171	333482
4	Chennai	1011072	234381	8450	310	1152	—	13721	1269086	1355550
5	Cochin **	136219	33028	3700	—	469	985	3713	178114	226185
6	Coimbatore	363042	52427	4039	424	5798	—	2037	427767	448327
7	Delhi	2354530	1009524	115669	379	4771	99	9305	3494277	3876407
8	Hyderabad $	757884	84187	15127	3802	204	282	659	861945	950624
9	Indore	425094	45953	4278	—	10694	7348	1633	495000	550388
10	Jaipur	518530	69284	21630	—	21393	2686	548	634071	693336
11	Kanpur	321215	39541	3887	1755	3543	422	1181	371544	384955
12	Kolkata *	298959	238560	(a)	—	4736	N.A.	11683	553938	664046
13	Lucknow	442441	59425	10803	—	11090	911	3006	527676	555773
14	Ludhiana ***	500685	63516	2589	—	44708	311	494	612303	645686
15	Madurai	203632	11769	780	97	3416	(b)	1008	220702	239987
16	Mumbai	475352	326886	22560	3971	1382	1100	4560	835811	1069499
17	Nagpur	384383	26069	8585	497	3475	3716	453	427178	458961
18	Patna	210033	33878	12500	1055	7760	6438	1280	272944	312801
19	Pune	491747	63489	11232	612	908	752	832	569572	658313
20	Surat	487013	46770	3432	—	132	206	403	537956	575373
21	Vadodara	395692	46597	6117	—	1568	3244	2451	455669	506014
22	Varanasi	283769	19045	2632	-	20371	1296	907	328020	338715
23	Visakhapatnam $	190546	12628	393	—	595	524	733	205419	208779
	Total	**12467126**	**2890473**	**277818**	**25873**	**164399**	**40110**	**77437**	**15943236**	**17632825**

Source : *Motor Transport Statistics of India 2001-02, Transport Research Wing, Ministry of RoadTransport & Highways*

* : *Data relates to 1997-98* (a) : *Included in cars* $: *Data relates to1998-99*

** : *Data relates to 1996-97* (b) : *Included in tractors* N. A. : *Not Available*

(—) : *Nil* *** : *Data relates to 2000-01*

With the increasing urbanization and industrialization, the transport demand has also increased consequently. The total number of vehicles in India has increased from about 11 million in 1986 to more than 48 million, in 1999-2000, of which about 31% is concentrated in the 23 metropolitan cities. This has increased the vehicular pollution. The different factors are the types of engines used, the age of the vehicles, poor road conditions and congested traffic. The principal vehicular pollutants are Carbon Monoxide, Oxides of Nitrogen, Hydrocarbons, suspended and particulate matters, a varying amount of Sulphur Dioxide depending on the Sulphur content of the fuel and lead compounds.

TABLE 4.1.7 : WORKING OF STATE TRANSPORT UNDERTAKINGS

(As on 31st March)

Sl. No.	Year/State/UT	Fleet Strength (Buses) (no.)	Vehicles in Bus Scheduled Service (No.)	Kilometers Performed (Lakh km.) (Rs. Lakh)	Gross Revenue Receipts	Current Expenditure (Total Operating Cost) (Rs. Lakh)	Net Revenue (Rs. Lakh)
1	2	3	4	5	6	7	8
	1990-91	100182	85481	3766032	509351	571019	-61668
	1991-92	96909	85099	3956416	608679	669574	-60895
	1992-93	105214	92089	4152713	691882	763124	-71242
	1993-94	102913	91835	4111659	777344	842947	-65603
	1994-95	90566	80213	3713205	613420	688359	-74939
	1995-96	91144	80572	3916078	657591	759655	-102064
	1996-97	88479	78896	3816364	632465	735700	-103234
	1997-98	101514	91916	4067927	831140	941947	-110807
	1998-99	105336	95092	4243137	902597	1080743	-178147
	1999-2000	115034	103392	4608822	1102700	1303904	-201204
	2000-2001	**104773**	**65211**	**—**	**1563541**	**1692108**	**-130071**
	State:						
1	Andhra Pradesh	18764	17811	—	254021	275016	-20995
2	Arunachal Pradesh	—	—	—	—	—	—
3	Assam	—	—	—	—	—	—
4	Bihar	—	—	—	—	—	—
5	Goa	—	—	—	—	—	—
6	Gujarat (1)	9402	747	—	133396	170403	-37007
7	Haryana	3358	—	—	49534	56755	-7221
8	Himachal Pradesh	1700	2485	—	20383	23859	-3476
9	Jammu & Kashmir	—	—	—	—	—	—
10	Karnataka (7)	11288	9291	—	144508	144391	118
11	Kerala	3502	4126	—	56725	68345	-11620
12	Madhya Pradesh	—	—	—	—	—	—
13	Maharashtra (2)	20172	4502	—	399162	368276	29441
14	Manipur	—	—	—	—	—	—
15	Mizoram	39	—	—	194	1062	-868
16	Meghalaya	44	—	—	594	778	-184
17	Nagaland	86	—	—	516	1421	-905
18	Orissa	254	173	—	2999	4167	-1168
19	Punjab (3)	3100	1738	—	35163	47844	-12745
20	Rajasthan	4401	4281	—	58807	67145	-8338
21	Sikkim	88	—	—	1191	1870	-679
22	Tamil Nadu (4)	15662	14523	—	285241	307865	-22622
23	Tripura	38	116	—	224	1049	-825
24	Uttar Pradesh	7001	—	—	73852	83637	-9785
25	West Bengal (5)	1149	971	—	10379	19587	-9206
26	**Union Territory:**						
27	A.& N. Islands	—	—	—	—	—	—
28	Chandigarh (6)	395	—	—	5486	5634	-148
29	Delhi	4330	4447		31166	43004	-11838

Source: *Transport Research Wing, Ministry of Surface Transport*

(1) *Relates to Gujarat SRTC, Ahmedabad MTS.*
(2) *Relates to Maharastra SRTC, BEST Undertaking, Kolhapur MTU, Pune MT, Pimpri-Chin.MT, Solapur MT.*
(3) *Relates to Pepsu RTC and Punjab Roadways.*
(4) *Relates to Metro.TC (Chennai Dvn-I) Ltd, Metro.TC (Chennai Dvn-II) Ltd, State Exp.TC (TN Dvn-I) Ltd, State Exp.TC (TN Dvn-II) Ltd, TN STC (Coimbatore Dvn-I) Ltd, TN STC (Coimbatore Dvn-II) Ltd, TN STC (Coimbatore Dvn-III) Ltd, TN STC (Kumakonam Dvn-I) Ltd, TN STC (Kumakonam Dvn-II) Ltd, TN STC (Kumakonam Dvn-III) Ltd, TN STC (Kumakonam Dvn-IV) Ltd, TN STC (Madurai Dvn-I) Ltd, TN STC (Madurai Dvn-II) Ltd, TN STC (Madurai Dvn-III) Ltd, TN STC (Madurai Dvn-IV) Ltd, TN STC (Salem Dvn-I) Ltd,TN STC (Salem Dvn-II) Ltd,TN STC(Villupuram Dvn-I) Ltd, TN STC (Villupuram Dvn-II) Ltd, TN STC (Villupuram-III) Ltd, Kadamba TCL.*
(5) *Relates to Calcutta STC, North Bengal STC. (6) Relates to Chandigarh TU only.*
(7) *Relates to KSRTC, North West Karnataka RTC & Bangalore Metropolitan TC.*

TABLE 4.1.8 : DIFFERENT CATEGORIES OF PETROL DRIVEN VEHICLES MONITORED AND PERCENTAGE MEETING CARBON MONOXIDE STANDARDS

Sl. No.	Categories of Vehicles	No. of Vehicles Monitored	No. of Vehicles Meeting CO Standards	% age of Vehicles Meeting CO Standards
1	2	3	4	5
1	Two Wheelers	400	358	89.5
2	Three Wheelers	66	63	95.45
3	Four Wheelers	246	213	86.58
	Total	**712**	**634**	**89.05**

Source : *Ministry of Environment & Forests, Annual Report 1999-2000*

Automobile exhausts accounts for a sizable part of pollution. Their effect on human health is particularly of concern. There is a strong correlation between average blood lead levels and the lead content in gasoline. Hydrocarbons present in the exhaust, particularly, in vehicles with poor combustion cause respiratory problems. In the urban areas with tall buildings, which act as concrete canyons, and in street crossings, the pollutants from vehicles stay for a much larger period. Pollution also causes photo chemical smog.

The National Environmental Engineering Research Institute (NEERI) has been involved in R&D for developing indigenous, lead-resistant, cost-effective catalytic converter for Indian conditions, under three-phased programme. Under the first phase, which has been completed, the test results indicate that the use of a catalytic converter reduces the Carbon-mono-oxide and hydrocarbons concentrations in petrol-driven vehicles to the tune of 50-60%.

Lead additions are added to petrol to enhance its anti-knock properties. It is estimated that only 30% of the lead is deposited in the engine and the balance 70% is exhausted out of the tail pipe into the atmosphere as inorganic salt which can be readily absorbed by people. While the permissible limit for lead is 2 micro gram per 100 ml of blood, an average citizen in a metropolis in India has a lead level between 3 to 82 micro gram per 100 ml of blood. The first phase of introducing petrol with a maximum lead content of 0.15 gms per litre (which was 0.56 gm/litre) in the four metropolitan cities of Delhi, Mumbai, Chennai and Kolkata has already been implemented by the Ministry of Petroleum and Natural Gas since December 15, 1994

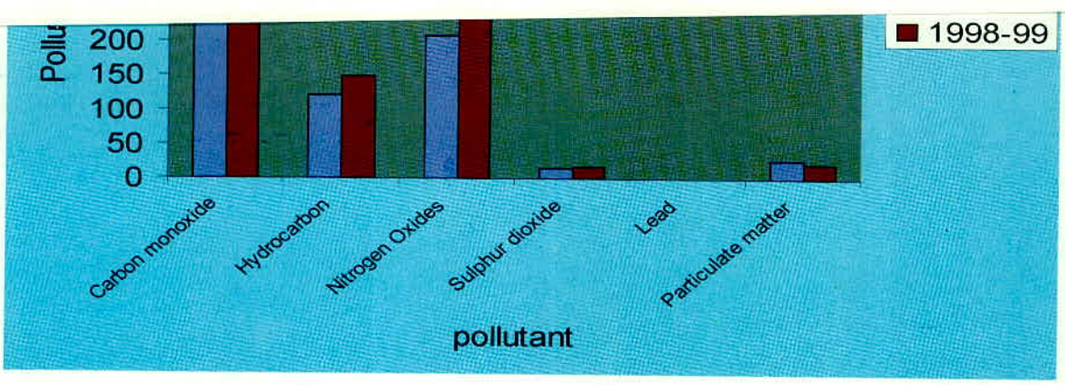


TABLE 4.1.9 (a): ESTIMATED VEHICULAR POLLUTION LOAD IN METROPOLITAN CITIES

Sl. No.	City	Emission Load of Pollutants in Thousand Tonnes in 2001					
		CO	HC	NOx	PM	Benzene	Butadiene
1	Delhi	292.51	112.57	62.69	14.30	2.97	0.3500
2	Hyderabad	128.89	72.57	15.11	5.64	2.92	0.1532
3	Bangalore	118.34	70.59	27.34	6.68	2.95	0.1533
4	Chennai	88.40	12.57	17.19	4.10	1.89	0.1100

TABLE 4.1.10 : AMBIENT AIR QUALITY IN DELHI

Sl. No.	Parameters/Area	Year				
		1995	1998	1999	2000	2001
1	2	3	4	5	6	7
1	**Sulphur Dioxide (µg/m³)**					
	Industrial Area	24.1	20.2	19.5	19.0	13.0
	Residential Area	16.5	15.8	17.0	17.0	14.0
	Traffic Intersection	42.0	25.0	20.0	18.0	15.0
2	**Nitrogen Dioxide (µg/m³)**					
	Industrial Area	37.0	34.7	33.5	36.0	29.0
	Residential Area	32.5	28.6	26.5	31.0	29.0
	Traffic Intersection	66.0	63.0	60.0	59.0	67.0
3	**Suspended Particulate Matter (µg/m³)**					
	Industrial Area	403.0	363.0	361.0	433.0	358.0
	Residential Area	409.0	345.0	349.0	370.0	311.0
	Traffic Intersection	452.0	426.0	418.0	490.0	476.0
4	**Lead (µg/m³)**					
	Residential Area	155.0	95.0	46.0	40.0	47.0
	Traffic Intersection	335.0	136.0	70.0	102.0	103.0
5	**Carbon Mono-oxide (µg/m³)**					
	Traffic Intersection	3916.0	5450.0	4241.0	4686.0	4183.0

Source : *Central Pollution Control Board*

TABLE 4.1.11: EMISSION LIMITS FOR DIESEL DRIVEN VEHICLES

Sl. No.	Test	Light absorption Coefficient (Millilitre)	Maximum Smoke Density Bosch Units	Maximum Smoke Density Hartridge Unit
1	2	3	4	5
1	Full load at a speed of 60 to 70 per cent of maximum engine rated speed specified by the manufacturer	3.1	5.2	75.0
2	Free acceleration	2.3	—	65.0

Source : *TERI Energy Data Directory and Yearbook, 2002-03*

TABLE 4.1.12 : PHASED TIGHTENING OF EXHAUST EMISSION STANDARDS FOR INDIAN AUTOMOBILES

Sl. No.	Category	1991	1996	2000 (Euro II)	2005 (Euro III)
1	2	3	4	5	6
1	**Petrol Vehicles : (in grams/km)**				
	I. Two wheelers				
	(a) CO	12-30	4.5	2.0	-
	(b) HC	8-12	-	-	-
	(c) ($HC+NO_x$)	-	3.6	2.0	-
	II. Three Wheelers				
	(a) CO	12-30	6.75	4.0	-
	(b) HC	8-12	-	-	-
	(c) ($HC+NO_x$)	-	5.40	2.0	-
	III. Cars with CC :				
	(a) CO	-	4.34-6.20	2.72	2.2
	(b) HC	-	-	-	-
	(c) ($HC+NO_x$)	-	1.5-2.18	0.97	0.5
	IV. Cars without CC :				
	(a) CO	14.3-27.1	8.68-12.4	2.72	2.2
	(b) HC	2.0-2.9	-	-	-
	(c) ($HC+NO_x$)	-	3.00-4.36	0.97	0.5
2	**Diesel Vehicles :**				
	A : Gross Vehicles Weight > 3.5 ton (Heavy Duty Vehicles)-in grams/kWh				
	(a) CO	14.0	11.2	4.5	4
	(b) HC	3.5	2.4	1.1	1.1
	(c) NO_x	18.0	14.4	8.0	7
	(d) PM > 85 KW/g/KWh	-	-	0.36	0.15
	(e) PM < 85 KW/g/KWh	-	-	0.61	0.15
	B : Gross Vehicles Weight < 3.5 ton (Light duty Vehicles)*-in grams/km				
	(a) CO	14.3-27.1	5.0-9.0	2.72-6.90	1.06
	(b) ($HC+NO_x$)	2.7-6.9	2.0-4.0	0.97-1.70	0.71
	(c) NO_x	-	-	-	0.566
	(d) PM	-	-	0.14-0.25	0.080

Source : *The Energy Research Institute.*
CO : *Carbon Monoxide*
HC : *Hydrocarbon*
NO_x : *Oxides of Nitrogen*
CC : *Catalytic Converter*
PM : *Particulate matter*
* : *The test cycle is as per 13 mode cycle or a chasis dynamometer.*
Euro I w.e.f. 1-6-99 and Euro II w.e.f. 1-4-2000 for private (non-commercial) vehicles in NCR.

Stricter emission norms for new vehicles effective from 1.4.2000 have been notified by the Ministry of Surface Transport and has come into force. The Progressive tightening of emission norms for vehicles at manufacturing stage has brought about significant improvement in exhaust emission of new vehicles after March, 2000.

TABLE 4.2.1 : INSTALLED CAPACITY OF POWER UTILITIES on 31st March, 2002(P)

(Megawatts)

Sl. No.	State/Union Territory	Hydro	Thermal			Wind	Nuclear	Total
			Steam	Gas	Diesel			
1	2	3	4	5	6	7	8	9
I	**Northern Region**	**8496.57**	**15469.50**	**2912.10**	**14.99**	**14.00**	**1180.00**	**28087.16**
1	Haryana	883.90	1102.50	0.00	3.92	0.00	0.00	1990.32
2	Himachal Pradesh	409.67	0.00	0.00	0.13	0.00	0.00	409.80
3	Jammu & Kashmir	311.69	0.00	175.00	8.94	0.00	0.00	495.63
4	Punjab	2398.94	2130.00	0.00	0.00	0.00	0.00	4528.94
5	Rajasthan	971.62	1975.00	38.50	0.00	14.00	0.00	2999.12
6	Uttar Pradesh & Uttranchal	1510.75	4102.00	0.00	0.00	0.00	0.00	5612.75
7	Chandigarh	0.00	0.00	0.00	2.00	0.00	0.00	2.00
8	Delhi	0.00	320.00	282.00	0.00	0.00	0.00	602.00
9	Central sector	2010.00	5840.00	2416.60	0.00	0.00	1180.00	11446.60
II	**Western region**	**4342.13**	**20691.50**	**4974.10**	**17.48**	**509.81**	**760.00**	**31295.02**
1	Goa	0.05	0.00	48.00	0.00	0.11	0.00	48.16
2	Gujarat	547.00	4819.00	1802.10	17.48	166.90	0.00	7352.48
3	Madhya Pradesh	947.91	3437.50	0.00	0.00	22.60	0.00	4408.01
4	Maharashtra	2847.17	8075.00	1832.00	0.00	320.20	0.00	13074.37
5	Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Central sector	0.00	4360.00	1292.00	0.00	0.00	760.00	6412.00
III	**Southern region**	**9862.84**	**12112.50**	**2378.40**	**949.29**	**981.00**	**780.00**	**27064.03**
1	Andhra Pradesh	3121.94	2952.50	1034.40	36.80	91.90	0.00	7237.54
2	Karnataka	2938.75	1520.00	220.00	234.42	54.80	0.00	4967.97
3	Kerala	1807.00	0.00	174.00	256.44	2.00	0.00	2239.44
4	Tamil Nadu	1995.15	2970.00	567.50	411.66	832.30	0.00	6776.61
5	Pondicherry	0.00	0.00	32.50	0.00	0.00	0.00	32.50
6	Lakshadweep	0.00	0.00	0.00	9.97	0.00	0.00	
7	Central sector	0.00	4670.00	350.00	0.00	0.00	780.00	5800.00
IV	**Eastern region**	**2458.76**	**13527.38**	**190.00**	**51.25**	**2.49**	**0.00**	**16229.88**
1	Bihar	174.90	2053.50	0.00	0.00	0.00	0.00	2228.40
2	Orissa	1877.00	420.00	0.00	0.00	1.49	0.00	2298.49
3	West Bengal	164.71	4506.38	100.00	12.20	1.00	0.00	4784.29
4	D.V.G.	144.00	2637.50	90.00	0.00	0.00	0.00	2871.50
5	A. & N. Islands	5.25	0.00	0.00	34.05	0.00	0.00	39.30
6	Sikkim	32.90	0.00	0.00	5.00	0.00	0.00	37.90
7	Central sector	60.00	3910.00	0.00	0.00	0.00	0.00	3970.00
V	**North-eastern region**	**1100.93**	**330.00**	**708.50**	**101.82**	**0.16**	**0.00**	**2241.41**
1	Assam	2.00	0.00	269.00	20.69	0.00	0.00	291.69
2	Manipur	3.20	0.00	0.00	27.41	0.00	0.00	30.61
3	Meghalaya	186.71	0.00	0.00	2.05	0.00	0.00	188.76
4	Nagaland ('@)	20.20	0.00	0.00	2.00	0.16	0.00	22.36
5	Tripura	16.01	0.00	64.50	4.85	0.00	0.00	85.36
6	Arunachal Pradesh	29.55	0.00	0.00	15.88	0.00	0.00	45.43
7	Mizoram	8.26	0.00	0.00	28.94	0.00	0.00	37.20
8	Central sector	835.00	330.00	375.00	0.00	0.00	0.00	1540.00
	All-India	**26261.23**	**62130.88**	**11163.10**	**1134.83**	**1507.46**	**2720.00**	**104917.50**

Source : *Central Electricity Authority*
(@) : *In case of Nagaland Wind includes .16 MW as Bio-Mass Gassifire.* P : *Provisional*
Note : *Installed capacity of jointly owned projects have been shown divided between the partner states as per their theoretical shares.*

TABLE 4.2.2 : GENERATING CAPACITY AND ELECTRICITY GENERATION

Sl.No.	Parameter	1980-81	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99
1	2	3	4	5	6	7	8	9	10	11	12
	Generating capacity*										
1	**All-India (Utilities + Non-Utilities)**	**33316**	**74699**	**78367**	**82375**	**87475**	**92332**	**95081**	**97874**	**102268**	**107355**
2	**Total (Utilites)**	**30214**	**66086**	**69065**	**72330**	**76753**	**81171**	**83294**	**85795**	**89102**	**93255**
	Public sector	28832	63344	66149	69426	73729	77625	79418	80783	82846	85430
	Private sector	1382	2742	2916	2904	3024	3546	3876	5012	6256	7825
	Average annual growth rate (per cent) during the decade	7.46	8.14	7.88	7.42	6.91	6.66	5.94	5.7	5.1	4.68
3	**Non-utilities(including railways)**	**3102**	**8613**	**9302**	**10045**	**10722**	**11161**	**11787**	**12079**	**13166**	**14100**
	Hydro	3	4	4	4	4	4	3	3	21	21
	Steam	2137	5010	5396	5560	5812	6029	6324	6171	6648	6950
	Gas	54	475	496	631	774	808	956	1166	1330	1950
	Diesel and wind	908	3124	3406	3850	4132	4320	4504	4739	5167	5179
4	**Electricity Generation****										
5	**All-India (Utilities + Non-Utilities)**	**119260**	**289439**	**315631**	**332713**	**356335**	**385557**	**418043**	**436729**	**465825**	**494143**
6	**Total (Utilities)**	**110844**	**264329**	**287029**	**301362**	**324050**	**350490**	**379877**	**395889**	**421747**	**448563**
	Public sector	104114	251382	273312	287536	310197	335293	361725	374126	395593	416726
	Private sector	6730	12947	13717	13826	13853	15197	18152	21763	26154	31837
	Average annual growth rate (per cent) during the decad	7.10	9.08	9.08	8.75	8.74	8.37	8.35	7.75	7.63	7.32
7	**Non-utilities(including railways)**	**8416**	**25110**	**28602**	**31351**	**32285**	**35067**	**38166**	**40840**	**44078**	**45580**
	Hydro	15	15	17	16	15	15	17	29	79	80
	Steam	7232	20017	23413	24682	25416	27390	28754	29130	30686	31900
	Gas	102	1845	1905	2803	3149	4255	4576	5039	5776	5900
	Diesel and wind	1067	3233	3267	3850	3705	3407	4819	6642	7537	7700

Source : *Central Electricity Authority*
* : *in megawatts*
** : *in gigawatts-hours*

TABLE 4.2.3 : ACTUAL POWER SUPPLY POSITION

(All figures in MU net)

Sl. No.	Region/ State/ System	April 2000 – March 2001				April 2001 – March 2002			
		Require-ment	Availa-bility	Shortage	Shortage %	Require-ment	Availa-bility	Shortage	Shortage %
1	2	8	9	10	11	4	5	6	7
I.	**Northern Region**	**145567**	**134633**	**10934**	**7.5**	**150383**	**142410**	**7973**	**5.3**
1	Chandigarh	1072	1068	4	0.4	1110	1108	2	0.2
2	Delhi	18575	17667	908	4.9	19350	18741	609	3.1
3	Haryana	17275	16793	482	2.8	18138	17839	299	1.6
4	Himachal Pradesh	3190	3087	103	3.2	3293	3206	87	2.6
5	Jammu & Kashmir	6410	5361	1049	16.4	6635	5899	736	11.1
6	Punjab	27670	26923	747	2.7	28780	27577	1203	4.2
7	Rajasthan	25080	24178	902	3.6	24745	24495	250	1.0
8	Uttar Pradesh	46295	39556	6739	14.6	48332	43545	4787	9.9
II.	**Western Region**	**173975**	**155384**	**18591**	**10.7**	**175016**	**156793**	**18223**	**10.4**
1	Chhatisgarh					8054	7825	229	2.8
2	Goa	1766	1576	190	10.8	1767	1767	0	0.0
3	Gujarat	53038	47877	5161	9.7	53693	47530	6163	11.5
4	Madhya Pradesh	39644	34747	4897	12.4	31013	26233	4780	15.4
5	Maharashtra	79527	71184	8343	10.5	80489	73438	7051	8.8
III.	**Southern Region**	**134300**	**123677**	**10623**	**7.9**	**140516**	**128095**	**12421**	**8.8**
1	Andhra Pradeash	47792	44055	3737	7.8	48394	44302	4092	8.5
2	Karnataka	30242	27490	2752	9.1	32556	28493	4063	12.5
3	Kerala	13564	12670	894	6.6	13334	12349	985	7.4
4	Tamil Nadu	42702	39462	3240	7.6	46232	42951	3281	7.1
IV.	**Eastern Region**	**48073**	**48101**	**-28**	**-0.1**	**50687**	**50197**	**490**	**1.0**
1	Bihar	9208	8563	645	7.0	9370	8992	378	4.0
2	D.V.C.	8368	8510	-142	-1.7	8319	8312	7	0.1
3	Orissa	11710	12070	-360	-3.1	12328	12318	10	0.1
4	West Bengal	18787	18958	-171	-0.9	20670	20575	95	0.5
V.	**North-Eastern Region**	**5298.1**	**5606.3**	**-308.2**	**-5.8**	**5935.1**	**5854.9**	**80.2**	**1.4**
1	Arunachal Pradesh	127.7	130.1	-2.4	-1.9	136.3	134.6	1.7	1.2
2	Assam	3092.9	3332.8	-239.9	-7.8	3450.5	3425.2	25.3	0.7
3	Manipur	463.9	453.4	10.5	2.3	456.5	440.6	15.9	3.5
4	Megnalaya	563.9	605.2	-41.3	-7.3	700.1	705	-4.9	-0.7
5	Mizoram	249.7	256.5	-6.8	-2.7	284.5	278.5	6	2.1
6	Nagaland	226.0	231.9	-5.9	-2.6	260.1	258.4	1.7	0.7
7	Tripura	574.0	596.4	-22.4	-3.9	647.1	612.6	34.5	5.3
	All India	**507213.1**	**467401.3**	**39811.8**	**7.8**	**522537**	**483350**	**39187**	**7.5**

Source : Central Electricity Authority
: *Indicates Surplus*

TABLE 4.2.4(a): CONSUMPTION OF FOSSIL FUELS FOR ELECTRICITY GENERATION FROM THERMAL POWER STATIONS (BY KIND OF FUELS) REGION-WISE/STATE-WISE DURING 2001-2002 (STEAM)

Sl. No.	State/Union Territory	team Stations								
		Coal ('000' MT)	Lignite ('000' MT)	Furnace Oil (KL)	Light Diesel Oil (KL)	LSHS/ HPS (KL)	HSD (KL)	Heat Input (K.Calx10)	Gross Gen. (GWH)	Average Heat Input (K. Cal/ Kwh)
1	2	3	4	5	6	7	8	9	10	11
1	**Northern Region**	**66207**		**139327**	**53260**	**15415**	**105**		**139928**	
	I. Haryana	4020		17003		12379	105		5082	
	II. Himachal Pradesh									
	III. Jammu & Kashmir									
	IV. Punjab	10049		19769	1606	3036			14695	
	V. Rajasthan	6471		9989					10591	
	VI. Uttar Pradesh	15420		4778	42974				59004	
	VII. Chandigarh									
	VIII. Delhi	5010			8680				6787	
	IX. Central Sector	25237		87788					43769	
2	**Western Region**	**106758**		**185342**	**27861**	**533637**	**3586**		**155090**	
	I. Gujarat	**15869**		**43013**	**2637**	**522992**	**143**		**24991**	
	II. Madhya Pradesh	**20195**		**46587**	**7158**		**3443**		**28113**	
	III. Chhattisgarh	**17234**		**10680**	**272**				**24348**	
	IV. Maharashtra	**32515**		**85062**	**17794**	**10645**			**45457**	
	V. Goa									
	VI. Daman & Diu									
	VII. Dadra & Nagar Haveli									
	VIII. Central Sector	**20945**							**32181**	
3	**Southern Region**	**56849**	**17317**	**141023**	**2288**	**24971**	**8299**		**83247**	
	I. Andhara Pradesh	26279		10784	408		1447		38119	
	II. Karnataka	5702		9469	240				8952	
	III. Kerala									
	IV. Tamil Nadu	14905	17317	104433	1404	16647	6852		20326	
	V. Pondicherry									
	VI. Central Sector	9963		16337	236	8324			15850	

TABLE 4.2.4(b): CONSUMPTION OF FOSSIL FUELS FOR ELECTRICITY GENERATION FROM THERMAL POWER STATIONS (BY KIND OF FUELS) REGION-WISE/STATE-WISE DURING 1999-2000 (Gas & Diesel)– Concld.

Sl. No.	State/Union Territory	Gas Stations					Diesel Stations	
		Natural Gas (Million Cu. Mts.)	HSD (Kilo Ltrs.)	Naphtha (Kilo Ltrs.)	Generation (GWH)	Diesel Oil (Kilo. Ltrs.)	Generation (GWH)	Average Oil Consumed (ltrs/Kwh)
1	2	3	4	5	6	7	8	9
5	**Eastern region**	**0**	**23145**	**5868**	**49.87**	**455**	**2.30**	**0.20**
	I. Bihar	0	0	0	0.00	0	0.00	0.00
	II. Orissa	0	0	0	0.00	0	0.00	0.00
	III. West Bengal	0	17728	0	23.72	89 e	0.45	0.20
	IV. Damodar Valley Corporation	0	5417 e	5868	26.15	0	0.00	0.00
	V. Sikkim	0	0	0	0.00	366	1.85	0.20
	VI. Central sector	0	0	0	0.00	0	0.00	0.00
6	**North-eastern region**	**1118**	**0**	**0**	**2178.54**	**10048**	**28.49**	**0.32**
	I. Assam	388	0	0	902.80	0	0.00	0.00
	II. Manipur	0	0	0	0.00	235	0.68	0.34
	III. Meghalaya	0	0	0	0.00	0	0.00	0.00
	IV. Nagaland	0	0	0	0.00	28 e	0.20	0.14
	V. Tripura	305 e	0	0	335.00	700e	2.00	0.35
	VI. Arunachal Pradesh	0	0	0	0.00	4953	13.10	0.18
	VII. Mizoram	0	0	0	0.00	4132	12.51	0.34
	VIII. Central sector	425	0	0	940.74	0	0.00	0.00
7	**Islands**	**0**	**0**	**0**	**0.00**	**37224**	**122.29**	
	I. Lakshadweep	0	0	0	0	6602	18.84	0.35
	II. A & N Islands	0	0	0	0	30622	103.45	0.30
	All-India	**9005**	**209295**	**649696**	**41311.63**	**270674**	**1303.66**	**0.21**

Source : *Central Electricity Authority*
e : *Estimated*

TABLE 4.2.5 : ANNUAL GROSS GENERATION OF POWER BY SOURCE

(in MU units)

Sl. No.	Year	Hydro	Steam @	Diesel & Wind @	Gas	Nuclear	Thermal*	Total
1	2	3	4	5	6	7	8	9
1	1980-81	46541.8	60713.8	61.5	522.0	3001.3		110840.4
2	1985-86	51020.6	112540.1	50.6	1756.9	4981.9		170350.1
3	1990-91	71641.3	178321.7	111.3	8113.2	6141.1		264328.6
4	1991-92	72757.1	197163.2	134.0	11450.0	5524.4		287028.7
5	1992-93	69869.2	211123.5	162.3	13480.4	6726.3		301361.7
6	1993-94	70462.7	233150.7	310.9	14727.6	5397.7		324049.6
7	1994-95	82712.0	243110.2	545.2	18474.8	5648.2		350490.4
8	1995-96	72759.2	273743.5	714.4	24858.4	7981.7		380057.2
9	1996-97	68900.8	289378.3	1554.3	26984.9	9071.1		395889.4
10	1997-98	74581.7	300730.5	1929.3	34423.2	10082.6		421747.3
11	1998-99	82690.0	308056.0	2136.0	43480.0	12015.0	353662.0	448367.0
12	1999-00	80637.0	377814.0	3989.0	49773.0	13267.0	386776.0	480680.0
13	2000-01	74481.0	357006.0	3822.0	48311.0	16928.0	408139.0	499548.0
14	2001-02	73940.0	369087.0	4113.0	48787.0	19320.0	421987.0	515247.0

Source: *Central Electricity Authority*
* : *Including Coal, Lignite, Diesel & Gas based stations*
@' : *We are not monitoring Captioc Power Plants Wind & Generation of small stations i.e. Mini & Micro Hydel*

The power generating capacity , owned and operated by utilities, has grown at a rate of over 10% per year since 1950. The shares of hydro power and thermal power have changed substantially. The share of hydro capacity declined from 43.4% in 1970-71 to 42% in 1980-81 and further reduced to 17.7% in 1997-98 and 14% in 2001-02.

It is difficult to strike an optional balance between Hydro and Thermal power, as it may depend upon the system load curve, performance of various types of plants etc.

Perhaps, one of the most important reasons for the decline in the share of hydro electricity is that its gestation period is larger than that of thermal capacity. This is, because, equipment and construction procedures for thermal projects are largely independent of site conditions and can, therefore, be standardized. Hydro-development has also lagged behind due to inter-state disputes and sharing of water, inadequate funding and on account of environmental considerations with addition to installed capacity, gross utility generation also increased rapidly.

TABLE 4.2.6 (a) : PER THOUSAND DISTRIBUTION OF HOUSEHOLDS BY PRIMARY SOURCE OF ENERGY USED FOR COOKING FOR EACH MAJOR STATE

(Rural)

Sl. No.	State	55th Round						50th Round					
		No Cooking Arrangement	Firewood and Chips	Dung Cake	LPG	Others	All	No Cooking Arrangement	Firewood and Chips	Dung Cake	LPG	Others	All
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Andhra Pradesh	31	871	3	63	32	1000	6	938	6	23	27	1000
2	Assam	2	934	2	56	6	1000	0	973	5	11	11	1000
3	Bihar	2	634	242	6	116	1000	3	634	256	3	104	1000
4	Gujarat	16	776	22	102	84	1000	5	788	65	49	93	1000
5	Haryana	0	494	303	184	19	1000	1	683	247	36	33	1000
6	Karnataka	22	869	1	43	65	1000	10	940	3	17	30	1000
7	Kerala	9	847	3	116	25	1000	14	921	2	41	22	1000
8	Madhya Pradesh	5	927	26	17	25	1000	3	912	62	5	18	1000
9	Maharashtra	29	702	9	91	169	1000	9	967	13	35	176	1200
10	Orissa	13	894	55	8	30	1000	21	889	39	3	48	1000
11	Punjab	2	349	375	142	132	1000	6	507	340	51	96	1000
12	Rajasthan	5	930	18	29	18	1000	2	900	44	20	34	1000
13	Tamil Nadu	14	859	1	67	59	1000	13	913	1	31	42	1000
14	Uttar Pradesh	3	573	329	36	59	1000	4	627	329	12	28	1000
15	West Bengal	4	785	54	17	140	1000	11	613	88	3	285	1000
	All India	**11**	**755**	**106**	**54**	**74**	**1000**	**7**	**782**	**115**	**19**	**77**	**1000**

Source: NSS Report 1999-2000

TABLE 4.2.6 (b) : PER THOUSAND DISTRIBUTION OF HOUSEHOLDS BY PRIMARY SOURCE OF ENERGY USED FOR COOKING FOR EACH MAJOR STATE

(Urban)

Sl. No.	State	55th Round						50th Round					
		No Cooking Arrangement	Firewood and Chips	Dung Cake	LPG	Others	All	No Cooking Arrangement	Firewood and Chips	Dung Cake	LPG	Others	All
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Andhra Pradesh	3	271	216	438	72	1000	27	441	211	279	42	1000
2	Assam	1	341	111	500	47	1000	45	441	155	345	14	1000
3	Bihar	10	257	93	279	361	1000	59	218	89	172	462	1000
4	Gujarat	13	107	258	559	63	1000	78	161	310	396	55	1000
5	Haryana	0	193	167	546	97	1003	43	238	230	387	102	1000
6	Karnataka	3	232	251	438	76	1000	58	362	265	260	55	1000
7	Kerala	3	541	68	310	78	1000	73	703	52	168	4	1000
8	Madhya Pradesh	1	346	179	377	97	1000	30	414	156	308	92	1000
9	Maharashtra	11	97	304	515	73	1000	74	138	376	389	23	1000
10	Orissa	2	432	224	169	173	1000	99	424	120	180	177	1000
11	Punjab	4	113	310	480	93	1000	11	145	359	409	76	1000
12	Rajasthan	0	312	144	509	35	1000	24	391	243	285	57	1000
13	Tamil Nadu	1	233	329	372	65	1000	115	430	250	192	13	1000
14	Uttar Pradesh	4	305	141	431	119	1000	21	391	148	341	125	1026
15	West Bengal	40	121	192	347	300	1000	106	84	140	187	483	1000
	All India	**7**	**223**	**217**	**442**	**111**	**1000**	**63**	**300**	**232**	**296**	**109**	**1000**

Source: *NSS Report 1999-2000*

TABLE 4.2.6 (c): PER THOUSAND DISTRIBUTION OF HOUSEHOLDS BY MPCE CLASS AND AVERAGE MPCE SEPARATELY FOR EACH PRIMARY SOURCE OF ENERGY USED FOR COOKING

(All India Rural)

Sl. No.	MPCE Class	No Cooking Arrangement	Coke	Firewood and Chips	Gobar Gas	Dung Cake	Charcoal	Kerosene	LPG	Electricity	Others	All
1	2	3	4	5	6	7	8	9	10	11	12	13
1	0-225	117	64	48	0	36	48	3	1	3	51	44
2	225-255	23	32	47	6	34	35	3	1	0	70	42
3	255-300	21	81	94	7	91	76	20	5	0	131	87
4	300-340	29	112	97	7	101	82	19	8	37	134	90
5	340-380	38	83	101	14	101	164	44	14	2	115	94
6	380-420	71	87	97	24	99	43	50	21	29	111	92
7	420-470	53	118	106	70	102	92	57	36	60	109	100
8	470-525	83	93	101	59	96	118	80	49	34	80	96
9	525-615	72	102	111	158	116	2	134	99	112	92	111
10	615-775	143	110	106	151	114	161	177	191	221	69	113
11	775-950	62	56	50	186	58	64	164	183	73	26	61
12	950-More	289	63	42	318	53	115	249	390	429	11	71
13	All Classes	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
14	Av. MPCE (Rs.)	828	461	454	842	476	515	693	892	902	393	486

Source: *NSS Report 1999-2000*

TABLE 4.2.6 (d): PER THOUSAND DISTRIBUTION OF HOUSEHOLDS BY MPCE CLASS AND AVERAGE MPCE SEPARATELY FOR EACH PRIMARY SOURCE OF ENERGY USED FOR COOKING

(All India Urban)

Sl. No.	MPCE Class	No Cooking Arrangement	Coke	Firewood and Chips	Gobar Gas	Dung Cake	Charcoal	Kerosene	LPG	Electricity	Others	All
1	2	3	4	5	6	7	8	9	10	11	12	13
1	0-300	93	56	114	0	79	39	21	3	7	43	38
2	300-350	65	60	100	64	101	67	25	7	0	16	37
3	350-425	158	142	173	0	186	108	78	17	56	26	75
4	425-500	186	161	163	57	130	114	95	37	54	33	86
5	500-575	114	138	133	80	114	93	109	50	73	35	86
6	575-665	59	128	101	35	132	111	119	73	49	35	91
7	665-775	42	108	77	420	76	121	119	100	66	46	96
8	775-915	45	97	60	25	71	167	124	122	142	59	104
9	915-1120	53	58	41	137	54	97	120	152	136	137	113
10	1120-1500	88	40	26	112	36	47	121	190	224	230	130
11	1500-1925	54	9	6	64	7	27	43	112	107	129	67
12	1925-More	42	3	5	5	14	9	26	137	86	210	77
13	All Classes	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
14	Av. MPCE (Rs.)	588	574	502	838	542	620	729	1134	910	1426	855

Source: *NSS Report 1999-2000*

TABLE 4.2.7 : NUMBER OF TOWNS AND VILLAGES ELECTRIFIED IN INDIA

(As on 31.03.2002)

Sl. No.	State/Union Territory	Towns		Villages		
		Total	Electrified	Total	Electrified (provisional)	
1	2	3	4	5	6	
I.	**Northern Region**	**1342**	**1342**	**193577**	**168740**	
1	Haryana	94	94	6759	6759	
2	Himachal Pradesh	58	58	16997	16886	
3	Jammu & Kashmir	58	58	6477	6315	(a)($)
4	Punjab	120	120	12428	12428	
5	Rajasthan	222	222	37889	36488	
6	Uttar Pradesh	753	753	97122	77152	(g)
7	Uttaranchal			15681	12488	(b)
8	Chandigarh	5	5	25	25	
9	Delhi	32	32	199	199	
II.	**Western Region**	**1099**	**1099**	**130421**	**127251**	
1	Gujarat	264	264	18028	17940	(*)
2	Madhya Pradesh	465	465	51806	50306	
3	Chattisgarh			19720	18201	
4	Maharashtra	336	336	40412	40349	(*)
5	Goa	31	31	360	360	(@)
6	Daman & Diu	2	2	24	24	
7	Dadra & Nagar Haveli	1	1	71	71	
III.	**Southern Region**	**1251**	**1251**	**71128**	**70805**	
1	Andhra Pradesh	264	264	26586	26565	(*)
2	Karnataka	306	306	27066	26764	(+)
3	Kerala	197	197	1384	1384	
4	Tamil Nadu	469	469	15822	15822	
5	Pondicherry	11	11	263	263	
6	Lakshadweep	4	4	7	7	
IV.	**Eastern Region**	**786**	**786**	**153363**	**113728**	
1	Bihar	271	271	67513	47954	($$)
2	Jharkhand (++)					
3	Orissa	124	124	46989	35232	(c)
4	West Bengal	382	382	37910	29636	
5	A & N Island	1	1	504	501	
6	Sikkim	8	8	447	405	(#)
V.	**North-Eastern Region**	**195**	**195**	**38769**	**28530**	
1	Assam	93	93	24685	19019	(e)
2	Manipur	31	31	2182	2001	
3	Meghalaya	12	12	5484	2588	
4	Nagaland	9	9	1216	1212	(d)
5	Tripura	18	18	855	813	(h)
6	Arunachal Pradesh	10	10	3649	2206	(f)
7	Mizoram	22	22	698	691	(h)
	Total (All India)	**4673**	**4673**	**587258**	**509054**	

Source : *Central Electricity Authority*

@ : *Provisional, to be confirmed as per 1991 census*
(*) : *Fully electrified Balance not feasible for electrification.*
(#) : *Provisional 42 Nos. forest villages not electrified*
($$) : *Achievements as per 1981 census.*
($) : *Achievements as per 1971 census. 1991 census not held*
(+) : *281 villages declared non-feasible for electrification.*
(++) : *Separate data not available*

a : *as on 31.03.1998*
b : *as on 30.09.2001*
c : *as on 30.04.2001*
d : *as on 30-09-2001*
e : *as on 31.10.2001*
f : *as on 30.11.2001*
g : *as on 31.12.2001*
h : *as on 28.02.2002*

TABLE 4.2.8 : STATE–WISE PRODUCTION OF COAL AND LIGNITE

(Million tonnes)

Sl.No.	States	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02(P)
1	2	3	4	5	6	7	8
I.	**Coal**	**289.321**	**300.403**	**296.508**	**304.103**	**313.696**	**327.644**
1	Andhra Pradesh	28.734	28.941	27.326	29.556	30.274	30.811
2	Assam	0.752	0.687	0.637	0.572	0.660	0.640
3	Jharkhand	77.678	81.274	76.161	76.533	75.416	76.807
4	Jammu & Kashmir	0.021	0.005	0.010	0.028	0.033	0.035
5	Madhya Pradesh	83.283	84.753	84.937	87.901	42.503	44.156
6	Meghalaya	3.241	3.234	4.238	4.060	4.065	5.015
7	Chhatisgarh					50.227	53.621
8	Maharashtra	24.857	26.171	25.279	27.698	28.754	30.83
9	Orissa	37.365	42.162	43.512	43.554	44.803	47.805
10	Uttar Pradesh	15.397	15.781	15.646	16.220	16.863	16.533
11	West Bengal	17.993	17.395	18.762	17.981	20.098	21.391
II.	**Lignite**	**22.640**	**23.052**	**23.419**	**22.125**	**22.947**	**23.503**
1	Gujarat	5.184	4.943	5.002	4.351	4.558	4.849
2	Rajasthan			0.249	0.222	0.217	0.277
3	Tamilnadu	17.456	18.109	18.168	17.552	18.172	18.377

Source : *Office of the Coal Controller*
P : *Provisional*

Coal is the most abundant source of commercial energy in India. Coal resources are continually assessed by the Geological Survey of India through regional mapping and exploratory drilling. The total coal reserves (as on 1 January, 2001) have been assessed at about 214 billion tonnes of which 84 billion tonnes are proven resources.

Coal production increased rapidly after the nationalisation of coal mines. From about 72.9 million ton in 1970/71, it rose to 211.7 million ton in 1990/91 and to 327 million ton in 2001-2002 making India the world's fourth largest coal producer. The increase is predominantly in non-coking coal production. One of the major constraints on the profitability of the coal sector is the low productivity levels in underground mines. The underground mines employ 80% of manpower, but contribute to only 30% of the total output. Since the nationalisation of the coal industry, India's mine planners have chosen opencast mining over underground methods, to enhance productivity and meet production targets. The drawback of extracting the majority of the coal with opencast methods is that its quality is unavoidably affected by contamination of overburden mixes into the coal

TABLE 4.2.9 : PRODUCTION OF COAL FROM OPENCAST WORKING BY MECHANISATION AND OVERBURDEN REMOVED DURING THE YEAR, 2000

(Tonne)

Sl. No.	States	Total Opencast Output	Mechanisation			Overburden Removed (in '000 Cubic metre)
			Fully Mechanised	Semi Mechanised	Manual	
1	2	3	4	5	6	7
I	**COAL**	**244586515**	**244586515**	—	—	**565948**
1	Andhra Pradesh	16265321	16265321	—	—	73967
2	Arunachal Pradesh	962	962	—	—	50
3	Assam	437406	437406	—	—	2100
4	Chhattisgarh	41880833	41880833	—	—	54988
5	Jharkhand	62908515	62908515			129941
6	Madhya Pradesh	27038736	27038736	—	—	80233
7	Maharashtra	24508019	24508019	—	—	85247
8	Orissa	44368500	44368500	—	—	49408
9	Uttar Pradesh	18609000	18609000	—	—	62770
10	West Bengal	8569223	8569223	—	—	27244
II	**LIGNITE**	**23505354**	**23505354**	—	—	**131756**
1	Gujarat	5653598	5653598	—	—	18154
2	Rajasthan	219665	219665	—	—	11068
3	Tamilnadu	17632091	17632091	—	—	102534

Source: *Statistics of Mines in India, Vol. I (Coal), 2000*
Issued by - The Directorate -General of Mines Safety, Dhanbad

TABLE 4.2.10 : PRODUCTIVITY IN COAL MINES IN THE YEAR 2000

(Tonne)

Sl. No.	State	Output Per Man Year			Output Per Manshift		
		Below-ground	Opencast	Overall	Below-ground	Opencast	Overall
1	2	3	4	5	6	7	8
I	**COAL**	**266**	**3765**	**692**	**0.87**	**11.67**	**2.22**
1	Andhra Pradesh	247	2872	438	0.84	9.40	1.49
2	Arunachal Pradesh	—-	30	21	—-	0.08	0.06
3	Assam	137	1458	217	0.45	4.09	0.68
4	Chhattisgarh	399	8815	1390	1.21	25.54	4.21
5	Jharkhand	221	2077	525	0.72	6.54	1.69
6	Jammu & Kashmir	39	—-	31	0.13	—-	0.11
7	Madhya Pradesh	373	4907	738	1.17	14.49	2.30
8	Maharashtra	326	4018	874	1.03	12.07	2.69
9	Orissa	259	8612	2591	0.85	27.20	8.26
10	Uttar Pradesh	—-	5285	2839	—-	16.24	8.63
11	West Bengal	209	2352	234	0.69	7.29	0.76
II	**LIGNITE**	**—-**	**6046**	**2510**	**—-**	**19.52**	**8.10**
1	Gujarat	—-	6967	2672	—-	23.36	8.88
2	Rajasthan	—-	2197	1603	—-	7.255.29	
3	Tamil Nadu	—-	5917	2479	—-	18.92	7.93

Source : *Statistics of Mines in India, Vol. I (Coal), 2000*
Issued by - The Directorate -General of Mines Safety, Dhanbad

TABLE 4.2.11 : STATE-WISE INVENTORY OF GEOLOGICAL RESERVES OF COAL

(Million tonnes)

Sl.No.	State	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
1	**Andhra Pradesh**	1-1-2000	7346	3312	2929	13587
	(Gondawana)	1-1-2001	7529	3364	2782	13675
		1-1-2002	7729	5459	2448	15636
2	**Arunachal Pradesh**	1-1-2000	31	11	48	90
	(Tartiary)	1-1-2001	31	11	48	90
		1-1-2002	31	40	19	90
3	**Assam**	1-1-2000	259	27	34	320
	(Tartiary)	1-1-2001	259	27	34	320
		1-1-2002	279	27	34	340
4	**Jharkhand & Bihar (Gondawana)**	1-1-2000	34794	28692	5642	69128
	Jharkhand & Bihar (Gondawana)	1-1-2001	35148	28444	5583	69175
	Jharkhand (Gondawana)	1-1-2002	35235	28987	6282	70503
5	**Bihar (Gondawana)**	1-1-2002	0	0	160	160
6	**M P & Chhatisgarh (Gondawana)**	1-1-2000	13010	22148	8334	43492
	M P & Chhatisgarh (Gondawana)	1-1-2001	14017	22102	8200	44319
	MP (Gondawana)	1-1-2002	6857	7866	3234	17957
7	**Chhatisgarh (Gondawana)**	1-1-2002	7627	23640	4108	35375
8	**Maharashtra**	1-1-2000	4149	1323	1605	7077
	(Gondawana)	1-1-2001	4389	1302	1605	7296
		1-1-2002	4495	2050	1536	8081
9	**Meghalaya**	1-1-2000	118	41	301	460
	(Tartiary)	1-1-2001	118	41	301	460
		1-1-2002	118	41	301	460
10	**Nagaland**	1-1-2000	3	1	15	19
	(Tartiary)	1-1-2001	3	1	15	19
		1-1-2002	3	1	15	19
11	**Orissa**	1-1-2000	11140	22755	16554	50449
	(Gondawana)	1-1-2001	11308	23728	16535	51571
		1-1-2002	13080	29809	15123	58012
12	**Uttar Pradesh**	1-1-2000	766	296	0	1062
	(Gondawana)	1-1-2001	766	296	0	1062
		1-1-2002	766	296	0	1062
13	**West Bengal**	1-1-2000	10779	10894	4236	25909
	(Gondawana)	1-1-2001	10846	10926	4147	25919
		1-1-2002	11099	11163	4157	26419
	India (Total)	**1-1-2000**	**82395**	**89500**	**39698**	**211593**
		1-1-2001	**84414**	**90242**	**39250**	**213906**
		1-1-2002	**87320**	**109378**	**37417**	**234114**

Source : *Office of Coal Controller*
Note : *Data may not add up to respective total due to rounding up*

TABLE 4.2.12 : INVENTORY OF GEOLOGICAL RESERVES OF COAL BY TYPE

(Million tonnes)

Sl.No.	Types of Coal	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
1	**Coking**					
	I. Prime coking	1-1-2000	4614	699	0	**5313**
		1-1-2001	4614	699	0	**5313**
		1-1-2002	4614	699	0	**5313**
	II. Medium coking	1-1-2000	11267	11133	1106	**23506**
		1-1-2001	12060	11522	1106	**24688**
		1-1-2002	11294	11749	1866	**24909**
	III. Blendable/semi-coking	1-1-2000	482	904	222	**1608**
		1-1-2001	482	904	222	**1608**
		1-1-2002	482	907	222	**1610**
2	**Non-coking**	1-1-2000	66032	76765	38369	**181167**
	(Including High Sulphur)	1-1-2001	67258	77118	37922	**182297**
		1-1-2002	70929	96024	35329	**202282**
	Total	**1-1-2000**	**82396**	**89854**	**39250**	**211594**
		1-1-2001	**88085**	**90242**	**36657**	**213906**
		1-1-2002	**87320**	**109378**	**37417**	**234114**

Source : *Office of the Coal Controller*

TABLE 4.2.13 : ESTIMATED POTENTIAL FOR RENEWABLE ENERGY TECHNOLOGIES IN INDIA

Sl. No.	Source/Systems	Approximate Potential
1	Biogas Plants	120 lakh
2	Improved Chulhas	1200 lakh
3	Wind	45000 MW
4	Small Hydro	15000 MW
5	Biomas Power/Cogeneration	1 9500 MW
6	Biomass Gasifiers	—
7	Solar PV	20 MW/sq.km
8	Waste -to -Energy	2500 MW
9	Solar Water Heating	140 Million sq.m Collector Area.

Source : *Ministry of Non-Conventional Energy Sources*

The Ministry of Non-Conventional Energy Resources was created in 1992. The main responsibilities of the ministry include the development and utilization of new and renewable sources of energy such as biogas, biomass, solar energy, wind energy, small hydro power, ocean energy, geothermal energy, hydrogen and drought animal power.

TABLE 4.2.14 : STATE-WISE WIND POWER INSTALLED CAPACITY
(AS ON 31-12-2002)

(In megawatts)

Sl. No.	State	Demonstration Projects	Commercial Projects	Total
1	2	3	4	5
1	Andhra Pradesh	5.4	87.2	92.6
2	Gujarat	17.3	149.6	166.9
3	Karnataka	2.6	93.6	96.2
4	Kerala	2.0	—	2.0
5	Madhya Pradesh	0.6	22.0	22.6
6	Maharashtra	6.4	392.8	399.2
7	Orissa	6.4	18.7	25.1
8	Tamil Nadu	19.4	875.6	895.0
9	West Bengal	1.0	—	1.1
9	Others	1.6	—	1.6
	Total	**62.7**	**1639.5**	**1702.3**

Source : *TERI Energy Data Directory and Year Book v2002-03*

TABLE 4.2.15 : STATE-WISE SMALL HYDRO STATION INSTALLED/UNDER CONSTRUCTION UPTO 3 MW CAPACITY, 1997-98

Sl. No.	State	SHP Station installed		SHP Projects Under Construction	
		Number	Capacity(MW)	Number	Capacity(MW)
1	2	3	4	5	6
1	Andhra Pradesh	7	7.01	36	42.10
2	Arunachal Pradesh	30	20.15	17	20.63
3	Assam	2	2.20	—	—
4	Bihar	4	0.04	5	2.46
5	Goa	—	—	2	2.90
6	Gujarat	1	2.00	—	—
7	Haryana	1	0.20	1	0.10
8	Himachal Pradesh	14	9.49	18	11.19
9	Jammu & Kashmir	15	4.37	10	11.20
10	Karnataka	12	17.20	18	23.17
11	Kerala	4	3.52	6	14.00
12	Madhya Pradesh	5	3.25	8	14.40
13	Maharashtra	5	6.82	4	6.20
14	Manipur	6	4.10	4	3.50
15	Meghalaya	1	1.51	7	0.28
16	Mizoram	9	5.36	9	8.80
17	Nagaland	5	3.17	4	5.50
18	Orissa	3	1.26	7	9.92
19	Punjab	4	3.90	8	9.50
20	Rajasthan	5	4.32	1	0.54
21	Sikkim	8	9.25	2	3.20
22	Tamil Nadu	3	4.75	4	6.40
23	Tripura	2	1.01	1	0.10
24	Uttar Pradesh	61	32.54	25	19.73
25	West Bengal	8	7.98	7	9.23
26	A. & N. Island	—	—	1	2.25
	Total	**215**	**155.40**	**205**	**227.30**

Source : *Annual Report, 1997-98, Ministry of Coal Govt. of India, New Delhi*
As reproduced in Yearbook of Energy - Environment Statistics(YES), 1998
Bharat Information Technology Services(BIT)

In India, power generation in small scale hydro-resources is categorized as micro hydro for projects with an installed capacity of upto 100 kW, mini-hydro upto 2 MW, and small hydro upto 15 MW capacity. The categorization is fairly fluid, but here small hydro refers collectively to micro, mini, and small hydro upto 3 MW capacity.

TABLE 4.2.16 : DOMESTIC PRODUCTION OF PETROLEUM PRODUCTS IN INDIA

(000' Tonne)

Sl. No.	Year	Light Distillates			Middle Distillates			
		Liquified Petroleum Gas @	Motor Gasoline	Naphtha	Kerosene	Aviation Turbine Fuel	High Speed Diesel oil	Light diesel Oil
1	2	3	4	5	6	7	8	9
1	1970-71	169	1526	1205	2896	710	3840	986
2	1971-72	195	1615	1217*	2995	808	4356	1065
3	1972-73	227	1581	1330*	2813	801	4598	1010
4	1973-74	259	1647	1438*	2613	875	5039	1079
5	1974-75	278	1298	1720	2052	837	6034	1084
6	1975-76	331	1275	1910	2439	925	6285	946
7	1976-77	363	1340	1986	2581	1001	6399	1047
8	1977-78	383	1423	2120	2450	1077	7129	1224
9	1978-79	403	1515	2262	2514	1177	7350	1227
10	1979-80	406	1512	2415	2539	1104	7975	1230
11	1980-81	366	1519	2115	2396	1001	7371	1108
12	1981-82	410	1614	3004	2907	1009	9042	949
13	1982-83	406	1797	2986	3393	1137	9761	1121
14	1983-84	514	1937	3578	3528	1195	10862	1081
15	1984-85	596	2144	3470	3364	1297	11086	1253
16	1985-86	867	2309	4955	4030	1519	14624	1177
17	1986-87	995	2515	5437	4912	1553	15450	1172
18	1987-88	1026	2662	5462	5104	1695	16296	1259
19	1988-89	1034	2822	5378	5201	1753	16656	1468
20	1989-90	1179	3328	5227	5700	1575	17737	1540
21	1990-91	1221	3552	4859	5471	1801	17185	1509
22	1991-92	1250	3420	4546	5339	1539	17404	1482
23	1992-93	1249	3709	4586	5199	1636	18289	1453
24	1993-94	1314	3843	4666	5270	1788	18809	1474
25	1994-95	1432	4129	5662	5261	1968	19593	1364
26	1995-96	1539	4462	5975	5267	2127	20661	1351
27	1996-97	1598	4704	6123	6236	2119	22202	1286
28	1997-98	1666	4849	6103	6701	2147	23354	1246
29	1998-99	1724	5573	6081	5341	2289	26716	1336
30	1999-00	2487	6232	8170	5735	2292	34793	1624
31	2000-01	4088	8070	9908	8714	2513	39015	1481
32	2001-02 (P)	4778	9699	9180	9681	2595	39773	1703

(P)- *Provisional*
@ *Excludes LPG production from natural gas.*
* *Estimated from calendar year figures.*

TABLE 4.2.16 : DOMESTIC PRODUCTION OF PETROLEUM PRODUCTS IN INDIA- Concld.

(000' Tonne)

Sl. No.	Year	Heavy Ends				Others**	Total
		Fuel Oil	Lubricants	Petroleum Coke	Bitumen		
1	2	10	11	12	13	14	15
1	1970-71	4090	231	151	805	501	17110
2	1971-72	4098	140*	142*	1009*	999	18639
3	1972-73	3688	304*	132*	1109*	267	17830
4	1973-74	3931	318*	131*	1093*	1072	19495
5	1974-75	4243	387	137	873	668	19603
6	1975-76	5083	342	160	697	436	20829
7	1976-77	4728	368	163	945	471	21432
8	1977-78	5332	413	155	992	521	23219
9	1978-79	5644	490	122	962	527	24193
10	1979-80	6351	487	99	1103	573	25794
11	1980-81	6120	426	86	1082	533	24123
12	1981-82	6908	407	141	1298	493	28182
13	1982-83	7964	434	149	1397	528	31073
14	1983-84	8000	470	136	1069	556	32926
15	1984-85	7886	414	181	944	601	33236
16	1985-86	7955	501	192	1107	645	39881
17	1986-87	8011	491	264	1224	737	42761
18	1987-88	8466	478	257	1370	653	44728
19	1988-89	8171	497	275	1548	896	45699
20	1989-90	8952	547	275	1671	959	48690
21	1990-91	9429	561	229	1603	1142	48562
22	1991-92	9637	390	216	1710	1416	48349
23	1992-93	10403	533	221	1862	1219	50359
24	1993-94	10304	489	233	1874	1020	51084
25	1994-95	9822	504	259	1845	1088	52927
26	1995-96	9579	633	256	2032	1199	55081
27	1996-97	10298	619	246	2283	1291	59005
28	1997-98	11080	593	282	2158	1129	61308
29	1998-99	11030	586	286	2419	1163	64544
30	1999-00	11352	728	465	2485	3048	79411
31	2000-01	11392	684	2473	2721	4555	95614
32	2001-02 (P)	12227	651	2784	2561	4372	100004

Source: *Ministry of Petroleum & Natural Gas.*

(P) - *Provisional*

* *Estimated from calendar year figures*

** *Includes those of light distillates, middle distillates and heavy ends.*

TABLE 4.2.17 : AVAILABILITY OF CRUDE OIL AND PETROLEUM PRODUCTS IN INDIA

(000' Tonne)

Sl. No.	Year	Crude Oil			Petroleum Products		
		Production	Net Imports	Gross Availability	Production	Net Imports	Gross Availability
1	2	3	4	5	6	7	8
1	1970-71	6822	11683	18505	17110	752	17862
2	1971-72	7299	12951	20250	18639	2011	20650
3	1972-73	7321	12084	19405	17830	3399	21229
4	1973-74	7189	13855	21044	19495	3387	22882
5	1974-75	7684	14016	21700	19603	2473	22076
6	1975-76	8448	13624	22072	20829	2048	22877
7	1976-77	8898	14048	22522	21432	2550	23982
8	1977-78	10763	14507	25270	23219	2832	26051
9	1978-79	11633	14657	26290	24193	3834	28027
10	1979-80	11766	16121	27887	25794	4636	30430
11	1980-81	10507	16248	26755	24123	7253	31376
12	1981-82	16194	14460	30654	28182	4829	33011
13	1982-83	21063	12397	33460	31073	4233	35306
14	1983-84	26020	10445	36465	32926	2856	35782
15	1984-85	28990	7164	36154	33236	5159	38395
16	1985-86	30168	14616	44784	39881	1902	41783
17	1986-87	30480	15476	45956	42761	556	43317
18	1987-88	30357	17734	48091	44728	739	45467
19	1988-89	32040	17815	49855	45699	4200	49899
20	1989-90	34087	19490	53577	48690	3971	52661
21	1990-91	33021	20699	53720	48562	6012	54574
22	1991-92	30346	23994	54340	48349	6509	54858
23	1992-93	26950	29247	56197	50359	7564	57923
24	1993-94	27026	30822	57848	51084	8042	59126
25	1994-95	32239	27349	59588	52927	10697	63624
26	1995-96	35167R	27342	62509R	55081	16900	71981
27	1996-97	32900	33906	66806	59005	17103	76108
28	1997-98	33858	34493R	68351R	61308	20589R	81897R
29	1998-99	32722R	39808	72530R	64544	23052R	87596R
30	1999-00	31949	57805R	89754R	79411	15862R	95273R
31	2000-01	32426	74097R	106523R	95614	902R	96516R
32	2001-2002(P)	32032	78706	110738	100004	-3504*	96500

Source : Ministry of Petroleum & Natural Gas.

P : Provisional R : Revised * Relates to exports

TABLE 4.2.18 : GROSS AND NET PRODUCTION & UTILISATION OF NATURAL GAS IN INDIA.

(Million cubic metre)

Sl. No.	Year	Gross Production	Re-injected	Flared	Net Production	Utilisation
1	2	3	4	5	6	7
1	1970-71	1445	36	762	647	647
2	1971-72	1535	49	768	718	718
3	1972-73	1565	141	653	771	771
4	1973-74	1713	115	836	762	762
5	1974-75	2041	139	951	951	951
6	1975-76	2368	162	1082	1124	1124
7	1976-77	2428	190	857	1381	1381
8	1977-78	2839	184	1191	1464	1464
9	1978-79	2812	148	953	1711	1711
10	1979-80	2767	127	964	1676	1676
11	1980-81	2358	67	769	1522	1522
12	1981-82	3851	110	1519	2222	2222
13	1982-83	4936	91	1888	2957	2957
14	1983-84	5961	45	2517	3399	3399
15	1984-85	7241	48	3052	4141	4141
16	1985-86	8134	66	3118	4950	4950
17	1986-87	9853	63	2718	7072	7072
18	1987-88	11467	54	3445	7968	7968
19	1988-89	13217	84	3883	9250	9250
20	1989-90	16988	96	5720	11172	11172
21	1990-91	17998	102	5130	12766	12766
22	1991-92	18645	132	4072	14441	14441
23	1992-93	18060	90	1854	16116	16116
24	1993-94	18335	71	1924	16340	16340
25	1994-95	19381	23	2020	17338	17338
26	1995-96	22639	17	1437	21202	21202
27	1996-97	23255R	-	1760	21495	21495
28	1997-98	26401	-	1879	24522	24522
29	1998-99	27428	-	1712	25716	25716
30	1999-00 R	28446	-	1560	26886	26886
31	2000-01 P	29477	-	1617R	27860R	27860R

Source : Ministry of Petroleum & Natural Gas.
P : Provisional
R : Revised

TABLE 4.2.19 : INDUSTRY-WISE OFF-TAKE OF NATURAL GAS IN INDIA.

(Million Cubic Metre)

Sl No.	Year	Energy Purposes				Non-Energy Purposes		
		Power Generation	Industrial Fuel	Tea Plantation	Others*	Fertilizer Industry	Others @	Total
1	2	3	4	5	6	7	8	9
1	1970-71	261	116	15	68	187	-	647
2	1971-72	313	129	19	61	196	-	718
3	1972-73	339	148	20	63	201	-	771
4	1973-74	323	157	22	81	179	-	762
5	1974-75	354	164	29	86	318	-	951
6	1975-76	366	143	33	117	463	2	1124
7	1976-77	344	155	38	157	663	24	1381
8	1977-78	372	165	39	184	673	31	1464
9	1978-79	560	175	43	189	721	23	1711
10	1979-80	514	156	39	187	755	25	1676
11	1980-81	492	163	45	190	611	21	1522
12	1981-82	612	166	47	379	991	27	2222
13	1982-83	1025	185	51	513	1155	28	2957
14	1983-84	1209	230	56	588	1283	33	3399
15	1984-85	1454	250	62	739	1603	33	4141
16	1985-86	1299	223	78	816	2500	34	4950
17	1986-87	2041	257	93	1320	3335	26	7072
18	1987-88	2721	281	99	1347	3490	30	7968
19	1988-89	1823	526	87	1371	5334	109	9250
20	1989-90	2140	695	78	1567	6578	114	11172
21	1990-91	3634	827	89	1825	5612	779	12766
22	1991-92	4774	766	108	2237	5509	1047	14441
23	1992-93	4967	1450	105	2103	6672	819	16116
24	1993-94	4785	1794	121	2466	6499	675	16340
25	1994-95	5229	1927	134	2420	6936	693	17339
26	1995-96 $	6836	2301	111	767	7602	474	18091
27	1996-97 $	6935	2631	130	802	7625	509	18632
28	1997-98 $	8114	3106	117	775	8752	649	21513
29	1998-99 $	8714	3005	147	1104	886[illegible]	650	22489
30	1999-2000	8829	2329	140	5126	8592	1869	26885
31	2000-2001	8801	2870	151	5377	8480	2181	27860

Source : Ministry of Petroleum & Natural Gas.

P : Provisional @ : Includes petro-chemicals.

* : Includes domestic fuel, captive use & LPG shrinkage.

$: Excludes off-takes of Natural Gas by ONGC.

TABLE 4.2.20 : BIOMASS ENERGY IN INDUSTRY IN SELECTED ASIAN COUNTRIES

Sl. No.	Country	Year	Total Industrial Energy Use[a]	Wood Fuel		All Biomass	
				Energy[a]	Share[b]	Energy[a]	Share[b]
1	2	3	4	5	6	7	8
1	Bangladesh	1994	178000	28500	15.9	114900	64.2
2	Cambodia	1995	533	383	71.9	383	71.5
3	India	1996	4656003	375000	8.1	1094878	23.5
4	Malaysia	1993	1297	293	22.6	293	22.6
5	Nepal	1997	15951	3684	23.1	3935	24.7
6	Pakistan	1994	422280	N. A.	N. A.	92318	21.9
7	Sri Lanka	1996	51163	21773	42.6	26826	52.4
8	Philippines	1995	279211	38220	13.7	77533	27.8
9	Thailand	1997	700367	42789	6.1	194853	27.8
10	Vietnam	1995	219427	43500	19.8	87250	39.8

Source : TERI Energy Data Directory and Yearbook, 2001-2002

a : Energy measured in Terra joules ;

b : Percentage of total industrial energy consumption

TABLE 4.2.21 : BIOMASS POWER POTENTIAL

(MW)

Sl. No.	States	Potential
1	Andhra Pradesh	200
2	Gujrat	200
3	Karnataka	300
4	Mahrashtra	1000
5	Punjab	150
6	Uttar Pradesh	1000
7	Others	300
	Total	**3500**

Source : TERI Energy Data Directory and Yearbook, 2002-2003.

TABLE 4.2.22 : THE STATUS OF BIOMASS PROJECTS AS ON 31 DEC. 2002

Sl. No.	Project Status	Biomass Power		Cogeneration		Total	
		MW	Nos	MW	Nos	MW	Nos
1	2	3	4	5	6	7	8
1	Commissioned	164	34	304	43	468	77
2	Under implementation	218	36	312	31	530	67

Source : TERI Energy Data Directory and Yearbook, 2002-2003

TABLE 4.2.23 : STATEWISE AND YEARWISE COMPOSITION OF COMMISSIONED BIOMASS POWER PROJECTS

(MW)

Sl. No.	State	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	-	-	-	1.0	-	10.0	1.0	24.2	35.4
2	Gujarat	-	-	-	-	-	0.5	-	-	-
3	Haryana	-	-	-	-	-	-	-	-	-
4	Karnataka	-	-	-	1.0	-	10.0	26.0	24.6	.4
5	Madhya Pradesh	-	-	-	-	-	5.0	-	-	-
6	Maharashtra	-	1.5	4.5	1.5	-	-	-	-	21.0
7	Punjab	10.0	-	-	-	-	-	-	2.0	12.0
8	Tamil Nadu	3.0	-	1 .0	25.5	33.5	10.0	-	-	8 .5
	Uttar Pradesh	-	4.0	6.5	-	8.0	8.0	24.0	-	46.5
	Total	**13.0**	**5.5**	**30.0**	**29.0**	**41.5**	**43.5**	**51.0**	**50.8**	**308.7**

Source : TERI Energy Data Directory and Yearbook, 2002-2003

TABLE 4.2.24 : INSTALLATION OF SOLAR PHOTOVOLTAIC SYSTEM IN DIFFERENT STATES/UT's AS ON 31st DECEMBER 1996

Sl. No.	State / UT's	Lighting			Power Plants	Water
		Solar lantern	Home Lighting System	Street Lighting System	$(kW)_p$	Pumps
1	2	3	4	5	6	7
	States					
1	Andhra Pradesh	5 63	730	2 32	18	345
2	Arunachal Pradesh	1518	52	720	8	-
3	Assam	175	700	8	1	45
4	Bihar	5800	6	61	0	86
5	Gujarat	3663	370	1564	14	16
6	Goa	-	31	38	2	14
7	Haryana	5018	6	577	24	16
8	Himachal Pradesh	6000	34	304	-	1
	Jammu & Kashmir	2625	1051	88	-	15
10	Karnataka	300	-	441	-	3
11	Kerala	810	65	513	5	240
12	Madhya Pradesh	1348	100	5427		11
13	Maharashtra	37 2	72	2 41	6	102
14	Manipur	767	-	351	5	1
15	Meghalaya	2055	230	588	31	-
16	Mizoram	-	-	-	-	-
17	Nagaland	-	8	271	6	-
18	Orissa	1846	252	2036	34	1
1	Punjab	682	-	60	2	77
20	Rajasthan	722	-	5545	114	121
21	Sikkim	1 6	31	3	-	-
22	Tamil Nadu	88	50	1 40	26	424
23	Tripura	-	-	-	-	-
24	Uttar Pradesh	28250	35585	470	41	62
25	West Bengal	2102	1282	52	42	42
	Union Territories					
1	Andaman and Nicobar Islands	234	3 0	315	12	5
2	Chandigarh	-	-	-	-	7
3	Dadra and Nagar Haveli	-	-	-	-	1
4	Daman and Diu	-	-	-	-	-
5	Delhi	4508	-	371	5	33
6	Lakshadweep	442	-	514	25	-
7	Pondicherry	215	-	-	-	14
	Misc. (through agencies)	-	-	-	-	-
	Total	**88920**	**42845**	**30569**	**925**	**1772**

Source : TERI Energy Data Directory and Yearbook, 2001-2002

TABLE 4.2.29 : DISTRIBUTION OF FAMILY-TYPE BIOGAS PLANTS (NUMBER OF INSTALLATIONS)

Sl. No.	State/UT	Total Estimated Potential	Cumulative Achievement as on 31-12-96 #	Cumulative Achievement 2001-02	Achievement 2002 (April-December)
1	2	3	4	5	6
	State				
1	Andhra Pradesh	1065600	172410	334054	8023
2	Arunachal Pradesh	7500	139	1514	49
3	Assam	307700	12629	51269	—
4	Bihar	939900	74499	121913	12
5	Chhattisgarh	—		3047	2215
6	Goa	8000	2212	3355	32
7	Gujarat	554000	237513	351745	3501
8	Haryana	300000	28896	44160	1095
9	Himachal Pradesh	125600	34871	43933	190
10	Jammu & Kashmir	128500	1068	1965	—
11	Jharkhand	—		400	—
12	Karnataka	680000	135428	340270	8986
13	Kerala	150500	37374	79532	618
14	Madhya Pradesh	1491200	86461	204100	3347
15	Maharashtra	897000	535279	675177	3539
16	Manipur	38700	1038	1956	16
17	Meghalaya	24000	329	2309	—
18	Mizoram	3000	1178	2818	53
19	Nagaland	6700	401	1667	75
20	Orissa	605000	106156	185690	4285
21	Punjab	411600	31235	68745	1877
22	Rajasthan	915300	55304	66552	162
23	Sikkim	7300	1622	3475	255
24	Tamil Nadu	615800	169605	201295	1210
25	Tripura	28500	3576	1719	16
26	Uttaranchal	—		1547	288
27	Uttar Pradesh	2021000	241396	370219	4600
28	West Bengal	695000	76713	203679	7983
	Union Territories				
1	Andaman and Nicobar Islands	2200	117	137	—
2	Chandigarh	1400	87	97	—
3	Dadra and Nagar Haveli	2000	157	169	—
4	Daman and Diu	100	1	—	—
5	Delhi	12900	624	676	—
6	Pondicherry	4300	517	573	
7	Others	—	104094	—	
	Agencies				
1	KVIC	—	—	—	11649
2	AIWC	—	—	—	—
3	SDA, Kanjirapally	—	—	—	5810
4	Biotech	—	—	—	525
	Total	**12050300**	**2152929**	**3369757**	**70411**

Source : TERI Energy Data Directory Yearbook, 2001-2002 & 2002-03

\# : These figures are lower estimates of the actual installations.

KVIC : Khadi and Village Industries Commission AIWC : All India Women's Conference

SDA : Sustainable Development Agency

TABLE 4.3.1 : NUMBER OF REGISTERED FACTORIES BY MANUFACTURING INDUSTRIES

Sl. No.	Year	Manufacturing	Electricity, Gas & Water	Repair Services & Cold Storage	All Activities
1	2	3	4	5	6
1	1987-88	98379	458	3759	102596
2	1988-89	99724	481	3872	104077
3	1989-90	103373	493	4126	107992
4	1990-91	105511	518	4150	110179
5	1991-92	107454	505	4327	112286
6	1992-93	113890	961	4643	119494
7	1993-94	116227	542	4825	121594
8	1994-95	117564	554	4892	123010
9	1995-96	125281	4013	5277	134571
10	1996-97	125166	4160	5230	134556
11	1997-98	126272	3856	5423	135551
12	1998-99 *	130222	143	1341	131706
13	1999-2000*	130035	158	1365	131558

Source : Central Statistical Organisation

* : From 1998-99, all electricity undertakings other than Captive Units have been kept outside the purview of ASI

TABLE 4.3.2 : SUMMARY STATUS OF POLLUTION CONTROL IN 17 CATEGORIES OF INDUSTRIES

(As on 30-09-2002)

Sl. No.	Category	Total No. of Units	Status (No of Units)		
			Closed	C #	Defaulter ##
1	2	3	4	5	6
1	Aluminium	7	1	6	0
2	Caustic Soda	25	0	25	0
3	Cement	116	8	108	0
4	Copper	2	0	2	0
5	Distillery	177	33	142	2
6	Dyes & Dying Industries	64	8	56	0
7	Fertilizer	110	12	97	1
8	Iron and Steel	8	0	4	4
9	Leather	70	11	59	0
10	Pesticide	71	7	64	0
11	Petrochemicals	49	0	49	0
12	Pharmaceuticals	251	26	225	0
13	Pulp & Paper	96	20	76	0
14	Refinery	12	0	12	0
15	Sugar	392	49	342	1
16	TPP	97	3	80	14
17	Zinc	4	0	4	0
	Total	**1551**	**178**	**1351**	**22**

Source : Ministry of Environment & Forests, Annual Report 2002-2003

\# : Having adequate facilities to comply with the standards

\## : Not having adequate facilities to comply with the standards

Air-borne emissions emitted from various industries are a cause of major concern. These emissions are of two forms, viz., solid particles (SPM) and gaseous emission (SO_2, NOx, CO etc.). Liquid effluents, generated from various industries, containing organic and toxic pollutants are also a cause for severe concern. Heavily polluting industries were identified which are included under the 17 categories of highly polluting industries for the purpose of monitoring and regulating pollution from them.

There are 1551 industries in the country falling under the 17 categories of highly polluting industries. Thermal power and fertilizer industries are defaulting in meeting air pollution standards; sugar and pulp & paper industries are the major defaulters in complying with the norms for liquid effluents.

CHART 8 : SUMMARY STATUS OF POLLUTION CONTROL IN 17 HIGHLY POLLUTED INDUSTRIES

TABLE 4.3.3: STATE-WISE SUMMARY STATUS OF THE POLLUTION CONTROL IN 17 CATEGORIES OF INDUSTRIES

(As on 31.12.2002)

Sl. No.	State/UT	Total No. of Units	Status (No. of Units)		
			Closed	C#	Defaulters ##
1	2	3	4	5	6
1	Andhra Pradesh	173	29	144	0
2	Arunachal Pradesh	0	0	0	0
3	Assam	15	3	11	1
4	Bihar	44	19	25	0
5	Chattisgarh	16	1	14	1
6	Goa	16	0	6	0
7	Gujarat	177	7	170	0
8	Haryana	43	6	37	0
9	Himachal Pradesh	9	0	9	0
10	Jammu & Kashmir	8	3	5	0
11	Jharkhand	18	3	13	2
12	Karnataka	85	9	76	0
13	Kerala	28	6	22	0
14	Madhya Pradesh	62	11	48	3
15	Maharashtra	335	24	306	5
16	Manipur	0	0	0	0
17	Meghalaya	1	0	1	0
18	Mizoram	0	0	0	0
19	Nagaland	0	0	0	0
20	Orissa	23	3	16	4
21	Punjab	45	6	39	0
22	Rajasthan	49	6	43	0
23	Sikkim	1	0	1	0
24	Tamil Nadu	119	2	117	0
25	Tripura	0	0	0	0
26	UT-Andaman & Nicobar	0	0	0	0
27	UT-Chandigarh	1	0	1	0
28	UT-Daman & Diu, Dadra & Nagar Haveli	0	0	0	0
29	UT-Delhi	5	1	4	0
30	UT-Lakshadweep	0	0	0	0
31	UT-Pondicherry	6	1	5	0
32	Uttaranchal	17	0	17	0
33	Uttar Pradesh	207	21	183	3
34	West Bengal	58	17	38	3
	Total	**1551**	**178**	**1351**	**22**

Source : Ministry of Environment & Forests, Annual Report 2002-2003

\# : Having adequate facilities to comply with the standards

\## : Not having adequate facilities to comply with the standards

TABLE 4.3.4 : SUMMARY STATUS OF POLLUTION CONTROL IN GROSSLY POLLUTING INDUSTRIES DISCHARGING THEIR EFFLUENTS INTO RIVERS AND LAKES

(As on 30.09.2002)

Sl. No.	Name of the State/UT	No. of Defaulters as on August 1997	No. of Industries Closed	No. of industries Which Have Provided Requisite Treatment/ Disposal Facilities after Issuance of Directions	No. of Defaulters
1	2	3	4	5	6
1	Andhra Pradesh	60	42	18	0
2	Arunachal Pradesh	0	0	0	0
3	Assam	7	1	6	0
4	Bihar	14	10	4	0
5	Delhi*	0	0	0	0
6	Goa	0	0	0	0
7	Gujarat	17	14	3	0
8	Haryana	21	12	9	0
9	Himachal Pradesh	0	0	0	0
10	Jammu & Kashmir	0	0	0	0
11	Karnataka	20	18	2	0
12	Kerala	36	32	4	0
13	Madhya Pradesh	2	0	1	1
14	Maharashtra	6	3	3	0
15	Manipur	0	0	0	0
16	Meghalaya	0	0	0	0
17	Mizoram	0	0	0	0
18	Nagaland	0	0	0	0
19	Orissa	9	4	3	2
20	Pondicherry	4	0	4	0
21	Punjab	18	16	1	1
22	Rajasthan	0	0	0	0
23	Sikkim	0	0	0	0
24	Tamil Nadu	366	248	118	0
25	Tripura	0	0	0	0
26	UT- Andaman & Nicobar	0	0	0	0
27	UT-Chandigarh	0	0	0	0
28	UT-Daman & Diu, Dadra & Nagar Haveli	0	0	0	0
29	UT-Lakshadweep	0	0	0	0
30	Uttar Pradesh	241	181	59	1
31	West Bengal	30	23	7	0
	Total	**851**	**608**	**238**	**5**

Source : Ministry of Environment & Forests, Annual Report 2002-2003

* : Covered under the separate Plan involving shifting/relocation of the units as per the orders of Honourable Supreme Court.

TABLE 4.3.5 : MAXIMUM PERMISSIBLE LIMITS FOR INDUSTRIAL EFFLUENT DISCHARGES

(Mg/Litre)

Sl. No.	Parameter	Into Inland Surface Waters Indian Standards 2490 (1974)	Into Public Sewers Indian Standards: 3306 (1974)	Onland for Irrigation Indian Standards: 3307 (1974)
1	2	3	4	5
1	pH	5.9-9	5.5-9.0	5.5-9.0
2	Biological oxygen demand (for 5 days at 20°C)	30	350	100
3	Chemical oxygen demand	250	-	-
4	Suspended solids	100	600	200
5	Total dissolved solids (inorganic)	2100	2100	2100
6	Temperature (°C)	40	45	-
7	Oil and grease	10	20	10
8	Phenolic Compounds	1	5	-
9	Cyanides	0.2	2	0.2
10	Sulphides	2	-	-
11	Fluorides	2	15	-
12	Total residual chlorine	1	-	-
13	Pestisides	-	-	-
14	Arsenic	0.2	0.2	0.2
15	Cadmium	2	1	-
16	Chromium (hexavalent)	0.1	2	-
17	copper	3	3	-
18	Lead	0.1	1	-
19	Mercury	0.01	0.01	-
20	Nickel	3	3	-
21	Selenium	0.05	0.05	-
22	Zinc	5	15	-
23	Chlorides	1000	1000	600
24	Boron	2	2	2
25	Sulphates	1000	1000	1000
26	Sodium (%)	-	60	60
27	Ammoniacal nitrogen	50	50	-
28	Radioactive materials			
29	Alpha emitters (milli curie/millilitre)	10^{-7}	10^{-7}	10^{-8}
30	Beta emitters (μ curie/millilitre)	10^{-6}	10^{-6}	10^{-7}

Source : TERI Energy Data Directory and Yearbook, 2002-2003

TABLE 4.3.6 : EFFLUENT STANDARDS FOR SUGAR INDUSTRY

Sl. No.	Parameter	Permissible Limits (Mg/Litres)	
		Disposal on Land	Disposal in Surface Water
1	2	3	4
1	Biological Oxygen Demand (5 days at 20°C)	100	30
2	Suspended Solids	100	30

Source : TERI Energy Data Directory and Yearbook, 2002-2003

TABLE 4.3.7 : EFFLUENT STANDARDS FOR LARGE PULP AND PAPER INDUSTRIES

Capacity (Tonnes a year)	Parameter	Permissible Limits
1	2	3
Above 24,000	pH	7.0-8.5
	Biological Oxygen Demand at 20°C	30 mg/litre
	Chemical Oxygen Demand	350 mg/litre
	Suspended solids	50 mg/litre
	Total organic chloride	2.0 kg/tonne of paper produced
	Flow (total waste water discharge)	—
	Large pulp and paper[a]	200 m^3/tonne of paper produced
	Large rayon grade newsprint	150 m^3/tonne of paper produced

Source : TERI Energy Data Directory and Yearbook, 2002-2003

a : the standards with respect to total waste water discharge for large pulp and paper mills established from 1992 will meet the standards of 100 m^3/tonne of paper produced

TABLE 4.3.8 : EFFLUENT STANDARDS FOR OIL REFINERIES

(Mg/Litre)

Sl. No.	Parameter	Permissible Limit	Quantum (Kg/Thousand Tonnes of Crude Processed)
1	2	3	4
1	Oil and grease	10.0	7.00
2	Phenol	1.0	0.70
3	Sulphide	0.5	0.35
4	Biological Oxygen Demand (5 days at 20°C)	15.0	10.50
5	Suspended Solids	20.0	14.00

Source : TERI Energy Data Directory and Yearbook, 2002-2003

TABLE 4.3.9 : EFFLUENT STANDARDS FOR ALUMINIUM INDUSTRY

Sl. No.	Plant	Parameters	Permissible Limits
1	2	3	4
1	**Alumina Plant**		
	Raw material handling	Primary and secondary crusher particulate matter	150 mg/m^3
	Precipitation area : calcination	Particulate matter	250 mg/m^3
		Carbon Mono-oxide	1 % maximum
		Stack Height[a]	
2	**Smelter plant**		
	Green anode shop	Particulate matter	150 mg/m^3
	Anode bake oven	Particulate matter	150 mg/m^3
		Total fluoride	0.3kg/tonne at Al
3	**Potroom**	Particulate matter	150 mg/m^3
		Total fluoride	
		Vertical stud soderberg	4.7 kg/tonne of Al produced
		Horizontal stud soderberg	6.0 kg/tonne of Al produced
		Prebacked side worked	2.5 kg/tonne of Al produced
		Prebacked centre worked	1.0 kg/tonne of Al produced
		Stack Height[a]	

Source : TERI Energy Data Directory and Yearbook, 2002-2003

a $H = 14\ Q^{0.3}$, where Q is the emission rate of sulphur dioxide in Kg/h and H is the stack height in meters.

TABLE 4.3.10 : EFFLUENT STANDARDS FOR PETRO-CHEMICAL (BASIC & INTERMEDIATES) INDUSTRY

(Mg/Litre)

Sl. No.	Parameter	Permissible Limit
1	2	3
1	pH	6.5-8.5
2	Biological Oxygen Demand (5 days at 20°C)[a]	50.0
3	Phenol[b]	5.0
4	Sulphide (as S)	2.0
5	Chemical Oxygen Demand	250.0
6	Cyanide (as CN)	0.2
7	Fluoride (as F)[c]	15.0
8	Total Suspended Solids	1000.0
9	Hexavalent Chromium	0.1
10	Total Chromium (as Cr)[d]	2.0

Source : TERI Energy Data Directory and Yearbook, 2002-2003

a : The state board may prescribe the biological oxygen demand value of 30 mg/l if the recepient system so demands.

b : The limit for phenol shall be confirmed at the outlet of effluent treatment of phenol plant. However, at the final disposal point, the limit shall be less than 1 mg/l

c : The limit for fluoride shall be confirmed at the outlet of the chrome removal unit. However, at the disposal point, fluoride concentration shall be lower than 5 mg/l

d : The limits for total and hexavalent chromium shall be confirmed at the outlet of the chromate removal. This implies that in the final treated effluent total, and hexavalent chromium shall be lower than prescribed herein

TABLE 4.4.1 : CONTRIBUTION OF GREEN HOUSE GASES TO ATMOSPHERE

Sl. No.	Green Houses Gases	Contribution to atmosphere (%)
1	2	3
1	Carbondioxide	55
2	Methane	15
3	CFCs 11 & 12	17
4	Nitrousoxide	6
5	Others	7

Source : Central Pollution Control Board

CHART 9 : CONTRIBUTION OF GREEN HOUSE GASES TO ATMOSPHERE (%)

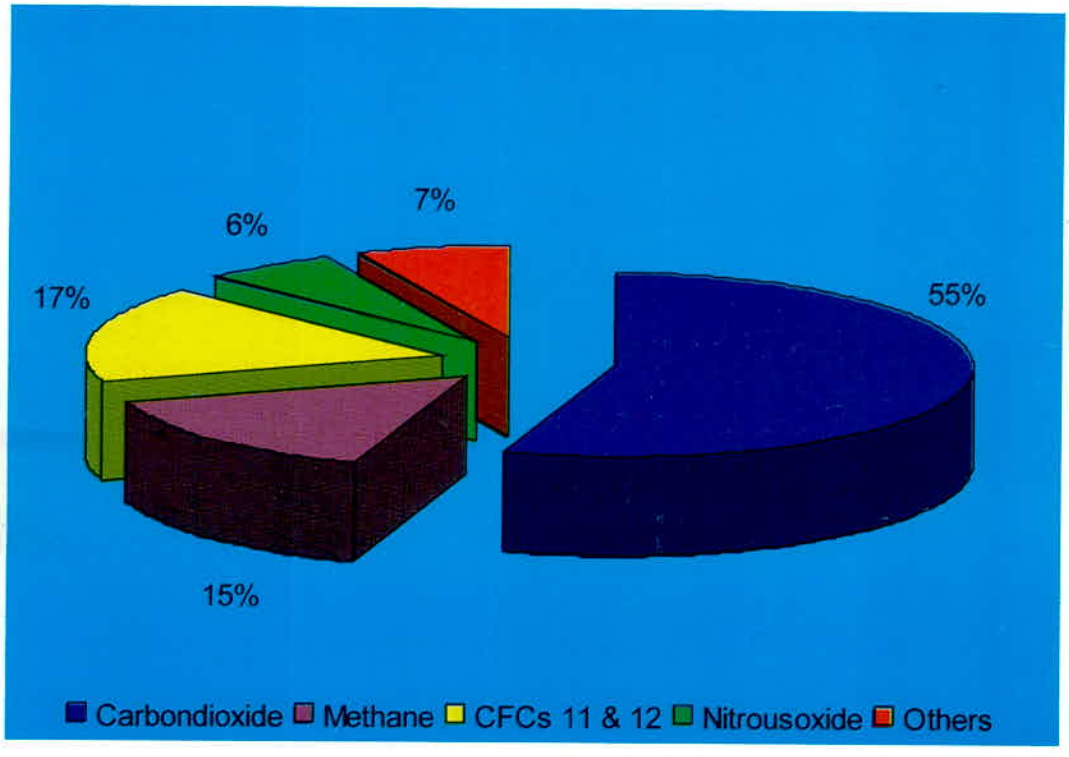


TABLE 4.4.2 : A SUMMARY OF KEY GREENHOUSE GASES

Sl. No.		CO_2	CH_4	N_2O	CFC-12	HCFC-22 (A CFC Substitute)	CF_4 (A Perfluoro-Carbon)
1	2	3	4	5	6	7	8
1	Pre-industrial concentration	280 ppmv	700 ppbv	275 ppbv	zero	zero	zero
2	Concentration in 1992	355 ppmv	1714 ppbv	311 ppbv	503 pptv	105 pptv	70 pptv
3	Concentration in 1994	358 ppmv	1720 ppbv	312 ppbv	268 pptv	110 pptv	72 pptv
4	Concentration in 1997$	366.7 ppmv	1800 ppbv	312 ppbv	264 pptv	126 pptv	
5	Concentration Change per year	1.8 ppmv/yr	13.8 ppbv/yr	0.6 ppbv/yr	-0.6 pptv/yr	5.1 pptv/yr	1.2 pptv/yr
6	Rate of Concentration change per year$	0.5%	0.8%	0.2%	-0.2%	5%	2%
7	Atmospheric lifetime (years)	(50-200)*	12#	120	50	12	50000
8	Global warming potential (100 year time horizon)$	1	21	310	4000	1700	6500

Source : TEDDY 1999/2000, The Energy Reseach Institute

* No single lifetime for CO_2 can be defined because of the different rates of uptake by different sink processes.

\# This has been defined as an adjustment time which takes into account the indirect effect of methane on its own lifetime.

$ Compiled by TERI based on data from Carbon-di-Oxide Information Analysis Centre(website:http://cdiac.esd.ornl.gov), values of Concentration in 1997 are from the advanced global atmospheric gases experiment, Mace Head Ireland Monitoting site.

Global warming can have major physical, environmental and socio-economic consequences, which can be both positive and negative. The estimation of these impacts are complex and marked with uncertainties.

Climate change would cause changes in precipitation patterns, ocean circulation and marine systems, soil moisture, water availability, and sea-level rise. These would make an impact on agriculture, forestry and natural eco-systems like wet-lands and fisheries. Also with rising temperatures, and subsequent increasing heat stress and alteration in patterns of vector-borne diseases, the global population would be more vulnerable to health problems, causing disruptions in settlement patterns and large-scale migration. All these would have significant socio-economic consequences.

TABLE 4.4.3 : OZONE DEPLETION POTENTIAL(ODP), GLOBAL WARMING POTENTIAL (GWP) & ATMOSPHERE LIFETIME OF THE COMMON CHLORO-FLORO-CARBON(CFC)

Sl. No.	CFC/HCFC	ODP	GWP	Atmospheric Lifetime (Years)
1	2	3	4	5
1	CFC-11	1.00	1.00	65.0
2	CFC-12	1.00	2.80-3.40	120.0
3	CFC-13	1.00	2.40	400.0
4	HCFC-22	0.05	0.35	20.0
5	CFC-113	0.80	1.40	90.0
6	CFC-114	1.00	3.90	180.0
7	CFC-115	0.60	7.50	380.0
8	CFC-502	0.19	0.50-1.50	—
9	HFC-152A	0.00	<0.10	2.0
10	HCFC-142B	< 0.05	<0.20	2.1
11	HFC-134A	0.00	0.26	8.0

Source : The State of Environment 1995, Ministry of Environment and Forests

The green-house effect plays a crucial role in regulating the heat balance of the earth. It allows the incoming short-wave solar radiation to pass through the atmosphere relatively unimpeded; but the long wave terrestrial radiation emitted by the earth's surface is partially absorbed and then re-emitted by a number of trace gases in the atmosphere. These gases, known as GHGs (Green House Gases) are: water vapour, carbon-di-oxide, Methane, Nitrous oxide and Ozone in the Troposphere (the lowest 10-15 Kms of the atmosphere) and in the Stratosphere. This natural green-house effect warms the lower temperature.

TABLE 4.4.4 : GLOBAL AVERAGE TEMPERATURE AND ATMOSPHERIC CONCENTRATIONS OF CO_2

Sl. No.	Year	Temperature (°C)	Carbon Dioxide (Parts Per Million)	Emissions from Fossil Fuel Burning (Million Tonnes of Carbon)
1	2		3	4
1	1950	13.87	—	1612
2	1955	13.88	—	2013
3	1960	14.01	316.80	2535
4	1965	13.90	319.90	3087
5	1966	13.96	321.20	3222
6	1967	14.00	322.00	3334
7	1968	13.94	322.90	3501
8	1969	14.03	324.50	3715
9	1970	14.02	325.50	3997
10	1971	13.89	326.20	4143
11	1972	14.00	327.30	4305
12	1973	14.13	329.50	4538
13	1974	13.89	330.10	4545
14	1975	13.94	331.00	4518
15	1976	13.86	332.00	4776
16	1977	14.11	333.70	4910
17	1978	14.02	335.30	4962
18	1979	14.10	336.70	5249
19	1980	14.16	338.50	5177
20	1981	14.21	339.80	5004
21	1982	14.06	341.00	4959
22	1983	14.25	342.60	4942
23	1984	14.07	344.20	5113
24	1985	14.03	345.70	5274
25	1986	14.12	347.00	5436
26	1987	14.27	348.70	5558
27	1988	14.29	351.30	5774
28	1989	14.18	352.70	5879
29	1990	14.36	354.00	5939
30	1991	14.31	355.50	6025
31	1992	14.14	356.40	5922
32	1993	14.15	357.00	5914
33	1994	14.25	358.90	6050
34	1995	14.37	360.90	6182
35	1996	14.23	362.60	6327
36	1997	14.39	363.80	6419
37	1998	14.54	366.60	6401
38	1999	14.30	368.30	6366
39	2000	14.30	369.40	6480
40	2001	14.43	370.90	6553

Source : TERI Energy Data Directory and Yearbook, 2002-03

TABLE 4.4.5 : LAND AREA AND POPULATION AFFECTED BY ONE METRE SEA LEVEL RISE

Sl. No.	State	% of State Area Inundated	% of State's Population Affected
1	2	3	4
1	Goa	4.84	7.25
2	Tamil Nadu	0.52	2.91
3	Orissa	0.81	1.76
4	West Bengal	1.88	2.35
5	Andhra Pradesh	0.19	0.93
6	Gujarat	0.92	1.07
7	Maharashtra	0.18	1.75
8	Andaman & Nicobar Island	0.72	N.A.
9	Karnataka	0.15	0.56
	Total	**0.41**	**1.68**

Source : The State of the Environment 1995, Ministry of Environment and Forests.

The projected global warming is expected to increase global sea-level by expanding ocean water, melting mountain glaciers, and causing the ice sheets of Greenland and Antarctica to melt or slide into the oceans. A rise in sea-level would inundate wetlands and lowlands, erode shoreline, exacerbate coastal flooding, increase the salinity of estuaries and aquifers and impair water quality.

India has coastline of about 6000 Kms. Sea-level Rise (SLR) threatens sections of all the coastal states of the country. The region most vulnerable to accelerate SLR is the low-lying coral atolls of the Lakshadweep archipelago. The east coast of India, with a larger frequency of storms and lower continental slopes, is more vulnerable than the west coast to damages from storms surges. According to a study done by Jawaharlal Nehru University (1993), a total area of 5763 Sq. Kms. is expected to be directly affected by one meter SLR. The most vulnerable area of the coast to a 1 m SLR are Gujarat, Greater Mumbai, Southern Kerala and the deltas of river Cauveri (Tamil Nadu), Krishna and Godavari (Andhra Pradesh), Mahanadi(Orissa) and the Ganga (West Bengal). Islands of the Lakshadweep archipelago would be totally lost.

TABLE 4.5.1 : AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Sl. No.	Area	Limits in dB(A)L_{eq}	
		Day Time	Night Time
1	2	3	4
1	Industrial Area	75	70
2	Commercial Area	65	55
3	Residential Area	55	45
4	Silence Zone	50	40

Source : Central Pollution Control Board

Notes :

1 Day Time — 06.00 hour to 22.00 hour (16 hours)

2 Night time —22.00 hour to 06.00 hour (08 hours)

3 Areas upto 100 metres around certain premises like hospitals, educational institutions and courts, religious places or any other area which is declared as silence zones by the competent authority.

4 Mixed categories of areas may be declared as one of four aforesaid categories by the competent Authority.

— * dB (A) L_{eq} denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

— A "decibel" is a unit in which noise is measured.

— A", in dB (A) L_{eq} denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

— L_{eq} : It is an energy mean of the noise level over a specified period.

According to study on occupational hazards, even short exposures to intense noise can shift upward the hearing threshold while prolonged exposure or intermittent exposure over a long period produces a damaging effect on hearing resulting in a permanent threshold shift. Accordingly, the Central Pollution Control Board(CPCB) has prescribed norms for noise levels.

TABLE 4.5.2 : AVERAGE NOISE LEVELS IN VARIOUS METROPOLITAN CITIES

(dB[A])

Sl. No.	Metropolitan Cities	Day/ Night	Industrial Area	Commercial Area	Residential Area	Silence Area
1	2	3	4	5	6	7
1	Kolkata	Day	78	82	79	79
		Night	67	75	65	65
2	Mumbai	Day	76	75	70	66
		Night	65	66	62	52
3	Chennai	Day	71	78	66	63
		Night	66	71	48	49
4	Bangalore	Day	78	76	67	67
		Night	53	57	50	—

Source : TEDDY (TERI Energy Data Directory and Yearbook) 2002/03.

The noise pollution has already reached at a high level in most of the metropolitan cities in all the residential, commercial, industrial and silence zones. The increasing noise pollution may be attributed to increase in no. of vehicles, urbanization and industrialization. The increase in noise levels may cause impaired hearing ability.

TABLE 4.5.3 : EFFECTS OF NOISE POLLUTION ON HUMAN HEALTH

A. Noise Hazards

Stage : I

Threat to Survival
(a) Communication interference
(b) Permanent hearing loss

Stage : II

Causing Injury
(a) Neural -humoral stress response
(b) Temporary hearing loss
(c) Permanent hearing loss

B. Noise Nuisances

Stage III

Curbing Efficient Performance
(a) Mental Stress
(b) Task Interference
(c) Sleep Interference

Stage IV

Diluting Comfort and Enjoyment
(a) Invasion of Privacy
(b) Disruption of Social Interaction
(c) Hearing Loss

Source : Sound Pollution, During Festivals in West Bengal a growing menace
West Bengal Pollution Control Board

TABLE 5.1.2 : SELECTED CATEGORIES OF LAND USE CLASSIFICATION

(Million hectare)

Sl. No.	Years	Net Sown Area (A)	Gross Sown Area (B)	Area Sown More Than Once (B-A)	Net Irrigated Area (C)	Gross Irrigated Area (D) Once (D-C)	Area Irrigated More Than
1	2	3	4	5	6	7	8
1	1950-51	118.75	131.89	13.14	20.85	22.56	1.71
2	1960-61	133.20	152.77	19.57	24.66	27.98	3.32
3	1970-71	140.27	165.79	25.52	31.10	38.19	7.09
4	1980-81	140.00	172.63	32.63	38.72	49.78	11.06
5	1985-86	140.90	178.46	37.56	41.86	54.28	12.42
6	1990-91	143.00	185.74	42.74	47.78	62.47	14.69
7	1991-92	141.63	182.24	40.61	49.87	65.68	15.81
8	1992-93	142.72	185.70	42.98	50.30	66.76	16.46
9	1993-94P	142.34	186.58	44.24	51.34	68.25	16.91
10	1994-95P	142.96	188.05	45.09	53.00	70.65	17.65
11	1995-96P	142.20	187.47	45.27	53.40	71.35	17.95
12	1996-97P	142.81	189.59	46.78	55.05	73.25	18.20
13	1997-98P	142.08	190.57	48.49	54.98	73.00	18.02
14	1998-99P	142.58	193.03	50.45	57.08	75.95	18.87
15	1999-2000P	141.23	189.74	48.51	57.24	76.34	19.10

Source : Department of Agriculture & Cooperation, Ministry of Agriculture.
P : Provisional

The net area under irrigation has increased from 21 mha in 1950-51 to 57.24 mha in 1999-2000. The development in irrigation potential is largely due to the efforts of the Govt. in developing irrigation facilities through major/medium and minor irrigation projects.

Ground water sources contributed nearly 51% of the total area irrigated in 1991-92. There has been a drastic increase in the utilization of ground water since the 1960's due to rural electrification. As a result our ground water resources are getting depleted .Surface water sources, rivers, canals, tanks and rivulets have also been affected considerably due to the degradation and siltation of riverbeds.

TABLE 5.1.3 : STATE-WISE INFORMATION ON PRIORITY WATERSHEDS OF RIVER VALLEY PROJECTS/FLOOD PRONE RIVER CATCHMENTS

(Area in Lakh hectare)

Sl. No.	State/UT	Total Area	Surveyed Area	Total SWS/MWS		Very High		Area	High		Area	Total Priority SWS/MWS		Area
				Full	Partly	Full	Partly		Full	Partly		Full	Partly	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	State													
1	Andhra Pradesh	57.55	57.55	1587.00	21.00	159.00		4.62	338.00		10.79	497.00		15.41
2	Arunachal Pradesh	0.00	0.00	—		—		0.00	—		0.00	—		0.00
3	Assam	1.53	1.53	66.00	2.00	21.00	2.00	0.52	14.00		0.34	35.00	2.00	0.86
4	Bihar	83.59	83.59	3103.00	13.00	321.00	1.00	7.90	656.00	8.00	16.25	977.00	9.00	24.15
5	Goa	0.00	0.00	—		—		0.00	—		0.00	—		0.00
6	Gujarat	5.74	5.74	232.00	25.00	54.00	5.00	0.88	55.00	6.00	1.31	109.00	11.00	2.19
7	Haryana	18.13	18.13	624.00		66.00		1.58	55.00		1.49	121.00		3.07
8	Himachal Pradesh	28.96	28.96	1719.00	2.00	497.00	2.00	8.85	404.00		6.97	901.00	2.00	15.82
9	Jammu & Kashmir	2.76	2.76	338.00	2.00	36.00	2.00	0.69	25.00		0.48	61.00	2.00	1.17
10	Karnataka	103.90	103.90	3148.00	66.00	318.00		11.83	594.00	2.00	14.15	912.00	2.00	25.98
11	Kerala	2.86	2.86	106.00	11.00	25.00		0.48	28.00		1.10	53.00		1.58
12	Madhya Pradesh	287.67	261.39	9400.00	153.00	1321.00	15.00	30.68	1742.00	38.00	44.02	3063.00	53.00	74.70
13	Maharashtra	201.71	197.08	5201.00	49.00	449.00	3.00	16.33	774.00	5.00	29.42	1223.00	8.00	45.75
14	Manipur	0.00	0.00	—		—		0.00	—		0.00	—		0.00
15	Meghalaya	0.00	0.00	—		—		0.00	—		0.00	—		0.00
16	Mizoram	0.05	0.05	—	2.00	—	2.00	0.05	—		0.00	—	2.00	0.05
17	Nagaland	0.00	0.00	—		—		0.00	—		0.00	—		0.00
18	Orissa	30.37	27.39	997.00	41.00	134.00	5.00	3.20	204.00	5.00	5.48	338.00	10.00	8.68
19	Punjab	10.32	10.32	326.00		12.00		0.17	12.00		0.35	24.00		0.52
20	Rajasthan	51.49	35.71	1402.00	107.00	185.00	10.00	4.23	222.00	28.00	6.13	407.00	38.00	10.36
21	Sikkim	9.68	4.09	97.00		39.00		1.74	12.00		0.40	51.00		2.14
22	Tamil Nadu	5.38	5.38	313.00	1.00	41.00		0.53	43.00		0.56	84.00		1.09
23	Tripura	0.45	0.45	34.00		7.00		0.09	18.00		0.26	25.00		0.35
24	Uttar Pradesh	65.39	62.28	2592.00		458.00		8.59	737.00		16.16	1195.00		24.75
25	West Bengal	19.74	19.74	788.00	2.00	53.00		1.42	105.00	1.00	2.65	158.00	1.00	4.07
	UT													
1	Andaman & Nicobar	0.00	0.00	—		—		0.00	—		0.00	6.00		0.00
2	Chandigarh	0.10	0.10	11.00		6.00		0.04	—		0.00	2.00		0.04
3	Dadra & Nagar Haveli	0.13	0.13	4.00	12.00	2.00	4.00	0.04	—	2.00	0.03	—	6.00	0.07
4	Daman & Diu	0.00	0.00	—		—		0.00	—		0.08	12.00		0.00
5	Delhi	1.06	1.06	54.00		8.00		0.09	4.00		0.00	—		0.17
6	Lakshadweep	0.00	0.00	—		—		0.00	—		0.00	—		0.00
7	Pondicherry	0.00	0.00	—		—		0.00	—		0.00	—		0.00
	Total	**988.56**	**930.19**	**32142.00**	**509.00**	**4212.00**	**51.00**	**104.55**	**6042.00**	**95.00**	**158.42**	**10254.00**	**146.00**	**262.97**

Source : All India Soil and Land Use Survey, Ministry of Agriculture.
SWS : Sub Watershed MWS : Micro Watershed (P) : Partly

TABLE 5.1.4 : STATEWISE INFORMATION ON SOILS OF PRIORITY WATERSHEDS OF RIVER VALLEY PROJECTS/ FLOODPRONE RIVER CATCHMENTS

(Area in lakh hectares)

Sl. No.	State/UT	Catchment Area	Surveyed Area	Priority Area	Subwatershed Area On Which Reports Available
1	2	3	4	5	6
	State				
1	Andhra Pradesh	57.55	57.55	15.41	7.27
2	Arunachal Pradesh	0.00	0.00	0.00	0.00
3	Assam	1.53	1.53	0.86	0.24
4	Bihar	83.59	83.59	24.15	11.34
5	Goa	0.00	0.00	0.00	0.00
6	Gujarat	5.74	5.74	2.19	1.88
7	Haryana	18.13	18.13	3.07	0.22
8	Himachal Pradesh	28.96	28.96	15.82	4.85
9	Jammu & Kashmir	2.76	2.76	1.17	0.16
10	Karnataka	103.90	103.90	25.98	12.19
11	Kerala	2.86	2.86	1.58	0.88
12	Madhya Pradesh	287.67	261.39	74.70	27.78
13	Maharashtra	201.71	197.08	45.75	14.82
14	Manipur	0.00	0.00	0.00	0.00
15	Meghalaya	0.00	0.00	0.00	0.00
16	Mizoram	0.05	0.05	0.05	0.00
17	Nagaland	0.00	0.00	0.00	0.00
18	Orissa	30.37	27.39	8.68	10.67
19	Punjab	10.32	10.32	0.52	0.01
20	Rajasthan	51.49	35.71	10.36	4.60
21	Sikkim	9.68	4.09	2.14	1.10
22	Tamil Nadu	5.38	5.38	1.09	1.19
23	Tripura	0.45	0.45	0.35	0.04
24	Uttar Pradesh	65.39	62.28	24.75	3.90
25	West Bengal	19.74	19.74	4.07	7.10
	UT				
1	Andaman & Nicobar	0.00	0.00	0.00	0.00
2	Chandigarh	0.10	0.10	0.04	0.00
3	Dadra & Nagar Haveli	0.13	0.13	0.07	0.10
4	Daman & Diu	0.00	0.00	—	—
5	Delhi	1.06	1.06	0.17	0.00
6	Lakshadweep	0.00	0.00	0.00	0.00
7	Pondicherry	0.00	0.00	0.00	0.00
	Total	**988.56**	**930.19**	**262.97**	**110.34**

Source : All India Soil and Land Use Survey, Ministry of Agriculture.

TABLE 5.2.1 : USE OF AGRICULTURAL INPUTS

Sl. No.	Programme	Unit	1980-81	1990-91	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000
1	2	3	4	5	6	7	8	9	10	11
1.	Seeds									
	I. Production of Breeder Seeds	Thousand Quintals	5.27	33.89	40.11	43.36	46.03	46.13	38.99	51.13
	II. Production of Foundation Seeds	Lakh Quintals	—	3.35	4.73	4.76	5.76	6.84	6.75	4.66
	III. Distribution of Certified/Quality Seeds	Lakh Quintals	25.01	57.10	65.86	69.90	73.27	78.79	83.00	87.98
2.	Consumption of Chemical Fertilizers (I+II+III)	Lakh Tonnes	55.16	125.46	135.64	138.77	143.08	161.88	167.98	180.69
	Kg./ha	31.83	67.49	72.13	74.02	75.47	84.86	88.05	94.72	
	I. Nitrogenous(N)	Lakh Tonnes	36.78	79.97	95.07	98.23	103.02	109.02	113.54	115.92
	II. Phosphatic(P)	Lakh Tonnes	12.14	32.21	29.32	28.98	29.77	39.14	41.12	47.99
	III. Potassic(K)	Lakh Tonnes	6.24	13.28	11.25	11.56	10.29	13.72	13.32	16.78
3.	Consumption of Pesticides (Technical Grade Material)	Thousand Tonnes	45.00	75.00	61.36	61.26	56.11	52.24	49.16	46.20
4.	Area under High Yielding Varieties	Million ha	43.08	64.98	71.19	72.29	76.40	76.00	N.A.	N.A.
	Paddy	Million ha	18.23	27.39	31.00	31.40	33.40	32.20	N.A.	N.A.
	Wheat	Million ha	16.10	20.97	23.20	23.10	23.70	23.00	N.A.	N.A.
	Jowar	Million ha	3.50	7.06	7.10	7.49	8.30	9.00	N.A.	N.A.
	Bajra	Million ha	3.64	5.70	5.40	5.50	6.10	7.00	N.A.	N.A.
	Maize	Million ha	1.60	2.61	3.39	3.60	3.80	3.60	N.A.	N.A.
	Ragi	Million ha	—	1.25	1.10	1.20	1.10	1.20	N.A.	N.A.
5.	Area covered under Soil Conservation (Cummulative)	Million ha	24.37	34.90	38.20	39.30	39.40*	39.40*	39.44*	39.4*
6.	Irrigated Area	Million ha	54.10	70.80	77.5	79.3	80.70	81.80	83.60	N.A.
	Major & Medium	Million ha	22.70	26.00	27.50	27.90	28.40	28.90	30.10	N.A.
	Minor @	Million ha	31.40	44.80	50.20	51.40	52.30	52.90	53.50	N.A.

Source : Agricultural Statistics at a Glance, 2003, Department of Agriculture & Cooperation, Ministry of Agriculture

N.A. : Not available (E) : Estimated

@ : The figures for minor irrigation indicate the net benefit after allowing for seepage.

* : excluding state sector soil conservation programme

TABLE 5.2.2 : PERFORMANCE OF CROP PRODUCTION

Sl. No.	Crops	Production (Million Tonne)									
		1991-92	1992-93	1993-94	1994-95	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02$
1	2	3	4	5	6	7	8	9	10	11	12
1	Rice	74.68	72.86	80.30	81.81	81.73	82.54	86.08	89.68	87.70	93.08
2	Wheat	55.69	57.21	59.84	65.77	69.35	66.35	71.29	76.37	69.68	71.81
3	Coarse Cereals	25.99	36.59	30.82	29.88	34.11	30.40	31.33	30.33	31.08	33.94
4	Total Cereals	156.36	166.67	170.96	177.46	185.19	179.29	188.70	196.38	188.46	198.84
5	Total Pulses	12.02	12.82	13.30	14.04	14.25	12.97	14.91	13.42	11.08	13.19
6	Total Foodgrains	168.38	179.48	184.26	191.50	199.44	192.26	203.61	209.80	199.54	212.03
7	Sugarcane	254.00	228.03	229.66	275.54	277.56	279.54	29.57	299.32	295.96	300.10
8	Total Oilseeds	18.60	20.11	21.50	21.34	24.38	21.32	24.75	20.72	18.44	20.46
9	Cotton @	9.71	11.40	10.74	11.89	14.23	10.85	12.29	11.53	9.52	10.09
10	Jute & Mesta #	10.29	8.59	8.43	9.08	11.13	11.02	9.81	10.56	10.56	11.64
11	Non-Foodgrains *	158.80	164.00	169.50	180.90	200.90	181.80	200.20	189.00	177.90	186.00
	All Crops *	145.50	151.60	157.30	165.20	175.70	165.40	178.20	176.90	167.30	177.10

Source : Department of Agriculture & Cooperation, Ministry of Agriculture

@ : Production in million bales of 170 kg. each

$: Final Estimate for 2001-2002

: Production in million bales of 180 kg. each

* : Index number base : 1981-82 = 100

The crop yields have increased greatly in India over the past 20-25 years. Most of these increases have been due to the development of crop varieties which respond to fertilizers. The different types of cropping systems practised in traditional agriculture have given way to systems involving only a few crops which are highly nutrient depleting but high yielding. The legumes, grasses, and millets which were regular components of cropping systems in Indian agriculture have largely been phased out in highly productive areas due to poor economic returns and replaced by high yielding rice, wheat, sugarcane, etc. As a result, the water level is receding at an alarming rate. This has created the problems of soil erosion and the destruction and disturbances to wild life habitats.

TABLE 5.2.3 : AREA UNDER PRINCIPAL CROPS

(Million hectare)

Sl. No.	Crops	1970-71	1980-81	1990-91	1994-95	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02
1	2	3	4	5	6	7	8	9	10	11	12
1	Rice	37.6	40.2	42.7	42.8	43.4	43.4	44.8	45.2	44.7	44.6
2	Wheat	18.2	22.3	24.2	25.8	25.9	26.7	27.5	27.5	25.7	25.9
3	Pulses	22.5	22.5	24.7	23.0	22.4	22.9	23.5	21.1	20.3	21.7
4	Foodgrains	124.3	126.7	127.8	123.9	123.6	123.8	125.2	123.1	121.0	121.9
5	Cotton	7.6	7.8	7.4	7.9	9.1	8.9	9.3	8.7	8.5	9.1
6	Jute & Mesta	1.1	1.3	1.0	0.9	1.1	1.1	1.0	1.0	1.0	1.0
7	Sugarcane	2.6	2.7	3.7	3.9	4.2	3.9	4.1	4.2	4.3	4.4
8	Tobacco	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.4	0.3	N.A.
9	Oilseeds	16.6	17.6	24.1	25.3	26.3	26.1	26.2	24.3	22.8	22.8

Source : Department of Agriculture and Cooperation, Ministry of Agricuture

TABLE 5.2.4 : CONSUMPTION OF TECHNICAL GRADE PESTICIDES

(Tonnes)

Sl. No.	Names	1971	1994-95 *
1	Insecticides	22013	51755
2	Fungicides	2067	22895
3	Herbicides	30	7620
4	Rodenticides	195	1860
5	Others	NA	900
	Total	**24305**	**85030**

Source : Teri Energy Data Directory & Yearbook, 1996-97
* : Projected

Most part of the applied pesticide, irrespective of crop, applicator or the formulation used, ultimately finds its way into the soil. Before pesticides are completely inactivated, they may adversely affect the functioning of non-target microbes and other forms of life inhabiting the soil. They may also be taken up by the plants or get translocated in the aquatic system by leaching or run-off, thus contaminating the plankton, fish, invertebrate and other forms of life using their water.

Pesticide residues in food items have been a matter of considerable concern. Even small quantities of these residues ingested daily along with food can build up high levels in the body fat. The long term effects of these residues in the human body include carcinogenecity, reduced life span and fertility, increased cholesterol, high infant mortality and varied metabolic and genetic disorders.

TABLE 5.2.5 (a) : CAPACITY AND PRODUCTION IN THE CHEMICAL INDUSTRY (INSECTICIDES) IN INDIA

(Thousand Tonnes)

Sl. No.	Products	1998-99		1999-2000		2000-2001		2001-2002	
		Inst. Cap.	Production	Inst. Cap.	Production	Inst. Cap.	Production	Inst. Cap.	Production
1	2	3	4	5	6	7	8	9	10
	Insecticides								
1	B.H.C.	37.00	0.00	0.00	0.00	*	*	*	*
2	D.D.T.	6.30	3.40	6.30	3.60	6.34	3.80	6.34	3.51
3	Malathion	9.90	5.20	9.50	5.90	9.45	5.90	9.45	5.60
4	Parathion (Methyl)	4.50	2.30	4.00	1.90	4.00	1.98	4.00	2.06
5	Dimethoate	3.60	1.60	0.80	1.40	0.81	1.50	0.81	0.85
6	D.D.V.P.	4.50	2.50	3.90	2.50	3.92	2.60	3.92	2.83
7	Quinalphos	5.60	3.40	5.60	2.20	5.58	2.60	5.58	2.06
8	Monocrotophos	17.10	10.20	16.20	9.50	16.15	8.30	16.15	6.71
9	Phosphamidon	4.70	3.00	5.70	3.20	5.70	3.50	5.70	3.13
10	Phorate	5.30	3.80	7.50	6.10	7.55	6.10	7.55	4.72
11	Ethion	1.90	1.80	5.10	3.40	5.08	3.50	5.08	3.84
12	Endosulphan	10.10	8.40	10.10	8.30	10.10	8.50	10.10	4.49
13	Fenvalerate	2.30	1.80	2.10	1.40	2.13	1.60	2.13	1.07
14	Cypermethrin	3.00	3.20	4.60	3.70	4.64	4.40	4.64	5.06
15	Anilophos	0.60	1.00	0.60	0.90	0.60	0.80	0.60	0.60
16	Acephate	4.80	4.80	4.80	2.90	4.80	3.10	4.80	4.01
17	Chlorpyriphos	10.30	7.20	10.30	7.50	10.34	8.03	10.34	6.62
18	Phosalone	1.00	0.90	1.00	0.50	1.00	0.60	1.00	0.44
19	Metasystox	*	0.80	*	0.70	*	0.60	*	0.66
20	Abate	*	0.20	*	0.20	*	0.30	*	NA
21	Fenthion	*	0.20	*	0.20	*	0.20	*	0.07
22	Triazaphos	*	0.80	*	0.80	*	0.80	*	1.51
23	Lindane	1.20	0.90	1.30	1.10	1.28	0.50	1.28	0.27
24	Temephos	0.10	0.02	0.10	NEG	0.10	0.20	0.10	0.14
25	Deltamethrin	*	0.20	0.25	0.10	0.25	0.10	0.25	0.10
26	Alphamethrin	*	0.10	0.40	0.40	0.36	0.10	0.36	0.30
	Total	**133.80**	**67.72**	**100.15**	**64.80**	**100.15**	**69.61**	**100.15**	**60.64**

Source : Department of Chemicals & Petrochemical, Ministry of Chemicals & Fertilizers

* : Not available

TABLE 5.2.5 (b) : CAPACITY AND PRODUCTION IN THE CHEMICAL INDUSTRY IN INDIA (FUNGICIDES, HERBICIDES, WEEDICIDES, RODENTICIDES, FUMIGENTS)

(Thousand Tonnes)

Sl. No.	Products	1998-99		1999-2000		2000-2001		2001-2002	
		Inst. Cap.	Production	Inst. Cap.	Production	Inst. Cap.	Production	Inst. Cap.	Production
1	2	3	4	5	6	7	8	9	10
I	**Fungicides**	**16.00**	**11.40**	**14.80**	**12.54**	**14.80**	**12.14**	**14.60**	**13.54**
1	Captan & Captafol	1.80	1.00	1.80	1.10	1.8	1.40	1.80	1.18
2	Ziram	0.40	0.20	0.40	0.00	0.4	0.10	0.38	0.00
3	Thiram	1.40	0.90	0.20	0.20	0.2	0.00	N/A	N/A
4	Carbendazim (Bavistin)	1.20	0.80	1.20	0.90	1.2	0.70	1.22	0.67
5	Calixin	0.20	0.20	0.20	0.04	0.2	0.04	0.20	0.07
6	Mancozeb	11.00	8.30	11.00	10.30	11.0	9.90	11.00	11.63
7	Copperoxychloride	N/A	N/A	N/A	N/A	1.5	0.00	1.5	0.02
II	**Herbicides**	**4.80**	**2.80**	**3.80**	**2.00**	**4.30**	**2.02**	**4.30**	**0.51**
1	2, 4-D	2.20	2.10	2.90	1.30	2.9	1.3	2.9	0.20
2	Butachlor	2.60	0.70	0.90	0.70	0.9	0.22	0.9	0.31
3	Metamitron	N/A	N/A	N/A	N/A	0.5	0.50	N/A	N/A
III	**Weedicides**	**11.20**	**7.13**	**15.04**	**8.00**	**14.98**	**5.75**	**14.68**	**5.52**
1	Isoproturon	7.00	5.50	8.50	4.60	8.54	3.75	8.54	3.78
2	ODUC	0.30	0.30	0.30	0.00	0.30	0.00		
3	Glyphosate	1.80	1.30	1.80	1.70	1.80	0.67	1.80	0.41
4	Paraquat	2.00	0.00	4.00	1.40	4.00	1.24	4.00	1.00
5	Atrazine	0.00	0.00	0.04	0.10	0.04	0.01	0.04	0.20
6	Diuron	0.10	0.03	0.10	0.00	N/A	0.02	N/A	0.00
7	Fluchloralin	N/A	0.00	0.30	0.20	0.30	0.05	0.30	0.13
IV	**Rodenticides**	**0.90**	**0.60**	**0.90**	**0.50**	**0.86**	**0.59**	**0.86**	**0.34**
1	Zinc Phosphide	0.90	0.60	0.90	0.50	0.86	0.59	0.86	0.34
V	**Fumigants**	**2.70**	**2.20**	**2.75**	**3.02**	**2.75**	**2.63**	**2.75**	**2.33**
1	Aluminium Phosphide	2.30	2.00	2.30	1.80	2.30	2.46	2.30	2.18
2	Methyl Bromide	0.30	0.10	0.30	0.10	0.30	0.06	0.30	0.04
3	Dicofol	0.10	0.10	0.15	1.12	0.15	0.11	0.15	0.11

Source : Department of Chemicals & Petrochemical, Ministry of Chemicals & Fertilizers
* : Not available

TABLE 5.2.6 : STATE-WISE CONSUMPTION OF PESTICIDES

(MT's Technical Grade)

Sl. No.	Name of State/ U.T.s	1995-96	1996-97	1997-98	1998-99	1999-00
1	2	3	4	5	6	7
1	Andhra Pradesh	10957	8702	7298	4741	4054
2	Assam	316	300	284	260	260
3	Arunachal Pradesh	22	20	18	18	17
4	Bihar	1383	1039	1150	834	832
5	Gujarat	4560	4545	4642	4803	3646
6	Goa	4	2	2	4	4
7	Haryana	5100	5040	5045	5035	5025
8	Himachal Pradesh	300	300	200	276	385
9	Jammu & Kashmir	108	63	78	75	26
10	Karnataka	3924	3665	2962	2600	2484
11	Kerala	1280	1141	602	1161	1069
12	Madhya Pradesh	1748	1159	1641	1643	1528
13	Maharashtra	5097	4567	3649	3468	3614
14	Manipur	41	31	20	31	21
15	Meghalaya	20	20	8	9	8
16	Mizoram	21	18	17	16	19
17	Nagaland	9	9	9	9	10
18	Orissa	1293	885	924	942	998
19	Punjab	7200	7300	7150	6760	6972
20	Rajasthan	3210	3075	3211	3465	2547
21	Sikkim	26	16	16	15	N.A.
22	Tamil Nadu	2080	1851	1809	1730	1685
23	Tripura	25	22	19	16	17
24	Uttar Pradesh	8110	7859	7444	7419	7459
25	West Bengal	4213	4291	3882	3678	3370
26	Andaman & Nicobar Islands	7	9	4	5	5
27	Chandigarh	3	3	3	3	4
28	Delhi	76	61	65	64	62
29	Dadra & Nagar Haveli	7	4	4	4	2
30	Daman and Diu	1	1	1	1	1
31	Lakshadweep	1	1	1	1	1
32	Pondicherry	118	115	81	71	70
	All-India	**61260**	**56114**	**52239**	**49157**	**46195**

Source : Department of Chemical and Petrochemicals, Ministry of Chemicals & Fertilizers

TABLE 5.2.7 : CONSUMPTION OF CHEMICAL FERTILIZERS

(Thousand Tonnes)

Sl. No.	Year	Nitrogen (N)	Phosphate (P_2O_5)	Potash (K_2O)	TotalL
1	2	3	4	5	6
1	1960-61	210.0	53.1	29.0	292.1
2	1970-71	1487.0	462.0	228.0	2177.0
3	1980-81	3678.1	1213.6	623.9	5515.6
4	1990-91	7997.2	3221.0	1328.0	12546.2
5	1991-92	8046.3	3321.2	1360.5	12728.0
6	1992-93	8426.8	2843.8	883.9	12154.5
7	1993-94	8788.3	2669.3	908.4	12366.0
8	1994-95	9507.1	2931.7	1124.7	13563.5
9	1995-96	9822.8	2897.5	1155.8	13876.1
10	1996-97	10301.7	2976.8	1029.6	14308.1
11	1997-98	10901.7	3913.6	1372.5	16187.8
12	1998-99	11353.8	4112.2	1331.5	16797.5
13	1999-2000(P)	11593.0	4799.0	1678.0	18070.0
14	2000-01(P)	10920.0	4215.0	1567.0	16702.0
15	2001-02(P)	12197.0	5198.0	1911.0	19306.0

Source : Department of Chemicals and Petrochemicals, Ministry of Chemicals & Fertilizers
P : Provisional

TABLE 5.2.8 : INSECTICIDE LEVEL IN SOIL

Sl. No.	Location	Year	No. of Samples		Insecticide	Residue
			Analysed	Contaminated	Detected	(PPM)
1	2	3	4	5	6	7
1	Uttar Pradesh	1966	138	120	DDT	0.67-15
2	Punjab	1978	108	91	DDT	0.17-1.63
					HCH	0.5
		1979	12	12	DDT	0.036-.0.08
					HCH	0.032-0.32
		1980	16	12	DDT	0.02-0.09
					HCH	0.02-0.05
3	Karnataka	1973	—	—	HCH	0.125
4	Delhi	1979	50	49	DDT	0.08-4.88
		1981	—	—	DDT	0.01-2.61
		1986	50	50	DDT	0-2.6

Source : State of the Environment, 1995

TABLE 5.2.9 : INSECTICIDE LEVEL IN WATER

Location	Year	No. of Samples		Insecticide	Residue	
		Analysed	Detected	Detected	Water	Sediments
1	2	3	4	5	6	7
Yamuna River						
Delhi						
Upstream	1979	12	12	DDT	0.1-0.528	0.007-1.121
Downstream	1979	9	9	DDT	0.063-0.404	0.010-0.258
Wazirabad						
Upstream	1979	14	14	DDT	0.062-0.639	0.017-1.121
Downstream	1979	15	15	DDT	0.083-3.416	0.012-1.326
Ujjain	1989	—	—	HCH	2.720	—
				DDT	0.219	—
				ALABIN	5.000	—
Kala	1989	—	—	HCH	.0154-1.412	—
	1989	—	—	HCH	0.166	—
				DDT	0.166	—

Source : State of the Environment, 1995.

TABLE 5.3.1 : FREQUENTLY OCCURRING NATURAL DISASTERS IN INDIA

Sl. No.	Type	Location/ Area	Affected Population (in Million)
1	2	3	4
1	Cyclones	Entire 5700 km long coastline of Southern, Peninsular India covering 9 States viz Gujarat, Maharashtra,Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Orissa and West Bengal and Union Territory of Pondicherry besides Islands of Lakshadweep and Andaman and Nicobar	10
2	Floods	8 major river valleys spread over 40 million hectares of area in the entire country	260
3	Drought	About 68% of total sown area and 16% of total area of the country spread in 14 States of Andhra Pradesh, Bihar, Gujarat, Haryana, Jammu & Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal & Himachal Pradesh covering a total of 116 districts and 746 blocks	86
4	Earthquake	56% of the total area of the countrysusceptible to seismic disturbances	400
5	Landslide	Entire sub Himalayan region and Western Ghats	10
6	Avalanche	Many parts of the Himalaya	
7	Fires	States of Bihar, West Bengal, Orissa and north eastern States	140

Source : India: State of the Environment, 2001

India is prone to natural disasters. Due to its locational and geographical features, it is vulnerable to a number of natural hazards like cyclones, droughts, floods, earthquakes, fires, landslides and avalanches.

Natural disasters result in heavy economic losses, apart from the loss of human life and the hardship inflicted on the survivors. On an average, atleast one major disaster hits India every year, causing irrepairable damage to life and property.

TABLE 5.3.2 : MAJOR EARTHQUAKES IN INDIA

Sl. No.	Date (Degree N)	Lattitude (Degree E)	Longitude	Magnitude Others at Source	Yield in Mega/	Region	Remarks
1	2	3	4	5	6	7	8
1	16.06.1819	24.00	70.00	8.0	12.59(0.62)	Kutch	About 2000 people killed
2	12.06.1897	25.00	92.00	8.7	63.1	Assam	One of the greatest earthquake of historical time Shillong city was razed to the ground 1542 killed.
3	04.04.1905	32.30	76.25	8.0	12.59(0.62)	Kangra	20000 lives lost
4	15.01.1934	26.60	86.80	8.3	25.12(1.25)	India-Nepal Border	Most severe in Indian history, More than 10000 killed
6	26.06.1941	12.40	92.50	8.1	15.85(0.79)	Andaman Islands	Flooding in port Blair
7	15.08.1950	28.46	96.66	8.5	39.81(1.99)	Assam	532 people killed
8	06.08.1988	25.14	95.12	5.8	0.79(0.04)	Burma-India Border	3 killed 11 injured
9	20.08.1988	26.78	86.61	6.5	0.04(0.02)	Nepal-India Border	1000 people killed, 1000 injured Extensive damage in Northern Bihar
10	19.10.1991	30.75	78.86	6.6	0.50(0.03)	West UP Hills (Uttarkashi)	768 people killed
11	30.09.1993	18.07	76.00	6.3	0.48(0.2)	Latur, Osmanabad	7601 people killed
12	22.05.1997			6.0		Jabalpur	38 People killed
13	29.03.1999	—	—	—	—	Uttar Pradesh	106 Human Lives lost, 395 Persons injured
14	26.01.2001	—	—	—	—	Gujarat	Over 20000 people killed, 150000 injured and 15900000 affected

Source : Ministry of Environment & Forests and State Forest Report 2001

The two thirds of India lies in the Seismic zones of moderate to severe intensity. The Himalayan Range, the Indo-gangetic plains and the Kuthch and Kathaiwar region of Western India are geologically the most unstable parts, and are most prone to earthquakes. The Himalayan frontal arc flanked by the chaman fault in the west constitutes one of the most seismically active intra-continental regions in the world. In a span of 53 years, four earthquakes, exceeding magnitude 8 on the Richter scale, occurred in this region. These are the Assam earthquakes of 1897 and 1950, the Kangra earthquake of 1905 and the Bihar-Nepal earthquake of 1935. Besides the Himalayan regions, the Union Territories of Andaman and Nicobar Islands are also quite vulnerable to earthquakes. Peninsular India comprises stable continental crust regions, which are considered stable since they are away from tectonic activity of the boundaries. These regions are considered seismically the least active but the Latur earthquake in Maharashtra on September 30, 1993 of magnitude 6.4 in the Richter scale showed that this region, too, is unstable and earthquake prone.

The Department of earthquake engineering, University of Roorkee was established in 1960 to carry out Research and Development, Consultancy and Training in Earthquake Engineering. The Department helps in designing earthquake resistant structure. They use various techniques of seismic methods of geophysics in assessing the status of a locality.

TABLE 5.3.3 : LIST OF IDENTIFIED DROUGHT PRONE DISTRICTS IN THE COUNTRY

Sl. No.	State/District	No. of Talukas	Area of the District (Sq. Kms.)	As Per CWC's Study-1982		
				No. of Talukas Affected by Drought	Area Affected by Drought (Sq. Kms)	Percentage Area Affected
1	2	3	4	5	6	7
I	**Andhra Pradesh**	**79**	**125113.03**	**19**	**32839.51**	26
1.	Anantpur	11	19134.9	5	10455.8	55
2.	Chittoor	11	15143.1	-	-	
3.	Cuddapah	9	15372.9	1	1473.7	10
4.	Hyderabad	9	7762.49	3	3157.9	41
5.	Kurnool	11	17600.4	2	3825.97	22
6.	Mahboob Nagar	12	18472	3	4285	23
7.	Nalgonda	7	14223.24	1	1772.05	12
8.	Prakasam	9	17404	4	7869	45
II	**Jharkhand**	**3**	**12019.9**	—	—	
9.	Palamau	3	12019.9	—	—	
III	**Bihar**	**12**	**31364.6**	-	-	
10.	Munger	4	7884.5	-	-	
11.	Nawadah	1	2494	-	-	
12.	Rohtas	2	7199.7	-	-	
13.	Bhojpur	2	3971.1	-	-	
14.	Aurangabad	1	3305	-	-	
15.	Gaya	2	6510.3	-	-	
IV	**Gujarat**	**124**	**121238.9**	**103**	**106818.4**	88
16.	Ahmedabad	7	8565.9	5	7530.3	88
17.	Amreli	10	6711.4	10	6711.4	100
18.	Banaskantha	11	12404.3	9	11018.1	89
19.	Bhawnagar	12	9786.3	12	9786.3	100
20.	Bharuch	11	7805.7	11	7805.7	100
21.	Jamnagar	10	10143	10	10143	100
22.	Kheda	10	6888.1	3	2407	35
23.	Kachchh	9	19476.5	9	19476.5	100
24.	Mahesana	11	9011.8	3	2803.5	31
25.	Panchmahal	11	8849.8	10	7975.1	90
26.	Rajkot	13	11152.3	12	10667.7	96
27.	Surender Nagar	9	10443.8	9	10443.8	100
V	**Haryana**	**15**	**16587.85**	**8**	**8338.5**	50
28.	Bhiwani	4	4657.38	4	4657.38	100
29.	Gurgaon	5	4862.8	2	1462.44	30
30.	Mahendergarh	3	3221.67	2	2218.68	69
31.	Rohtak	3	3846	-	-	
VI	**Jammu & Kashmir**	**8**	**15999.3**	**2**	**2407.6**	15
32.	Doda	4	11691	-	-	
33.	Udhampur	4	4308.3	2	2407.6	56

TABLE 5.3.3 : LIST OF IDENTIFIED DROUGHT PRONE DISTRICTS IN THE COUNTRY-Contd.

Sl. No.	State/District	No. of Talukas	Area of the District (Sq. Kms.)	As Per CWC's Study-1982		
				No. of Talukas Affected by Drought	Area Affected by Drought (Sq. Kms)	Percentage Area Affected
1	2	3	4	5	6	7
VII	**Karnataka**	**139**	**152163.33**	**42**	**57645.54**	38
34.	Bangalore	11	7949.5	-	-	
35.	Belgaum	10	13460.8	1	1996	15
36.	Bellary	8	9548.5	3	3994.3	42
37.	Bijapur	11	17092.83	7	12477.44	73
38.	Chikmagalur	7	7222	1	804.8	11
39.	Chitradurga	9	10754.5	5	7477.5	70
40.	Dharwar	17	13480.1	3	2772.32	21
41.	Gulbarga	10	16167.8	5	8131	50
42.	Hasan	8	6833.3	1	1277.8	19
43.	Kolar	11	8215.2	4	3444.7	42
44.	Mandya	7	4961	1	1034.28	21
45.	Mysore	11	11947	1	1235.9	10
46.	Raichur	9	13972.4	4	6347.6	45
47.	Tumkur	10	10557.7	6	6651.9	6
VIII	**Madhya Pradesh**	**47**	**87219.52**	**26**	**37307.93**	43
48.	Betul	3	7062.9	-	-	
49.	Datia	2	2034	-	-	
50.	Dewas	5	6723.5	3	4219	63
51.	Dhar	5	8195.41	4	6287	77
52.	Jhabua	5	6792.8	5	6792.8	100
53.	Khandwa	3	6379.6	1	1865	29
54.	Khargone	8	13490	5	6955.37	52
55.	Shahdol	4	13860.06	-	-	
56.	Shajapur	4	6178	3	4533.07	73
57.	Sidhi	3	10390.75	1	3768.49	36
58.	Ujjain	5	6112.5	4	4887.2	80
IX	**Maharashtra**	**100**	**123767.05**	**45**	**57664.7**	47
59.	Ahmednagar	13	16762.2	7	9491.8	57
60.	Aurangabad	12	16385	2	3111.3	19
61.	Bir	7	11169	3	4595	41
62.	Nasik	13	15631.5	7	8098.9	52
63.	Oosmandabad	11	14027	7	9515	68
64.	Pune	14	15688.2	4	4932.1	31
65.	Sangli	8	8610.25	5	5939.66	69
66.	Satara	11	10436.9	4	3878.5	37
67.	Solapur	11	15057	6	8102.5	54
X	**Orissa**	**6**	**22862.41**	**1**	**2002.07**	9
68.	Phulbani	3	11090.41	1	2002.07	18
69.	Kalahandi	3	11771	-	-	

TABLE 5.3.3 : LIST OF IDENTIFIED DROUGHT PRONE DISTRICTS IN THE COUNTRY-Concld.

Sl. No.	State/District	No. of Talukas	Area of the District (Sq. Kms.)	As Per CWC's Study-1982		
				No. of Talukas Affected by Drought	Area Affected by Drought (Sq. Kms)	Percentage Area Affected
1	2	3	4	5	6	7
XI	**Rajasthan**	**76**	**218950.45**	**57**	**194203.27**	**89**
70.	Ajmer	5	8449.6	3	4317.8	51
71.	Banswara	5	5055	5	5055	100
72.	Barmer	5	29521.4	5	29521.4	100
73.	Bikaner	4	27396.4	4	27396.4	100
74.	Churu	7	16861.35	7	16861.35	100
75.	Dungerpur	3	3770	3	3770	100
76.	Jaisalmer	2	41674.3	2	41674.3	100
77.	Jalore	4	10554.4	3	8308.8	79
78.	Jhunjhunun	4	5928	3	4460.2	75
79.	Jodhpur	5	22633.8	5	22633.8	100
80.	Nagpur	8	17628	8	17628	100
81.	Pali	7	12211.2	2	4763.8	39
82.	Udaipur	17	17267	7	7812.42	45
XII	**Tamilnadu**	**77**	**84091.14**	**8**	**7451.66**	9
83.	Coimbatore	10	15603.79	-	-	
84.	Dharmapuri	8	9718.6	1	1227.8	13
85.	Madurai	12	12264.1	-	-	
86.	Ramanathapuram	12	12575.49	3	3090.36	25
87.	Salem	9	8543	-	-	
88.	Tiruchirapalli	10	11078.86	1	943.3	9
89.	Tirunelveli	12	12505.5	3	2190.2	18
90.	Kanyakumari	4	1701.8	-	-	
XIII	**Uttar Pradesh**	**31**	**43033.1**	**4**	**4609.4**	11
91.	Allahabad	8	7255	-	-	
92.	Banda	5	7645.1	1	1354.4	18
93.	Hamirpur	6	7192	1	1072	45
94.	Jalaun	4	4549	2	2183	48
95.	Mirzapur	4	11301	-	-	
96.	Varanasi	4	5091	-	-	
XIV	**West Bengal**	**8**	**26720.8**	-	-	
97.	Bankura	2	6855.8	-	-	
98.	Midnapur	5	13606	-	-	
99.	Puruliya	1	6259	-	-	
	Total	**725**	**1081131.38 in 99 Districts**	**315**	**511288.64 in 74 Districts**	**47**

Source : Central Water Commission.

TABLE 5.3.4 : DAMAGE DUE TO DROUGHTS, 1984-87

Sl. No.	Damage	1984	1985	1986	1987
1	2	3	4	5	6
1	Number of Districts affected	151	109	280	263
2	Population affected (lakh)	704.58	785.91	1919.42	2854.19
3	Cropped Area affected (lakh ha)	153.69	282.10	400.13	586.00
4	Cattle population affected (lakh)	475.06	654.30	1119.89	1681.11

Source : The Drought of 1987, Response and Management, Ministry of Agriculture,1989

TABLE 5.3.5 : FLOOD AFFECTED AREA & FLOOD DAMAGES IN INDIA (ABSTRACT FOR THE PERIOD 1953 TO 1999)

Sl. No.	Item	Unit	Average Flood Damage During 1953-2001	Maximum Damage (With Year)	Damage During 2001 (Tentative)
1	2	3	4	5	6
1	Area Affected	Million ha.	7.48	17.50 (1978)	3.01
2	Population Affected	Million	33.18	70.45 (1978)	22.44
3	Human Lives Lost	No.	1579.00	11316.00 (1977)	811.00
4	Cattle Lost	No.	94610	618248 (1979)	25025.00
5	Crop Area Affected	Million ha.	3.52	10.15 (1988)	1.91
6	Value of damage to crops	Rs. Crore	597.98	2510.90 (1988)	446.73
7	Houses damaged	Million	1.20	3.51 (1978)	0.49
8	Value of damage to houses	Rs. Crore	183.67	1307.80 (1988)	357.74
9	Value of damage to public utilities	Rs. Crore	567.86	3171.40 (1998)	1820.34
10	Value of damage to houses, crops and public utilities	Rs. Crore	1373.78	5845.98 (1998)	2624.81

Source : Central Water Commission.
Note : Figures from 1998, 1999,2000 & 2001 are tentative

TABLE 5.3.6 (a) : STATE-WISE DAMAGE DUE TO HEAVY RAINS, FLOOD, CYCLONE DURING SOUTH-WEST MONSOON —1999

(As on 28.1.2000)

Sl. No.	State/UT's Occurrence	Period/Date of	Calamity	Total Districts (No.)	District Affected (No.)	Villages Affected (No.)	Area Affected (Lakh Hectares)	Population Affected (Lakh)	Damage to Crop Area (Lakh Ha.)	Damage to Houses/ Huts (No.)	Human Lives Lost (No.)	Animals Lost (No.)
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Arunachal Pradesh	1 June, 1999	H.R./L	12	1							
2	Assam - I Wave	24 June, 1999	H.R./F	23	12	813	1.45	3.39	0.52	126	1	N.R.
	Assam - II Wave	23 Aug., 1999	H.R./F		10	923	1.48	5.37	0.54		2	
3	Bihar	5 July, 1999	H.R./F	55	21	4028	7.4	60.56	2.82	23538	216	12
		22-29 Sep., 1999	H.R./C.R.		12	8812	0.62	15.72	0.62	225365	69	2016
4	Gujarat	16 July-30 Aug. 1999	H.R./F	24	15						46	Nil
5	Himachal Pradesh	July-Aug. 99	H.R./F	12	12	8461		22.05		2224	30	129
6	Karnataka	12 July, 1999	H.R./F	27	27	3701	0.40	68.62	0.40	16828	122	959
7	Kerala	25 May-8 Oct., 1999	H.R./F/Lig./L	14	14	1368				20083	131	
8	Madhya Pradesh	20 Sep., 1999	H.R./F	45	7	1807	0.62	4.36	0.62	29168	27	654
9	Orissa	7 Aug., 1999	H.R./F	30	7	2486	1.53	17.73	1.53		14	
10	Punjab	12 July, 1999	H.R./F	17	3		0.02		0.02	2	11	
11	Rajasthan	June-Sep., 1999	H.R./F	30	15						46	
12	Tripura	9-12 July, 1999	H.R./F	4	2		0.2		0.05	4014	16	82
13	Uttar Pradesh	18 Aug. 1999	H.R./F/L	83	11	620	0.39	1.84	0.33	1023	86	9
14	West Bengal	25-26 June, 1999	L	18	1					10		
	West Bengal	23-26 Sep. 1999	H.R./F	18	14			128.48		559527	79	
	Total			**412**	**184**	**33019**	**14.11**	**328.12**	**7.45**	**881908**	**896**	**3861**

Source : Natural Disaster Management, Ministry of Agriculture
Note : F- Flood L- Landslide HR - Heavy Rain

TABLE 5.3.6 (b) : STATE-WISE DAMAGE DUE TO HEAVY RAINS, FLOOD, CYCLONE DURING SOUTH-WEST MONSOON —2000

Sl. No.	State/UT's	Calamity	Total districts (No.)	District affected (No.)	Talukas/ Blocks/ Mpls.	Villages Affected (No.)	Area Affected (Lakh ha)	Population Affected (Lakh)	Damage to crop Area (Lakh Ha.)	Estimated Value of Crops Damaged (Rs. in Crores)	Damage to houses/ huts	Estimated Value of Houses Damaged (Rs. in Crores)	Estimated Value of Public Properties (Rs. in Crores)	Human Lives Lost (No.)	Animals Lost (No.)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Andhra Pradesh	HR/F	23	18		4522	—	29.35	4.22	94.52	104374		776	257	5368
2	Arunachal Pradesh	H.R./F/L	13	4		30	—	0.42	0.04	—	17	—		26	9131
3	Assam	H.R./F/L	23	19		3474	4.43	36.09	2.24	250-300	NR	—		32	NR
														34.09+	
4	Bihar	H.R./F	53	3	203	11696	7.00	79.72	3.92	222.81	312076	167.67	792.1	274	1861
5	Gujarat	H.R./F	25	10	48	389	—	4.08	NR	NR	23844	2.64		116	406
6	Himachal Pradesh	H.R./F	12	3		—	—	—	NR	NR	NR	—		149	NR
7	Karnataka	H.R./F/L		27			—		0.57		54591	16.38	389.72	152	690
8	Kerala	H.R./F/L	14	14	61	1049	—	—	NR	27.43	9474	5.59		75	NR
9	Madhya Pradesh	H.R./F	61	6		459	—	—	Neg.	—	3297	—		13	147
10	Punjab	H.R./F	17	7		40	—	—	0.25	Neg.	35	—		7	NR
13	Sikkim	H.R./F/L	4	1		—	—	—	NR	—	140	—		11	NR
11	Uttar Pradesh	H.R./F	83	49		6893	9.85	48.4	4.35	—	33649	—		462	888
12	West Bengal	H.R./F	17	9	239	1412	—	218.18	19.20	3866	2194858	438.97		1474	83630
	Total		**345**	**170**	**551**	**29964**	**21.28**	**416.24**	**34.79**	**4210.76**	**2736355**	**631.25**	**1957.82**	**3048**	**102121**

Source : Natural Disaster Management, Ministry of Agriculture
Note : F - Flood
L - Landslide
HR - Heavy Rains
NR - Not Reported
Neg. - Negligible

TABLE 5.3.6 (c) : STATE-WISE DAMAGE DUE TO HEAVY RAINS, FLOOD, CYCLONE DURING SOUTH-WEST MONSOON —2002 (Provisional)

(As on 23-09-2002)

Sl. No.	States/UT's	Calamity	Total Districts (No.)	Affected			Damage							Lives lost		Remarks
				Districts (No.)	Talukas/ Blocks/ Mpls.	Villages	Total Area (in Lakh Ha.)	Popula-tion (in Lakh)	Crops Area (in (Lakh Ha.)	Estimated Value of Crops (Rs. in Crores)	Houses (No.)	Estimated Value of Houses (Rs. in Crores)	Estimated Value of Public Properties (Rs. in Crores	Human (No.)	Cattles (No.)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Andhra Pradesh	HR	NR	3	NR	NR	NR	NR	NR	NR	800	NR	NR	7		
2	Arunachal Pradesh	FF/L	15	14	NR	75.00	0.2	NR	0.10	0.65	7	0.06	34.66	11	20	
3	Assam	HR/L	23	22	NR	6560.00	57.08	8.37	3.30	NR	19827	NR	NR	41	482	
4	Bihar	HR	38	25	205.00	8208.00	18.45	158.18	8.10	467.44	396096	451.98	296.21	434	1380	
5	Gujarat	HR	25	10	23.00	134.00	6.50	NR	NR	NR	2753	13.57	27.71	134	1152	
6	Himachal Pradesh	HR/L	12	1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	3 missing
7	Kerala	HR/F/L	14	14	NR	776.00	0.23	NR	NR	1.57	2335	1.09	0.01	21	NR	8 missing
8	Madhya Pradesh	HR	45	1	NR	2.00	NR	NR	NR	NR	NR	NR	NR	4	NR	7 missing
9	Manipur	HR/F	NR	4	NR	NR	NR	NR	0.49	NR	30024	NR	NR	2	NR	
10	Maharashtra	HR/L	35	8	NR	311.00	NR	NR	NR	NR	13466	NR	149.23	138	593	
11	Uttar Pradesh	HR	70	8	NR	443.00	1.07	2.58	0.33	NR	1615	NR	NR	6	15	
12	Uttranchal	HR/L	13	2	2.00	50.00	0.03	Neg	Neg	NR	541	NR	NR	33	87	
13	West Bengal	HR/L	NR	3	22.00	617.00	3.07	NR	0.26	27.62	17584	2.31	25.64	4	NR	
	TOTAL			**115**		**17176**					**485048**			**841**	**3729**	

Source : Website of Natural Disaster Management, Ministry of Home Affairs

Note : F - Flood, FF- Flash Flood, L - Landslide, HR - Heavy Rains, C – Cyclone, NR - Not Reported, Neg.- Negligible

TABLE 5.3.7 : STATE-WISE DAMAGE DUE TO HEAVY RAINS, CYCLONE ETC. DURING PRE-MONSOON, 1999

(As on 8.12.1999)

Sl. No.	State/UT's	Period/Date of Occurrence	Total Districts (No.)	District Affected (No.)	Villages Affected (No.)	Area Affected (Lakh Hectares)	Population Affected (Lakh)	Damage to crop Area (Lakh Ha.)	Value of (Rs. Lakhs)	Damage to Houses/ Huts (No.)	Value of Houses Damaged (Rs. lakhs)	Human Lives Lost (No.)	Animals Lost (No.)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Arunachal Pradesh	9 May, 1999	14	1	—	—	0.02	—	—	17	—	1	—
2	Gujarat	17 May. 1999	24	3	—	—	—	—	—	—	—	453	—
3	Kerala	4 Feb.- 9 April, 99	14	14	139	55.36	—	1.00	541.61	2898	72.07	25	—
	Total	**52**	**18**	**139**	**55.36**	**0.02**	**1**	**541.61**	**2915**	**72.07**	**479**		

Source : Natural Disaster Management, Ministry of Agriculture

TABLE 5.3.8 : STATE-WISE DAMAGE DUE TO HEAVY RAINS, FLOOD AND SUPER CYCLONIC STORMS DURING NORTH-EAST MONSOON —1999

(As on 23-2-2000)

Sl. No.	State/UT's	Period/Date of Occurrence	Calamity	Total Districts (No.)	District Affected (No.)	Villages Affected (No.)	Area Affected (Lakh Hectares)	Popu-lation Affected (Lakh) Ha.)	Damage to Crop Area (Lakh (No.)	Damage to Houses/ Huts	Human Lives Lost (No.)	Animals Lost (No.)	No. of Persons Injured (No.) Lakhs)	Value of Crops Damaged (Rs. In
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Andhra Pradesh	17-18 Oct. 99	Cyclone	23	1	1044	—	1.89	—	3425	3	388	—	—
2	Kerala	22 oct.- 22 Nov. 99	H.R./Lig./Lan.	14	14	50	—	—	—	1218	21	—	—	110.35
3	Orissa	17-18 Oct. 99	Cyclone	30	4	5181	1.58	37.47	1.58	331580	199	10578	406	—
		29-30 Oct. 99	Super Cyclone	30	12	14643	18.43	129.22	18.43	1828532	9887	444531	2507	—
4	Tamilnadu	1st Oct. - 15 Dec.99	Heavy Rains	30	29	—	—	—	0.20	36072	103	573		—
5	West Bengal	28-29 Oct. 99	Super Cyclone	18	4	1109 & 1901*	1.02	7.85	0.34	16240	—	—	2913	5773.00

Source : Natural Disaster Management, Ministry of Agriculture
* : Mandals/Mouzas

TABLE 5.3.9 : INFORMATION ON DROUGHT-EXTENT OF DAMAGE, 2001-2002

(As on December 2001)

Sl. No.	State/UT's	Total District (No.)	District Affected (No.)	Villages Affected (No.)	Population Affected (Lakh)	Damage to Crop Area (Lakh Ha.)	Estimated Value of Dameged Crop (Rs. In Thousand)	Cattle Population Affected (In Lakhs)
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	23	22	142	61.55	17.69	NR	NR
2	Bihar	37	32	NR	NR	3	NR	NR
3	Karnataka	27	15	NR	NR	16.22	NR	NR
4	Madhya Pradesh	45	22	14851	26.64	9.53	NR	34.28
5	Maharashtra	35	12	7262	NR	21	NR	NR
	Total	**167**	**103**	**22255**	**88.19**	**67.44**	**0**	**34.28**

Source : Natural Disaster Management, Ministry of Agriculture

TABLE 5.3.10 : DAMAGE DUE TO EARTHQUAKE DURING 2001-2002

(As on 27.11.2001)

Sl. No.	State	Priod of Occurrence	Total Districts (No.)	District Affected (No.)	Talukas/ Blocks/ Mpls.	Villages Affected (No.)	Population Affected (Lakh)	Damage to Houses/ Huts (No. in Lakh)	Estimaed Value of Houses (Rs in Crores)	Estimaed Value of Public Properties . (Rs in Crores)	Human Lives Lost (No.)	Animals Lost (No.)
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Gujarat	26.01.2001	25	21	181	7633	157	12.54	—	21262	13805	20717

Source : Natural Disaster Management, Ministry of Agriculture

TABLE 5.3.11(a) : INCIDENCE OF ACCIDENTAL DEATHS (BY NATURAL CAUSES)

Sl. No.	Year/State/U.T.	Avalanche	Cold & Exposure	Cyclone/ Tornado	Starvation/ Thirst	Earth-quake	Epidemic
1	2	3	4	5	6	7	8
1	1995	106	618	180	183	537	1165
2	1996	61	547	1104	442	483	180
3	1997	27	743	73	227	396	82
4	1998	90	651	1283	299	7	161
5	1999	52	761	3958	472	101	174
6	2000	13	762	115	587	1	102
	State: Year 2000	**13**	**500**	**114**	**295**	**1**	**102**
1	Andhra Pradesh	1	14	14	22	0	12
2	Arunachal Pradesh	0	0	0	0	0	0
3	Assam	0	0	0	0	0	39
4	Bihar *	6	39	9	3	1	14
5	Goa	0	0	0	0	0	0
6	Gujarat	0	36	3	138	0	2
7	Haryana	2	11	0	31	0	8
8	Himachal Pradesh	1	13	0	0	0	0
9	Jammu & Kashmir	1	5	0	0	0	0
10	Karnataka	0	0	0	18	0	0
11	Kerala	0	0	0	0	0	0
12	Madhya Pradesh	0	24	3	1	0	5
13	Maharashtra	0	12	3	1	0	8
14	Manipur	0	0	0	0	0	0
15	Meghalaya	0	6	2	2	0	0
16	Mizoram	0	0	0	0	0	0
17	Nagaland	0	0	0	0	0	0
18	Orissa	0	3	4	0	0	5
19	Punjab	0	65	39	5	0	4
20	Rajasthan	0	39	2	23	0	0
21	Sikkim	0	0	0	0	0	0
22	Tamil Nadu	2	0	0	13	0	0
23	Tripura	0	0	0	0	0	0
24	Uttar Pradesh	0	229	34	34	0	5
25	West Bengal	0	4	1	4	0	0
	Union Territory :	**0**	**262**	**1**	**292**	**0**	**0**
1	A. & N.Islands	0	0	0	0	0	0
2	Chandigarh	0	3	0	0	0	0
3	D. & N. Haveli	0	0	0	0	0	0
4	Daman & Diu	0	0	0	8	0	0
5	Delhi	0	259	0	284	0	0
6	Lakshadweep	0	0	0	0	0	0
7	Pondicherry	0	0	1	0	0	0
	All India	**13**	**762**	**115**	**587**	**1**	**102**

TABLE 5.3.11(a) : INCIDENCE OF ACCIDENTAL DEATHS (BY NATURAL CAUSES) – Concld.

Sl. No.	Year/State/ U.T.	Flood	Heatstroke	Landslide	Lightning	Torrential Rains	Other Natural Causes	Total
1	2	9	10	11	12	13	14	15
1	1995	822	1677		1664	335	14313	23596
2	1996	708	434		1699	110	13162	20928
3	1997	580	393		1957	129	14301	20908
4	1998	958	1016	423	1891	411	15572	22762
5	1999	740	628	331	1621	398	18260	27506
6	2000	1863	534	264	1472	150	11503	17366
	State: Year 2000	**1857**	**500**	**263**	**1471**	**150**	**10903**	**16169**
1	Andhra Pradesh	116	56	2	62	3	386	688
2	Arunachal Pradesh	10	0	4	0	0	0	16
3	Assam	25	5	6	9	1	130	215
4	Bihar *	142	19	3	51	27	336	650
5	Goa	0	0	0	0	0	220	220
6	Gujarat	24	19	17	29	33	726	1027
7	Haryana	0	7	2	12	4	2	79
8	Himachal Pradesh	53	1	28	5	1	235	337
9	Jammu & Kashmir	1	0	6	9	0	196	218
10	Karnataka	19	5	3	96	9	82	232
11	Kerala	2	1	18	45	1	148	215
12	Madhya Pradesh	18	36	12	361	8	170	638
13	Maharashtra	78	12	52	293	14	1795	2268
14	Manipur	0	0	0	0	0	17	17
15	Meghalaya	0	0	5	4	0	5	24
16	Mizoram	0	0	3	0	0	0	3
17	Nagaland	0	0	0	0	0	0	0
18	Orissa	0	74	11	170	4	1304	1575
19	Punjab	0	52	12	1	0	41	219
20	Rajasthan	3	22	2	16	2	1824	1933
21	Sikkim	0	0	10	0	0	0	10
22	Tamil Nadu	12	25	5	73	3	168	301
23	Tripura	0	6	0	11	0	27	44
24	Uttar Pradesh	90	115	54	110	38	1827	2536
25	West Bengal	1264	45	8	114	2	1264	2706
	Union Territory :	**6**	**34**	**1**	**1**	**0**	**600**	**1197**
1	A. & N.Islands	0	0	0	0	0	0	0
2	Chandigarh	0	0	0	0	0	96	99
3	D. & N. Haveli	0	0	0	0	0	0	0
4	Daman & Diu	0	0	0	0	0	0	8
5	Delhi	6	34	1	0	0	504	1088
6	Lakshadweep	0	0	0	0	0	0	0
7	Pondicherry	0	0	0	1	0	0	2
	All India	**1863**	**534**	**264**	**1472**	**150**	**11503**	**17366**

Source : National Crime Record Bureau, Ministry of Home Affairs

* : The figures of Jharkhand,chattisgarh & uttranchal the newly carved state are not included due to non-availability

TABLE 5.3.11(b) : INCIDENCE OF ACCIDENTAL DEATHS(BY UN-NATURAL CAUSES)

Sl. No.	Year/State/U.T./City	Air crash	Collapse of Structure	Drowning	Electro-cution	Explosion	Falls	Factory/ Machine Accidents	Fire	Fire Arms	Sudden Deaths	Killed by Animals
1	2	3	4	5	6	7	8	9	10	11	12	13
1	1995	10	2881	21226	3861	581	5149	616	22922	1052	7598	804
2	1996	338	2050	20873	4303	563	5413	613	22649	1400	9749	735
3	1997	16	2126	21821	4583	933	6172	669	25166	1496	11041	771
4	1998	13	2412	23041	5304	511	6201	642	25898	2917	13509	730
5	1999	36	2386	21457	5671	697	6613	667	28400	2303	12937	692
	2000	20	2233	21996	5663	725	7087	625	25467	2634	13934	669
	State: Year 2000	**19**	**2209**	**21654**	**5415**	**714**	**6689**	**589**	**24677**	**2624**	**13284**	**661**
1	Andhra Pradesh	1	275	1680	757	132	768	61	2124	2	517	46
2	Arunachal Pradesh	0	0	24	6	0	18	2	7	0	5	5
3	Assam	0	22	274	46	1	16	6	173	12	38	62
4	Bihar	0	61	205	68	11	46	8	367	13	118	2
5	Goa	0	8	166	18	3	66	3	76	0	51	1
6	Gujarat	7	227	860	425	103	786	91	2989	2	1381	57
7	Haryana	0	38	268	168	1	176	21	496	12	482	5
8	Himachal Pradesh	7	19	119	11	1	112	1	40	2	92	2
9	Jammu & Kashmir	0	6	53	17	132	54	0	25	270	46	1
10	Karnataka	0	118	1673	264	10	386	17	1675	19	641	38
11	Kerala	0	70	1193	148	9	396	14	340	13	511	30
12	Madhya Pradesh	0	240	4889	1296	84	952	117	3359	88	1411	98
13	Maharashtra	1	306	5551	866	35	1226	93	7791	4	5380	82
14	Manipur	0	2	8	6	13	4	0	2	0	17	0
15	Meghalaya	0	0	19	5	5	15	1	10	10	13	1
16	Mizoram	0	2	10	2	0	6	0	3	4	5	1
17	Nagaland	0	1	5	1	0	2	0	0	1	0	0
18	Orissa	0	24	486	148	8	279	8	326	3	195	67
19	Punjab	0	18	234	141	15	54	21	395	23	308	1
20	Rajasthan	2	129	1371	304	13	425	48	993	7	600	24
21	Sikkim	0	2	13	5	0	42	0	5	0	8	0
22	Tamil Nadu	0	153	1133	247	10	339	24	1998	11	566	38
23	Tripura	0	4	43	4	0	6	0	8	0	10	0
24	Uttar Pradesh	0	431	690	366	92	358	41	885	2108	450	52
25	West Bengal	1	53	687	96	36	157	12	590	20	439	48
	Union Territory:	**1**	**24**	**342**	**248**	**11**	**398**	**36**	**790**	**10**	**650**	**8**
1	A. & N.Islands	0	0	29	6	0	4	0	25	0	28	0
2	Chandigarh	0	0	6	11	0	20	1	38	0	42	0
3	D. & N. Haveli	0	0	15	3	0	6	0	7	0	17	2
4	Daman & Diu	0	0	14	1	0	6	2	0	0	10	0
5	Delhi	1	24	188	201	11	328	33	660	10	351	6
6	Lakshadweep	0	0	1	0	0	0	0	0	0	0	0
7	Pondicherry	0	0	89	26	0	34	0	60	0	202	0
	All India	**20**	**2233**	**21996**	**5663**	**725**	**7087**	**625**	**25467**	**2634**	**13934**	**669**

TABLE 5.3.11(b) : INCIDENCE OF ACCIDENTAL DEATHS(BY UN-NATURAL CAUSES)-Concld.

Sl.	Year/State/U.T./City	Mines or quary Disaster	Poisoning	Stampede	Suffocation	Traffic Accidents	Rail-Road Accident	Other Railway Accident	Other Causes	Causes not Known	Total
1	2	14	15	16	17	18	19	20	21	22	23
1	1995	349	20135	233	444	84803			14001	14222	222487
2	1996	447	18907	64	665	84775			13552	14068	201164
3	1997	614	21552	19	584	88474			14665	14293	214995
4	1998	426	24262	19	628	93996			17839	17299	155199
5	1999	446	25734	20	838	99541			19059	16915	52767
	2000	467	23395	50	981	80118			19500	15033	238550
	State: Year 2000	**466**	**23025**	**50**	**940**	**77714**	**1282**	**15900**	**18880**	**14648**	**231440**
1	Andhra Pradesh	26	1313	0	11	9730	581	727	1439	822	**21012**
2	Arunachal Pradesh	0	5	0	0	89	0	0	1	37	**199**
3	Assam	0	214	0	0	618	5	275	61	76	**1899**
4	Bihar	0	562	0	7	2080	66	728	122	63	**4527**
5	Goa	0	5	0	1	272	21	12	61	8	**772**
6	Gujarat	32	1224	30	64	5100	13	1172	821	386	**15770**
7	Haryana	9	588	0	35	2870	15	1195	355	210	**6944**
8	Himachal Pradesh	0	156	0	18	808	10	9	76	20	**1503**
9	Jammu & Kashmir	4	21	0	0	741	0	11	32	46	**1459**
10	Karnataka	2	1640	6	98	5632	17	557	223	1238	**14254**
11	Kerala	15	126	1	4	2789	4	234	420	109	**6426**
12	Madhya Pradesh	171	5744	9	217	5324	153	1231	1219	4189	**30791**
13	Maharashtra	89	4730	4	226	10369	64	4034	6140	2518	**49509**
14	Manipur	0	1	0	0	131	0	0	2	13	**199**
15	Meghalaya	0	1	0	1	131	0	0	3	5	**220**
16	Mizoram	0	6	0	0	62	0	0	5	31	**137**
17	Nagaland	0	0	0	0	27	0	37	0	0	**74**
18	Orissa	3	948	0	4	1920	7	315	510	718	**5969**
19	Punjab	0	556	0	12	1324	18	567	334	169	**4190**
20	Rajasthan	88	1090	0	136	5378	34	141	1436	939	**13158**
21	Sikkim	0	4	0	1	40	0	0	0	6	**126**
22	Tamil Nadu	4	1616	0	9	9300	37	0	3134	335	**18954**
23	Tripura	0	0	0	0	125	0	0	0	0	**200**
24	Uttar Pradesh	22	1224	0	95	9197	195	2426	1353	957	**20942**
25	West Bengal	1	1251	0	1	3657	42	2229	1133	1753	**12206**
	Union Territory:	**1**	**370**	**0**	**41**	**2404**	**0**	**771**	**620**	**385**	**7110**
1	A. & N.Islands	0	11	0	0	24	0	0	37	0	**164**
2	Chandigarh	0	49	0	0	126	0	0	81	0	**374**
3	D. & N. Haveli	0	8	0	0	32	0	0	16	7	**113**
4	Daman & Diu	0	1	0	1	20	0	0	8	2	**65**
5	Delhi	1	275	0	40	2051	0	763	478	369	**5790**
	Lakshadweep	0	0	0	0	0	0	0	0	0	**1**
	Pondicherry	0	26	0	0	151	0	8	0	7	**603**
	All India	**467**	**23395**	**50**	**981**	**80118**	**1282**	**16671**	**19500**	**15033**	**238550**

Source : National Crime Records Bureau, Ministry of Home Affairs

TABLE 5.3.12 : INDIA'S MAJOR NATURAL DISASTERS SINCE 1980

Sl. No.	Year	Type	Affected Population Location/Area	Loss of Human (Million)	Life	Loss to Crops and Property
1	1980	Floods	Uttar Pradesh	30	1525	Rs. 2.0 Billion
2	1981	Floods	Uttar Pradesh	13	362	1.5 Million hectares of cropped area affected
3	1982	Floods	Orissa	10	1000	3 Million hectares of agri-cultural land affected. Loss estimated to run into thou-sands of millions of Rupees.
4	1982	Cyclone	Saurashtra	—	514	Livestock death toll nearly 0.15 million.Loss to crops estimated at about Rs. 1.27 Billion
5	1983	Cyclone	Andhra Pradesh	—	134	Livestock death toll-42800. Damage to crops estimated at Rs. 0.34 Billion
6	1984	Cyclone	Andhra Pradesh and Tamil Nadu	—	658	Livestock death toll-90650. Damage to crops estimated at Rs. 2.32 Billion
7	1985	Floods	Haryana, Punjab and Uttar Pradesh	—	Heavy Toll	Large area of standing Kharif crop affected heavily
8	1986	Floods	Andhra Pradesh, Bihar and Uttar Pradesh	—	Heavy Toll	Large area of standing Kharif crop affected heavily
9	1987	Floods	Assam, Bihr and West Bengal	—	Over 1400	—
10	1988	Cyclone	West Bengal	—	532	Livestock death toll-57604
11	1989	Floods	Andhra Pradesh, Assam, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Maharashtra, Orissa, Uttar Pradesh and West Bengal	—	Over 1400	—
12	1990 *	Cyclone	Andhra Pradesh and Tamil Nadu	7.78	928	Rs. 22.470 Billion
13	1991*	Earthquake	Uttarkashi, Uttar Pradesh	0.4	768	Rs. 0.890 Billion
14	1992	Drought	Maharashtra			Rs. 28.23 Billion
15	1993*	Floods	Arunachal Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, J & K, Mizoram, Punjab, Rajasthan, Tripura and Uttar Pradesh	28.8	1643	Rs. 21.060 Billion
16	1994	Cyclone	Andhra Pradesh and Tamil Nadu	—	226	Loss to propertty estimated at Rs. 6.12 Billion in Tamil Nadu and 444194 Hectares of land in Andhra Pradesh
17	1995	Floods	Large parts of the country	—	1360	Property worth Rs. 17.7 Billion and crop in 2.35 Million Hectares dameaged
18	1996	Floods	Large parts of the country	—	1700	Property worth Rs. 22.0 Billion and crop in 20.0 Million Hectares dameaged
19	1996	Cyclone	Andhra Pradesh	—	1058	0.3 Million houses fully and a similar number partially dama-ged. 0.1 Million Hectares of crop damaged. Loss to pro-perty worth Rs. 61.26 Billion.
20	1997*	Earthquake	Jabalpur	—	39	—
21	1998*	Earthquake	Chamoli	—	100	—
22	1999**	Cyclone	Orissa	12.9	9887	1.8 Million Hectares of crop area and 1.6 Houses damaged.

Source : India: State of Environment Report 2001 & State Forest Report, 2001
* : State of the Environment: India 1995, Ministry of Environment and Forests, Government of India
** : Minstry of Agrivulture

TABLE 5.4.1 : NUMBER OF MINES IN INDIA

Sl. No.	State	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	431	418	412	406	385	394	375
2	Arunanchal Pradesh	0	—	—	—	—	—	
3	Assam	8	9	9	9	10	10	10
4	Bihar	371	360	23	20	13	10	9
5	Chhattisgarh	—	...	87	86	66	113	107
7	Goa	81	77	74	76	71	74	68
8	Gujarat	510	475	461	443	454	432	408
9	Haryana	25	99	31	29	30	32	26
10	Himachal Pradesh	34	36	39	38	33	33	32
11	Jammu & Kashmir	5	6	5	6	7	7	7
12	Jharkhand	—	...	312	311	343	336	327
13	Karnataka	236	236	207	202	184	171	182
14	Kerala	47	51	54	54	45	42	39
15	Madhya Pradesh	546	552	427	425	436	374	357
16	Maharashtra	148	155	148	142	150	135	130
17	Manipur	1	1	1	—	—	—	
18	Meghalaya	2	2	2	2	2	2	2
21	Orissa	264	257	238	239	229	236	231
23	Rajasthan	616	579	526	501	465	456	442
24	Sikkim	1	1	2	2	2	2	2
25	Tamilnadu	133	126	122	130	134	148	161
26	Uttar Pradesh	51	51	31	21	21	28	25
28	Uttaranchal	—	...	12	16	8	15	18
29	West Bengal	124	130	129	125	121	123	120
	Total	**3634**	**3641**	**3352**	**3283**	**3209**	**3173**	**3078**

Source : Indian Bureau of Mines

TABLE 5.4.2 : PRODUCTION OF MINERALS

Sl. No.	Minerals	Unit	Production						
			1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02(P)
1	2	3	4	5	6	7	8	9	10
1	Coal	000 t	273415	286080	296656	296508	304103	313696	327644
2	Lignite	000 t	22144	22540	23052	23419	22124	22947	23503
3	Natural Gas (U)	M.C.M.	20929	21325	24544	25705	26885	27860	27863
4	Petroleum (Crude)	000 t	34517	32900	33858	32722	31949	32426	32037
5	Bauxite	Tonne	5564775	6076217	6108214	6609525	7053582	7992782	8585368
6	Chromite	Tonne	1699534	1455849	1515286	1418119	1737985	1971806	1810920
7	Copper Ore	Tonne		3895528	4514615	4229996	3084849	3498270	3496824
8	Copper Conc.	Tonne	4747683	201582	223328	198531	165024	163564	164465
9	Gold Ore	Tonne	453334	476225	437475	644059	569824	471042	458131
10	Gold	Kg.	2036	2892	2846	2683	2586	2615	2759
11	Iron Ore	000 t	67418	68161	75723	72230	74946	80762	83367
13	Lead & Zinc Ore	Tonne	2386894	2263982	2483419	2650854	2755390	2505265	2745641
12	Lead Conc.	Tonne	61583	60271	60881	62842	62899	54487	51594
14	Manganese Ore	Tonne	1836705	1870783	1641963	1537693	1585726	1595458	1552723
15	Silver	Kg.	35531	39717	5395t	55409	53641	46150	57672
16	Tin Conc.	Kg.	54991	31184	39351	39391	22812	12979	13887
17	Tungsten	Tonne	6451	3826	-	-	-	-	-
18	Zinc Conc.	Tonne	289072	276992	292524	349934	360138	365164	399105
19	Agate	Tonne	542	400	239	154	120	120	53
20	Apatite	Tonne	10777	9147	7150	14031	11642	11117	12084
21	Asbestos	Tonne	23844	27180	26034	20111	18550	15397	10629
22	Ball Clay	Tonne	507681	492207	464201	448949	423989	461836	574700
23	Barytes	Tonne	442733	381832	453073	660854	360538	845001	915557
24	Calcareous Sand	Tonne	312652	107968	32008	14067	-	-	-
25	Calcite	Tonne	74705	37254	51686	61908	60134	62044	67310
26	Chalk	Tonne	147293	123336	114838	118623	142065	129173	110910
27	Clay (Others)	Tonne	75117	69304	93855	95671	217446	216354	183103
28	Corundum	Kg.	1416	3758	945	807	20	9	1
29	Corundum (Ruby)	Kg.	215	168	400	-	0	0	0
30	Diamond	Carat	29931	31836	30994	34580	40956	57407	81448
31	Diaspore	Tonne	10287	14874	6956	9334	9406	8818	8749
32	Dolomite	Tonne	3717541	3468622	2990857	2921748	2841607	3077573	3087705
33	Dunite	Tonne	171491	158808	193777	230203	229667	168121	52068
34	Emerald	Kg.	0	-	-	-	-	-	-
35	Felsite	Tonne	1183	1209	1481	657	656	928	1121
36	Felspar	Tonne	106896	101697	112238	114948	194158	179046	204275
37	Fire Clay	Tonne	452817	406695	450214	469721	407296	440982	367625
38	Fluorite (Conc.)	Tonne	22944	19926	11338	48	220	3253	6799
39	Fluorite (Graded)	Tonne	4099	5135	5519	4025	44784	44302	47646
40	Fuch. Quartzite	Tonne	17	1	-	195	-		-
41	Garnet (Abrasive)	Tonne	62314	42296	76946	133107	193406	232259	281546
42	Garnet (Gem)	Kg.	602	654	742	950	800	502	677
43	Graphite	Tonne	136263	117761	112786	135668	108826	124790	105375
44	Gypsum	Tonne	2195111	2209937	2195423	2267240	3247009	2644415	2887834
45	Jasper	Tonne	4780	5059	6119	5570	5709	5041	4340
46	Kaolin	Tonne	831098	775283	790802	740542	815595	871331	807559

TABLE 5.4.2 : PRODUCTION OF MINERALS – Concld.

Sl. No.	Minerals	Unit	Production						
			1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02(P)
1	2	3	4	5	6	7	8	9	10
47	Kyanite	Tonne	8944	6996	6068	6134	6191	4773	3850
48	Laterite	Tonne	677173	661843	591875	594665	795017	605598	572200
49	Lime Kankar	Tonne	307050	330154	378844	252125	206767	228926	171737
50	Lime Shell	Tonne	105973	80015	82294	91761	98033	82008	128247
51	Lime Stone	000 t	96832	102723	110417	110968	128787	127202	129771
52	Magnesite	Tonne	345077	377510	373520	349852	325764	317765	280450
53	Mica (Crude)	Tonne	1832	1954	1697	1484	1807	1154	1266
54	Mica (Waste & SCR)	Tonne	1240	1109	909	1067	1579	2963	2886
55	Ochre	Tonne	346682	322383	358155	375371	424019	390019	516247
56	Perlite	Tonne	452	310	80	207	383	274	176
57	Phosphorite	Tonne	1308551	1340836	1141671	1262238	1191640	1252918	1056965
58	Pyrites	Tonne	141000	143602	125474	88730	9539	-	0
59	Pyrophyllite	Tonne	144050	141655	103022	91924	107458	148346	146051
60	Quartz	Tonne	139283	178378	209133	253859	251157	302226	205888
61	Quartzite	Tonne	116085	111110	58714	45109	60506	55311	23571
62	Salt (Rock)	Tonne	1827	2700	2801	2607	2813	2530	2606
63	Sand (Others)	Tonne	1723559	1642881	2060426	2589600	2152751	1817439	2354146
64	Shale	Tonne	302959	467283	614198	816492	779949	828422	872187
65	Silica Sand	Tonne	1146418	1540321	1451156	1718325	1558419	2357601	1428193
66	Sillimanite	Tonne	9086	8528	12458	12123	14938	15498	14618
67	Slate	Tonne	9696	7826	10655	9711	10559	10046	4122
68	Steatite	Tonne	540570	531224	474541	481554	557112	553241	548845
69	Sulphur	Tonne	19826	8820	12852	14889	24883	62047	85818
70	Vermiculite	Tonne	1798	4064	4699	4274	3123	5003	5025
71	Wollastonite	Tonne	96017	97330	97742	94700	117094	121891	134763

Source : Indian Bureau of Mines P : Provisional

TABLE 5.4.3 : INFORMATION ON REHABILITATION OF MINING LAND/RECLAIMATION OF ABANDONED MINES

Sl. No.	Item	For the Year 2000-2001	Cumulative
1	2	3	4
1	No. of abandoned mines	10	38
2	No. of abandoned mines reclaimed	4	18
3	Total area reclaimed in abnandoned mines (hect.)	0.03	461.185
4	No. of mines (working) where reclaimation / rehabilitation is being carried out	109	450
5	Area of such reclaimed / rehabilitation in working mines (in hect.)	1303.6	7236.256

Source : Indian Bureau of Mines

TABLE 5.4.4 : STATUS OF AFFORESTATION IN MAJOR NON-COAL MINES From 1989-90 to 2000-01

Sl. No.	Minerals	Mines Covered (Hects.)	Area Covered (000 No.)	Trees Planted (000 No.)	Trees Survived	Survival Rate (%)
1	2	3	4	5	6	7
1	Limestone	312	8220.00	13420	9796	73.00
2	Iron Ore	130	8109.00	23062	16294	71.00
3	Manganese Ore	57	2031.00	5147	3331	65.00
4	Bauxite	83	1547.00	5224	3929	75.00
5	Lead & Zinc	8	1344.00	680	596	88.00
6	Magnesite	16	491.00	449	309	69.00
7	Gold	5	412.00	906	634	70.00
8	Chromite	14	351.00	1507	911	60.00
9	Copper Ore	7	337.00	1297	815	63.00
10	Dolomite	67	284.00	489	331	68.00
11	Iron and Manganese	31	172.00	514	383	74.00
12	Pyrites	1	7.00	21	15	71.00
13	Others	375	1725.00	2723	1793	66.00
	Total	**1106**	**25030**	**55439**	**39137**	**913**

Source : Indian Bureau of Mines

TABLE 5.4.5 : MINING MACHINERY IN METALLIFERROUS OPEN CAST MECHANISED MINES DURING 2000-01 (Excluding Fuel, Atomic and Minor Minerals)

Sl. No.	Machinery	In Use	In Reserve
1	2	3	4
1	Dipper Shovels	622	45
2	Loaders	477	20
3	Bulldozers	456	33
4	Motor Graders	62	3
5	Haulers/Dumpers	4454	287
6	Drills	924	179
7	Crushers	270	14
8	Air Compressors	776	144
9	Locomotives	33	12
10	Hydraulic Excavators	353	14
11	Cranes	118	17
12	Surface Miner	14	-
13	Drag Lines	1	-

Source : Indian Bureau of Mines

TABLE 5.4.6 : CONSUMPTION OF EXPLOSIVES FOR MINING
(excluding fuel, atomic & minor minerals)

Explosives	Unit	1992-93	1993-94	1994-95	.1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01
1	2	3	4	5	6	7	8	9	10	11
Gun Powder	Tonne	54	93	124	354	97	71	43	53	35
High Explosive	Tonne	40270	42075	48235	44110	41295	44925	46237	52250	52805
Liquid Oxygen	Tonne	252	189	211	176	129	208	364	345	303
Detonators	000 No.	15588	14580	16195	14336	13452	14257	12914	11441	10848
Fuse	M (000)	23028	23907	26044	23977	22820	24729	25988	26178	24768

Source : Indian Bureau of Mines

CHAPTER SIX

WATER

6.1 India is rich in surface water resources. Average annual precipitation is nearly 4000 cubic km. and the average flow in the river system is estimated to be 1880 cubic km. Because of concentration of rains only in the three monsoon months, the utilizable quantum of water is about 690 cubic km. However, conditions vary widely from region to region. Whereas, some regions are drought affected, others are frequently flooded. With the rapid increase in the population, the demand for irrigation, human and industrial consumption of water has increased considerably, thereby causing depletion of water resources. The assumption that "Fresh water is a gift of God which would continue to be available in perpetuity and in abundance" is under challenge. The main preoccupation of water resources development in the country is the extension and improvement of irrigation and hydel power generation. Water requirements for industrial and domestic use are met partly from reservoirs constructed and managed by the irrigation department. The agriculture production technologies have put a lot of stress on underground water resources.

River Water

6.2 Rivers are the lifeline of majority of population in cities, towns and villages and most of these are considered as sacred. Every river stretch has a distinct water use like bathing, drinking, municipal supply, navigation, irrigation and fishing, sports, etc. Simultaneously, it is also used as receptacle for discharge of industrial effluent, municipal sewage and dumping of solid wastes. The Water (Prevention and Control of Pollution) Act, 1974 is aimed to support the quality of various designated best uses of water bodies. The Water Quality Atlas of the Indian River System has been prepared by CPCB on the basis of five major uses of the river water such as:

(a) Drinking water source without conventional treatment but after disinfection;
(b) Outdoor bathing organized;
(c) Drinking water source but with conventional treatment followed by disinfection;
(d) Propagation of wildlife, fisheries;
(e) Irrigation, industrial cooling, controlled waste disposal.

For maintaining the quality of river water, the pollution levels in rivers have been detected by monitoring limited number of the physico-chemical parameters, which could only determine the changes in chemical characteristics of water bodies. Deterioration in water quality, over the past several years has gradually rendered the river water quality unsuitable for various beneficial purposes.

Monitoring of Rivers

6.3 The river water quality monitoring is most essential aspect of restoring the water quality. The Central Pollution Control Board (CPCB) has undertaken the responsibility to monitor the quality of water through 495 monitoring stations located in various water bodies all over the country. This is done through three major schemes 1) Global Environmental Monitoring System (GEMS)- 50 stations, 2) Monitoring of Indian National Aquatic

Resources (MINARS) - 430 stations and 3) Yamuna Action Plan (YAP) - 15 stations.

Biological Water Quality Evaluation and Criteria

6.4 There are two methods adopted for water quality evaluation which are complementary to each other.

1. Saprobic Score (BMWP)

This methodology involves inventory of the presence of benthic macro-invertibrate fauna up to the family level with the taxonomic precision. All possible families having saprobic indicator value are classified on score scale of 1 to 10 according to their preference for saprobic water quality. The saprobic scores of all the families are registered and averaged to produce BMWP score.

2. Diversity Score (Sequential Comparison)

This method involves pairwise comparison of sequentially encountered individuals and the difference of two benthic animals can be observed upto the species level, where no taxonomic skill is required. The diversity is the ratio of total no. of different animals (runs) and the total number of organisms encountered. The ratio of diversity has a value between 0 and 1.

Water Pollution

6.5 The types and sources of water contamination include "point" sources of pollution which usually refers to wastes being discharged from a pipe; and "non point" sources, which means all other sources such as storm water runoff (which picks up oils and other contaminants from various areas), irrigation (which carries fertilizers and pesticides into groundwater), leaks from storage tanks and leakage from disposal sites. The non-point sources are technically the most difficult to regulate in India. Water pollution comes from three main sources: domestic sewage, industrial effluents and run-off from activities such as agriculture. Water pollution from domestic and human wastewater causes many severe water borne diseases. The problem of water pollution due to industries is because of the inadequate measures adopted for effluent treatment than to the intensity of industrial activities. The 13 major water polluting industries have been identified and are closely monitored by the Central Pollution Control Board.

6.6 Access to safe drinking water remains an urgent need as about 70.5% of the households in the urban area and 8.7 % in rural areas receive organized piped water-supply and the rest have to depend on surface or ground water which is untreated. The diseases commonly caused due to contaminated water are diarrhea, trachoma, intestinal worms, hepatitis, etc. The most common contamination in the water is from the disease bearing human wastes, which is usually detected by measuring fecal coliform levels. Inadequate access to safe drinking water and sanitation facilities leads to higher infant mortality and intestinal diseases.

6.7 An uncontrolled disposal of urban waste into water bodies, open dumps and poorly designed landfills, causes contamination of surface water and ground water. For industries, surface water is the main source for drawing water and discharging effluents. Industrial wastes containing heavy metals such as mercury, chromium, lead and arsenic can threaten or destroy marine life besides polluting aquatic food resources.

TABLE 6.1.1 : PERFORMANCE OF MONSOON

Sl. No.	Year (June-Sept)	Number of Meterological Sub-Divison According ot Rainfall*			Percentage of Districts Average Normal/ Excess Rainfall	Percent of Long Period Average Rainfall for the country as a whole
		Normal	Excess	Deficient/ Scanty		
1	2	3	4	5	6	7
1	1991	26	1	8	68	91
2	1992	30	2	3	65	93
3	1993	29	2	4	78	100
4	1994	13	12	10	77	110
5	1995	26	7	2	79	100
6	1996	22	10	3	82	103
7	1997	26	6	3	81	102
8	1998	20	13	2	81	106
9	1999	25	3	7	67	96
10	2000	23	5	7	66	92
11	2001	29	1	5	68	92

Source : Economic survey 2001-2002

* : Total number of Meteorological sub-divisions is 35.

TABLE 6.1.2 : SUB DIVISIONAL ACTUAL AND NORMAL RAINFALL

(Millimetre)

Sl. No.	Sub Divisions	1997		1998		1999		2000		2001	
		Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal
1	2	3	4	5	6	7	8	9	10	11	12
1.	Andaman & Nicobar Island	2321.30	2961.20	2354.00	2966.00	2395.00	2965.00	2386.20	2964.70	2935.10	2934.70
2.	Arunachal Pardesh	1795.60	2678.50	2752.00	2926.00	2796.00	2955.00	2762.00	2847.10	2199.90	2844.50
3.	Assam and Meghalaya	2190.30	2747.60	2440.00	2885.00	2625.00	2817.00	2696.30	2771.20	2260.00	2768.90
4	Nagaland, Mizoram, Mannipur & Tripura	1666.90	1917.30	1833.00	1910.00	1877.00	2007.00	1998.30	2029.90	1962.90	2027.30
5.	Sub-Himalayan West Bengal & Sikkim	2127.70	2696.60	2350.00	2682.00	3007.00	2682.00	2559.70	2661.80	2620.10	2645.50
6.	Gangeatic West Bengal	1262.80	1427.40	1669.00	1445.00	1850.00	1448.00	1590.20	1448.50	1460.00	1435.80
7.	Orissa	1405.40	1512.00	1547.00	1489.00	1527.00	1497.00	1163.00	1488.70	1777.40	1488.40
8.	Jharkhand	982.00	1325.00	1515.00	1309.00	1782.00	1314.00	1360.40	1312.60	1397.80	1311.80
9.	Bihar	779.20	1201.40	1344.00	1179.00	1434.00	1178.00	1302.90	1178.80	1353.80	1178.90
10.	East Uttar Pardesh	842.40	1022.80	1021.00	1022.00	1031.00	1022.00	1027.90	1021.70	1025.70	1021.50
11.	West Uttar Pradesh	783.60	898.90	888.00	891.00	851.00	893.00	838.00	890.60	696.00	892.00
12.	Uttranchal	1214.50	1673.70	1432.00	1669.00	1508.00	1669.00	1935.60	1668.00	1460.70	1667.90
13.	Haryana, Chandigarh & Delhi	527.10	610.90	864.00	616.00	464.00	617.00	539.10	616.20	617.20	616.00
14.	Punjab	562.90	646.30	897.00	646.00	570.00	651.00	544.20	649.50	634.40	649.80
15.	Himachal Pardesh	1323.00	1346.20	1370.00	1343.00	1118.00	1341.00	1113.90	1341.10	1102.70	1340.40
16.	Jammu & Kashmir	1098.80	908.10	1045.00	982.00	789.00	1065.00	825.40	1075.10	795.50	1077.50
17.	West Rajasthan	600.40	321.10	573.00	318.00	275.00	312.00	236.70	312.80	294.30	312.50
18.	East Rajasthan	804.50	679.30	799.00	679.00	590.00	679.00	481.60	680.40	579.70	680.60
19.	West Madhya Pradesh	829.10	1016.20	1149.00	1007.00	1143.00	1012.00	625.50	1015.50	830.90	1015.40
20.	East Madhya Pradesh	1124.80	1340.90	1316.00	1308.00	1308.00	1307.00	863.60	1313.00	1334.50	1298.40
21.	Gujarat Region	1135.60	1098.50	1407.00	1091.00	917.00	1113.00	788.40	1110.40	1007.60	1110.00
22.	Saurashtra, Kutch	597.00	572.80	659.00	581.00	350.00	581.00	320.10	585.80	532.50	580.90
23.	Konkan & Goa	2727.20	2998.30	2897.00	2999.00	2894.00	2998.00	3134.50	2998.20	2373.70	2998.40
24.	Madhya Maharashtra	810.40	904.30	1061.00	904.00	874.00	904.00	789.90	902.60	866.60	903.60
25.	Marathwada	732.10	847.00	809.00	845.00	845.00	844.00	863.90	845.60	849.10	845.20
26.	Vidarbha	1080.10	1118.40	1078.00	1113.00	1119.00	1111.00	1024.10	1113.90	1107.30	1114.10
27.	Coastal Andhra Pradesh	944.20	1034.70	1077.00	1031.00	849.00	1034.00	1043.10	1034.70	1051.60	1034.40
28.	Telangana	788.90	954.80	855.00	934.00	866.00	946.00	1074.20	945.30	896.00	946.00
29.	Rayalaseema	572.20	683.50	795.00	675.00	587.00	679.00	861.40	679.40	860.30	679.10
30.	Tamilnadu & Pondicherry	952.30	992.60	1207.00	994.00	840.00	984.00	784.90	996.90	785.50	991.10
31.	Coastal Karnataka	3780.40	3500.90	4107.00	3466.00	4071.00	3654.00	3542.50	3653.30	3589.30	3653.70
32.	North Interior Karnataka	724.80	732.90	726.00	739.00	738.00	700.00	746.50	698.10	609.60	698.20
33.	South Interior Karnataka	1325.50	1174.20	1232.00	1122.00	1210.00	1071.00	1241.50	1072.20	1010.40	1072.50
34.	Kerala	3293.70	3063.60	3213.00	3106.00	2871 .0	3108.00	2465.70	3107.60	2910.60	3107.00
35.	Lakshadweep	1581.40	1495.80	1764.00	1313.80	1858.00	1496.00	1372.70	1495.50	1383.70	1495.30

Source : Indian Meteorological Department

TABLE 6.1.3 : ANNUAL ACTUAL RAINFALL BY METEOROLOGICAL SUB-DIVISION

(Millimetre)

Sl. No.	Sub-Division	Actual Rainfall									
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
1	2	3	4	5	6	7	8	9	10	11	12
1	Andaman & Nicobar Island	2321	2426	3045	3084	3118	2354	2823	2395	2386	2935
2	Arunachal Pardesh	1796	2825	2142	2971	2662	2752	3684	2796	2762	2200
3	Assam and Meghalaya	2190	3021	2351	2719	2683	2440	2994	2625	2696	2260
4	Nagaland, Mizoram, Mannipur & Tripura	1667	2376	1413	1686	1609	1833	1851	1877	1998	1963
5	Sub-Himalayan West Bengal & Sikkim	2128	2801	1868	2934	2531	2350	3275	3007	2560	2620
6	Gangeatic West Bengal	1263	1660	1357	1762	1399	1669	1589	1850	1590	1460
7	Orissa	1405	1391	1780	1696	1042	1547	1334	1527	1163	1777
8	Jharkhand	982	1227	1470	1422	1062	1515	1540	1782	1360	1398
9	Bihar	779	1241	958	1128	1131	1344	1373	1434	1303	1354
10	East Uttar Pardesh	842	863	985	907	1048	1021	1147	1031	1028	1026
11	West Uttar Pradesh	784	820	852	869	953	888	1073	851	838	696
12	Uttranchal	1215	1511	1269	1413	1271	1432	1902	1508	1936	1461
13	Haryana, Chandigarh & Delhi	527	661	749	1013	872	864	925	464	539	617
14	Punjab	563	694	673	829	747	897	845	570	544	634
15	Himachal Pardesh	1323	1186	1421	1454	1254	1370	1385	1118	1114	1103
16	Jammu & Kashmir	1099	847	1095	847	1137	1045	1000	789	825	796
17	West Rajasthan	600	391	509	455	457	573	389	275	237	294
18	East Rajasthan	805	692	863	798	941	799	667	590	482	580
19	West Madhya Pradesh	829	1068	1351	930	1143	1149	954	1143	626	831
20	East Mada Pradesh	1125	1231	1742	1204	1127	1316	1061	1308	864	1335
21	Gujarat Region	1136	1236	1933	887	1182	1407	1399	917	788	1008
22	Saurashtra & Kutch	597	398	772	413	480	659	707	350	320	533
23	Konkan & Goa	2727	3231	3069	2696	2656	2897	3263	2894	3135	2374
24	Madhya Maharashtra	810	1078	1106	868	966	1061	1151	874	790	867
25	Marathawada	732	822	608	808	844	809	1245	845	864	849
26	Vidarbha	1080	994	1443	1055	844	1078	1156	1119	1024	1107
27	Coastal Andhra Pradesh	944	878	1034	1337	1251	1077	1319	849	1043	1052
28	Telangana	789	808	883	1194	1014	855	1139	866	1074	896
29	Rayalaseema	572	818	580	758	1305	795	952	587	861	860
30	Tamilnadu & Pondicherry	952	1171	953	865	1231	1207	1030	840	785	786
31	Coastal Karnataka	3780	3431	4360	3632	3123	4107	4172	4071	3543	3589
32	North Interior Karnataka	725	811	701	754	816	726	943	738	747	610
33	South Interior Karnataka	1326	1172	1320	1041	1149	1232	1223	1210	1242	1010
34	Kerala	3294	2816	3432	2994	2685	3213	3122	2871	2466	2911
35	Lakshadweep	1581	1471	1566	1679	1603	1764	1979	1858	1373	1384

Source : India Meteorological Department

TABLE 6.1.4 : STATE-WISE DISTRIBUTION OF NO. OF DISTRICTS WITH EXCESS, NORMAL, DEFICIENT, SCANTY AND NO RAINFALL

(01-06-2001 TO 30-09-2001)

Sl. No.	State/UT	E	N	D	S	NR	ND	Total
1	2	3	4	5	6	7	8	9
1	Andaman & Nicobar Island	0	0	1	0	0	0	1
2	Arunachal Pradesh	1	0	4	0	0	0	5
3	Assam	0	8	8	0	0	0	16
4	Meghalaya	0	2	0	0	0	0	2
5	Nagaland	0	0	1	0	0	0	1
6	Manipur	0	1	0	0	0	0	1
7	Mizoram	0	1	0	0	0	0	1
8	Tripura	0	1	0	0	0	0	1
9	Sikkim	0	0	1	0	0	0	1
10	West Bengal	1	13	2	0	0	0	16
11	Orissa	6	7	0	0	0	0	13
12	Jharkhand	3	5	1	0	0	3	12
13	Bihar	4	17	2	0	0	4	27
14	Uttar Pradesh	5	24	19	0	0	0	48
15	Uttaranchal	1	3	4	0	0	0	8
16	Haryana	3	8	5	0	0	0	16
17	Chandigarh	0	1	0	0	0	0	1
18	Delhi	0	0	1	0	0	0	1
19	Punjab	2	6	3	0	0	1	12
20	Himachal Pradesh	1	5	6	0	0	0	12
21	Jammu & Kashmir	1	7	1	1	0	2	12
22	Rajasthan	2	13	16	1	0	0	32
23	Madhya Pradesh	1	16	20	0	0	1	38
25	Gujarat	0	14	5	0	0	0	19
26	D. & N. Haveli & Daman	0	1	0	0	0	0	1
27	Diu	0	0	0	0	0	1	1
28	Goa	0	0	1	0	0	0	1
29	Maharashtra	0	23	7	0	0	0	30
24	Chhattisgarh	2	5	0	0	0	0	7
30	Andhra Pradesh	1	19	3	0	0	0	23
31	Tamil Nadu	1	12	9	0	0	0	22
32	Pondicherry	0	1	0	0	0	0	1
33	Karnataka	6	13	8	0	0	0	27
34	Kerala	0	10	4	0	0	0	14
35	Lakshadweep	0	1	0	0	0	0	1

Source : India Meteorological Department.

Legend :

E : Excess N : Normal

D : Deficient S : Scanty

NR : No Rain

TABLE 6.1.5 : LIST OF DISTRICTS WITH DEFICIENT OR SCANTY RAINFALL

(01-06-2000 TO 30-09-2000)

State/UT		Districts	
1		2	
I.	A & N Islands	1	A & N Islands
II.	Arunachal Pradesh	1	Tirap
III.	Meghalya	1	Khasi & J Hills
IV.	Assam	1	Karbi-Along
V.	Nagaland	1	Nagaland
VI.	Orissa	1	Bolangir
		2	Cuttack
		3	Ganjam
		4	Sambalpur
		5	Sundargarh
VII.	Jharkhand	1	Singbhum
VIII.	Bihar	1	Saran
		2	Siwan
IX.	Uttar Pradesh	1	Ballia
		2	Hardoi
		3	Rae Bareilly
		4	Agra
		5	Aligarh
		6	Etah
		7	Etawah
		8	Jhansi
		9	Rampur
		10	Lalitpur
X.	Uttaranchal	1	Garhwal Tehri
XI.	Haryana	1	Bhiwani
		2	Gurgaon
		3	Hissar
		4	Jind
		5	Karnal
		6	Kurukshetra
		7	Mahendragarh
		8	Panipat
		9	Rewari
XII.	Delhi	1	Delhi
XIII.	Punjab	1	Bhantinda
		2	Faridkot
		3	Gurdaspur
		4	Jalandhar
		5	Ludhiana
		6	Sangrur
XIV.	Himachal Pradesh	1	Chamba
		2	Kangra
		3	Lahaul & Spiti
		4	Sirmur
		5	Solan

State/UT		Districts	
1		2	
XV.	Madhya Pradesh	1	Betul
		2	Bhind
		3	Bhopal
		4	Chhatarpur
		5	Chhindwara
		6	Damoh
		7	Datia
		8	Dewas
		9	Dhar
		10	Gwalior
		11	Hoshangabad
		12	Indore
		13	Jhabua
		14	Khandwa
		15	Khargon
		16	Mandsour
		17	Morena
		18	Narsingpur
		19	Raisen
		20	Rajgarh
		21	Ratlam
		22	Sehore
		23	Seoni
		24	Shajapur
		25	Shivpuri
		26	Tikamgarh
		27	Ujjain
		28	Balaghat
		29	Bastar
		30	Durg
		31	Panna
		32	Raigarh
		33	Raipur
		34	Rajnandgaon
		35	Rewa
		36	Setna
		37	Sidhi
XVI.	Maharashtra	1	Dhulie
		2	Pune
		3	Amraoti
XVII.	Tamil Nadu	1	Chengalpattu M.G.R.
		2	South Arcot
		3	Thanjavur
		4	Tiruchirapalli
		5	Nagapatinam Q.E.M.

TABLE 6.1.5 : LIST OF DISTRICTS WITH DEFICIENT OR SCANTY RAINFALL - Concld.

(01-06-2000 TO 30-09-2000)

State/UT		Districts	
1		2	
XVIII.	Jammu & Kashmir	1	Anantnag
		2	Srinagar
		3	Kupwara
		4	Badgam
		5	Baramula
		6	Ladakh
XIX.	Rajasthan	1	Churu
		2	Sri Ganganagar
		3	Hanumangarh
		4	Jaisalmer
		5	Jodhpur
		6	Pali
		7	Alwar
		8	Banswara
		9	Bharatpur
		10	Bhilwara
		11	Bundi
		12	Chittorgarh
		13	Dausa
		14	Dholpur
		15	Dungarpur
		16	Jhalawar
		17	Jhunjhunu
		18	Karauli
		19	Rajsamand
		20	Sawai Madhopur
		21	Sikar
		22	Sirohi
		23	Tonk
		24	Udaipur
XX.	Kerala	1	Kozhikode
		2	Cannur
		3	Malapuram
		4	Thiruvananthapuram
		5	Kasargode
		6	Wynad, Trisur
XXI.	Gujarat	1	Banaskantha
		2	Baroda
		3	Broach
		4	Dangs
		5	Gandhinagar
		6	Kaira
		7	Mehsana
		8	Panchmahal
		9	Sabarkantha
		10	Surat
		11	Amreli
		12	Bhavnagar
		13	Diu
		14	Junagarh
		15	Kutch
		16	Rajkot
		17	Suendranagar
XXII.	Sikkim	1	Sikkim

Source : India Meteorological Department.

TABLE 6.1.6 (a) : NUMBER OF METEOROLOGICAL SUB-DIVISIONS WITH EXCESS/ NORMAL AND DEFICIENT/SCANTY RAINFALL AT THE END OF MONSOON SEASON (JUNE-SEPTEMBER)

Sl. No.	Year	No. of Sub-Divisions	
		Excess/Normal	Deficient/Scanty
1	2	3	4
1	1991	27	8
2	1992	32	3
3	1993	31	4
4	1994	25	10
5	1995	33	2
6	1996	32	3
7	1997	32	3
8	1998	33	2
9	1999	28	7
10	2000	28	7
11	2001	29	6

Source : India Meteorological Department

TABLE 6.1.6 (b) : PERCENTAGE OF DISTRICTS WITH EXCESS/NORMAL AND DEFICIENT/SCANTY RAINFALL AT THE END OF MONSOON SEASON (JUNE-SEPTEMBER)

Sl. No.	Year	Percentage of Districts	
		Excess/Normal	Deficient/Scanty
1	2	3	4
1	1991	68	32
2	1992	65	35
3	1993	78	22
4	1994	77	23
5	1995	79	21
6	1996	82	18
7	1997	81	19
8	1998	83	17
9	1999	67	33
10	2000	65	35
11	2001	68	32

Source : India Meteorological Department

CHART 11 (a): NUMBER OF METEOROLOGICAL SUBDIVISIONS WITH EXCESS/NORMAL AND DEFICIENT /SCANTY RAINFALL AT THE END OF MONSOON SEASON (JUNE-SEPTEMBER)

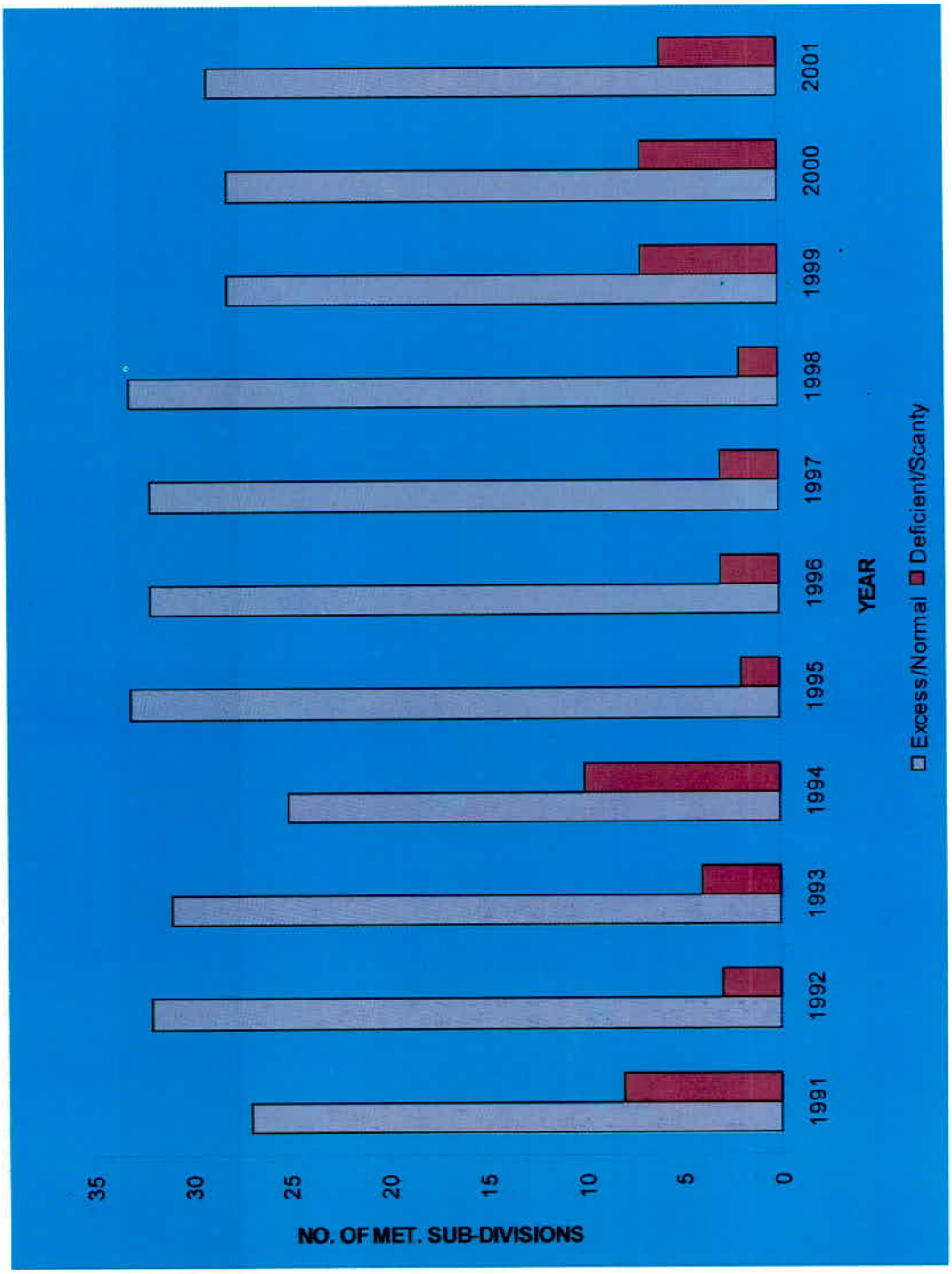


CHART 11 (b): PERCENTAGE OF DISTRICTS WITH EXCESS/NORMAL AND DEFICIENT/SCANTY RAINFALL AT THE MONSOON (JUNE-SEPTEMBER)

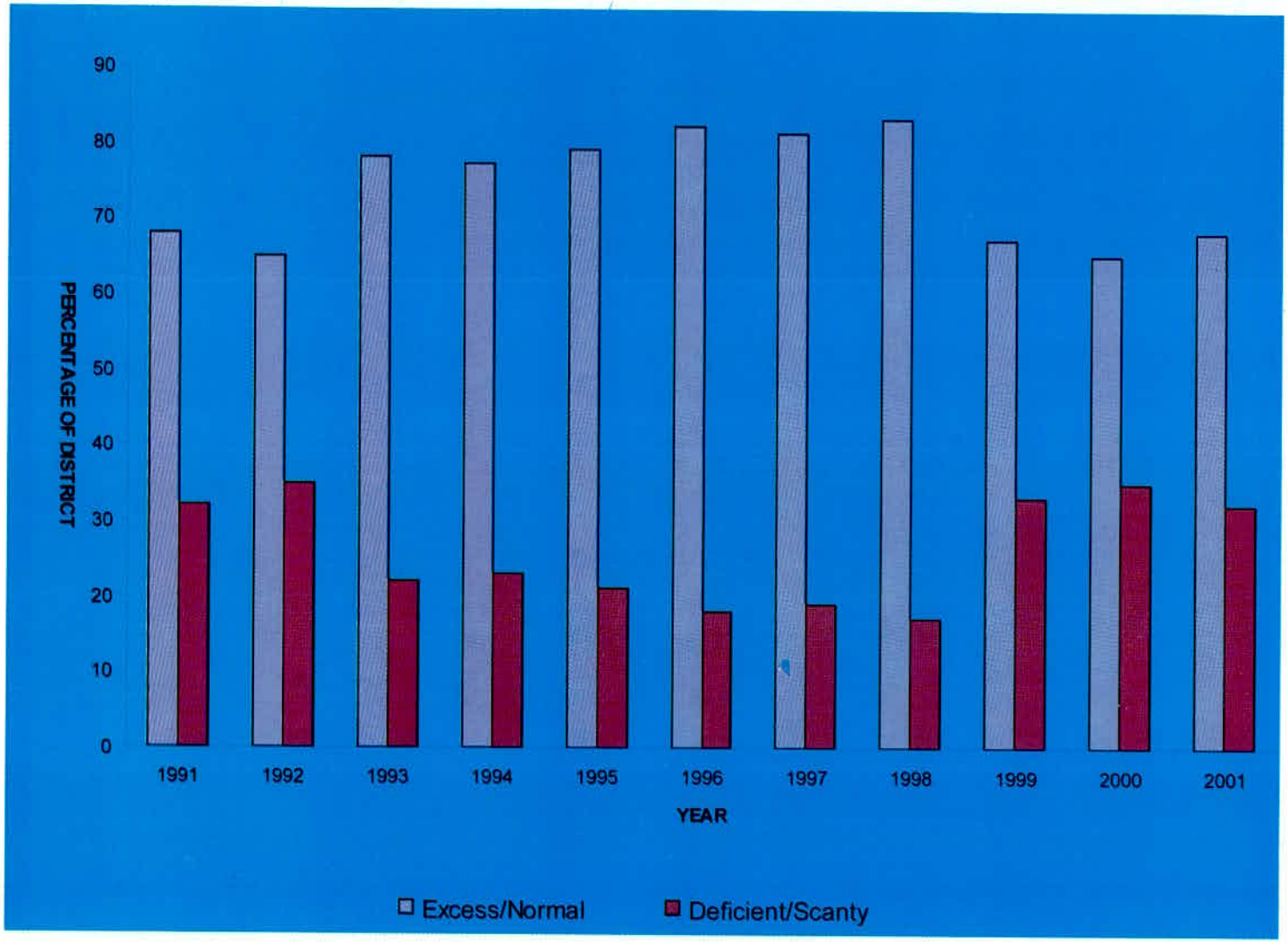


TABLE 6.1.7 : WATER FLOW IN STREAM FOR THE YEAR MENTIONED IN THE TABLE

(Cusecs)

Sl. No.	Name of Basin/River	Name of Guage Station		No. of CWS Sites	*Year for Which Data Given	Maxium Flow		Minimum Flow	
		First Site	Last Site			First Site	Last Site	First Site	Last Site
1	2	3	4	5	6	7	8	9	10
1	Mahi	Mataji	Khanpur	6	1996-97	10257.00	7796.00	0.00	11.00
2	Tapi	Dedtalai	Ghala	12	1998-99	13000.00	10040.00	0.00	10.00
3	Narmada	Dindori	Garudeshwar	21	1998-99	1256.00	21743.00	1.28	54.71
4	Godavari	Ghargaon	Polavaram	58	2000-01	242.20	35215.00	0.00	67.62
5	Cauvery	Kudige	Musiri	16	1998-99	2265.00	6400.00	0.00	0.20
6	Krishna	Karad	Vijaywada	57	1998-99	2944.00	25082.00	0.00	19.61
7	Mahanadi	Baronda	Tikarpara	21	2002-03	406.70	12306.00	0.00	154.10
8	Subarnarekha	Muri	Ghatsila	3	2002-03	74.57	2037.00	0.42	11.33

Source : Central Water Commission.

* : Latest year data available in Hydrology Data Directorate, Information System Organisation.

TABLE 6.1.8 : STATE-WISE DETAILS OF INLAND WATER RESOURCES OF VARIOUS TYPES, 1993

(Lakh Hectares)

Sl. No.	State/UT	Rivers & Canals (Length in Kms.)	Reservoir	Tanks, Lakes & Ponds Water	Beels, Oxbow, Lakes & Derelict	Brackish Water	Total Water Bodies
1	2	3	4	5	6	7	8
	States						
1	Andhra Pradesh	11514	2.34	5.17	——	0.64	8.15
2	Arunachal Pradesh	2000	——	0.01	0.03	——	0.04
3	Assam	1820	0.55	0.21	1.10	——	1.86
4	Bihar	3200	0.60	0.95	0.05	——	1.60
5	Goa	250	0.03	0.03	——	——	0.06
6	Gujarat	3865	2.43	0.71	——	0.95	4.09
7	Haryana	5000	Neg.	0.10	0.10	——	0.20
8	Himachal Pradesh	3000	0.40	0.01	——	——	0.41
9	Jammu & Kashmir	27781	0.07	0.17	0.06	——	0.30
10	Karnataka	9000	2.11	3.52	——	0.08	5.71
11	Kerala	3092	0.30	0.03	2.43	2.43	5.19
12	Madhya Pradesh	20661	2.91	1.17	——	——	4.08
13	Maharashtra	3200	2.79	0.32	——	0.10	3.21
14	Manipur	3360	0.01	0.05	0.40	——	0.46
15	Meghalaya	5600	0.08	0.02	Neg.	——	0.10
16	Mizoram	1743	——	0.02	——	——	0.02
17	Nagaland	1600	0.17	0.50	Neg.	——	0.67
18	Orissa	4500	2.56	0.64	1.80	4.33	9.33
19	Punjab	15270	Neg.	0.07	——	——	0.07
20	Rajasthan	N.A.	1.20	1.80	——	——	3.00
21	Sikkim	900	——	——	0.03	——	0.03
22	Tamil Nadu	7420	0.53	2.24	5.24	0.56	8.57
23	Tripura	1200	0.05	0.12	——	——	0.17
24	Uttar Pradesh	31200	1.50	1.62	1.33	——	4.45
25	West Bengal(P)	2526	0.17	2.76	0.42	2.10	5.45
	Union Tetitories						
1	A. & N. Island	115	0.01	0.30	——	1.15	1.46
2	Chandigarh	2	——	Neg.	Neg.	——	0.00
3	D. & N. Haveli	54	0.05	——	——	——	0.05
4	Daman & Diu	12	——	——	——	——	0.00
5	Delhi	150	0.04	——	——	——	0.04
6	Lakshadweep		——	——	——	——	0.00
7	Pondicherry	247	——	Neg.	0.01	0.01	0.02
	Total	**170282**	**20.90**	**22.54**	**13.00**	**12.35**	**68.79**

Source : Fisheries Division, Department of Agriculture & Cooperation, Ministry of Agriculture
N.A. : Not Available
(P) : Provisional
Neg. : Negligible

TABLE 6.1.9 : TOTAL LENGTH OF IMPORTANT RIVERS - BY STATE
(As on 2000-01)

(Km.)

Sl. No.	State	River	Total Length
1	2	3	4
1.	**Andhra Pradesh**		**3140**
		Godavari	757
		Krishna	386
		Others *	1997
2.	**Assam (a)**		**3839**
		Brahmputra	724
		Buridhing	161
		Disang	129
		Gangadhar	113
		Subansiri	143
		Kapali	103
		Kolodeye	112
		Kolong	121
		Katakhal	161
		Panchas	105
		Others	1967
3.	**Bihar**		**4414**
		Ganga	631
		Gandak	300
		Koshi	233
		Ghaghra	100
		Sone	226
		Damodar	200
		Others	2724
4.	**Gujarat (b)**		**N/A**
		Narmada	230
		Tapti	200
		Others	N/A
5.	**Karnataka**		**2823**
		Cauvery	270
		Tungabhadra	375
		Krishna	325
		Malaprabha	230
		Sharavathi	250
		Bheema	860
6.	**Orissa**		**N/A**
		Mahanadi	493
		Brahmani	541
		Baitarani	344
		Others	N/A
7.	**Kerala**		**3918**
		Pamba	275
		Manimala	135
		Kurumali	64
		Chalkudi	130
		Mahi	54
		Valappattanam	110
		Chaliyar Puzha	207
		Kuttiyadi	74
		Others **	2869
8.	**West Bengal**		**4741**
		Hooghly	580
		Mahananda	206
		Ajoy	174
		Jalangi	232
		Dwarka	129
		Bakreswar	102
		Damodar	437
		Dwarekeswar	103
		Silabati	135
		Kumari	308
		Ichamati	232
		Others @	2103
9.	**Goa**		**N/A**
		Mandovi	78
		Zuari	56
		Mapusa	26
		Chapora	34
		Others	N/A

Source : Transport Research Wing, Ministry of Surface Transport

@ : Includes 268 Kms. Pertaining to canals.
** : Includes 1234 Kms. Pertaining to canals.
* : Including canals
(a) : Relates to 1993-94
(b) : Relates to 1994-95
Notes : In respect of other States, information is not available.

TABLE 6.1.10: GROUND WATER RESOURCE POTENTIAL AS PER BASIN (PRORATA BASIS)

Sl. No.	Basin Replenishable	Total for Ground Water Resource (M.C.M/Yr)	Provision for Domestic Industrial & Other Uses (M.C.M/Yr)	Available Draft Irrigation (M.C.M/Yr)	Net for (M.C.M/Yr)	Balance of Future Use (M.C.M/Yr)	% Level G.W. Develop-ment
1	2	3	4	5	6	7	8
1	Brahmaputra	26545.69	3981.35	22564.34	760.06	21804.29	3.37
2	Brahmani with Baitarni	4054.23	608.13	3446.09	291.22	3154.88	8.45
3	Cambai composite	7187.25	1078.09	6109.16	2449.06	3660.10	40.09
4	Caveri	12295.71	1844.35	10451.35	5782.85	4668.50	55.33
5	Ganga	170994.74	26030.47	144964.26	48593.67	96370.56	33.52
6	Godavari	40649.82	9657.69	30992.12	6054.23	24937.90	19.53
7	Indus	26485.42	3053.95	23431.47	18209.30	5222.17	77.71
8	Krisnhna	26406.97	5578.34	20828.63	6330.45	14498.19	30.39
9	Kutch & Saurashtra	11225.09	1738.10	9486.99	4851.87	4791.02	51.14
10	Madras & Southern	18219.72	2732.95	15486.77	8933.25	6553.52	57.68
11	Mahanadi	16460.55	2471.10	13989.45	972.63	13016.81	6.95
12	Meghna	8516.69	1277.48	7239.21	285.34	6953.87	3.94
13	Narmada	10826.54	1653.75	9172.79	1994.18	7178.61	21.74
14	Northeast Composite	18842.61	2826.39	16016.22	2754.93	13261.29	17.20
15	Pennar	4929.29	739.39	4189.89	1533.38	2656.51	36.60
16	Subranarekha	1819.41	272.91	1546.50	148.06	1398.43	9.57
17	Tapi	8269.50	2335.79	5933.70	1961.33	3972.38	33.05
18	Western Ghat	17693.72	3194.78	14499.18	3318.12	11181.06	22.88
	Total	**431422.93**	**71075.02**	**360348.15**	**115223.93**	**245280.08**	**31.92**

Source : Central Ground Water Board

Out of the total replenishable ground water; about 84% is made available for agriculture and livestock, the rest 16% is made available for domestic consumption, industrial use and power generation. However, not all the water abstracted is effectively used, there are sizeable losses in conveyance and application of irrigated water, a large part of water used by industry and domestic purposes is returned to the streams as effluent waste; and most of the water drawn by power station is used for cooling purposes and is available for reuse.

The water pollution in India comes from three main sources: domestic sewage, industrial effluents and run off from activities such as agriculture. Major industrial sources of pollution in India include the fertilizer plants, refineries, pulp and paper mills, leather tanneries, metal plating and other chemical industries.

TABLE 6.1.11 : GROUND WATER RESOURCES

Sl. No.	States	Total Replenishable Ground Water Resource	Provision for Domestic Industrial & other Uses	Available Ground Water Resource for Irrigation in Net Terms MHaM/Yr	Utilizable Ground Water Resource for Irrigation in Net Terms MHaM/Yr	Gross Draft Estimated on Prorata Basis MHaM/Yr	Net Draft MHaM/Yr	Balance Ground Water Resource for Future Use in Net Terms MHaM/Yr	Level of Ground Water Develop-ment [%]
1	2	3	4	5	6	7	8	9	10
	States	**43.30063**	**7.09873**	**36.20191**	**32.58033**	**19.25207**	**13.47627**	**22.72564**	**37.23**
1	Andhra Pradesh	3.52909	0.52936	2.99973	2.69975	1.11863	0.78304	2.21668	26.10
2	Arunachal Pradesh	0.14385	0.02158	0.12227	0.11005	-	-	0.12227	-
3	Assam	2.24786	0.33718	1.91068	1.71962	0.20356	0.14249	1.76819	7.46
4	Bihar	2.69796	0.40470	2.29327	2.06394	1.17895	0.82527	1.46800	35.99
5	Chhattisgarh	1.60705	0.24106	1.36599	1.22939	0.10925	0.07647	1.28952	5.60
6	Goa	0.02182	0.00327	0.01855	0.01669	0.00219	0.00154	0.01701	8.30
7	Gujarat	2.03767	0.30566	1.73199	1.55881	1.21895	0.85327	0.87872	49.27
8	Haryana	1.11794	0.16769	0.95025	0.85523	1.02637	0.71846	0.23179	75.61
9	Himachal Pradesh	0.02926	0.00439	0.02487	0.02238	0.00591	0.00413	0.02073	16.63
10	Jammu & Kashmir	0.44257	0.06640	0.37620	0.33860	0.00586	0.00403	0.37217	1.07
11	Jharkhand	0.66045	0.09907	0.56138	0.50525	0.17352	0.12146	0.43992	21.64
12	Karnataka	1.61750	0.24186	1.37564	1.23665	0.64973	0.45481	0.92083	33.06
13	Kerala	0.79003	0.13135	0.65869	0.59281	0.17887	0.12509	0.53360	18.99
14	Madhya Pradesh	3.48186	0.52228	2.95958	2.66362	1.05494	0.73846	2.22112	24.95
15	Maharashtra	3.78677	1.23973	2.54704	2.29233	1.26243	0.88370	1.66334	34.70
16	Manipur	0.31540	0.04730	0.26810	0.24129	Neg.	Neg.	0.26810	Neg.
17	Meghalaya	0.05397	0.00810	0.04587	0.04128	0.00260	0.00182	0.04405	Neg.
18	Mizoram				Not Assessed				
19	Nagaland	0.07240	0.01090	0.06150	0.05535	Neg.	Neg.	0.06150	Neg.
20	Orissa	2.01287	0.30193	1.71094	1.53984	0.37196	0.26037	1.45057	15.22
21	Punjab	1.81923	0.18192	1.63730	1.47357	2.30028	1.61020	0.02710	98.34
22	Rajasthan	1.26021	0.19977	1.06044	0.95440	1.10350	0.77245	0.28799	72.84
23	Sikkim				Not Assessed				
24	Tamil Nadu	2.64069	0.39610	2.24458	2.02013	2.00569	1.40398	0.84060	62.55
25	Tripura	0.06634	0.00995	0.05639	0.05075	0.02692	0.01885	0.03754	33.43
26	Uttar Pradesh	8.25459	1.23819	7.01640	6.31476	4.25171	2.97619	4.04021	42.42
27	Uttaranchal	0.28411	0.04262	0.24149	0.21734	0.09776	0.06843	0.17306	28.34
28	West Bengal	2.30914	0.34637	1.96277	1.76649	0.90250	0.63175	1.33102	32.19
	Union Territories	**0.0853**	**0.02782**	**0.03358**	**0.03022**	**0.03966**	**0.02777**	**0.00581**	
1	Andaman & Nicobar				Not Assessed				
2	Chandigarh	0.00297	0.00044	0.00252	0.00227	0.00351	0.00245	0.00007	-
3	Dadar & Nagar Haveli	0.00422	0.00063	0.00359	0.00323	0.00065	0.00046	0.00313	12.81
4	Daman	0.00071	0.00011	0.00060	0.00054	0.00069	0.00048	0.00012	80.00
5	Diu	0.00037	0.00006	0.00031	0.00028	0.00042	0.00029	0.00002	94.84
6	NCT Delhi	0.02916	0.01939	0.00977	0.00879	0.01684	0.01180	-0.00203	120.78
7	Lakshadweep	0.03042	0.00456	0.00195	0.00176	0.00109	0.00076	0.00119	39.12
8	Pondicherry	0.01746	0.00262	0.01484	0.01335	0.01645	0.01152	0.00332	77.63
	Grand Total	**43.38593**	**7.12665**	**36.25938**	**32.63345**	**19.29173**	**13.50404**	**22.73145**	**37.24**

Source: Central Ground Water Board

For resources available to meet the needs, it is useful to distinguish between (a) total volume of water resources from surface flow and ground water recharge available in a year; (b) the volumes which are considered to be utilizable; (c) actual utilization.

The estimates of surface flows continue to be based largely on empirical formulae relating rainfall to surface runoff. The lack of data based on measurement of actual flow in the main river and tributaries of different river systems over sufficiently long periods (30-40 years observations are considered to be reasonable basis) remains one of the most serious handicaps in the planning of water resources development. The states have their own gauges, but since many rivers are the subject of inter-state disputes, they are unwilling to provide the data on observed flows.

Table 6.1.12 : PROJECTED ANNUAL REQUIREMENT OF WATER (BY DIFFERENT USES)

(In BCM)

Sl. No.	Different Uses of Water	Year				
		1990	2000	2010	2025	2050
1	2	3	4	5	6	7
1	Domestic	32	42	56	73	102
2	Irrigation	437	541	688	910	1072
3	Industry	—	8	12	23	63
4	Energy	—	2	5	15	130
5	Others	33	41	52	72	80
	Total	**502**	**634**	**813**	**1093**	**1447**

Source : Central Water Commission
BCM : Billion Cubic Meters

TABLE 6.1.13 : CATCHMENT AREA OF MAJOR RIVER BASINS

Sl. No.	Name of the River	Origin	Length (Km.)	Catchment Area (Sq. Km.)
1	2	3	4	5
1	Indus	Mansarover (Tibet)	1114 (2880)	321289 (1165500)
2	a) Ganga	Gangotri (Uttaranchal)	2525	861452 (1186000)
	b)Brahmaputra	Kailash Range (Tibet)	916 (2900)	194413 (580000)
	c) Barak & other rivers flowing into Meghna like Gomti, Muhari, Fenny etc.			41723
3	Sabarmati	Aravalli Hills (Rajasthan)	371	21674
4	Mahi	Dhar (Madhya Pradesh)	583	34842
5	Narmada	Amarkantak (Madhya Pradesh)	1312	98796
6	Tapi	Betul (Madhya Pradesh)	724	65145
7	Brahmani	Ranchi (Bihar)	799	39033
8	Mahanadi	Nazri Town (Madhya Pradesh)	851	141589
9	Godavari	Nasik (Maharashtra)	1465	312812
10	Krishna	Mahabaleshwar (Maharashtra)	1401	258948
11	Pennar	Kolar (Karnataka)	597	55213
12	Cauvery	Coorg (Karnataka)	800	81155
		Total		**2528084**

Source : Central Water Commission
Note : Figures within bracket indicate the total river basin in india and neighbouring countries.

Table 6.1.14 : PRIMARY WATER QUALITY CRITERIA

Sl. No.	Designated Best Use	Class of Water	Criteria
1	2	3	4
1	Drinking Water Source without Conventional Treatment but after Disinfection	A	1 Total Coliforms Organised MPN/100ml shall be 50 or less 2 pH between 6.5 & 8.5 3 Dissolved Oxygen 6mg/l or more 4 Biochemical Oxygen Demand 5 days 20°C 2mg/l or less.
2	Outdoor bathing (organised)	B	1 Total Coliforms Organism MPN/100ml shall be 500 or less 2 pH between 6.5 & 8.5 3 Dissolved Oxygen 5mg/l or more 4 Biochemical Oxygen demand 5 days 20°C 3mg/l or less.
3	Drinking Water Source	C	1 Total Coliforms Organism MPN/100ml shall be 5000 or less 2 pH between 6 & 9 3 Dissolved Oxygen 4mg/l or more 4 Biochemical Oxygen demand 5 days 20°C 3mg/l or less.
4	Propagation of Wild Life	D	1 pH between 6.5 & 8.5 Fisheries 2 Dissolved Oxygen 4mg/l or more 3 Free Ammonia (as N) 1.2 mg/l or less
5	Irrigation, Industrial Cooling, Controlled Waste	E	1 pH between 6.0 or 8.5 2 Electrical conductivity at 25°C Micro mhos/cm Max 2250. 3 Sodium Absorption Ratio, Max 26 4 Boron, Max 2mg/l

Source : Water Quality - Status & Statistics (1996 & 1997), Central Pollution Control Board

The water quality at any location is determined as the one which is satisfied at least 80% of time by all the criteria parameters. To further elucidate on this as if at a location 80% of the time DO, pH were in the range specified for class A, BOD for class B and total coliforms for class C, then the existing status is determined as C.

TABLE 6.1.15 : BIOLOGICAL WATER QUALITY CRITERIA (BWQC)

Sl. No.	Taxonomic Groups	Range of Saprobic Score (BMWP)	Range of Diversity Score	Water Quality Characteristics	Water Quality Class	Indicator Colour
1	2	3	4	5	6	7
1	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Diptera	7 and more	0.2 - 1	Clean	A	Blue
2	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Planaria, Odonata, Diptera	6 - 7	0.5 - 1	Slight Pollution	B	Light Blue
3	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Odonata, Crustacea, Mollusca, Polychaeta, Coleoptera, Diptera, Hirudinea, Oligochaeta	3 - 6	0.3 - 0.9	Moderate Pollution	C	Green
4	Hemiptera, Mollusca, Coleoptera, Diptera, Oligochaeta	2 - 5	0.4 & less	Heavy Pollution	D	Orange
5	Diptera, Oligochaeta, No Animal	0 - 2	0 - 0.2	Severe Pollution	E	Red

Source : Central Pollution Control Board

TABLE 6.1.16 : PHYSICO - CHEMICAL AND BIOLOGICAL WATER QUALITY OF POLLUTED STRETCH OF RIVER YAMUNA AND AGRA CANAL

Sl. No.	Location	Water Quality Class		Water Quality (Biological)
		Physico - Chemical (PWQC)	Biological (BWQC)	
1	2	3	4	5
1.	Okhla Barrage (River Yamuna)	E	E	Severe Pollution
2.	Inlet of BTPP at Agra Canal	E	E	Severe Pollution
3.	Mixing of BTPP outlet at Agra Canal	E	E	Severe Pollution

Source : Central Pollution Control Board
BTPP : Badarpur Thermal Power Plant

TABLE 6.1.17 : WASTE WATER GENERATION, COLLECTION, TREATMENT IN METRO CITIES : STATUS

Sl. No.	Name of Metro City	Total Population	Municipal Population	Volume of Waste Water Generated (mld)			Waste Water Collected		Capa-city	Treat-ment		Mode of Disposal
				Domestic	Industrial	Total	Volume (mld)	%	(mld)	Primary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Ahmedabad	3312216	2876710	520.0	36.0	556.0	445.0	80.0	430.0	Y	Y	Sabarmati river
2	Bangalore	4130288	4130288	375.0	25.0	400.0	300.0	75.0	290.0	Y	Y	V. Valley,Ksc Valley
3	Bhopal	1062771	1062771	189.3	—	189.3	94.6	50.0	87.0	Y	Y	Agriculture
4	Bombay	12596243	12288519	2228.1	227.9	2456.0	2210.0	90.0	109.0	Y	Y	Sea
5	Kolkata	11021918	9643211	1383.8	48.4	1432.2	1074.9	75.1	—	—	—	Hughly river/ Fish Farm
6	Coimbatore	1100746	816321	60.0	—	60.0	45.0	75.0	—	—	—	Nayal river, Irrigation
7	Delhi	8419084	8419084	1270.0	—	1270.0	1016.0	80.0	981.0	Y	Y	Agriculture, Yamuna River
8	Hyderabad	4344437	4098734	348.3	25.0	373.3	299.0	80.1	115.0	Y	—	River, Irrigation
9	Indore	1109056	1091674	145.0	—	145.0	116.0	80.0	14.0	Y	—	Khan River, Irrigation
10	Jaipur	1518235	1458483	220.0	—	220.0	165.0	75.0	27.0	Y	Y	Agriculture
11	Kanpur	2029889	1874409	200.0	—	200.0	150.0	75.0	41.0	Y	Y	Ganga, Sewage Farm
12	Kochi	1140605	670009	75.0	—	75.0	45.0	60.0	—	—	—	Cochin Back waters
13	Lucknow	1669204	1619115	106.0	—	106.0	80.0	75.5	—	—	—	Gomati River
14	Ludhiana	1042740	1042740	94.4	—	94.4	47.0	49.8	—	—	—	Agriculture
15	Madras	5421985	4752974	276.0	—	276.0	257.0	93.1	257.0	Y	Y	Agriculture, Sea
16	Madurai	1085914	940989	48.0	—	48.0	33.6	70.0	—	—	—	Agriculture
17	Nagpur	1664006	1624752	204.8	—	204.8	163.0	79.6	45.0	Y	Y	Agricultire
18	Patna	1099647	917243	219.0	—	219.0	164.0	74.9	105.0	Y	N	River, Fishries
19	Pune	2493987	2244196	432.0	—	432.0	367.0	85.0	170.0	Y	Y	River
20	Surat	1518950	1498817	140.0	—	140.0	112.0	80.0	70.0	Y	-	Garden/Creek
21	Vadodara	1126824	1031346	120.0	20.0	140.0	105.0	75.0	81.0	Y	Y	river, Agriculture
22	Varanasi	1030863	1030863	170.0	—	170.0	127.0	74.7	101.0	Y	Y	Ganga, Agriculture
23	Vishakhapatnam	1057118	752037	68.0	—	68.0	55.0	80.9	—	—	—	—
	Total	**70996726**	**65885285**	**8892.7**	**382.3**	**9275.0**	**7471.1**	**80.6**	**2923.0**			

Source : Central Pollution Control Board Y = Yes N = No
Note : Data Collected During 1995-96

TABLE 6.1.18 : WATER QUALITY OF YAMUNA RIVER (DELHI STRETCH) IN RESPECT OF SELECTIVE PHYSICO-CHEMICAL PARAMETERS, DURING 2000.

Sl. No.	Parameters	Value	Palla (Upstream Wazirabad)	Nizamuddin		Agra Canal (Originated from Okhla Barrage)	
				Midstream Sample	Quarterstream Sample	Midstream Sample	Quarterstream Sample
1	2	3	4	5	6	7	8
1	pH (units)	Minimum	7.18	6.97	7.01	6.90	7.07
		Maximum	8.18	7.84	7.85	7.94	7.98
		Average	7.75	7.31	7.30	7.35	7.32
2	Dissolved Oxygen (mg/l)	Minimum	5.91	—	—	—	—
		Maximum	9.80	6.14	7.70	3.25	2.91
		Average	7.84	1.42	1.60	1.11	1.11
3	BOD (mg/l)	Minimum	1.00	3.00	4.00	4.00	5.00
		Maximum	3.00	51.00	43.00	21.00	25.00
		Average	1.54	21.16	20.66	12.66	13.75
4	Fecal coliform Nos./100 ml	Minimum	34	13000	12000	5000	4000
		Maximum	5000	6600000	4100000	1380000	1250000
		Average	883	1279500	1158250	370666	408000
5	Total coliform Nos./100 ml	Minimum	600	43000	31000	14000	16000
		Maximum	69000	179000000	185000000	142000000	151000000
		Average	21408	20856250	22641667	14365500	16531750
6	COD (mg/l)	Minimum	2.00	18.00	11.00	14.00	15.00
		Maximum	22.00	104.00	108.00	80.00	76.00
		Average	11.83	61.41	59.50	47.33	45.16
7	Ammonical Nitrogen (mg/l)	Minimum	0.02	0.74	1.02	1.28	1.14
		Maximum	1.25	31.00	31.00	25.00	23.00
		Average	0.26	13.05	13.08	9.21	9.35

Source : Central Pollution Control Board

TABLE 6.1.19 : MINIMUM & MAXIMUM OF OBSERVED VALUES OF WATER QUALITY PARAMETERS AT CWC SITES ON WEST FLOWING RIVERS (JUNE 1994 TO MAY 1995)

Sl. No.	Name of the Site	Name of the River/ Stream	pH Value		Specific Conductance in Micromhos/cm at 25 °C		Sodium Absorption Ratio (%/cm)		Cl	SO_4	NO_3	Fe	Mg	SP Max.	RSC Max.	Total Hardness
			Min.	Max.	Min.	Max.	Min.	Max.	Maximum (9me/l)							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Gadat	Ambika	7.60	8.20	170.00	475.00	0.29	1.53	1.13	0.35	0.00	0.01	0.72	1.05	0.40	115.97
2	Kamalpur	Banas	7.80	8.10	178.00	432.00	0.22	1.57	1.35	0.34	0.00	0.02	0.96	9.73	0.22	135.94
3	Chitrasani	Balaram	7.61	8.00	444.00	269.00	0.95	1.31	1.01	0.27	0.00	0.01	0.80	6.98	0.24	128.04
4	Aburoad	Banas	7.60	8.11	224.00	717.00	0.44	2.87	2.48	0.38	0.01	0.03	1.04	3.57	0.67	146.87
5	Ganod	Bhadar	7.80	8.20	248.00	751.00	0.60	3.73	2.99	0.57	0.01	0.02	1.20	1.08	1.05	147.95
6	Pingalwada	Dhodar	7.70	8.21	178.00	1866.00	0.46	9.24	8.11	1.54	0.01	0.03	1.13	8.63	2.76	161.83
7	Motinaroli	Kim	7.80	8.20	220.00	1765.00	0.52	9.06	7.55	0.59	0.01	0.03	0.96	8.47	2.69	143.95
8	Khanpur	Mahi	7.80	8.20	188.00	591.00	0.38	1.59	1.13	0.36	0.01	0.01	0.72	3.63	0.43	119.99
9	Padardibadi	Mahi	7.80	8.20	229.00	553.00	0.51	1.56	1.18	0.38	0,00	0.0!	0.80	1.74	0.40	123.97
10	Rangeli	Som	7.70	8.20	185.00	654.00	0.28	1.91	1.41	0.34	0.00	0.01	0.72	46.59	0.65	115.76
11	Mataji	Mahi	7.80	8.20	1 66.00	686.00	0.29	2.11	1.58	0.43	0.00	0.02	0.72	8.15	0.25	123.85
12	Mahuwa	Purna	7.70	8.20	187.00	466.00	0.29	1.54	1.01	0.17	0.00	0.01	0.72	42.38	0.42	115.97
13	Nabohi	Sabarmati	6.50	8.10	266.00	4504.00	0.64	12.20	15.44	7.71	0.02	0.09	2.50	80.63	2.31	391.39
14	Wautha	Sabarmati	5.60	7.90	257.00	4542.00	0.65	11.59	16.00	7.46	0.02	0.22	3.46	74.29	1.48	432.34
15	Derol Bridge	Sabarmati	7.70	8.20	178.00	1402.00	0.52	4.68	3.83	0.51	0.01	0.03	1.20	64.52	1.62	155.09
16	Lowara	Shetrunji	7.80	8.20	167.00	1083.00	0.29	3.94	3.32	1.01	0.01	0.02	0.95	61.01	0.24	142.35
17	Ghala	Tapi	7.70	8.20	186.00	341.00	0.29	0.77	0.56	0.28	0.00	0.01	0.64	27.13	0.12	108.17
18	Sarangkheda	Tapi	7.80	8.10	229.00	523.00	0.52	1.54	1.13	0.38	0.01	0.02	0.72	41.11	0.41	119.78
19	Gidhade	Tapi	7.80	8.20	211.00	653.00	0.45	2.26	1.69	0.39	0.01	0.02	0.80	49.90	0.47	124.05
20	Morane	Panshara	7.80	8.20	202.00	414.00	0.36	1.51	1.07	0.39	0.00	0.02	0.72	40.27	0.16	119.99
21	Malkheda	Bori	7.90	8.20	240.00	547.00	0.60	1.64	1.18	0.38	0.01	0.02	0.72	43.15	0.38	115.97
22	Savkheda	Tapi	7.80	8.20	172.00	628.00	0.29	2.30	1.41	0.43	0.01	0.02	0.72	50.71	0.40	119.99
23	Dapuri	Girna	7.60	8.20	204.00	431.00	0.36	1.53	1.13	0.34	0.01	0.02	0.72	41.07	0.27	116.00
24	Yerli	Purna	7.80	8.20	211.00	770.00	0.44	3.44	2.54	0.51	0.01	0.02	0.96	60.19	0.80	127.93
25	Gopalkheda	Purna	7.80	8.20	211.00	845.00	0.56	2.98	2.59	0.51	0.01	0.02	0.96	50.90	1.10	135.82
26	Lakhpuri	Purna	7.70	8.20	255.00	898.00	0.61	3.66	3.10	0.56	0.01	0.03	1.04	60.75	1.04	127.96
27	Burhanpur	Tapi	7.60	8.20	163.00	750.00	0.28	3.16	2.54	0.50	0.01	0.03	1.04	56.73	0.84	140.05
28	Dedtalai	Tapi	7.70	8.20	176.00	991.00	0.36	4.77	3.66	0.57	0.01	0.02	0.94	66.75	1.21	136.02
29	Durvesh	Vaitarna	7.40	8.20	165.00	202.00	0.30	0.70	0.45	0.20	0.00	0.01	0.48	25.33	0.14	99.95

Source : Central Water Commission

Remarks :

pH : The logarithm to the base 10 of the reciprocal of Hydrogen ion concentration

Cl : Chlorine **SO_4** : Sulphate **NO_3** : Nitrate **Fe** : Iron **Mg** : Magnesium

SP : Sodium Percentage **RSC** : Residual Sodium Carbonate **me/l** : Milli equivalent per litre

TABLE 6.1.20 : MINIMUM & MAXIMUM OF OBSERVED VALUES OF WATER QUALITY PARAMETERS AT CWC SITES ON EAST FLOWING RIVERS (JUNE 1995 TO MAY 1996)

Sl. No.	Name of the Site	Name of the River/ Stream	pH Value		Specific Conductance in Micromhos/cm at 25 °C		Sodium Absorption Ratio (%/cm)		Cl	SO_4	NO_3	Fe	Mg	SP	RSC	Total Hardness
			Min.	Max.	Min.	Max.	Min.	Max.	Maximum (9me/l)					Max.	Max.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Tikarapara	Mahanadi	7.10	8.49	140	227	0.26	0.65	0.381	0.19	0.101	0.011	0.560	29.32	0.80	84.07
2	Kantamal	Tel	7.19	8.21	99	234	0.33	0.67	0.530	0.18	0.770	0.013	1.000	29.90	0.55	105.08
3	Salebhata	Ong	7.61	8.04	200	487	0.60	1.14	0.500	0.14	0.010	0.024	1.250	34.57	0.80	175.14
4	Sundergarh	Ib	7.38	8.12	130	158	0.26	0.59	0.270	0.10	0.015	0.005	0.700	27.85	0.30	70.06
5	Kurubhanta	Mand	6.36	8.01	82	192	0.10	0.32	0.300	0.51	0.102	0.001	0.900	17.19	0.18	75.06
6	Basantpur	Mahanadi	7.53	8.21	103	260	0.36	0.70	0.435	0.26	0.097	0.014	0.640	31.83	0.18	104.08
7	Bamnidhi	Hasdeo	7.28	8.10	91	159	0.17	0.73	0.321	0.30	0.098	0.015	0.480	32.98	0.03	60.05
8	Rampur	Jonk	7.42	7.96	123	277	0.33	0.85	0.400	0.11	0.046	0.004	0.800	32.11	0.61	125.10
9	Jondhra	Seonath	7.22	8.10	480	518	0.92	1.83	1.690	0.71	0.244	0.001	2.400	40.17	0.64	365.29
10	Andhiyarkora	Hamp	7.20	8.32	220	860	0.61	2.66	0.610	2.44	0.158	0.005	3.450	44.71	1.48	340.27
11	Simga	Seonath	7.29	8.28	183	458	0.42	1.58	0.710	1.04	0.086	0.007	1.400	38.61	1.10	162.63
12	Rajim	Mahanadi	7.43	8.02	92	263	0.12	0.76	0.330	0.28	0.196	0.006	0.800	30.72	0.30	120.10
13	Baronda	Pairi	6.94	8.12	76	163	0.16	0.40	0.400	0.15	0.046	0.004	0.800	22.92	0.24	75.06
14	Jenapur	Brahmani	7.51	8.40	88	145	0.31	0.53	0.217	0.26	0.155	0.013	0.400	27.56	0.01	48.04
15	Telecher	Brahmani	7.62	8.26	81	310	0.30	0.65	0.536	0.81	0.138	0.019	0.880	27.66	0.06	116.09
16	Gomlai	Brahmani	7.63	8.22	70	204	0.32	0.56	0.435	0.33	0.670	0.024	0.560	31.43	0.10	76.06
17	Jaraikela	Koel	7.74	8.20	83	198	0.31	0.54	0.965	0.17	0.256	0.011	0.960	25.35	0.20	84.07
18	Anandpur	Baitarni	7.10	8.26	106	178	0.27	0.71	0.702	0.23	0.158	0.082	0.320	34.85	0.21	60.05
19	Ghatsila	Subarnarekha	7.72	8.50	145	390	0.36	1.27	0.761	1.79	0.547	0.325	0.880	36.27	0.10	128.10
20	Jamshedpur	Subarnarekha	7.70	10.70	183	610	0.41	1.42	0.707	0.70	0.122	0.130	1.200	33.11	0.77	188.15
21	Adityapur	Karkai	7.81	8.66	141	820	0.41	1.02	0.653	0.31	0.175	0.014	0.800	32.59	0.24	104.08
22	Muri	Subarnarekha	7.47	8.63	133	273	0.51	1.76	0.857	0.28	0.113	0.025	0.480	50.54	0.46	92.07
23	Kashinagar	Vamsadhara	7.35	8.15	140	520	0.44	1.11	1.073	0.34	0.188	0.200	1.281	33.23	0.45	176.19
24	Tilga	Sankh	7.66	8.21	46	110	0.36	0.60	0.324	0.18	0.071	0.024	0.240	39.25	0.13	36.08
25	Bolani	Brahmani	7.63	8.20	95	247	0.31	0.57	0.375	0.42	0.696	0.014	0.720	25.38	0.07	100.08

Source : Central Water Commission

Remarks :

pH : The logarithm to the base 10 of the reciprocal of Hydrogen ion concentration
Cl : Chlorine **SO_4** : Sulphate **NO_3** : Nitrate **Fe** : Iron **Mg** : Magnesium
SP : Sodium Percentage **RSC** : Residual Sodium Carbonate **me/l** : Milli equivalent per litre

Table 6.1.21 : RIVER-BASINWISE DISTRIBUTION OF WATER QUALITY MONITORING STATIONS

Sl. No.	River (main stream) Lake etc.	Tributaries	Total Stations
1	2	3	4
1	**Baitarni (5)**		5
2	**Brahmani (11)**	Karo (1), Koel (2), Sankh (2).	15
3	**Brahmputra (6)**	Dhansiri (6), Disang (1),Jhanji (1), Subansiri (1), Bhogdoi (1), Bharalu (1), Bhuhidihing(1) Borak (1), Deepar Bill (1), Digboi (1), Mora Bharali (1), Teesta (4), Dickhu (1), Maney (2), Ranchu (2).	31
4	**Cauvery (20)**	Arkavati (1), Amravati (1), Bhawani (5),Kabini (4), Laxmantirtha (1), Shimsa (2), Hemvati (1).	35
5	**Ganga (28)**	Barakar (1),Betwa (3),Chambal (8),Damodar (4),Gandak (1),Saryu-Ghghra(3), Gomti (5),Hindon (3), Kali (West) (2), Kali Nadi (2), Khan (1),Kshipra (3), Mandakini (Madhya Pradesh (1), Parvati (2), Ramganga (1), Rapti (1), Rihand (2),Rupanarayan (1),Sai (1),Sone (5),Tons (Madhya Pradesh) (2),Yamuna (23), Sind (1), Johila (1), Saonkh (1), Gohad (1), Kolar (1), Sal (1), Churnl (2), Tons (Himachal Pradesh) (1)	118
6	**Godavari (11)**	Manjira (2), Maner (2), Nira (1), Wainganga (3), Wardha (1).	20
7	**Indus**	Beas (19), Chenab (1), Jhelum (3), Larji (1), Parvati (1), Ravi (3), Sutlej (20), Tawi (1), Gawkadal (1) Chuntkol (1), Sirsa (2).	53
8	**Krishna (17)**	Bhadra (3),Bhima (9), Ghataprabha (2), Malprabha (3), Muneru (1), Musi (2), Nira (1), Paleru (1), Tunga (1) Tungabhadra (5), Panchganga (1).	46
9	**Mahi (7)**	Anas (1), Panam (1).	9
10	**Mahanadi (16)**	Ib (4), Hasdeo (2), Kathaijoda (1), Kharoon (1), Kuakhai (2) Sheonath (2), Birupa (1).	29
11	**Narmada (14)**	Chhota Tawa (1).	15
12	**Pennar (4)**	——	4
13	**Sabarmati (8)**	Meswa (1), Shedhi (1), Khari (1).	11
14	**Subarnarekha (6)**	——	6
15	**Tapi (10)**	Girna (2).	12
16	**Medium rivers**	Ambika (1), Ulhas (2), Ulhas-Bhasta (1), Imphal (4), Mandovi (2), Palar (1), Pamba (3), Pariyar (3), Rushikulya (2), Tambiraparani (7), Achankoil (2), Chalakudy (1), Damanganga (5), Ghaggar (16), Kallada (1), Kali Karnakaka (1), Manimala (2), Mindhola (1), Nagavalli (3), Amlakhadi (1), Chaliyar (2), Iril (2), Kharkhala (1), Karmana (1), Kolak (2), Kundalika (1), Meenachil (1), Muvattupuza (1), Patalganga (2), Umtrew (1), Vamanpuram (1), Zuari (2), Gumti (2), Kalna (1), Valvant (1), Madai (1), Khandepar (1), Asanora (1), Bhadar (1), Neyyar (1), Ithikkara (1), Kadalundy (1), Kuttiyady (1), Mahe (1), Kuppum (1), Neelsvaram (1), Karingoda (1), Chandergiri (1), Chitrapuzha (1), Nambul (2), Ganol (1), Simsang (1), Myntdu (1), Arasalar (1), Kodra (1), Haora (1).	104

Table 6.1.21 : RIVER-BASINWISE DISTRIBUTION OFWATER QUALITY MONITORING STATIONS -Concld.

Sl. No.	River (main stream) Lake etc.	Tributaries	Total Stations
1	2	3	4
17	**Lakes**	Hussainsagar (1), Saroornagar (1), Himayatsagar (1), Pulicate (1), Salaulim (1), Kankoria (1), Chandola (1), Ajwah (1), Sursagar (1), Brahamsarovar (1), Sukhna (1), Govindsagar (1), Pongdam (1), Renuka (1), Wuller (1), Dal (1), Ulsoor (1), Hebbala Valley (1), Oruvathikotta (1), Sasthamcotta (1), Ashthamudi (1), Paravur (1), Vembanad (1), Peryar (1), Kodumgallor (1), Kayamkula (1), Punnamadakayal (1), Pookotekayal (1), Upper Lake (1), Lower Lake (1), Multai Lake (1), Loktak (4), Umiam (1), Ward (1), Thadlaskena (1), Osteri (1), Bahour (1), Harike (1), Pichola (1), Udaisagar (1), Ramgarhjaipur (1), Pushkar (1), Fatchsagar (1), Kalyana (1), Nakki (1), Udhagamadalam (1), Kodaikanal (1), Yereaud (1), Lakshminarayan Baridigh (1), Rudrasagar (1), Ramgarh-Uttar Pradesh (1), Naini (1), Rabindrasarovar (1)	64
	Tanks	Dharamsagar (1), Bibinagar (1), Kistrapetrareddy (1), Gandigudem (1), Goysagar (1)	
	Ponds	Elangabeel System (1), Lakshadweep (1)	
18	**Creeks, Canals, Tanks, Ponds, Drains**	Creeks (3M), Agartala Canal (1M), Gurgaon Canal (1M), Western Yamuna Canal (9M), Drains (12M)	26
19	**Groundwater**	——	181
		Total	**784**

Source : Central Pollution Control Board.

G - GEMS (Global Environment Monitoring System),

M - MINARS (Monitoring of Indian National Aquatic Resources)

YAP - Yamuna Action Plan

TABLE 6.1.22 : ANNUAL INTERNAL RENEWABLE WATER RESOURCES & WATER WITHDRAWALS IN SELECTED COUNTRIES OF WORLD

Sl. No.	Country	Annual Internal Renewable Water Resources[a]		Annual Withdrawals			Sectoral Withdrawals (Percent)		
		Total (Cubic Kilometres)	1995 Per Capita (Cubic Metres)	Year of Data	% of Water Resources[a]	Per Capita (Cubic Metres)	Domestic	Industry	Agriculture
1	2	3	4	5	6	7	8	9	10
1	Egypt	58.1	923	1992	97	956	6 [d]	9	85
2	Kenya	30.2	1069	1990	7	87	20 [d]	4	76
3	Nigeria	280.0	2506	1987	1	41	31 [d]	15	54
4	Bhutan	95.0	57998	1987	0	14	36 [b]	10	54
5	China	2800.0	2292	1980	16	461	6 [b]	7	87
6	India	2085.0	2228	1975	18	612	3 [b]	4	93
7	Indonesia	2530.0	12804	1987	1	96	13 [b]	11	76
8	Iran	117.5	1746	1975	39	1362	4 [b]	9	87
9	Japan	547.0	4373	1990	17	735	17 [b]	33	50
10	Korea, Rep.	66.1	1469	1992	42	632	19 [b]	35	46
11	Italy	167.0	2920	1990	34	986	14 [d]	27	59
12	Russian Federation	4498.0	30599	1991	3	790	17 [d]	60	23
13	United Kingdom	71.0	1219	1991[c]	17	205	20 [d]	77	3
14	Argentina	994.0	28739	1976	4	1043	9 [b]	18	73
15	Brazil	6950.0	42957	1990	1	246	22 [b]	19	59
16	Mexico	357.4	3815	1991[c]	22	899	6 [b]	8	86
17	Canada	2901.0	98462	1991[c]	2	1602	18 [b]	70 [b]	12 [b]
18	United States	2478.0	9413	1990	19	1870	13 [d]	45 [b1]	42 [b1]

Source : Global Environment Outlook, 1997, United Nations Environment Programme

Notes :

a : Annual Internal Renewable water Resources usually include river flows from other countries.

b : Sectoral withdrawal percentages are estimated for 1987.

c : Data are from early 1990s.

d : Sectoral percentages date from the year of other annual withdrawal data.

TABLE 6.1.23 : STATEWISE ANNUAL REQUIREMENT OF WATER FOR DOMESTIC PURPOSE

(Cubic Km.)

Sl. No.	Name of the State/UT	Water Requirement	
		During 1991	During 2001
1	2	3	4
1	Andhra Pradesh	2.548	2.927
2	Arunachal Pradesh	0.027	0.038
3	Assam	0.691	0.817
4	Bihar	2.746	3.237
5	Goa	0.053	0.074
6	Gujarat	1.731	2.052
7	Haryana	0.613	0.749
8	Himachal Pradesh	0.153	0.201
9	Jammu & Kashmir	0.284	0.371
10	Karnataka	1.809	2.120
11	Kerala	1.108	1.239
12	Madhya Pradesh	2.419	2.968
13	Maharashtra	3.466	4.044
14	Manipur	0.071	0.099
15	Meghalaya	0.061	0.085
16	Mizoram	0.033	0.046
17	Nagaland	0.041	0.058
18	Orissa	1.010	1.153
19	Punjab	0.803	0.942
20	Rajasthan	1.602	1.984
21	Sikkim	0.012	0.017
22	Tamil Nadu	2.332	2.599
23	Tripura	0.090	0.126
24	Uttar Pradesh	4.864	6.094
25	West Bengal	2.627	3.087
26	Andaman & Nicobar Island	0.011	0.015
27	Chandigarh	0.044	0.062
28	Dadra & Nagar Haveli	0.004	0.006
29	Daman & Diu	0.005	0.007
30	Delhi	0.643	0.981
31	Lakshadweep	0.003	0.004
32	Pondicherry	0.045	0.063
	Total	**31.949**	**38.263**

Source : Central Water Commission

Norms

: Rural Water requirement = 70 Litres per Capita per day

: Urban Water requirement = 200 Litres per Capita per day

TABLE 6.2.1 : LENGTH OF COASTLINE AND POPULATION OF COASTAL STATES AND ISLANDS

Sl. No.	Name of State/ Union Territories	Length of Coastline (Km.)	Area(Thousand Sq. Km.)	Population 1991 (000000)
1	2	3	4	5
1	Gujarat	1600	196.00	41.20
2	Maharashtra	840	307.70	78.70
3	Goa	300	3.70	1.20
4	Karnataka	400	191.80	44.80
5	West Bengal	950	88.70	68.00
6	Tamil Nadu	720	130.10	55.60
7	Orissa	560	155.70	31.50
8	Kerala	1014	39.00	29.00
9	Andhra Pradesh	960	275.00	66.30
10	Andaman & Nicobar Islands	—	8.50	0.30
11	Lakshadweep	—	0.03	0.05

Source : The State of Environment, 1995, Ministry of Environment & Forests

India has a coastline of about 7515 Km., its peninsular shape jutting into the Indian Ocean. The major portion of the west coast is dominated by a scarped slope resulting in a well-drained, flood free hinterland. In the Gujarat area, the coastal zone is marked by low land, free from rocky terrain. The east coast is flatter and wider and tends to be better cultivated and more densely populated than the west coast.

The Indian coastline can be divided into the Gujarat region, the West Coast, the East Coast and the Islands. Gujarat region is made up of Kutch and Kathiawar peninsular to the west, separated by the Gulf of Kutch. This is a region of mudflats while the east, the Khambat region is made up estuaries and rias. The West Coast is made up of the Konkan Coast, the Karnataka Coast and the Malabar Coast. While North Konkan is low lying with sandy spits, the southern region is rugged and rocky. The Malabar Coast is characterized by sand dunes, backwaters and lagoons. The east-coast has extensive coastal plains and large deltas of the river Cauvery, Krishna, Godavari and Mahanadi. To the north lies the large delta of the Ganga and the Brahmaputra rivers. A number of sand dunes occur on this coast extending well inland.

The Lakshadweep group of islands are characterized by extensive coral reef system with lagoons and beach vegetation. The Andaman and Nicobar Islands are covered with dense forests from shore to the hills.

TABLE 6.2.2 : MAIN ACTIVITIES ALONG THE INDIAN COASTAL ZONE

1		2
	Land Based :	
I.	Coast dependent	Ports & Harbours Oil Terminals Paper & Pulp mills Metallurgical Plants Fish Processing Power Plants
II.	Coast prefering	Urban, commercial & residential development Tourism & beach recreation Agriculture
III.	Coast independent **Water based**	Defence Offshore oil and gas Offshore placer mining Navigation Naval defence Water sports Fishing

Source : The State of Environment, 1995, Ministry of Environment & Forests

Coastal areas are of enormous socio-economic importance, because of both their traditional resources viz. fish, tourist potential, commercial and residential development as well as the new types of resources using new technologies such as ocean thermal energy, wave energy, offshore mineral deposits, mariculture etc. The high economic value of these areas and the relative fragility and vulnerability to natural hazards, sea level rise and anthropogenic activities make the preservation and the management of coastal zone resources and its environment of enormous importance

TABLE 6.2.3 : INDUSTRIAL & SEWAGE DISCHARGES TO THE COASTAL WATERS

Sl. No.	State/Coast	Industrial Waste Water(MLD)
1	2	3
1	Gujarat	566
2	Maharashtra	80
3	Goa	12
4	Karnataka	43
5	Kerala	151
6	Tamil Nadu	378
7	Pondicherry	6
8	Andhra Pradesh	2466*
9	Orissa	1
10	West Bengal	22
	Total	**3725**

Source : Central Pollution Control Board
* : Including 2116 MLD from Aquaculture farms
Note : The data collected during 1995-96

TABLE 6.2.4 : POLLUTANTS AND THEIR IMPACTS ON THE MARINE ENVIRONMENT

Sl. No.	Sources	Impacts
1	2	3
1	Municipal and Domestic Waste	Reduce dissolved oxygen (DO); increase hydrogen sulphide levels; incidence of faecal coliform & faecal streptococci; high biological oxygen demand (BOD)
2	Industrial Waste	Affect DO, temperature, turbidity, pH, ammonia values; increases BOD, COD, suspended solids
3	Toxic Metals	Cause change in chemical and biochemical processes, increase in turbidity, lethal and sublethal effects on marine life
4	Oil Pollution	Causes smothering, clogging and toxicity
5	Fertilizers	Affect nutrient levels and may cause eutrophication
6	Dredging & Reclamation	Affect habitats of marine organisms; lethal and sublethal effects; affects flushing capacity of the waterbody
7	Siltation	Increases in nutrient levels and can cause excessive algal bloom; may also cause damage to coral reefs and coastal nurseries
8	Discharge of Coolant Waters	Raises the temprature of the water can cause the growth of the blue-green algae
9	Toxic Chemicals	Cause lethal and sublethal effects on marine organisms
10	Offshore Mining	Increases particulate loading which can lead to loss of light and reduced primary productivity ; smothering and clogging of benthic communities
11	Radionuclides	Bioaccumulation in fish and other benthic communities

Source : The State of Environment, 1995

TABLE 6.2.5 : "POTENTIAL HOTSPOTS" ALONG THE INDIAN COAST

Sl. No.	States	Coastal Cities/ Towns
1	2	3
1	Gujarat	Okha, Veraval
2	Maharashtra	Bassein, Bombay Harbour, Thane, Trombay, Versova, Ulhas creek, Mahim
3	Goa	Marmagoa
4	Karnataka	Karwar, Mangalore
5	Kerala	Kochin, Thiruvananthapuram
6	Tamil Nadu	Ennore, Madras Harbour, Cooum, Port Calimere, Koodankulam, Arumuganeri, Tuticorin
7	Andhra Pradesh	Vishakhapatnam
8	Orissa	Gopalpur, Paradip, Puri
9	West Bengal	Indo-Bangladesh border, Sandheads, Diamond Harbour

Source: State of the Environment, 1995

Pressures on the marine environment arise from both natural as well as anthropogenic activities. The latter occurs either due to overexploitation of coastal and marine resources or due to the use of the coastal and marine environment as sinks of pollutants and other wastes arising as by-products of development activities. There are various such sources of marine pollution, their impacts varying according to the nature of the coastal or marine environment impacted upon and on the nature of the pollutant itself.

Marine population occurs off most metropolitan cities and densely populated coastal towns in India, but there are 25 heavily polluted potential 'hot spots' along the Indian coast.

TABLE 6.2.6 : CRITERIA FOR CLASSIFICATION OF INLAND SURFACE WATER

Sl. No.	Parameter	Maximum /Minimum	Drinking Water without Conventional Treatment but after Disinfection	Outdoor Bathing Organized	Drinking Water with Conventional Treatment Followed by Disinfection	Propagation of Wildlife and Fishries	Irrigation, Industrial, Cooling etc.
1	2	3	4	5	6	7	8
1	Dissolved oxygen (mg/litre)	Minimum	6	5	4	4	-
2	Biological oxygen demand (mg/letre)	Minimum	2	3	3	-	-
3	Total coliform bacteria (most probable number per 100 millilitres)	Maximum	50	500	5000	-	-
4	Total dissolved solids (mg/litre)	Maximum	500	-	1500	-	2100
5	Chloride as chlorine (mg/litre)		250	-	600	-	500
6	Colour (hazen)	Mximum	10	300	300	-	-
7	Sodium absorption ratio	Maximum	-	-	-	-	26
8	Boron (mg/litre)	Maximum	-	-	-	-	2
9	Sulphates (mg/litre)	Maximum	400	-	400	-	1000
10	Nitrates (mg/litre)	Maximum	20	-	50	-	-
11	Free ammonia as nitrogen (mg/litre)	Maximum	-	-	-	12	-
12	Conductivity at 25°C(μs/cm)	Maximum	-	-	-	1	2.25
13	PH	-	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.0
14	Arsenic (mg/litre)	Maximum	0.05	0.2	0.2	-	-
15	Iron (mg/litre)	Maximum	0.3	-	50	-	-
16	Fluorides (mg/litre)	Mximum	1.5	1.5	1	-	-
17	Lead (mg/litre)	Maximum	0.1	-	0.1	-	-
18	copper (mg/litre)	Maximum	1.5	-	1.5	-	-
19	Zinc (mg/litre)	Maximum	15	-	15	-	-

Source : TERI Energy Data Directory and Yearbook, 2002-2003

CHAPTER SEVEN

HUMAN SETTLEMENTS

POPULATION & POVERTY

7.1 The root cause of environmental degradation in India can be attributed to rapid growth of population. India has approximately 18 per cent of the world population but only 2 per cent of the geographical area. The application of medical knowledge and social care has lowered the death rate while the birth rate remains fairly constant. Dandekar has analysed the pattern of decline in the death rate and the birth rate for the period 1972-78 and 1979-1990 and observed that the death rate declined faster during the second sub-period (1979-90) than in the first sub-period (1972-78). However, in contrast to the decline in the death rate, the decline in the birth rate during the second sub-period was smaller than in the first sub-period. Due to this, poverty could not be eradicated, inspite of the fact, that poverty alleviation is on the national agenda for more than fifty years. In 1972, in the Stockholm Conference on Environment, the then Prime Minister of India, Smt. Indira Gandhi has said that poverty is a great pollutant. Twenty years later, in 1992, World Bank stated, "poor are the agents and victims of environmental degradation". The poor become agents of environmental degradation when they are victims of it.

7.2 Human development is also adversely affected by the environmental degradation. Two of the environmental indicators, viz. access to the safe drinking water and the sanitation are closely linked with two of the very important human development indicators, viz. an infant mortality rate and the life expectancy. Polluted air and poor and unhygienic conditions in settlements contribute to reduction in life expectancy and increase in infant mortality. Life expectancy in India is still on very low ebb and an infant mortality rate is much more than desirable. The poor, therefore, take fertility decisions to compensate for all those factors and to avoid risks. Larger population leads to more poverty and worsens the environment, and creates vicious cycle.

HOUSING AND BASIC SERVICES

7.3 Access to safe drinking water and proper sanitation is both a right and a basic need. It has a significant bearing on the achievements of other Millennium Development Goals including poverty reduction, and gender equality. However, despite two decades of concerted efforts by national governments and international communities, equitable access to safe drinking water supply and improved sanitation for all remains elusive. It is a pressing development issue.

7.4 Almost two-third of the world's population without access to safe water and 80 percent without access to improved sanitation, lives in Asia. In the last decade of the 20th century, Asian countries invested about $60 billion in water supply and about $ 11 billion in sanitation. This enabled about 585 million people in both rural and urban areas to gain access to safe water supply, and the

Johannesburg Summit goal of halving the number of people without access to improved sanitation by 2015, are to be achieved, about 1 billion people in Asia would have to obtain access to safe drinking water and another 1 billion people to improved sanitation.

7.5 Water is a finite resource. We are wasting too much. Conserving water is one way of ensuring that more is available for those who do not have it. The reduction of non-revenue water in Asia (currently ranging from 25-70 per cent in most water utilities) will significantly lower capital requirements for new investments and conserve. It costs far less to reduce non-revenue water than to expand capacity and perpetuate system inefficiencies. Access can also be expanded by applying the results of research in new technologies that separate water use (e. g., for cooking, drinking, bathing, sanitation), and through natural means such as rainwater harvesting and storage. In conjunction, water quality must remain a key focus area.

7.6 We do not need only food, we also need potable drinking water, adequate system for disposal of excreta, good sanitation and personal hygiene to reduce prevalence of morbidity. Several studies carried out in our villages confirm that diarrhea and respiratory diseases are the most common and dangerous diseases among children. The majority of illness tends to synergies malnutrition both by demanding higher energy intake to meet the rise in BMR which accompany fever and by requiring higher intake of protein and other nutrients to form antibodies to fight the illness. It is this negative correlation that Japan used to formulate its policy in post war years to provide water for drinking, pit latrines to dispose of excreta, sanitation to control breeding of flies and mosquitoes, which in turn resulted an increase in life expectation of 12 years during the immediate post war decade.

SOLID WASTE AND HAZARDOUS MATERIAL MANANGEMENT

7.7 Due to a rapid growth of urbanization, there is a substantial increase in generation of solid waste in both absolute and per capita terms. Surveys have been conducted to assess for solid waste generation, collection, treatment and disposal in 291 Class I cities and 345 Class II cities. It has been indicated that very little amount of waste generated is treated. The problems in management of wastes relate to its collection, handling, transport and disposal. Segregation of solid wastes is not uncommon in India as much of recycling work is being done either by ragpickers or non-Governmental agencies in few areas. Proper sanitary landfilling sites need to be developed which are effective in keeping the surface and ground water free from leachates.

7.8 When this solid waste is not collected and disposed of efficiently and effectively, it attracts rodents and flies which then spread diseases. It also pollutes and degrades land and water resources. If these wastes are left untreated, they would ferment slowly and produce bio-gas which would be distributed in the atmosphere. The bio-gas contains 65-70% methane, gas which is a green house gas, have a global warming potential 34 times more than that of Carbon Dioxide. Therefore, development of suitable technologies for

utilization of wastes is essential to minimize adverse health and environment consequences. Comprehensive guidelines are available with Central Pollution Control Board for Toxic Waste Management including hospital wastes.

STUDY ON SOLID WASTES IN DELHI

7.9 As per the study conducted in 1999, to generate data on Solid Wastes produced in Delhi, it was found that an average daily generation of municipal solid wastes in Delhi is 5327 tons. Its physical analysis revealed that the wastes consist of about 47% of biodegradable component. The recyclable components include paper and cardboard (6.7%), plastics (4.17%) and metal (1%). Total revenues to be earned through selling out these recyclable components will be of the order of crores of rupees. Data revealed that a large amount of Municipal Solid Waste generated can be recycled and reused. Technique and technologies for the same are available. It is also economically attractive and commonly practised by many countries in the world.

PLASTICS WASTE MANAGEMENT

7.10 Use of plastics have grown manifolds all over the world as it has many advantages. They are light, easy to mould, durable and easy to adopt to different user requirements. However, plastics are difficult to destroy and are classified as non-biodegradable. On the other hand, it is easy to recycle plastics.

7.11 In the Indian context, it is seen that the growth of the plastic industries is phenomenal. Polymer demand in India has consistently recorded double digit growth rates, trebling every 10 years. India's per capita consumption of 1.6 kg of plastics in 1998 was expected to rise to around 4 Kg by the year 2000. However, as compared to the world's statistics of per capita consumption of plastics, it is still far less. In the year 1998 , the per capita consumption of Western Europe was 60 Kg. that of Japan 70 Kg. and of USA 78 Kg. as against 1.6 Kg of India. Also, about 60% of the plastic wastes

generated in India are recycled which is the highest in the world. However, the remaining 40 % of the plastic wastes remains uncollected, unsegregated, strewn on the ground, littered around in open drains or in unmanaged garbage dumps. The collection of such Soiled Waste including the one recycled three or even four times earlier, is not only uneconomical for recovery of material, but also unhygienic and undermines the environmental benefits of materials recycling. These indiscriminately disposed solid plastic wastes are of concern in view of causing chokage of municipal sewers, blocking of the storm water run-offs in drains particularly in hilly areas, causing deaths to many animals, like, cows which feed on the garbage food thrown in polythene bags.

Table 7.1.1: Population Totals - India and States

(Numbers)

Sl. No.	States/U.Ts.	1981		1991		2001	
		Male	Female	Male	Female	Male	Female
1	2	3	4	5	6	7	8
	States						
1	Andhra Pradesh	27109616	26441410	33724581	32783427	38286811	37440730
2	Arunachal Pradesh	339322	292517	465004	399554	573951	517166
3	Assam	9444037	8597211	11657989	10756333	13787799	12850608
4	Bihar	35930560	33984174	45202091	41172374	43153964	39724832
5	Chhatisgarh++	..	..	..	..	10452426	10343530
6	Goa	510152	497597	594790	575003	685617	658381
7	Gujarat	17552640	16533159	21355209	19954373	26344053	24252939
8	Haryana	6909679	6012440	8827474	7636174	11327658	9755331
9	Himachal Pradesh	2169931	2110887	2617467	2553410	3085256	2991992
10	Jammu & Kashmir+	3164660	2822729	4014100	3704600	5300574	4769343
11	Jharkhand++	..	..	..	..	13861277	13048151
12	Karnataka	18922627	18213087	22951917	22025284	26856343	25877615
13	Kerala	12527767	12925913	14288995	14809523	15468664	16369955
14	Madhya Pradesh	26886305	25292539	34267293	31913877	31456873	28928245
15	Maharashtra	32414432	30368386	40825618	38111569	50334270	46417977
16	Manipur	721006	699947	938359	898790	1207338	1181296
17	Meghalaya	683710	652109	907687	867091	1167840	1138224
18	Mizoram	257239	236518	358978	330778	459783	431275
19	Nagaland	415910	359020	641282	568264	1041686	946950
20	Orissa	13309786	13060485	16064146	15595590	18612340	18094580
21	Punjab	8937210	7851705	10778034	9503935	12963362	11325934
22	Rajasthan	17854154	16407708	23042780	20963210	29381657	27091465
23	Sikkim	172440	143945	216427	190030	288217	252276
24	Tamil Nadu	24487624	23920453	28298975	27559971	31268654	30842185
25	Tripura	1054846	998212	1417930	1339275	1636138	1555030
26	Uttaranchal++	..	..	..	..	4316401	4163161
27	Uttar Pradesh	58819535	52042977	74036957	65075330	87466301	78586558
28	West Bengal	28560901	26019746	35510633	32567332	41487694	38733471
	Union Territories						
1	A&N Islands	107261	81480	154369	126292	192485	163280
2	Chandigarh	255278	196332	358614	283401	508224	392690
3	D&N Haveli	52515	51161	70953	67524	121731	98720
4	Daman & Diu	38298	40683	51595	49991	92478	65581
5	Delhi	3440081	2780325	5155512	4265132	7570890	6212086
6	Lakshadweep	20377	19872	26618	25089	31118	29477
7	Pondicherry	304561	299910	408081	399704	486705	487124
	All India+	**353374460**	**329954637**	**439230458**	**407072230**	**531277078**	**495738169**

Source : Office of the Registrar General, India

\+ : The 1991 Census was not held in Jammu & Kashmir. The Projected Population of Jammu & Kashmir, is based on the Report of Standing Committee of Experts on Population Projections (October, 1989).

'++ : The States of Uttaranchal, Jharkhand and Chhattisgarh are carved out from Uttar Pradesh, Bihar, and Madhya Pradesh respectivly, in 2001 Census.

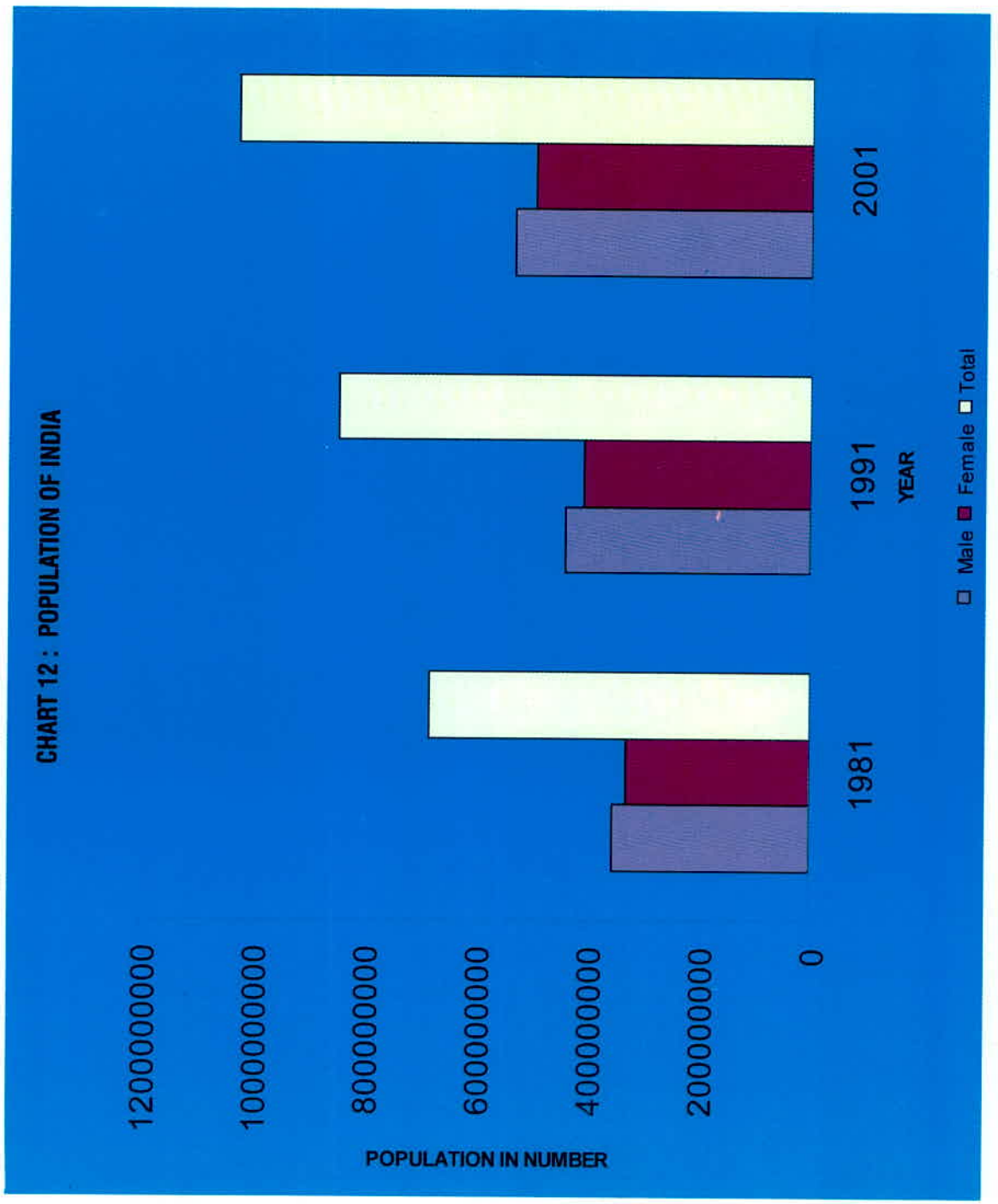


CHART 12 : POPULATION OF INDIA
POPULATION IN NUMBER
1200000000
1000000000
800000000
600000000
400000000
200000000
0
1981
1991
2001
YEAR
Male
Female
Total

TABLE 7.1.2 : INFANT MORTALITY RATE

(Per Thousand Live Births)

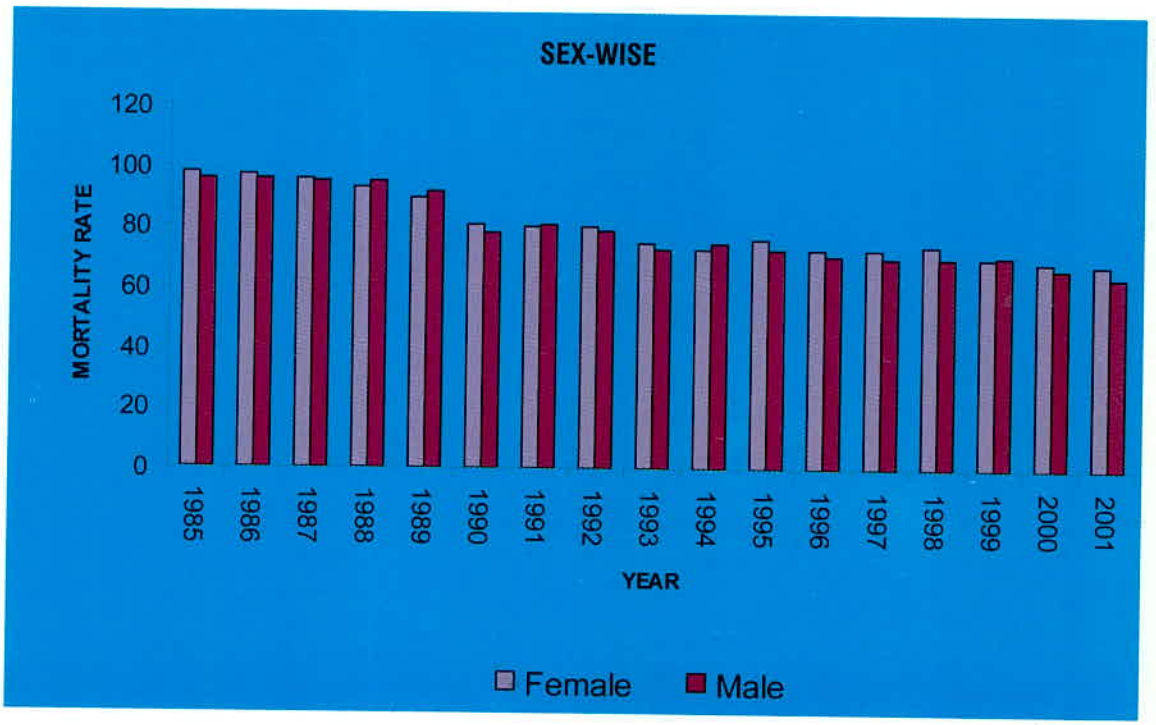
Sl. No.	Year	Sex		Sector		Overall
		Female	Male	Rural	Urban	
1	2	3	4	5	6	7
1	1985	98	96	107	59	97
2	1986	97	96	105	62	97
3	1987	96	96	104	61	95
4	1988	94	96	102	62	95
5	1989	90	92	98	58	91
6	1990	81	78	86	50	80
7	1991 *	80	81	87	53	80
8	1992 *	80	79	85	53	79
9	1993 *	75	73	82	45	74
10	1994*	73	75	80	52	74
11	1995*	76	73	80	48	74
12	1996*	73	71	77	46	72
13	1997*	72	70	77	45	71
14	1998*	74	70	77	45	72
15	1999	70	71	75	44	70
16	2000	69	67	74	44	68
17	2001	68	64	72	42	66

Source : Office of the Registrar General, India, Sample Registration System
* : Excludes Jammu and Kashmir due to non-receipt of returns.

Infant Mortality Rate (IMR) in India has significantly declined during 1970-80 and 1981-90, but the present IMR (66) is still very high in comparison to industrial (14) and even developing countries (64). The decline in the IMR was much greater during the second sub-period (1981-90) than during the first sub-period (1970-80) and this was entirely due to the decline in the IMR in the rural areas. In fact, in urban areas, the situation was reverse, the decline in the IMR was greater during 1970-80 than during 1981-90.

Kerala has recorded the minimum IMR of 16 which in fact is less than that of Costa Rica which is placed at third position among developing countries having lowest IMR. The variability between rural and urban areas is also minimum in Kerala. In contrast, Orissa has the maximum IMR and variability between rural and urban areas is also very high.

CHART 13 : INFANT MORTALITY RATE (PER THOUSAND LIVE BIRTHS)



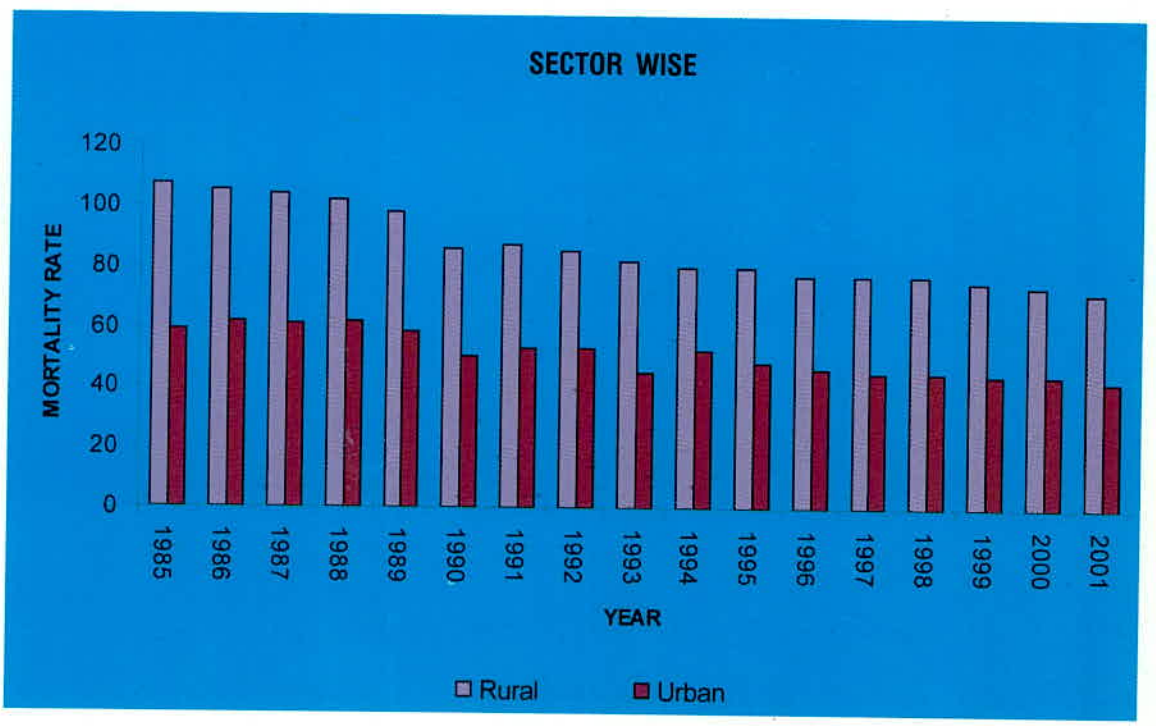


Table 7.1.3 : EXPECTATION OF LIFE AT BIRTH

(In Years)

Sl. No.	Year	Female	Male	Combined
1	2	3	4	5
1	1901-11	23.3	22.6	22.9
2	1911-21	20.9	19.4	20.1
3	1921-31	26.6	26.9	26.8
4	1931-41	31.4	32.1	31.8
5	1941-51	31.7	32.4	32.1
6	1951-61	40.6	41.9	41.3
7	1961-71	44.7	46.4	45.6
8	1970-75	49.0	50.5	49.7
9	1976-80	52.1	52.5	52.3
10	1981-85	55.7	55.4	55.5
11	1986-90	58.1	57.7	57.7
12	1987-91*	58.6	58.1	58.3
13	1988-92*	59.0	58.6	58.7
14	1989-93*	59.7	59.0	59.4
15	1990-94*	60.4	59.4	60.0
16	1991-95*	60.9	59.7	60.3
17	1992-96*	61.4	60.1	60.7
18	1993-97*	61.8	60.4	61.1

Source : Office of the Registrar General, India.

Notes : Figures for 1901-11 to 1961-71 are based on Census Actuarial Reports and for 1970-75 onwards on the basis of estimate from Sample Registration System

* : Excludes Jammu and Kashmir

The expectation of life at birth of female which was lower than that of male till 1980 has shown an upward trend during the decade 1981-90 and thereafter. This trend is similar in respect of almost all the states except in a few states i.e. Bihar and Orissa. This may be one of the reasons that in these States the combined expectation of life at birth is much lower than the National Average of 61.1(1993-97).

One of the major reasons for the decline in expectation of life in these states can be attributed to rapid growth of population and poverty, more than forty percent population living below the poverty line which is much more than National Average of 26.1 percent.

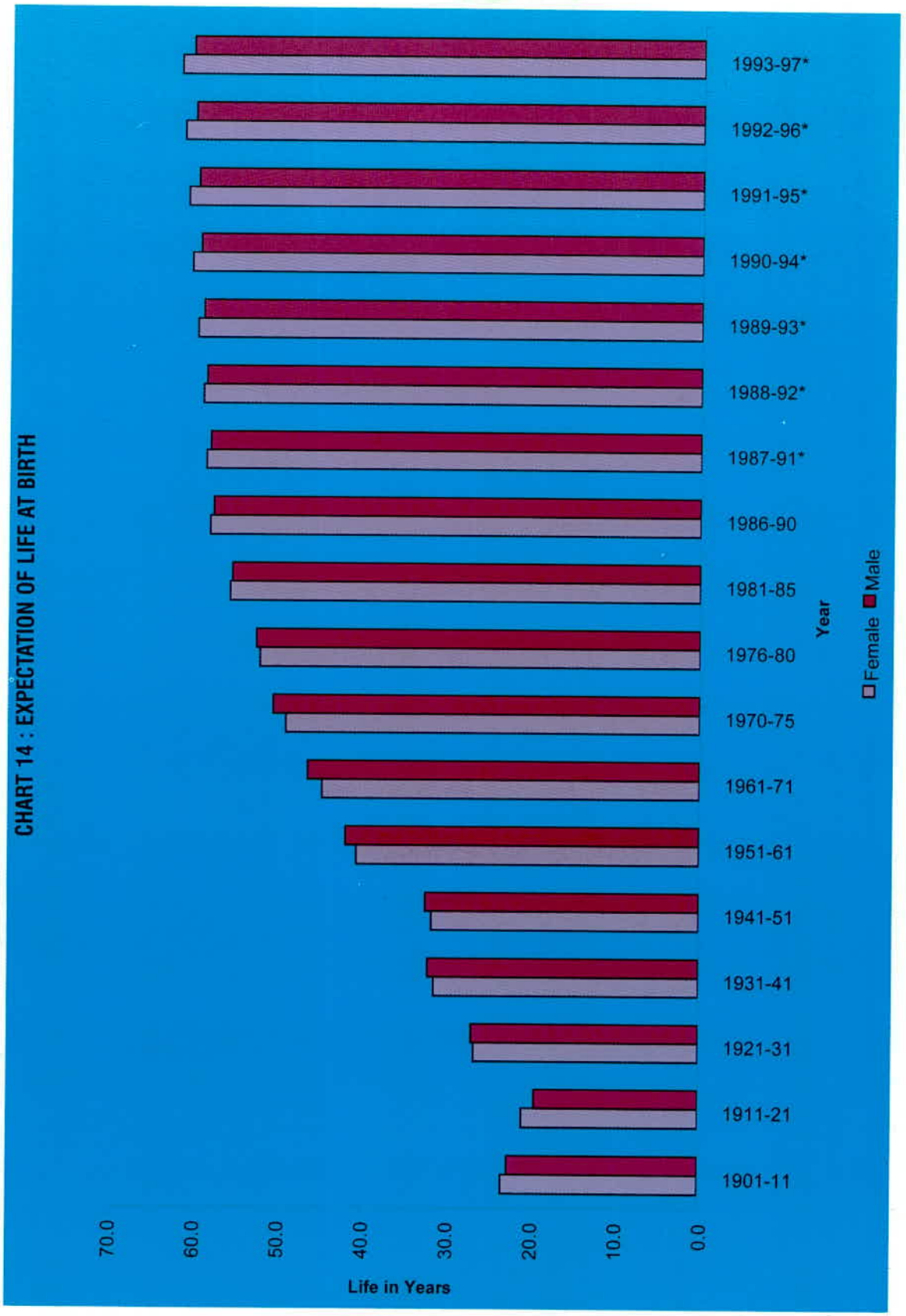


CHART 14 : EXPECTATION OF LIFE AT BIRTH
1993-97*
1992-96*
1991-95*
1990-94*
1989-93*
1988-92*
1987-91*
1986-90
1981-85
1976-80
1970-75
1961-71
1951-61
1941-51
1931-41
1921-31
1911-21
1901-11
Year
Female
Male
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Life in Years

TABLE 7.1.4 (a): STATE-WISE PERCENTAGE OF POPULATION BELOW THE POVERTY LINE -RURAL

Sl. No.	States/Union Territories	1973-74	1977-78	1983	1987-88	1993-94	1999-2000
1	2	3	4	5	6	7	8
	States						
1	Andhra Pradesh	48.41	38.11	26.53	20.92	15.92	11.05
2	Arunachal Pradesh	52.67	59.82	42.60	39.35	45.01	40.04
3	Assam	52.67	59.82	42.60	39.35	45.01	40.04
4	Bihar	62.99	63.25	64.37	52.63	58.21	44.30
5	Goa	46.85	37.64	14.81	17.64	5.34	1.35
6	Gujarat	46.35	41.76	29.80	28.67	22.18	13.17
7	Haryana	34.23	27.73	20.56	16.22	28.02	8.27
8	Himachal Pradesh	27.42	33.49	17.00	16.28	30.34	7.94
9	Jammu & Kashmir	45.51	42.86	26.04	25.70	30.34	3.97
10	Karnataka	55.14	48.18	36.33	32.82	29.88	17.38
11	Kerala	59.19	51.48	39.03	29.10	25.76	9.38
12	Madhya Pradesh	62.66	62.52	48.90	41.92	40.64	37.06
13	Maharashtra	57.71	63.97	45.23	40.78	37.93	23.72
14	Manipur	52.67	59.82	42.60	39.35	45.01	40.04
15	Meghalaya	52.67	59.82	42.60	39.35	45.01	40.04
16	Mizoram	52.67	59.82	42.60	39.35	45.01	40.04
17	Nagaland	52.67	59.82	42.60	39.35	45.01	40.04
18	Orissa	67.28	72.38	67.53	57.64	49.72	48.01
19	Punjab	28.21	16.37	13.20	12.60	11.95	6.35
20	Rajasthan	44.76	35.89	33.50	33.21	26.46	13.74
21	Sikkim	52.67	59.82	42.60	39.35	45.01	40.04
22	Tamil Nadu	57.43	57.68	53.99	45.80	32.48	20.55
23	Tripura	52.67	59.82	42.60	39.35	45.01	40.04
24	Uttar Pradesh	56.53	47.60	46.45	41.10	42.28	31.22
25	West Bengal	73.16	68.34	63.05	48.30	40.80	31.85
	Union Territories						
1	Andman& Nicobar Islands	57.43	57.68	53.99	45.80	32.48	20.55
2	Chandigarh	27.96	27.32	23.79	14.67	11.35	5.75
3	Dadra & Nagar Haveli	46.85	37.64	14.81	67.11	51.95	17.57
4	Daman & Diu	NA	NA	NA	NA	5.34	1.35
5	Delhi	24.44	30.19	7.66	1.29	1.90	0.40
6	Lakshadweep	59.19	51.48	39.03	29.10	25.76	9.38
7	Pondicherry	57.43	57.68	53.99	45.80	32.48	20.55
	All India	**56.44**	**53.07**	**45.65**	**39.09**	**37.27**	**27.09**

Source : Planning Commission Estimates.

Notes :
1. Poverty Ratio of Assam is used for Sikkim, Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, and Tripura.
2. Poverty Line of Maharashtra and expenditure distribution of Goa is used to estimate Poverty Ratio of Goa.
3. Poverty Line of Himachal Pradesh and expenditure distribution of Jammu & Kashmir is used to estimate poverty ratio of Jammu & Kashmir.
4. Poverty Ratio of Tamilnadu is used for Pondicherry and A & N Islands.
5. Urban Poverty Ratio of Punjab used for both rural and urban Poverty of Chandigarh.
6. Poverty Line of Maharashtra and expenditure distribution of Dadra & Nagar Haveli is used of estimate Poverty Ratio of Dadra & Nagar Haveli.
7. Poverty Ratio of Goa is used for Daman & Diu.
8. Poverty ratio of Kerala is used for Lakshadweep.
9. Urban poverty ratio of Rajasthan for the Year 1999-2000 may be treated as tentative.
10. Poverty Ratio of Himachal Pradesh is used for Jammu & Kashmir for 1993-94.

TABLE 7.1.4 (b) : STATE-WISE PERCENTAGE OF POPULATION BELOW THE POVERTY LINE- URBAN

Sl. No.	States/Union Territories	1973-74	1977-78	1983	1987-88	1993-94	1999-2000
1	2	3	4	5	6	7	8
	States						
1	Andhra Pradesh	50.61	43.55	36.30	40.11	38.33	26.63
2	Arunachal Pradesh	36.92	32.71	21.73	9.94	7.73	7.47
3	Assam	36.92	32.71	21.73	9.94	7.73	7.47
4	Bihar	52.96	48.76	47.33	48.73	34.50	32.91
5	Goa	37.69	36.31	27.00	35.48	27.03	7.52
6	Gujarat	52.57	40.02	39.14	37.26	27.89	15.59
7	Haryana	40.18	36.57	24.15	17.99	16.38	9.99
8	Himachal Pradesh	13.17	19.44	9.43	6.29	9.18	4.63
9	Jammu & Kashmir	21.32	23.71	17.76	17.47	9.18	1.98
10	Karnataka	52.53	50.36	42.82	48.42	40.14	25.25
11	Kerala	62.74	55.62	45.68	40.33	24.55	20.27
12	Madhya Pradesh	57.65	58.66	53.06	47.09	48.38	38.44
13	Maharashtra	43.87	40.09	40.26	39.78	35.15	26.81
14	Manipur	36.92	32.71	21.73	9.94	7.73	7.47
15	Meghalaya	36.92	32.71	21.73	9.94	7.73	7.47
16	Mizoram	36.92	32.71	21.73	9.94	7.73	7.47
17	Nagaland	36.92	32.71	21.73	9.94	7.73	7.47
18	Orissa	55.62	50.92	49.15	41.63	41.64	42.83
19	Punjab	27.96	27.32	23.79	14.67	11.35	5.75
20	Rajasthan	52.13	43.53	37.94	41.92	30.49	19.85
21	Sikkim	36.92	32.71	21.73	9.94	7.73	7.47
22	Tamil Nadu	49.40	48.69	46.96	38.64	39.77	22.11
23	Tripura	36.92	32.71	21.73	9.94	7.73	7.47
24	Uttar Pradesh	60.09	56.23	49.82	42.96	35.39	30.89
25	West Bengal	34.67	38.20	32.32	35.08	22.41	14.86
	Union Territories						
1	Andman& Nicobar Islands	49.40	48.69	46.96	38.64	39.77	22.11
2	Chandigarh	27.96	27.32	23.79	14.67	11.35	5.75
3	Dadra & Nagar Haveli	37.69	36.31	27.00	-	39.93	13.52
4	Daman & Diu	NA	NA	NA	NA	27.03	7.52
5	Delhi	52.23	33.51	27.89	13.56	16.03	9.42
6	Lakshadweep	62.74	55.62	45.68	40.33	24.55	20.27
7	Pondicherry	49.40	48.69	46.96	38.64	39.77	22.11
	All India	**49.01**	**45.24**	**40.79**	**38.20**	**32.36**	**23.62**

Source : Planning Commission Estimates.

Notes :
1. Poverty Ratio of Assam is used for Sikkim, Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, and Tripura.
2. Poverty Line of Maharashtra and expenditure distribution of Goa is used to estimate Poverty Ratio of Goa.
3. Poverty Line of Himachal Pradesh and expenditure distribution of Jammu & Kashmir is used to estimate poverty ratio of Jammu & Kashmir.
4. Poverty Ratio of Tamilnadu is used for Pondicherry and A & N Islands.
5. Urban Poverty Ratio of Punjab used for both rural and urban Poverty of Chandigarh.
6. Poverty Line of Maharashtra and expenditure distribution of Dadra & Nagar Haveli is used to estimate Poverty Ratio of Dadra & Nagar Haveli.
7. Poverty Ratio of Goa is used for Daman & Diu.
8. Poverty ratio of Kerala is used for Lakshadweep.
9. Urban poverty ratio of Rajasthan for the Year 1999-2000 may be treated as tentative.
10. Poverty Ratio of Himachal Pradesh is used for Jammu & Kashmir for 1993-94.

TABLE 7.1.4 (c): STATE-WISE PERCENTAGE OF POPULATION BELOW THE POVERTY LINE-COMBINED

Sl. No.	States/Union Territories	1973-74	1977-78	1983	1987-88	1993-94	1999-2000
1	2	3	4	5	6	7	8
	States						
1	Andhra Pradesh	48.86	39.31	28.91	25.86	22.19	15.77
2	Arunachal Pradesh	51.93	58.32	40.68	36.22	39.35	33.47
3	Assam	51.21	57.15	40.47	36.21	40.86	36.09
4	Bihar	61.91	61.55	62.22	52.13	54.96	42.60
5	Goa	44.26	37.23	18.90	24.52	14.92	4.40
6	Gujarat	48.15	41.23	32.79	31.54	24.21	14.07
7	Haryana	35.36	29.55	21.37	16.64	25.05	8.74
8	Himachal Pradesh	26.39	32.45	16.40	15.45	28.44	7.63
9	Jammu & Kashmir	40.83	38.97	24.24	23.82	25.17	3.48
10	Karnataka	54.47	48.78	38.24	37.53	33.16	20.04
11	Kerala	59.79	52.22	40.42	31.79	25.43	12.72
12	Madhya Pradesh	61.78	61.78	49.78	43.07	42.52	37.43
13	Maharashtra	53.24	55.88	43.44	40.41	36.86	25.02
14	Manipur	49.96	53.72	37.02	31.35	33.78	28.54
15	Meghalaya	50.20	55.19	38.81	33.92	37.92	33.87
16	Mizoram	50.32	54.38	36.00	27.52	25.66	19.47
17	Nagaland	50.81	56.04	39.25	34.43	37.92	32.67
18	Orissa	66.18	70.07	65.29	55.58	48.56	47.15
19	Punjab	28.15	19.27	16.18	13.20	11.77	6.16
20	Rajasthan	46.14	37.42	34.46	35.15	27.41	15.28
21	Sikkim	50.86	55.89	39.71	36.06	41.43	36.55
22	Tamil Nadu	54.94	54.79	51.66	43.39	35.03	21.12
23	Tripura	51.00	56.88	40.03	35.23	39.01	34.44
24	Uttar Pradesh	57.07	49.05	47.07	41.46	40.85	31.15
25	West Bengal	63.43	60.52	54.85	44.72	35.66	27.02
	Union Territories						
1	Andman& Nicobar Islands	55.56	55.42	52.13	43.89	34.47	20.99
2	Chandigarh	27.96	27.32	23.79	14.67	11.35	5.75
3	Dadra & Nagar Haveli	46.55	37.20	15.67	67.11	50.84	17.14
4	Daman & Diu	NA	NA	NA	NA	15.80	4.44
5	Delhi	49.61	33.23	26.22	12.41	14.69	8.23
6	Lakshadweep	59.68	52.79	42.36	34.95	25.04	15.60
7	Pondicherry	53.82	53.25	50.06	41.46	37.40	21.67
	All India	**54.88**	**51.32**	**44.48**	**38.86**	**35.97**	**26.1**

Source : Planning Commission Estimates.

Notes :
1. Poverty Ratio of Assam is used for Sikkim, Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, and Tripura.
2. Poverty Line of Maharashtra and expenditure distribution of Goa is used to estimate Poverty Ratio of Goa.
3. Poverty Line of Himachal Pradesh and expenditure distribution of Jammu & Kashmir is used to estimate poverty ratio of Jammu & Kashmir.
4. Poverty Ratio of Tamilnadu is used for Pondicherry and A & N Islands.
5. Urban Poverty Ratio of Punjab used for both rural and urban Poverty of Chandigarh.
6. Poverty Line of Maharashtra and expenditure distribution of Dadra & Nagar Haveli is used to estimate Poverty Ratio of Dadra & Nagar Haveli.
7. Poverty Ratio of Goa is used for Daman & Diu.

The estimates of poverty have been released from the year 1973-74 onward using the full survey data on household consumption expenditure collected by the National Sample Survey Organization (NSSO) at an interval of approximately five years. The estimates are available for the year 1973-74, 1977-78, 1983, 1987-88, 1993-94 and 1999-2000. The methodology behind these estimates, often termed as "official methodology", has been outlined in the Appendix VI.

The results show that during the last three decades the percentage of population below poverty line has declined significantly in rural areas as well as in urban areas. The 1999-2000 survey results have revealed that 27.09% of rural population and 23.62% of urban population is living below the poverty line.

CHART 15 : PERCENTAGE OF POPULATION BELOW POVERTY LINE

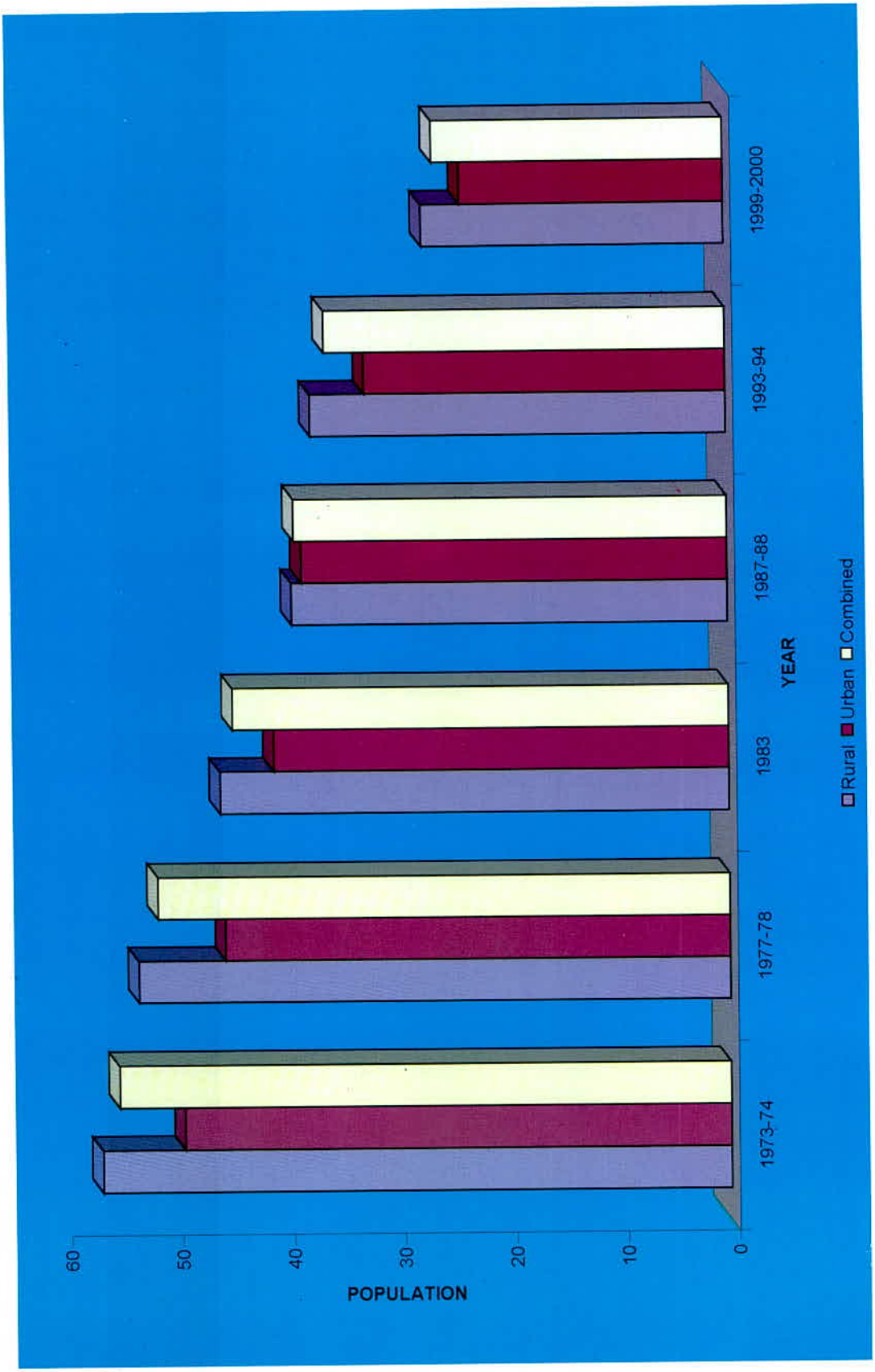


TABLE 7.1.5 : PERCENTAGE DISTRIBUTION OF DEATHS BY MAJOR CAUSE GROUPS, INDIA (RURAL), DURING 1992-98

Sl. No.	Code No.	Major Causes of Deaths	1992	1993	1994	1995	1996	1997	1998
1	2	3	4	5	6	7	8	9	10
1	R	Symptoms, Signs and Abnormal Clinical Findings not Elsewhere Mentioned	26.4	26.2	24.3	18.6	20.6	19.0	18.4
2	J	Diseases of the Respiratory System	14.4	14.4	15.1	16.6	17.8	16.4	17.2
3	A	Infectious and Parasitic Diseases	7.9	12.5	12.0	11.9	10.9	10.0	9.6
4	I	Diseases of Circulatory System	12.7	7.6	8.2	9.5	10.2	12.1	12.5
5	P	Conditions Originating in the Perinatal Period	8.9	10.0	9.0	9.2	7.9	8.7	7.9
6	X	With Venomous Animal Contact	4.5	4.7	5.0	6.0	5.6	5.9	6.7
7	G	Inflamatory Diseases of Central Nervous System	5.0	4.2	5.0	4.8	5.5	6.0	6.0
8	B	Viral Infection	3.2	4.2	4.4	4.7	3.9	3.1	2.4
9	C	Neoplasm	4.9	3.1	3.9	4.2	3.6	4.3	4.3
10	D	Diseases of the Blood and Blood Forming Organs	2.9	3.1	3.0	3.0	3.4	3.2	3.3
11	V	External Causes of Mortality	2.1	2.1	2.2	2.4	2.1	2.3	2.2
12	K	Diseases of the Digestive System	1.4	1.4	1.6	1.6	2.0	2.1	2.1
13	T	Injuries Poisoning and Other Consequences of External Causes	1.2	1.3	1.3	1.4	1.3	1.4	1.3
14	E	Metabolic Diseases	0.6	0.6	0.8	0.9	1.1	1.1	1.1
15	O	Pregnancy Child Birth and Puerperium	0.5	1.1	0.9	0.8	1.0	0.7	0.6
16	N	Diseases of Genitourinary System	0.9	0.5	0.6	0.7	0.8	1.0	1.2
17	F	Mental and Behavioural Disorders	0.4	0.6	0.4	0.5	0.7	0.5	0.6
18	W	Other External Causes of Accidental Injuries	0.3	0.5	0.5	0.5	0.6	0.6	0.7
19	Q	Congenital Malformations, Deformations and Abnormalities	0.4	0.5	0.3	0.3	0.5	0.4	0.4
		Other Medically Certified Deaths	1.4	1.4	1.5	2.4	0.4	1.2	1.7
		Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source : Office of the Registrar General of India.

TABLE 7.2.1 : URBAN-RURAL BREAKUP OF TOTAL POPULATION, NUMBER OF HOUSEHOLDS, LIVING QUARTERS AND AVERAGE SIZE OFHOUSEHOLDS AND PERSONS LIVING IN QUARTERS

Sl. No.	Year	Total Population	No. of Households Quarters**	No. of Living	Av. Size of Households	Av. No of Household Residing Per Living Quarters	Av. No. of Persons Per Living Quarter
1	2	3	4	5	6	7	8
1	1981*						
	Total	665287849	119772545	121782109	5.6	1.0	5.5
	Urban	157680171	28905949	29897491	5.5	1.0	5.3
	Rural	507607678	90866596	91884618	5.6	1.0	5.5
2	1991+						
	Total	838583988	152009467	159425666	5.5	1.0	5.3
	Urban	215771612	40418141	43518317	5.3	1.1	5.0
	Rural	622812376	111591326	115907349	5.6	1.0	5.4

Source : Office of Registrar General of India
* : Excluding Assam
\+ : Excluding J & K
** : No. of Occupied residential houses + No. of Census houses vacant at the time of house listing.

TABLE 7.2.2 : NUMBER OF HOUSEHOLDS, POPULATION AND LIVING QUARTERS WITH RURAL /URBAN BREAKUP

Sl. No.		Number of Households	Population			No. of Houses Vacant at the Time of Houselisting
			Total	Male	Female	
1	2	3	4	5	6	7
1	1981*					
	Total					
	Housing units	119772545	665287849	343930423	321357426	121782109
	Conventional dwelling	119772545	665287849	343930423	321357426	
	Occupied	119772545	665287849	343930423	321357426	113735542#
	Vacant					8046567 $
	Institutions		3790700	3116289	674411	
	Urban					
	Housing units	28905949	157680171	83876403	73803768	29897491
	Conventional dwelling	28905949	157680171	83876403	73803768	
	Occupied	28905949	157680171	83876403	73803768	27604947#
	Vacant					2292544$
	Institutions		2377559	1956711	420848	
	Rural					
	Housing units					91884618
	Conventional dwelling	90866596	507607678	260054020	247553658	86130595#
	Occupied	90866596	507607678	260054020	247553658	
	Vacant					5754023$
	Institutions		1413141	1159578	253563	
2	1991+					
	Total					
	Housing units	152009467	838583988	435216358	403367630	159425666
	Conventional dwelling					
	Occupied					147013766#
	Vacant					12411900$
	Institutions		4252976	3351584	901392	
	Urban					
	Housing units	40418141	215771612	113936953	101834659	43518317
	Conventional dwelling					
	Occupied					39073337#
	Vacant					4444980$
	Institutions		2406841	1893949	512892	
	Rural					
	Housing units	111591326	622812376	321279405	301532971	115907349
	Conventional dwelling					
	Occupied					107940429#
	Vacant					7966920$
	Institutions		1846135	1457635	388500	

Source : Office of the Registrar General of India
: No. of occupied residential houses
$: No. of census house
* : Excluding Assam
+ : Excluding Jammu & Kashmir

TABLE 7.2.3 : OCCUPIED HOUSING UNIT BY NUMBER OF ROOMS PER HOUSING UNIT,TOTAL NUMBER OF ROOMS,AVERAGE SIZE OF HOUSING UNIT AND AVERAGE NUMBER OF PERSONS PER ROOM FOR RURAL AND URBAN AREAS AND MAJOR CITIES (urban agglomeration)

		Occupied Housing Units by Number of Rooms								
	Total Occupied Housing Units	One Room Units	Two Room Units	Three Rooms Units	Four Room Units	Five or More Rooms Units	Unknown	Total No. of Rooms for All Units	Av. Size (Room per Units)	Av. No. of Persons Per Room
1	2	3	4	5	6	7	8	9	10	11
1981*										
Total	118614803	53046175	33948809	14496724	7482461	6852624	2788010	242795971	2.0	2.7
Rate	100.0	44.7	28.6	12.2	6.3	5.8	2.4			
Urban	28541877	13072617	7947026	3484741	1804721	1626979	605793	60924094	2.1	2.6
Rate	100.0	45.8	27.8	12.3	6.3	5.7	2.1			
Rural	90072926	39973558	26001783	11011983	5677740	5225645	2182217	181871877	2.0	2.8
Rate	100.0	44.4	28.9	12.2	6.3	5.8	2.4			
1991+										
Total	151032898	61154743	46180064	20910465	10791101	10608294	1388231			
Rate	100.0	40.5	30.6	13.8	7.2	7.0	0.9			
Urban	39493450	15620078	11992915	5852191	3070829	2751947	205490			
Rate	100.0	39.5	30.4	14.8	7.8	7.0	0.5			
Rural	111539448	45534665	34187149	15058274	7720272	7856347	1182741			
Rate	100.0	40.8	30.7	13.5	6.9	7.0	1.1			
Mumbai										
1981	1580095	1088460	267395	98185	30710	16770	78395	2234755	1.4	3.7
Rate	100.0	68.9	16.9	6.2	1.9	1.1	5.0			
1991	2663015	1886150	538090	170745	46260	21530	240			
Rate	100.0	70.8	20.2	6.4	1.7	0.8	0.01			
Calcutta										
1981	1713255	965255	413990	158000	70985	50800	54225	2992665	1.7	3.1
Rate	100.0	56.3	24.2	9.2	4.1	3.0	3.2			
1991	2150290	1185565	522980	225440	105325	106115	4865			
Rate	100.0	55.2	24.3	10.5	4.9	4.9	0.2			
Delhi										
1981	1116796	615415	291972	123108	52889	31755	1657	2072817	1.9	2.8
Rate	100.0	55.1	26.2	11.0	4.7	2.8	0.2			
1991	1689166	756596	456325	262271	122691	88363	2920			
Rate	100.0	44.8	27.0	15.5	7.3	5.2	0.2			
Chennai										
1981	831535	379660	248275	109140	55435	39000	25	1661270	2.0	2.6
Rate	100.0	45.6	29.9	13.1	6.7	4.7	N			
1991	1080695	445250	343435	163275	81595	46945	195			
Rate	100.0	41.2	31.8	15.1	7.6	4.3	0.0			

Source : Office of the Registrar General of India
* : Excuding Assam Excluding houseless and Institutional Households + : Excluding J & K Excluding Institutional households
Note : Unknown also Includes households with no exclusive rooms.

TABLE 7.2.4 : SHORTAGE OF HOUSING IN URBAN AREAS

(As on 01-03-91)

Sl. No.	Name of the City	Total House-holds	No. of Houses	Housing Shortage*	Congestion Factor	Obsole-scense Factor	Total Shortage	Shortage (In Million)
1	2	3	4	5	6	7	8	9
1	Greater Mumbai	2683855	2650850	78069	1282239	111336	317644	0.318
2	Kolkata	2163096	2138750	52150	103356	89828	245333	0.245
3	Delhi	1701338	1633300	227448	81293	68599	377339	0.377
4	Chennai	1084963	1071255	127261	51841	44993	224095	0.224
5	Hydrabad	695173	674090	44811	33216	28312	106339	0.106
6	Bangalore	798807	793310	34294	38168	33319	105781	0.106
7	Ahmedabad	666107	649005	31510	31828	27258	90596	0.091
8	Pune	493456	489775	13574	23578	20571	57723	0.058
9	Kanpur	358794	355360	15978	17144	14925	48047	0.048
10	Nagpur	301567	287825	26003	14409	12089	52501	0.053
11	Lucknow	300622	299090	17144	14364	12562	44070	0.044
12	Surat	286817	270350	27362	13705	11355	52421	0.052
13	Jaipur	267324	266410	8880	12773	11189	32842	0.033
14	Cochin	210582	206525	17419	10062	8674	36155	0.036
15	Vadodara	218627	187030	35936	10446	7855	54238	0.054
16	Indore	182438	180905	8516	8717	7598	24831	0.025
17	Coimbatore	232461	231540	9349	11107	9725	30181	0.030
18	Patna	165538	154270	19228	7910	6479	33617	0.034
19	Madurai	200058	198975	15867	9559	8357	33783	0.034
20	Bhopal	196232	193605	19374	9376	8131	36882	0.037
21	Vishakhapatnam	221048	219750	62498	10562	9230	82290	0.082
22	Ludhiana	165866	147805	20943	7925	6208	35076	0.035
23	Varanasi	133656	121270	13696	6386	5093	25175	0.025
	Total	**13728425**	**13421045**	**927310**	**655966**	**563684**	**2146959**	**2.147**

Source : National Building Organization, Ministry of Urban Affairs & Employment

* : Without Congestion and obsolescence factor.

Notes :

1. These estimates are based on provisional data.
2. Due to non-availability of data, CONGESTION factor has been wòrked out on the basis of 1991 Congestion factor for urban area.
3. Dilapidation/OBSOLESCENCE Factor has been worked out based on this factor for urban areas.

TABLE 7.2.5 : STATE-WISE URBAN HOUSING SHORTAGE PROJECTIONS DURING NINTH FIVE-YEAR PLAN (1997-2001)

(In Million)

Sl. No.	Name of State/ U.T.s	1997	1998	1999	2000	2001
1	2	3	4	5	6	7
	States					
1	Andhra Pradesh	1.01	0.98	0.96	0.93	0.89
2	Arunachal Pradesh	0.02	0.02	0.02	0.02	0.02
3	Assam	0.15	0.14	0.14	0.13	0.13
4	Bihar	0.41	0.40	0.39	0.38	0.36
5	Goa	0.01	0.01	0.01	0.01	0.01
6	Gujarat	0.32	0.31	0.30	0.29	0.28
7	Haryana	0.12	0.12	0.11	0.11	0.10
8	Himachal Pradesh	0.01	0.01	0.01	0.01	0.01
9	Jammu & Kashmir	0.11	0.11	0.11	0.10	0.10
10	Karnataka	0.42	0.41	0.40	0.39	0.37
11	Kerala	0.32	0.31	0.30	0.29	0.28
12	Madhya Pradesh	0.37	0.36	0.35	0.34	0.32
13	Maharashtra	0.78	0.76	0.74	0.72	0.69
14	Manipur	0.03	0.03	0.03	0.02	0.02
15	Meghalaya	0.01	0.01	0.01	0.01	0.01
16	Mizoram	0.01	0.01	0.01	0.01	0.01
17	Nagaland	0.01	0.01	0.01	0.01	0.01
18	Orissa	0.26	0.25	0.24	0.24	0.23
19	Punjab	0.16	0.16	0.16	0.15	0.15
20	Rajasthan	0.26	0.25	0.24	0.24	0.23
21	Sikkim	0.00	0.00	0.00	0.00	0.00
22	Tamil Nadu	0.95	0.92	0.90	0.87	0.83
23	Tripura	0.03	0.03	0.03	0.02	0.02
24	Uttar Pradesh	0.88	0.86	0.84	0.81	0.77
25	West Bengal	0.52	0.51	0.50	0.48	0.46
	Union Territories					
1	Andaman & Nicobar Islands	0.00	0.00	0.00	0.00	0.00
2	Chandigarh	0.03	0.03	0.03	0.02	0.02
3	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00
4	Daman and Diu	0.00	0.00	0.00	0.00	0.00
5	Delhi	0.33	0.32	0.31	0.30	0.29
6	Lakshadweep	0.00	0.00	0.00	0.00	0.00
7	Pondicherry	0.04	0.03	0.03	0.03	0.03
	All-India	**7.57**	**7.36**	**7.18**	**6.93**	**6.64**

Source : NBO/Working Group on Urban Housing for the 9th Five year Plan

TABLE 7.2.6 : NUMBER OF HOMELESS HOUSEHOLDS AND POPULATION SEXWISE WITH RURAL/URBAN BREAK-UP

Sl. No.		Numbers of Homeless households	Homeless Population		
			Total	Male	Female
1	2	3	4	5	6
1	**1981***				
	Total	629929	2342954	1376512	966442
	Urban	209520	618843	406154	212689
	Rural	420409	1724111	970358	753753
2	**1991+**				
	Total	522445	2007489	1180368	827121
	Urban	216917	725592	471077	254515
	Rural	305528	1281897	709291	572606

Source : Office of the Registrar General of India

* : Excluding Assam

\+ : Excludes Jammu & Kashmir

TABLE 7.2.7 : SIZE/CLASS-WISE IDENTIFIED/ESTIMATED SLUM POPULATION IN 1991.

(Population in Lakh)

Sl. No.	Size-class Category of Cities/Towns Towns	No. of Cities/ lation	Total Popu- lation	Slum Popu- Population	Percentage to Total Population	Percentage of Total Slum
1	2	3	4	5	6	7
1	>10 Lakh population	23	709.966	188.659	26.6	41.3
2	5-10 lakh population	31	214.500	42.555	19.8	9.3
3	3-5 lakh population	39	151.239	28.596	18.9	6.3
4	1-3 lakh population	207	325.139	54.493	16.8	11.9
	Total class-I	300	1400.844	314.303	22.4	68.8
5	50,000 to 99,999 population	345	236.288	47.151	20	10.3
6	<50,000 population	3052	520.581	95.232	18.3	20.9
	Total	3697	2157.713*	456.686*	21.2	100

Source : A Compendium on Indian Slums, 1996, Town and Country Planning Organisation
* : Excluding Jammu & Kashmir

The existence of slums is essentially manifestation of poverty, alongwith the economic growth and with industrial development, slums will continue to exist. Inspite of the efforts to contain the number of slum dwellers, it has been increasing fast which is causing tremendous pressure on urban basic services and infrastructure. The Slum population in the country as on 1991 was of the order of 463 lakh constituting nearly 21 percent of the urban population.The distribution of urban population indicates the preponderance of slum dwellers in the 23 metropolitan cities of the country which accommodate about 26.6 percent of the total population of these centres. The sprouting of slums in urban areas is the direct outcome of better economic opportunities available in cities and towns.

TABLE 7.2.8 : ALL INDIA AND STATEWISE SLUM POPULATION 1993-94 * (Jan-Jun 1993)

(In Million)

Sl. No.	Name of State/ U.T.s	Rural	Urban	Total
1	2	3	4	5
1	Andhra Pradesh	5.67	3.70	9.37
2	Arunachal Pradesh	—	—	—
3	Assam	0.02	0.10	0.12
4	Bihar	4.21	0.90	5.11
5	Goa	—	—	—
6	Gujarat	0.69	0.99	1.68
7	Haryana	0.21	0.58	0.79
8	Himachal Pradesh	—	0.02	0.02
9	Jammu & Kashmir	—	—	—
10	Karnataka	0.28	2.77	3.05
11	Kerala	0.08	0.12	0.20
12	Madhya Pradesh	0.21	1.41	1.62
13	Maharashtra	3.55	6.86	10.41
14	Manipur	—	—	—
15	Meghalaya	0.02	0.05	0.07
16	Mizoram	—	—	—
17	Nagaland	—	—	—
18	Orissa	1.43	0.66	—
19	Punjab	—	0.21	0.21
20	Rajasthan	—	0.43	0.43
21	Sikkim	—	0.01	0.01
22	Tamil Nadu	0.86	2.16	3.02
23	Tripura	0.01	—	0.01
24	Uttar Pradesh	0.87	1.16	2.03
25	West Bengal	0.30	3.70	4.00
26	Andaman & Nicobar Islands	—	—	—
27	Chandigarh	—	0.04	0.04
28	Dadra & Nagar Haveli	—	—	—
29	Daman and Diu	—	—	—
30	Delhi	—	2.03	2.03
31	Lakshadweep	—	—	—
32	Pondicherry	0.01	—	0.01
	All-India	**18.42**	**27.90**	**44.23**

Source : NSS, 49th Round (Jan-Jun 1993)

* : Estimates of Slum population have been arrived at by multiplying the estimated no. of households in slums to be estimated household size as given by NSSO on the basis of its 49th round (Jan-Jun 1993) Survey.

TABLE 7.2.9 : STATE-WISE IDENTIFIED/ ESTIMATED SLUM POPULATION

(Population in lakh)

Sl. No.	State/Uts	1981			1991			2001		
		Urban Population	Identified Slum Population	% age	Urban Population	Estimated Slum Population	% age	Urban Population	Estimated Slum Population	% age
1	2	3	4	5	6	7	8	9	10	11
	States	**1528.805**	**260.202**	**17.0**	**2078.830**	**436.460**	**21.0**	**2769.377**	**580.669**	**21.0**
1	Andhra Pradesh	124.876	28.579	22.9	178.871	43.133*	24.1	249.654	60.166	24.1
2	Arunachal Pradesh	0.414	Nil	Nil	1.106	0.221	20.0	1.879	0.375	20.0
3	Assam	17.824	1.236	6.9	24.878	4.483+	18.0	32.367	5.826	18.0
4	Bihar	87.190	32.699	37.5	113.530	26.906	23.7	149.556	35.444	23.7
5	Goa	3.518	0.242	6.9	4.798	0.833	17.4	6.559	1.141	17.4
6	Gujarat	106.017	15.316	14.4	142.461	25.814*	18.1	189.993	34.388	18.1
7	Haryana	28.274	2.742	9.7	40.547	6.843*	16.9	59.572	10.067	16.9
8	Himachal Pradesh	3.260	0.761	23.3	4.492	1.258+	28.0	5.765	1.614	28.0
9	Jammu & Kashmir	12.604	6.270	49.7	18.394	5.922	32.2	24.173	7.783	32.2
10	Karnataka	107.296	5.745	5.4	139.078	12.934	9.3	190.989	17.761	9.3
11	Kerala	47.713	4.101	8.6	76.803	12.218	15.9	103.474	16.452	15.9
12	Madhya Pradesh	105.865	10.749	10.2	153.388	21.029	13.7	204.050	27.954	13.7
13	Maharashtra	219.936	43.149	19.6	305.416	78.724	25.8	416.155	107.367	25.8
14	Manipur	3.755	0.165	4.4	5.056	0.853	16.9	6.702	1.132	16.9
15	Meghalaya	2.413	0.660	27.4	3.300	0.833+	25.2	4.608	1.161	25.2
16	Mizoram	1.218	Nil	Nil	3.179	0.572	18.0	6.424	1.156	18.0
17	Nagaland	1.202	Nil	Nil	2.082	0.416	20.0	3.049	0.609	20.0
18	Orissa	31.103	2.820	9.1	42.350	8.432*	19.9	56.320	11.207	19.9
19	Punjab	46.478	11.668	25.1	59.932	14.144*	23.6	80.241	18.936	23.6
20	Rajasthan	72.105	10.252	14.2	100.671	24.000+	23.8	137.193	32.651	23.8
21	Sikkim	0.511	0.024	4.7	0.370	0.095+	25.7	0.479	0.123	25.7
22	Tamil Nadu	159.519	26.760	16.8	190.776	35.713*	18.7	233.080	43.585	18.7
23	Tripura	2.256	0.184	8.2	4.217	0.744*	17.6	5.078	0.893	17.6
24	Uttar Pradesh	198.991	25.800	13.0	276.059	58.391*	21.1	365.397	77.098	21.1
25	West Bengal	144.467	30.280	21.0	187.076	51.949	27.8	236.620	65.780	27.8
	Uts	**65.821**	**18.942**	**28.8**	**97.277**	**26.148**	**26.9**	**140.060**	**37.589**	**26.8**
26	A. & N. Island	0.496	Nil	Nil	0.750	0.349+	46.5	1.102	0.512	46.5
27	Chandigarh	4.228	Nil	Nil	5.758	1.612	28.0	7.618	2.133	28.0
28	Dadra & Nagar Haveli	0.069	Nil	Nil	0.117	0.023	19.7	0.199	0.039	19.6
29	Daman and Diu**	Nil	Nil	Nil	0.475	0.095	20.0	0.698	0.139	19.9
30	Delhi	57.682	18.000	31.2	84.716	22.480+	26.5	122.891	32.566	26.5
31	Lakshadweep	0.186	Nil	Nil	0.291	0.058+	19.9	0.362	0.072	19.9
32	Pondicherry	3.160	0.942	29.8	5.170	1.531	29.6	7.190	2.128	29.6
	Grand Total	**1594.626**	**279.144**	**17.5**	**2176.107**	**462.608**	**21.3**	**2909.437**	**618.258**	**21.3**

Source : A Compendium on Indian Slums ,1996, Town and Country Planning Organisation

\+ : Figures of identified/estimated slum population have been furnished (for the state as a whole) by the respective State Governments.

* : Slum population estimates are based on the information (for Class-I and Class-II cities/towns) received from the State/Ut's Government for the Year 1991.

** : Figures of 1981 have already been included in Goa.

TABLE 7.2.10 : STATE-WISE IDENTIFIED/ESTIMATED PERCENTAGE DISTRIBUTION OF SLUM POPULATION ACCORDING TO SIZE/CLASS CATEGORIES OF CITIES/TOWNS IN 1991

Sl. No.	States/Uts. Class I	Percentage Distribution			Total Slum
		Class II	Others	Population (in lakhs)	
1	2	3	4	5	6
1	Andhra Pradesh	63.3	15.5	21.2	43.133
2	Arunachal Pradesh	-	-	100.0	0.221
3	Assam	62.5	16.1	21.4	4.483
4	Bihar	68.4	18.6	13.0	26.906
5	Goa	-	7.3	92.7	0.833
6	Gujarat	72.4	12.2	15.4	25.814
7	Haryana	52.5	22.4	25.1	6.843
8	Himachal Pradesh	27.2	-	72.8	1.258
9	Jammu & Kashmir	-	-	-	-
10	Karnataka	72.3	8.8	18.9	12.934
11	Kerala	50.4	2.7	46.9	12.218
12	Madhya Pradesh	48.5	16.1	35.4	21.029
13	Maharashtra	82.5	4.5	13.0	78.724
14	Manipur	25.0	-	75.0	0.853
15	Meghalaya	50.4	-	49.6	0.833
16	Mizoram	48.8	-	51.2	0.572
17	Nagaland	-	46.9	53.1	0.416
18	Orissa	43.0	15.4	41.6	8.432
19	Punjab	65.3	18.7	16.0	14.144
20	Rajasthan	51.2	5.5	43.3	24.000
21	Sikkim	-	-	100.0	0.095
22	Tamil Nadu	67.8	13.2	19.0	35.713
23	Tripura	33.6	-	66.4	0.744
24	Uttar Pradesh	53.9	14.8	31.3	58.391
25	West Bengal	87.2	4.1	8.7	51.949
	Total States	**67.1**	**10.8**	**22.1**	**430.538**
26	Andaman & Nicobar Islands	-	100.0	-	0.349
27	Chandigarh	100.0	-	-	1.612
28	Dadra & Nagar Haveli	-	-	100.0	0.023
29	Daman and Diu	-	-	100.0	0.095
30	Delhi	100.0	-	-	22.480
31	Lakshadweep	-	-	100.0	0.058
32	Pondicherry	76.9	14.4	8.6	1.531
	Total Uts	**96.6**	**2.2**	**1.2**	**26.148**
	Grand Total	**68.8**	**10.3**	**20.9**	**456.686***

Source : A Compendium on Indian Slums, 1996, Town and Country Planning Organisation
* : Excluding Jammu & Kashmir

TABLE 7.2.11 : ESTIMATED SLUM POPULATION IN METROPOLITAN CITIES

(Population in lakh)

Sl. No.	Name of City	1981			1991			2001*		
		Total Population	Slum Population	%age	Total Population	Slum Population	%age	Total Population	Slum Population	%age
1	2	3	4	5	6	7	8	9	10	11
1	Kolkata UA	91.940	30.280	32.9	110.219	36.262 @	32.9	131.147	43.147	32.9
2	Greater Mumbai UA	89.887	30.831	34.3	125.962	43.205 @	34.3	170.701	58.550	34.3
3	Delhi UA	57.228	18.000	31.5	84.191	22.480	26.7	122.204	32.628	26.7
4	Chennai UA	42.893	13.769	32.1	54.220	15.251	28.1	69.823	19.620	28.1
5	Hyderabad UA	25.500	5.000	19.6	43.444	8.593	19.8	62.964	12.466	19.8
6	Bangalore UA	29.218	3.650	12.5	41.303	5.162	12.5	63.597	7.949	12.5
7	Ahmedabad UA	25.480	5.172	20.3	33.122	6.724 @	20.3	43.629	8.859	20.3
8	Pune UA	17.222	2.807	16.3	24.940	4.065 @	16.3	35.299	5.753	16.3
9	Kanpur UA	16.391	6.140	37.5	20.299	4.172	20.6	24.875	5.124	20.6
10	Lucknow UA	10.076	2.850	28.3	16.692	2.778	16.6	22.581	3.748	16.6
11	Nagpur UA	12.195	3.890	31.9	16.640	5.308 @	31.9	23.212	7.405	31.9
12	Jaipur UA	10.152	2.958	29.1	15.182	4.418 @	29.1	22.108	6.433	29.1
13	Surat UA	9.239	2.347	25.4	15.190	3.858 @	25.4	22.916	5.821	25.4
14	Coimbatore UA	9.204	0.801 +	8.7	11.007	0.958	8.7	13.283	1.156	8.7
15	Cochin UA	8.249	2.046	24.8	11.406	2.829 @	24.8	15.364	3.810	24.8
16	Vadodara UA	7.449	1.182	15.9	11.268	2.063	18.3	17.074	3.125	18.3
17	Indore UA	8.293	1.263	15.2	11.091	1.686 @	15.2	15.430	2.345	15.2
18	Patna UA	9.189	5.837	63.5	10.996	6.982 @	63.5	15.273	9.698	63.5
19	Madurai UA	9.077	1.634 +	18.0	10.859	1.953	18.0	13.134	2.364	18.0
20	Bhopal UA	6.710	0.568	8.5	10.628	1.487 **	14.0	15.327	2.145	14.0
21	Vishakhapatnam UA	6.036	1.520	25.2	10.571	2.664	25.2	16.683	4.204	25.2
22	Varanasi UA	7.972	2.600	32.6	10.309	2.074	20.1	13.314	2.676	20.1
23	Ludhiana	6.071	3.104	51.1	10.427	3.687	35.4	16.342	5.785	35.4
	Total	**515.671**	**148.249**	**28.7**	**709.966**	**188.659**	**26.6**	**966.280**	**254.811**	**26.4**

Source : T.C.P.O., Ministry of Urban Affairs & Employment

@ : Based on the percentage identified slum population of 1981.

\+ : Based on the percentage identified slum population of 1991.

** : Based on the no. of identified Jhuggi collected by the State Govt. in 1991-92

* : Estimated

Note

Classification of the size of cities is based on 1991 census.

TABLE 7.2.12 : OCCUPIED HOUSING UNITS BY WATER SUPPLY SYSTEM AND TOILET INSTALLATION BY RURAL AND URBAN CITIES

Sl. No.		Total Occupied Housing Unit	Water Supply System With Piped Water			Toilet Installation	
			Total	Inside	Outside	With Toilet of Any Type Any Type	Without Toilet of
1	2	3	4	5	6	7	8
1	**1981***						
	Total	118614803	27317532	12851006	14466526		
	Percentage	100.0	23.0	10.8	12.2		
	Urban	28541877	18049114	10302247	7746867	16596103	11945774
	Percentage	100.0	63.2	36.1	27.1	58.1	41.9
	Rural	90072926	9268418	2548759	6719659		
	Percentage	100.0	10.3	2.8	7.5		
2	**1991+**						
	Total	151111383	48745490	23414175	25331315	35819780	115291603
	Percentage	100.0	32.3	15.5	16.8	23.7	76.3
	Urban	39523184	25713794	16691096	9022698	25236449	14286735
	Percentage	100.0	65.1	42.3	22.8	63.9	36.1
	Rural	111588199	23031696	6723079	16308617	10583331	101004868
	Percentage	100.0	20.6	6.0	14.6	9.5	90.5

Source : Office of the Registrar General of India

* : Excluding Assam, Excluding Institutional and houseless households

\+ : Excluding J&K

Access to safe drinking water remains an urgent need as only 65.1% of occupied housing unit in urban areas received organized piped water supply and rest have to depend on surface or ground water which is untreated. The situation in rural areas is much worst. In India, almost all surface water sources are contaminated and unfit for human consumption. The diseases commonly caused due to contaminated water are diarrhea, trachoma, intestine worms, hepatitis. Inadequate access to safe drinking water and sanitation facilities leads to infant mortality and intestinal diseases.

TABLE 7.2.13 : STATEWISE PERCENTAGE DISTRIBUTION OF URBAN SLUM BY BASIC AMENITIES

Sl. No.	State	Basic Amenities		
		Safe Drinking Water	Electricity	Toilet Facility
1	2	3	4	5
1	Andhra Pradesh	86.8	6.3	33.7
2	Assam	—	34.8	92.2
3	Bihar	88.5	54.2	—
4	Gujarat	64.2	48.1	53.1
5	Haryana	100.0	14.4	42.6
6	Himachal Pradesh	—	—	—
7	karnataka	95.2	72.5	17.6
8	Kerala	—	—	—
9	Madhya Pradesh	79.5	26.9	11.8
10	Maharashtra	98.3	21.0	76.6
11	Meghalaya	—	—	100.0
12	Orissa	89.7	13.1	—
13	Punjab	100.0	56.4	—
14	Rajasthan	100.0	21.5	38.0
15	Sikkim	—	—	100.0
16	Tamilnadu	73.0	31.9	16.9
17	Uttar Pradesh	93.5	5.4	27.7
18	West Bengal	100.0	20.8	82.8
19	Chandigarh	—	—	100.0
20	Delhi	100.0	4.6	57.5
	All India	**91.5**	**26.1**	**45.2**

Source : Report No. 417, NSS 49th Round (Jan.-Jun 1993)

TABLE 7.2.14 : POPULATION COVERED WITH DRINKING WATER AND SANITATION FACILITIES

(Jan.-June 1998)

Sl. No.	State	Sanitation Facility (% of Population Using Latrine)		Drinking Water (% of Population Having Drinking Water Within the Premises)	
		Rural	Urban	Rural	Urban
1	2	3	4	5	6
1	Andhra Pradesh	11.5	69.2	18.2	42.7
2	Assam	75.3	98.0	52.8	80.9
3	Bihar	10.6	54.7	43.1	58.4
4	Gujarat	20.1	78.9	41.1	79.9
5	Haryana	15.5	67.1	30.0	83.2
6	Karnataka	11.1	70.0	18.9	59.0
7	Kerala	76.9	94.9	56.7	68.9
8	Madhya Pradesh	5.4	54.8	14.5	59.5
9	Maharashtra	14.2	84.2	30.3	77.5
10	Orissa	3.9	64.2	12.9	42.7
11	Punjab	32.1	85.2	83.4	93.8
12	Rajasthan	13.0	74.5	17.0	80.7
13	Tamil Nadu	11.5	67.5	17.5	49.7
14	Uttar Pradesh	9.4	71.8	51.1	76.5
15	West Bengal	23.9	84.8	26.3	48.9
16	North-East *	81.9	97.6	29.9	51.2
17	North-Western #	38.3	88.1	39.6	83.2
18	Southern @	32.7	72.1	43.7	72.7
	All-India	**17.5**	**74.5**	**33.7**	**65.9**

Source : NSS 54th Round, January - June 1998

* : North-Eastern Group : Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim & Tripura

'# : North-Western Group : J&K, H.P., Chandigarh and Delhi

'@ : Southern Group : A&N Islands, Dadra & Nagar Haveli, Goa, Daman & Diu, Lakshadweep and Pondicherry

TABLE 7.2.15 : STATE-WISE ESTIMATED ANNUAL REQUIREMENT OF WATER FOR DOMESTIC PURPOSES INCLUDING FOR CATTLE IN DIFFERENT STATES

(In BCM)

Sl. No.	State/UT	Population		Water Requirement	
		1991	2001	1991	2001
1	2	3	4	5	6
1	Andhra Pradesh	66508008	75727541	2.50	3.20
2	Arunachal Pradesh	864558	1091117	0.03	0.05
3	Assam	22414322	26638407	0.84	1.13
4	Bihar	86374465	82878796	3.25	3.50
5	Chandigarh	642015	900914	0.02	0.04
6	Chhatisgarh	@	20795956	@	0.88
7	Goa	1169793	1343998	0.04	0.06
8	Gujarat	41309582	50596992	1.55	2.14
9	Haryana	16463648	21082989	0.62	0.89
10	Himachal Pradesh	5170877	6077248	0.19	0.26
11	Jammu & Kashmir	7718700	10069917	0.29	0.43
12	Jharkhand	@	26909428	@	1.14
13	Karnataka	44977201	52733958	1.69	2.23
14	Kerala	29098518	31838619	1.09	1.34
15	Madhya Pradesh	66181170	60385118	2.49	2.55
16	Maharashtra	78937187	96752247	2.97	4.09
17	Manipur	1837149	2388634	0.07	0.10
18	Meghalaya	1774778	2306069	0.07	0.10
19	Mizoram	689756	891058	0.03	0.04
20	Nagaland	1209546	1988636	0.05	0.08
21	Orissa	31659736	36706920	1.19	1.55
22	Punjab	20281969	24289296	0.76	1.03
23	Rajasthan	44005990	56473122	1.66	2.39
24	Sikkim	406457	540493	0.02	0.02
25	Tamil Nadu	55858946	62110839	2.10	2.62
26	Tripura	2757205	3191168	0.10	0.13
27	Uttar Pradesh	139112287	166052859	5.23	7.01
28	Uttaranchal	@	8479562	@	0.36
29	West Bengal	68077965	80221171	2.56	3.39
30	Andaman & Nicobar Islands	280661	356265	0.01	0.02
31	Dadra & Nagar Haveli	138477	220451	0.01	0.01
32	Lakshadweep	51707	60595	0.00	0.00
33	Pondicherry	807785	973829	0.03	0.04
34	Delhi	9420644	13782976	0.35	0.58
35	Daman & Diu	101586	158059	0.00	0.01
	All India	**846302688**	**1027015247**	**31.84**	**43.38**

Source : Central Water Commission
Estimated on the basis of the report of the Standing Sub-Committee for assessment of availability and requirement of Water for diverse uses in the Country, 2000.

BCM : Billion Cubic Metres
@ : Three States namely Jharkhand, Uttaranchal, and Chhatisgarh have been formed after 1991 as such their population as well as water requirment in year 1991 have been included in the respective States (i.e.) Chhatisgarh in MP, Jharkhand in Bihar and Utranchal in Uttar Pardesh.

TABLE 7.2.16 : PROGRESS OF COVERAGE OF PROBLEM VILLAGES WITH SUPPLY OF DRINKING WATER

Sl. No.	Name of State/UT	Total No. of Villages (1981 Census)	Villages with Drinking Water Facility as on 1-4-80	Problem Villages as on 1-4-80	Coverage of PVs during VI Plan	Problem Villages as on 1-4-80	Coverage of PVs during VII Plan (1985-90)	Problem Villages Balance as on 1-4-90	Coverage of PVs during (1990-91)	Coverage of PVs during (1991-92)	Coverage of PVs during (1993-94)	Coverage of PVs during (1993-94)	Coverage of PVs during (1994-95)	Problem Villages Balance as on 1-4-90
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Andhra Pradesh	27379	19173	8206	8094	15834	15834	0	0	0	0	0	—	0
2	Arunachal Pradesh	3257	1517	1740	1467	391	391	0	0	0	0	0	—	0
3	Assam*	—	6252	15743	8654	9570	9126	444	356	74	4	5	2	3
4	Bihar	67546	52352	15194	14172	9199	9155	44	37	7	0	0	—	0
5	Goa	386	334	52	57	31	31	0	0	0	0	0	—	0
6	Gujarat	18114	12796	5318	4492	4911	4812	99	47	24	17	2	—	9
7	Haryana	6745	3305	3440	2122	2314	2143	171	96	75	0	0	—	0
8	Himachal Pradesh	16807	8992	7815	4997	3539	2432	1107	310	460	337	0	—	0
9	Jammu & Kashmir	6477	1779	4698	2028	2959	2054	905	243	341	93	76	107	45
10	Karnataka	27028	11572	15456	15443	5410	5410	0	0	0	0	0	—	0
11	Kerala	1219	61	1158	1142	88	87	1	1	0	0	0	—	0
12	Madhya Pradesh	71352	46408	24944	23845	14714	14568	146	63	48	35	0	—	0
13	Maharashtra	39354	26419	12935	12016	5174	5076	98	46	13	17	0	—	22
14	Manipur	2035	823	1212	819	862	862	0	0	0	0	0	0	0
15	Meghalaya	4902	1975	2927	690	3658	2237	1421	406	240	491	210	20	54
16	Mizoram	721	507	214	127	595	527	68	68	0	0	0	—	0
17	Nagaland	1112	463	649	424	623	597	26	7	19	0	0	—	0
18	Orissa	46553	22937	23616	22357	14443	13123	1320	219	551	530	20	—	0
19	Punjab	12342	10575	1767	537	2254	1306	948	164	276	508	0	—	0
20	Rajasthan	34968	15165	19803	16043	7310	6910	400	261	50	25	51	—	13
21	Sikkim	440	144	296	212	121	114	7	7	0	0	0	—	0
22	Tamil Nadu	15831	9182	6649	6649	4882	4864	18	18	0	0	0	—	0
23	Tripura	856	1927	2800	2486	2893	2763	130	120	0	7	0	3	0
24	Uttar Pradesh	112566	84061	28505	27143	43906	42894	1012	563	187	154	108	—	0
25	West Bengal	38024	12781	25243	15628	5930	5930	0	0	0	0	0	—	0
26	Andaman & Nicobar Islands	491	318	173	173	40	40	0	0	0	0	0	—	0
27	Chandigarh	24	24	0	0	0	0	0	0	0	0	0	—	0
28	Dadra & Nagar Haveli	70	70	0	0	0	0	0	0	0	0	0	—	0
29	Lakshadweep	7	7	0	0	11	11	0	0	0	0	0	—	0
30	Pondicherry	291	173	118	111	53	53	0	0	0	0	0	—	0
31	Delhi	214	115	99	89	0	0	0	0	0	0	0	—	0
32	Daman & Diu	26	12	14	7	7	7	0	0	0	0	0	—	0
	All India	**557137**	**352219**	**230784**	**192024**	**161722**	**153357**	**8365**	**3032**	**2365**	**2218**	**472**	**132**	**146**

Source : Ministry of Rural Areas and Employment

Problem Villages : Problem villages means where drinking water is not available with in a radius of 1.6 km in plain areas and within elevation difference of 100 m in hilly areas

* : Census could not be held in 1981 due to disturbed conditions.

In India, about 78% of the urban population has access to safe drinking water and about 38% of the urban population has access to sanitation services. In the rural areas approximately 35% have access to water supply and about 12% have access to sanitation services. Monitoring done by CPCB for many rivers and wells in India has revealed that the total coliform count far exceeds the desired level in water fit for human consumption. Water for human consumption should usually contain zero fecal coliform per 100 milliliter sample, and bathing water and water for irrigation should contain less than 1000 fecal coliform per 100 milliliter sample. Almost all rivers however, do not meet the standards for safe drinking water (CPCB 1990). The impact of drinking water pollution is more severe on the poor.

TABLE 7.3.1 : HAZARDOUS WASTE REGULATORY QUANTITIES

Waste Category (Numbers)	Types of Wastes	Regulatory Quantities
1	2	3
1	Cyanide wastes	1 kilogram per year calculated as cyanide
2	Metal finishing wastes	10 kilograms per year the sum of the specified substance 'calculated as pure metal
3	Waste containing water soluble chemical compounds of lead, copper, zinc, chromium, nickle,selenium, bariumand antimony	10 kilograms per year the sum of the specified substance 'calculated as pure metal
4	Mercury, arsenic, thallium, and cadmium bearing wastes	5 kilograms per year the sum of the specified substance 'calculated as pure metal
5	Non-halogenated hydrocarbons including solvents	200 kilograms per year calculated as non-halogenated 'hydrocarbons
6	Halogenated hydrocarbons including solvents	50 kilograms per year calculated as halogenated 'hydrocarbons
7	Wastes from paints, pigments, glue, varnish and printing ink	250 kilograms per year calculated as oil or oil emulsions
8	Wastes from dyes and dye intermediates containing inorganic chemical compounds	200 kilograms per year calculated as inorganic chemicals
9	Wastes from dyes and dye intermediates containing organic chemical compounds	50 kilograms per year calculated as organic chemicals
10	Waste oils and oil-emulsions	1000 kilograms per year calculated as oil and oil emulsions
11	Tarry wastes from refining and tar residues from distillation or pyrolytic treatment	200 kilograms per year calculated as tar
12	Sludge arising from treatment of waste water containing heavy metals, toxic organics, oils, emulsions, and spend chemicals and incineration ash	Irrespective of any quantity
13	Phenols	5 kilograms per year calculated as phenols
14	Asbestos	200 kilograms per year calculated as asbestos
15	Wastes from manufacture of pesticides, herbicides, and residues from pesticides and herbicide formulation units.	5 kilograms per year calculated as pesticides and their intermediate products
16	Acidic/alkaline/slurry wastes	200 kilograms per year calculated as acids/alkalies
17	Off-specification and discarded products	Irrespective of any quantity
18	Discarded containers and container liners of hazardousand toxic wastes	Irrespective of any quantity

Source : TERI Energy Data Directory and Yearbook 2002-2003

TABLE 7.3.2 : TOTAL AMOUNT OF SOLID WASTE COLLECTED AND THE COLLECTION EFFICIENCY IN SOME TOWNS/CITIES IN INDIA

Sl. No.	Town	Population (1981)	Solid Waste (Tonnes)		Collection Efficiency % age
			Generated	Collected	
1	2	3	4	5	6
1	Mumbai	8227332	3200	3100	96.9
2	Chennai	4276635	1819	1637	90.0
3	Bangalore	2913537	1800	1225	68.1
4	Ahmedabad	2515195	1200	1080	90.0
5	Kanpur	1688424	2142	1500	70.0
6	Pune	1685300	1000	700	70.0
7	Lucknow	1006538	600	500	83.3
	Total		**11761**	**9742**	**82.8**
1	Coimbatore	917155	175	113	64.6
2	Madurai	904362	310	160	51.6
3	Indore	827071	120	100	83.3
4	Baroda	744043	321	193	60.1
5	Cochine	685686	230	120	52.2
6	Bhopal	672329	321	300	93.5
7	Tiruchi	607815	130	60	46.2
8	Calicut	546060	200	75	37.5
9	Meerut	538461	120	70	58.3
10	Hubli-Dharwad	526493	75	60	80.0
11	Trivendrum	519766	120	75	62.5
12	Salem	515021	130	25	19.2
13	Mysore	476446	204	122	59.8
14	Thane	388577	350	200	57.1
15	Jamnagar	317037	149	89	59.7
16	Gulbarga	218621	10	8	80.0
17	Sambalpur	162190	60	36	60.0
	Total		**3025**	**1806**	**59.7**

Source : State of Environment, 1995, India.

There has been a significant increase in the generation of domestic, urban and industrial wastes in the last few decades. This is due to rapid population growth and industrialization. The problem of waste disposal from both domestic and industrial sources has become quite acute in some towns and cities, with disposal facilities lagging far behind the total quantity of wastes generated. Although, a major part of the waste generated is non-hazardous, substantial quantities of hazardous waste is also generated by industries, hospitals etc.

Leaching of hazardous wastes at dumping sites is not uncommon. This results in the contamination of surface and groundwater supply and is a potential risk to human health. Therefore, effective control of hazardous waste is of paramount importance for the maintenance of health, environmental protection and natural resource management.

In view of the proliferation of the chemical industry and the significant increase in hazardous waste generation, the Ministry of Environment & Forest, GOI, framed the hazardous wastes (management and handling) Rules, 1989. These rules provide an effective inventorisation and controlled handling and disposal of hazardous wastes through voluntary disclosures by the industry. Under these rules, it is mandatory for hazardous waste generators to provide information on the quality and type of hazardous waste produced. The industries generating hazardous wastes are required to apply for authorization for handling hazardous wastes from the concerned state pollution control boards. In addition, they are required to maintain records and report the accidents.

TABLE 7.3.3 : COMPOSITION OF SOLID WASTES FROM CITIES

Sl. No.	Cities	Characteristics (%)					
		Non-Degradable					Degradable
		Paper	Plastics	Metal	Glass	Ash & Earth	
1	2	3	4	5	6	7	8
1	Kolkata	3.18	0.65	0.66	0.38	34.00	47.00
2	Delhi	6.29	0.85	1.21	0.57	36.00	35.00
3	Nagpur	1.88	1.35	1.33	1.34	41.42	34.81
4	Bangalore	4.00	2.00		1.00	15.00	78.00
5	Mumbai	10.00	2.00	3.60	0.20	44.20	40.00

Source : India's Development Report, 1997

TABLE 7.3.4 : MUNICIPAL SOLID WASTE (MSW) DATA FOR DELHI

(Year : 1999)

1	2
Total quantity of MSW (Tonnes/month)	158469.6
Specific Weight of MSW (Tonnes/cu.m.)	0.504
Water Content (%)	32.1
General Chemical Formula of MSW	Ca Hb Oc Nd Se
Where :	
a : 447.32	
b : 687.11	
c : 246.99	
d : 18.94	
e : 1.00	

Source : Report on the Development of Statistics in the Environment Sector - Solid Waste by Indian Society of Environmental Management, New Delhi

TABLE 7.3.4(a) : INDIVIDUAL COMPONENTS OF MUNICIPAL SOLID WASTE (MSW) IN DELHI

Sl. No.	Components	Percentage (By Weight)	Weight (T/Month)
1	2	3	4
1	Food Waste	25.22	39966.03
2	Paper	3.62	5736.60
3	Card board	3.08	4880.86
4	Plastics	4.17	6608.18
5	Textiles	0.52	824.04
6	Rubber	1.83	2899.99
7	leather	0.37	586.34
8	Yard Waste	21.85	34625.61
9	Wood	1.72	2725.68
10	Glass	0.49	776.50
11	Tin	0.20	316.94
12	Aluminium	0.00	0
13	Other metals	0.25	396.17
14	Dirt, Ash	36.56	57936.48
	Total	**99.88**	**158279.42**

Source : Report on the Development of Statistics in the Environment Sector - Solid Waste by Indian Society of Environmental Management, New Delhi

TABLE 7.3.4(b) : RECYCLABLE COMPONENTS OF MSW IN DELHI

Sl. No.	Components	Percentage (By Weight)	Weight (T/Month)
1	2	3	4
1	Paper	3.62	5736.60
2	Cardboard	3.08	4880.86
3	Plastics	4.17	6608.18
4	Glass	0.49	776.50
5	Tin	0.20	316.94
6	Aluminium	0.00	0.00
7	Other Metals	0.25	396.17
	Total	**11.81**	**18715.25**

Source : Report on the Development of Statistics in the Environment Sector - Solid Waste by Indian Society of Environmental Management, New Delhi

TABLE 7.3.4(c) : FILLING COMPONENTS OF MSW IN DELHI

Sl. No.	Components	Percentage (By Weight)	Weight (T/Month)
1	2	3	4
1	Dirt, Ash	36.56	57936.48

Source : Report on the Development of Statistics in the Environment Sector - Solid Waste by Indian Society of Environmental Management, New Delhi

TABLE 7.3.4 (d) : BIODEGRADABLE COMPONENTS OF MSW IN DELHI

Sl. No.	Components	Percentage (by Weight)	Weight (T/Month)	Carbon (T/month)	Nitrogen (T/Month)	C/N Ratio
1	2	3	4	5	6	7
1	Food Waste	25.22	39966.03	19183.70	1039.12	18.46
2	Yard Waste	21.85	34625.61	16551.04	1177.27	14.06
	Total	**47.07**	**74591.64**	**35734.74**	**2216.39**	**16.12**

Source : Report on the Development of Statistics in the Environment Sector - Solid Waste by Indian Society of Environmental Management, New Delhi

TABLE 7.3.4(e) : COMBUSTIBLE COMPONENTS OF MSW IN DELHI

Sl. No.	Components	Percentage (by Weight)	Weight (T/Month)
1	2	3	4
1	Paper	3.62	5736.6
2	Cardboard	3.08	4880.86
3	Plastics	4.17	6608.18
4	Textiles	0.52	824.04
5	Rubber	1.83	2899.99
6	Leather	0.37	586.34
7	Wood	1.72	2725.68
	Total	**15.31**	**24261.69**

Energy contents of Combustible Components (Dry) : 23583.62 KJ/T

Source : Report on the Development of Statistics in the Environment Sector - Solid Waste by Indian Society of Environmental Management, New Delhi

TABLE 7.3.5: MUNICIPAL SOLID WASTE GENERATION IN MAJOR CITIES

(Kg Per Capita Per Day)

Sl. No.	City	1971-73	1986/87	1994
1	Ahmedabad	0.24	-	0.59
2	Ajmer	0.24	0.44	-
3	Allahabad	0.20	0.50	-
4	Aurangabad	0.42	0.67	-
5	Bangalore	0.32	-	0.48
6	Baroda	0.29	-	0.39
7	Bhopal	0.26	-	0.51
8	Bikaner	0.29	-	-
9	Chandigarh	0.36	-	-
10	Chennai	0.32	-	0.66
11	Coimbatore	0.31	-	0.43
12	Delhi	0.21	-	0.48
13	Gorakhpur	0.21	0.64	-
14	Guwahati	0.24	-	-
15	Gwalior	0.27	-	-
16	Howrah	0.59	-	-
17	Hyderabad	0.33	-	0.40
18	Jabalpur	0.30	-	0.00
19	Jaipur	0.28	-	0.40
20	Jodhpur	0.20	0.45	-
21	Kanpur	0.55	-	0.64
22	Kochi	-	0.27	0.52
23	Kolkata	0.50	-	0.34
24	Kota	0.25	0.40	-
25	Kozhikode	0.15	0.16	-
26	Kurnool	0.20	-	-
27	Lucknow	-	-	0.62
28	Ludhiana	-	0.40	0.40
29	Madurai	0.38	-	0.39
30	Mumbai	0.49	-	0.44
31	Nagpur	0.22	-	0.27
32	Patna	0'.48	-	0.36
33	Pune	0.24	-	0.31
34	Raipur	0.32	0.23	-
35	Rajkot	0.07	0.21	-
36	Sangli	0.23	0.30	-
37	Surat	0.15	-	0.60
38	Tata nagar	0.45	-	-
39	Thane	0.23	-	-
40	Tiruchirapalli	0.21	-	-
41	fhiruvananthapuram	0.12	0.34	-
42	Udaipur	0.14	-	-
43	Vadodara	-	-	0.39
44	Varanasi	-	-	0.40
45	Vijayawada	0.17	0.44	-
46	Visakhapatnam	-	0.31	0.40

Source : TERI Energy Data Directory and Yearbook 2002-2003

TABLE 7.3.6 : PER CAPITA CONSUMPTION OF PLASTIC IN SOME SELECTED COUNTRIES OF WORLD DURING 1996

(In Kg.)

Sl. No.	Country	Per Capita Consumption
1	2	3
1	India	1.6
2	Vietnam	1.5
3	China	6.0
4	Indonesia	8.0
5	Mexico	13.0
6	Thailand	18.0
7	Malaysia	22.0
8	Western Europe	60.0
9	Japan	70.0
10	North America	78.0

Source : Central Pollution Control Board

CHART 16 : PER CAPITA CONSUMPTION OF PLASTIC (KG) DURING 1996

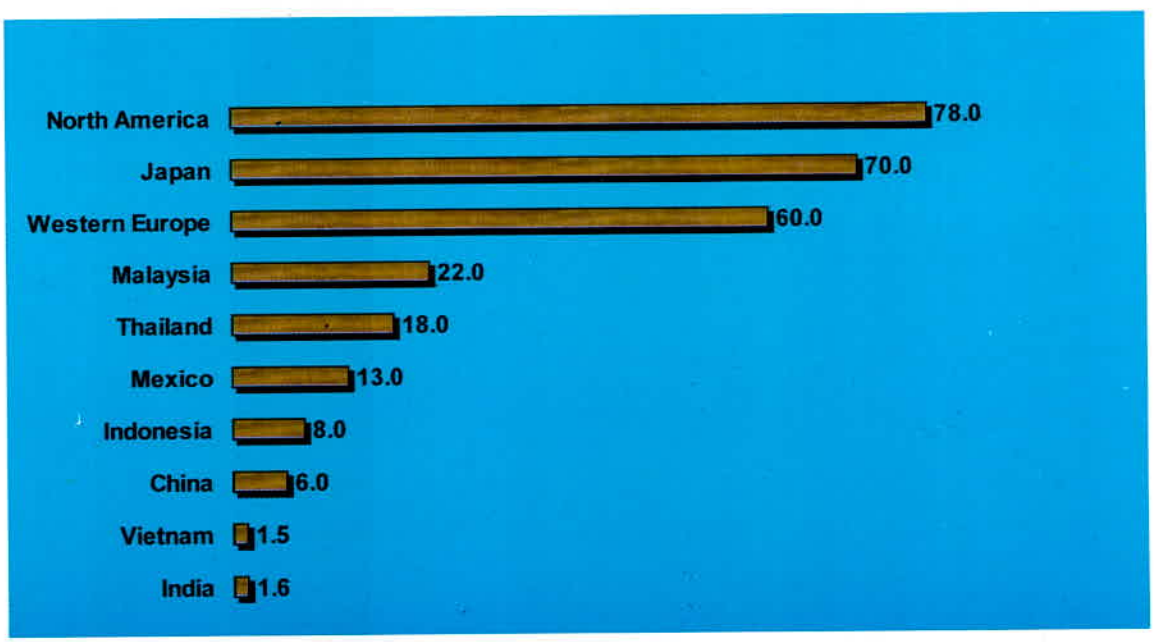


TABLE 7.3.7 : CONSUMPTION OF PLASTIC IN PACKAGING AND CONSUMER PRODUCTS

(In Thousand Tonnes)

Sl. No.	Item	1984	1990	1994	2000
1	2	3	4	5	6
1	Packaging	162	386	664	1518
2	Consumer Products	79	165	319	904
3	Building & Construction	73	159	228	490
4	Industrial Goods	80	137	222	478
5	Others	40	57	122	267

Source : Parivesh Newsletter, Sept.1998, CPCB

CHART 17 : CONSUMPTION OF PLASTIC (THOUSAND TONNES)

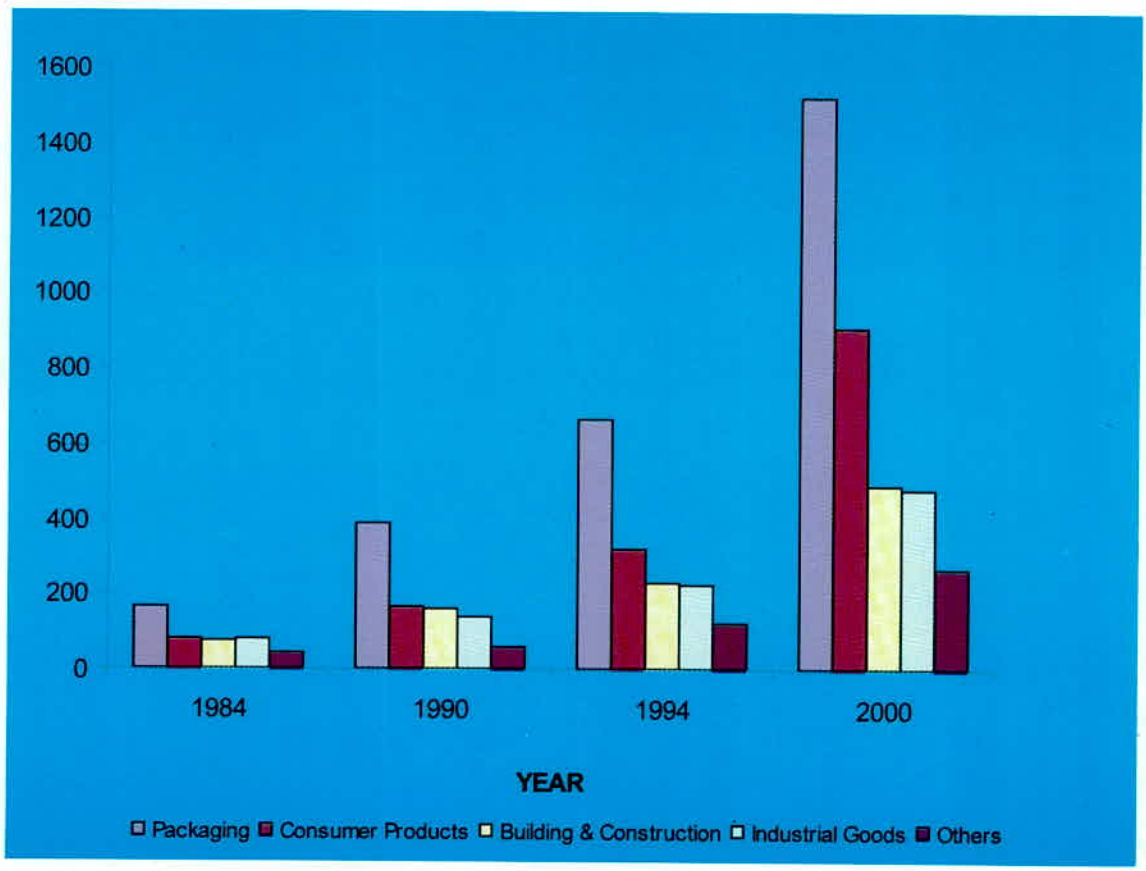


TABLE 7.3.8 : PLASTIC WASTE MANAGEMENT STATUS IN INDIA

(In thousand tonnes)

Sl. No.	Item	1995-96	2001
1	2	3	4
1	Consumption of Plastic	1889	4374
2	Waste available for Recycling	800	2000
3	Total	2689	6374

Source : Parivesh Newsletter, Sept.1998, CPCB

TABLE 7.3.9 :FIFTY YEARS OF WASTE GENERATION

(In thousand tonnes)

Sl. No.	Item	1947	1997
1	2	3	4
1	Urban Population (million)	56.9	274
2	Daily per capita waste generation (grams)	295	490
3	Total Waste Generated (million tonnes)	6	48
4	Area Under land fills (Thousand of ha)	0.12	20.2
5	Annual methane emmission (tonnes) from landfill sites	0.87	7.1

Source : Central Pollution Control Board

The above data is from Report 'Looking Back to Think Ahead', Green India 2047, growth with Resource Enhancement of Environment and Nature, The Energy Research Institute (TERI), New Delhi,1998.

TABLE 7.3.10 : CHARACTERISTIC LAND - FILL LEACHATES

Sl. No.	Parameters	Concentration (mg/l)
1	2	3
1	pH	3.7 - 8.3
2	Tot. Dis. Solid	725 - 55,000
3	Chlorides	2 - 11,373
4	Tot. Kj. Nitrogen	2 - 3,320
5	Lead	0 - 14.2
6	COD	50 - 99,000
7	BODS	0 - 19,500

Source : Central Pollution Control Board

Above characteristics of Leachate are typical characterioties of leachate {Ref. Datta, M. (1997)

Generation and Control of Leachate and Landfill Gas P. 90. In waste Disposal in engineering Landfill. Narson Publishing House, New Delhi}

TABLE 7.3.11 : STATUS OF MUNICIPAL SOLID WASTE MANAGEMENT IN SELECTED METROCITIES

(As Per CPCB Survey of 1999)

Sl. No.	City	Bangalore	Kolkata	Chennai	Delhi	Mumbai
1	2	3	4	5	6	7
1	Area (Sq. Km)	226.16	187.33	174.00	1484.46	437.71
2	Population (Projected for 1999, in million)	5.31	6.00	0.00	12.20	12.50
3	MSW Generation (Tonne/day)	2200	3100	3050	6000	6000
4	MSW per capita (Kg/day)	0.414	0.517	0.610	0.492	0.480
5	Garbage pressure (tonne/sq.km)	9.728	16.548	17.529	4.042	13.708
6	Pressure on landfill	1400	2500	3050	5000	6000
7	Safai Karamchari	12600	12030	10130	40483	22128

Source : Central Pollution Control Board

TABLE 7.3.12 : CURRENT STATUS OF MANAGEMENT OF MUNICIPAL SOLID WASTE

Sl. No.	Cities	Class I	Class II
1	2	3	4
1	No. of Cities	299	345
2	Total Population	1281138655	22375588
3	Waste Generation (MT/d)	48134	1454
4	**Mode of Collection**		
	I. Manually	50%	78%
	II. Trucks	49%	21%
	III. Others	1%	1%
5	**Disposal**		
	I. Dumping	94%	93%
	II. Composting	5%	6%
	III. Others	1%	1%

Source : Central Pollution Control Board

Note : No. of cities and Total population are as per 1991 census and other data is for 1994-95.

ABBREVIATIONS

ASI	Annual Survey of Industries
BSI	Botanical Survey of India
CEA	Central Electricity Authority
CFC	Chloro-Floro-Carbons
CO	Carbon Monoxide
CH_4	Methane
Cl	Chlorine
CPCB	Central Pollution Control Board
Cu.m	Cubic Metre
Fe	Iron
GWP	Global Warming Potential
GOI	Government of India
H_2S	Hydrogen sulphide
ha	Hectares HC Hydro Carbons
IQ	Institutional Qualified
Kms	Kilometers
M.C.M.	Million cubic metre
Mg	Magnesium
Mha	Million hectares
MOEF	Ministry of Environment and Forests
MW	Megawatts
NA	Not Available
Neg.	Negligible
NH_3	Ammonia
NIQ	Non-Institutional Qualified
NO_x	Oxides of Nitrogen
COD	Chemical Oxygen Demand
NO_2	Nitrogen dioxide
NO_3	Nitrate
NSFP	National Social Forestry Project
ODP	Ozone Depletion Potential
PM	Particulate matter
ppm	Parts per million
ppbv	Part per billion by volume
ppmv/year	Parts per million by volume per year
Pb	Lead
ppmv	Part per million by volume
pptv	Part per trillion by volume
Rs.	Rupees
RSC	Residual Sodium Carbonate
SAR	Sodium absorption ratio
SFP	Social Forestry Project
SO_2	Sulphur dioxide
SO_4	Sulphate
SP	Sodium Percentage
SPM	Solid Particulate Matter
SWS	Sub-Water Shed
RSPM	Residual Suspended Particulate Matter
Sq. Kms.	Square Kilometers
TDS	Total Dissolved Solids
TERI	The Energy Resources Institute
WB	World Bank
ZSI	Zoological Survey of India
BOD	Biological Oxygen Demand
TSP	Total Suspended Particulate

APPENDIX - 2

CONCEPTS AND DEFINITIONS OF THE TERMS USED

Area under miscellaneous tree crops, groves, etc.:
All culturable land which is not included under 'net area sown' but is put to some other agricultural use, such as land under casuarina trees, thatching grasses, bamboo bushes, and other groves for fuel, etc.

Barren and unculturable land:
Land which cannot be brought under cultivation unless at high cost, irrespective of whether such land is in isolated blocks or within cultivated holdings.

Critical :
A taxon is critical when it is facing an extremely high probability of extinction in the wild in immediate future.

Crown cover :
The canopy formed by the crowns of all the trees in a forest or in an uneven aged forest by the crowns of all trees in a specified crowns class.

Culturable waste :
Land available for cultivation but not taken up for cultivation or abandoned after a few years for one reason or the other. Such lands may be either fallow or covered with shrubs and jungles not put to any use. These may be assessed or unassessed and may lie in isolated blocks or within cultivated during the year and the last five or more consecutive years in succession, will be included in this category.

Current fallow :
Cultivable area kept fallow during the current agricultural year. Any seedlingarea in the current agricultural year not cropped in the same year is also treated as current fallow.

Demersal :
Refers to fish that live on or adjacent to the sea bottom.

Dense Forest :
Forests whose crown density is 40 percent or above.

Endangered :
Species in danger of extinction and whose survival is unlikely if the casual factors continue operating. Included are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Expectation of Life at Birth :
The Expectation of life at birth is defined as the average number of years expected to be lived at the time of birth if current mortality trends were to continue.

Extinct :
Species that are no longer known to exist in the wild after repeated searches of the type in localities and other known or likely places.

Flush system latrine :
The type of latrine which is connected to an under ground sewerage system, from which human excreta and wastes are flushed out by water.

Forest :
Includes all actually forested area on the lands so classed or administered as forests under any legal enactment dealing with forests, whether state-owned or private.

Gross area irrigated :
An irrigated plot growing crop in more than one season, is counted as many times as it is cropped to arrive at gross area irrigated. In case of mixed crops, the area under component crops as reported by household is taken into account.

Habitat :
An area and not a particular location is called habitat. The site or environment which a plant or animal lives, such as forest.

Household:
A household is a group of persons who commonly live together and would take their meal from common kitchen unless the exigencies of work prevented any of them from doing so. There may be a household of persons related by blood or a household of unrelated persons or having a mix of both. Examples of unrelated households are boarding houses, messes, hostels, residential hotels, rescue homes, jails, ashrams, etc. These are called "Institutional Households".

Infant Mortality Rate:
Infant mortality rate is defined as the number of deaths under one year of age to thousand live births in a year.

Insufficiently Known :
A taxon is insufficiently known when an evaluation has been made but the available data are inadequate to assign a category.

Irrigation :
A device of purposely providing land with water other than rain water by artificial means.

Land put to non-agricultural uses:
Includes all land occupied by buildings, paths, etc. or under water (e.g. tank, canals, etc.) and land put to uses other than agricultural production.

Neretic :
The part of the pelagic environment that extends from the nearshore zone out to depth of about 200 m; the water overlying the continental shelf related to shallow water on the margin of the sea, generally that overlying the continental shelf.

Net area irrigated :
The total of all the areas irrigated from different sources, counting each area irrigated only once even though it was irrigated more than once in the same year.

Net area sown:
Area sown with crops and orchards, counting the area sown more than once in the same year, only once.

The above definition was elaborated as follows:

The net area sown was defined as the difference between the total geographical area of all plots of land of the holding and the sum of the areas of land under

(1) forest, (2) barren & uncultivable wastes, (3) put to non-agricultural uses, (4) culturable wastes, (5) permanent pastures & other grazing land, (6) miscellaneous tree crops excluding orchards and (7) all type of fallow lands.

Open Forest:
Forest whose crown density is more than 10 percent but less than 40 percent.

Other fallow:
All lands which are taken up for cultivation in the past, but are temporarily out of cultivation for a period of not less than one year and not more than five years including the current agricultural year are classified under 'other fallow'.

Pastures and grazing land:
Include all grazing lands irrespective of whether they are permanent pastures and meadows or not. Grazing lands within forest area shall be included under this category.

pH:
The logarithm to the base 10 of the reciprocal of Hydrogen ion concentration.

Rare:
The species with small world populations that are not at present endangered or vulnerable but are at risk. These species are usually localised within restricted geographic areas or habitats or are thinly scattered over a more extensive range.

Room:
Covered space enclosed by walls on all sides reaching from the floor to the roof and having a door way. The rooms have been further classified as NBO rooms (specification for a room as recommended by the National Buildings Organisation)and other rooms. An NBO room is defined as a room having a floor space of at least four square metres and height of at least two metres from the floor to the ceiling.

Service latrine:
The types of latrine which are attended by the scavenging services of the Municipalities or Corporations.

Slum:
A slum is defined as an areal unit having twenty five or more kachcha structures mostly of temporary nature, or fifty or more households residing mostly in kachcha structures, huddled together, or inhabited persons with practically no private latrine and inadequate public latrine and water facilities.

Species:
A group of individual specimens having close resemblance but differing from others and belonging to the same genus.

Tap:
Source through which the drinking water is distributed through pipes laid out by corporations, municipalities or other local authorities like metropolitan or town development authorities or housing estates or similar agencies. But drinking water distributed through pipes by the house owner by pumping out from unprotected wells, tanks or springs should not be regarded as tap.

Type of dwelling:
Dwellings, have been classified under three categories, namely, chawl/bustee, independent house and flat.

(a) Chawl/Bustee:
A collection of poorly built katcha or semi-pucca huts or tenements.

(b) Independent house :
A separate structure with a room or rooms and having all its accessories and a separate entrance to it. In other words, if the dwelling unit and the entire structure of the building are physically coterminous, it should be considered an independent house.

(c) Flat :
All housing arrangements other than chawl/ bustee and independent house are to be taken as flats. Flat thus includes any self-contained dwelling unit with a room or rooms provided with normal housing facilities like water supply, bath and latrine used exclusively by the family residing there or jointly with other families. It also includes detached room or rooms with or without other housing facilities.

Type of structure:
The structures have been classified into three categories, namely pucca, semi-pucca and kachcha on the basis of the materials used for construction.

(a) Pucca Structure:
A structure whose walls and roof at least are made of pucca materials.

(b) Kachcha Structure:
A structure which has walls and roof made of non-pucca materials.

(c) Semi-Pucca Structure:
A structure which has either the walls or the roof, but not both, made of pucca materials. Walls/roof made partially of pucca materials will be regarded as kachcha walls/roof. Materials such as oven-burnt bricks, stone, stone-blocks, cement, concrete, jack-board (cement plastered reed), tiles and timber are pucca materials. Corrugated iron or asbestos sheets used in the construction of roof will also be treated as pucca materials.

Urban:
The criteria adopted for treating the urban for 1991 census is:

All statutory towns, i.e., all places with a

municipality, corporation, cantonment board or notified town area committee, etc.

(a) All places which satisfied the following criteria:

A minimum population of 5000;

(i) At least 75% of the male working population engaged in non-agricultural pursuits; and

(ii) A density of population of atleast 400 per sq. km. Mile (1000 per sq. mile).

Urban Agglomeration:

(i) A city or a town with a continuous outgrowth, the outgrowth being outside the statutory limits but falling within the boundaries of the adjoining villages; or

(ii) Two or more adjoining towns with their outgrowths, if any, as in (i) above; or

(iii) A city and one or more adjoining towns with or without outgrowths all of which form a continuous spread.

Vulnerable:

The species believed likely to move into the endangered category in the near future if the casual factors continue operating. Included are species of which most or all the populations are decreasing because of overexploitation, extensive destruction of habitat or other environmental disturbance; species with populations that have been seriously depleted and whose ultimate security is not yet assured; and species with populations that are still abundant but are under threat from serious adverse factors throughout their range.

19.	Chemical Oxygen Demand	Dichromate reflux method
20. & 21.	Total Dissolved Solids & Fixed Dissolved Solids	Gravemetric method
22.	Phosphate	Molybdate method (Colorimetry)
23.	Boron	Curcumine method (Colorimetry)
24.	Free Ammonia	

Source : Water Quality - Status & Statistics (1996 & 1997)
Central Pollution Control Board

Argentometric method has been given first preference but if the colour of the sample interferes with the chromate end point then mercurimetric method should be used. Usually sulphate concentration is low in surface waters & hence gravimetric method may not be accurate as turbidimetric method, therefore, turbidimetric method is suggested.

Note : Wherever more than one methods are given, they are in order of preference.

A NOTE ON POVERTY ESTIMATION

The official estimates of the poverty line are based on calorie norm of 2400 per capita per day for rural areas and 2100 per capita per day for urban areas. The poverty line for the base year 1973-74 has been taken as the per capita expenditure level of which these calorie norms have been met, on an average, for the country as a whole, as per the National Sample Survey (NSS) household consumption expenditure survey for the corresponding year.

In order to arrive at the estimates of the number of poor, Planning Commission has been making adjustments in the NSS data on distribution of households by consumption expenditure levels. Such an adjustment has been felt to be necessary because the aggregate private household consumption expenditure as estimated from the NSS data is different from the aggregate private expenditure estimated in the National Accounts Statistics (NAS). Based on this methodology estimates of poverty have been made at national and state levels for the years 1972-73, 1977-78, 1983-84 and 1987-88.

In September 1989 in order to look into the methodology for estimation of poverty at National and State level and also to go into the question of redefining the poverty line, if necessary, the Planning Commission constituted an Expert Group on Estimation of Proportion and Number of Poor under the Chairmanship of Prof. D. K. Lakadwala. The Expert Group submitted its report in July, 1993.

The Expert Group has recommended (i) for giving up adjustment of the NSS data on the basis of the estimates of Private Consumption given in the NAS (ii) State specific poverty lines as against an All-India poverty line for rural and urban areas and (iii) use of the State Specific cost of living indices for up-dating the poverty line separately for rural and urban areas.

The full Planning Commission under the Chairmanship of the Prime Minister has decided to accept the Expert Group methodology for estimating poverty. However, whereas the Expert Group had recommended taking a simple average of the weighted commodity indices of "Consumer Price Index for Industrial Workers" and Consumer Price Index for Urban Non-Manual Employees" for estimating and updating urban poverty line, in a slight simplification of this method, the Planning Commission has decided to use only the "Consumer Price Index for Industrial Workers" for estimating and up-dating the urban poverty line.

APPENDIX - 7

ENVIRONMENT LEGISLATION, ACTS, RULES, NOTIFICATIONS AND AMENDMENTS

In the Constitution of India it is clearly stated that it is the duty of the state to *'protect and improve the environment and to safeguard the forests and wildlife of the country'*. It imposes a duty on every citizen ***'to protect and improve the natural environment including forests, lakes rivers and wildlife'***. Reference to the environment has also been made in the Directive Principles of State Policy as well as the Fundamental Rights. The Department of Environment was established in India in 1980 to ensure a healthy environment for the country. This later became the Ministry of Environment and Forests in 1985.

The constitutional provisions are backed by a number of laws – acts, rules and notifications. The Environment Protection Act of 1986(EPA) came into force soon after the Bhopal Gas Tragedy and is considered an umbrella legislation as it fills many gaps in the existing laws. Thereafter a large number of laws came into existence as the problems began arising e.g. Handling and Management of Hazardous Waste Rules in 1989.

Following is a list of the environmental legislations that have come into effect:

- **General**
- **Forest and wildlife**
- **Water**
- **Air**

General

1986 – The Environment (Protection) Act authorizes the central government to protect and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and /or operation of any industrial facility on environmental grounds.

1986 – The Environment (Protection) Rules lays down procedures for setting standards of emission or discharge of environmental pollutants.

1989 – Hazardous waste (Management and Handling) Rules objective is to control generation, collection, treatment, import, storage and handling of hazardous waste.

1989 – The Manufacture, Storage and Import of Hazardous Chemical Rules defines the terms used in this context, and sets up an Authority to inspect, once a year, the industrial activity connected with hazardous chemicals and isolated storage facilities.

1989 – The Manufacture, Use, Import, Export and Storage of hazardous Micro-organisms/ Genetically Engineered Organisms or Cells Rules were introduced with a view to protect the environment, nature and health, in connection with the application of gene technology and micro organisms.

1991 – The Public Liability Insurance Act and Rules and Amendment, 1992 was drawn up to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident while handling any hazardous substance.

1995 – National environmental Tribunal Act has been created to award compensation for damages to persons, property and the environment arising from any activity involving hazardous substances.

1997 – The National Environment Appellate Authority Act has been created to hear appeals with respect to restrictions of areas in which classes of industries etc are carried out or prescribed subject to certain safeguards under the EPA (Environment Protection Act).

1998 – Biomedical waste (Management and Handling) Rules is a legal binding on the health care institutions to streamline the process of proper handling of hospital waste such as segregation, disposal, collection and treatment.

Forest and wildlife

1927 – Indian Forest Act and Amendment 1984 is one of the many surviving colonial statutes. It was enacted to 'consolidate the law related to forest, the transit of forest produce and the duty leviable on timber and other forest produce.

1972 – Wildlife Protection Act, Rules 1973 and Amendment 1991 provides for the protection of birds and **animals and for all matters that are connected to it whether it be their habitat or the waterhole or the forest that sustain them.**

1980 – The Forest (Conservation) Act and Rules 1981 provides for the protection of and the conservation of the forests.

Water

1882 – The Easement Act allows private rights to use a resource i.e. groundwater, by viewing it as an attachment to the land. It also states that all surface water belongs to the state and is a state property.

1897– Indian Fisheries Act establishes two sets of penal offences whereby the government can sue any person who uses dynamite or other explosive substance in any way (whether coastal or inland) with intent to catch or destroy any fish or poisons fish in order to kill.

1956 – The River Boards Act enables the states to enroll the Central Government in setting up an Advisory River Board to resolve issues in inter state cooperation.

1970 – Merchant Shipping Act aims to deal with waste arising from ships along the coastal areas within a specified radius.

1974 – The Water (Prevention and Control of Pollution) Act establishes an institutional structure for preventing and abating water pollution. It establishes standards for water quality and effluent. Polluting industries must seek permission to discharge waste **into effluent bodies. The Pollution Control Board (CPCB) was constituted under this act.**

1977 – The Water (Prevention and Control of Pollution) Cess Act provides for the levy and collection of cess or a fees on water consuming industries and local authorities.

1978 – The Water (Prevention and Control of Pollution) Cess Rules contains the standard definitions and indicate the kind of and location of meters that every consumer of water is required to affix.

1991 – Coastal Regulation Zone Notification puts regulations on various activities, including construction, are regulated. It gives some protection to the backwaters and estuaries.

Air

1948 – Factories Act and Amendment in 1987 was the first to express concern for the working environment of the workers. The amendment of 1987 has sharpened its environmental focus and expanded its application to hazardous processes.

1981 – Air (Prevention and Control of Pollution) Act provides for the control and abatement of air pollution. It entrusts the power of enforcing this act to the Central Pollution Control Board.

1982 – Air (Prevention and Control of Pollution) Rules defines the procedures of the meetings of the Boards and the powers entrusted on them.

1982 – Atomic Energy Act deals with the radioactive waste.

1987 – Air (Prevention and Control of Pollution) Amendment Act empowers the central and state pollution boards to meet with grave emergencies of air pollution.

1988 – Motor Vehicles Act states that all hazardous waste is to be properly packaged, labeled and transported.

Source : http://edugreen.teri.res.in/explore/laws.htm

RECENT ADDITION IN THE LIST OF THREATENED/ ENDANGERED SPECIES

As per the Gazette Notification number 1-4/95 WL dated 5th November, 2001, published in Part II Section 3, subsection (II), Extraordinary Gazette of India, the Central Government (Ministry of Environment and Forests) has made amendments in Schedule I and Schedule IV of the Subsection (1) of section 61 of the Wild Life (Protection) Act, 1972 and included the following species in the Schedules of Threatened and endangered species

1 **Schedule 1**

a) in Para II related to " Fishes" for serial number 2 and the entry relating thereto the following serial number and entries shall be substituted, namely

"2. Shark and Ray

(i) Anoxypristis cuspidate
(ii) Carcharhinus hemiodon
(iii) Glyphius gangeticus
(iv) Glyphius glyphius
(v) Himantura fluviatilis
(vi) Pristis microdon
(vii) Pristis zijsron
(viii) Rhynchobatus djiddensis
(ix) Urogymnus asperrimus

(b) for Part IVB, relating to Mollusca and the entries relating there to, the following Part IVB and the entries shall be substituted, namely:-

"Part IV B-Mollusca

1 Cassis cornuta
2 Charonia tritonis
3 Conus milmedwardsi4.
4 Cypraeassis rufa
5 Hippopus hippopu
6 Nautilus pompilus
7 Tridacna maxima
8 Tridacna squamosa
9 Tudicla spiralis".;

2 **In Schedule IV** to the said Act, after serial number 18 and the entries relating there to, the following serial numbers and entries shall be added, namely:-

"19. Mollusca

i. Cypraea limacine
ii. Cypraea mappa
iii. Cypraea talpa
iv. Fasciolaria trapezium
v. Harpulina arausica
vi. Lambis chiragra
vii. Lambis chiragraarthitica
viii. Lambis crocea
ix. Lambis millepeda
x. Lambis Scorpio
xi. Lambis truncata
xii. Placenta placenta
xiii. Strombus plicatus sibbaldi
xiv. Trochus niloticus
xv. Turbo marmoratus

Source : *Zoological Survey of India.*