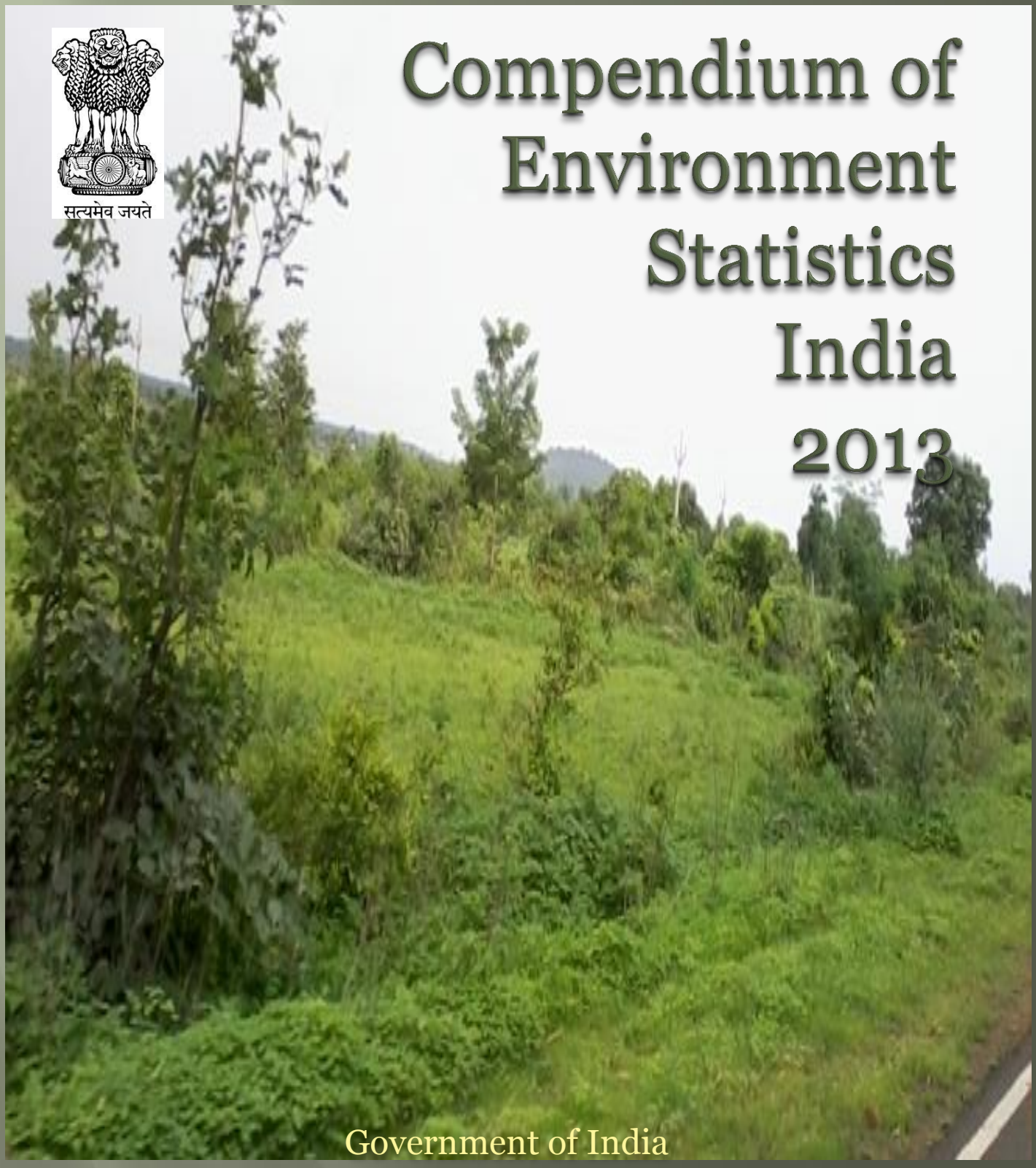

Compendium of Environment Statistics India 2013

Government of India
Ministry of Statistics & Programme Implementation
Central Statistics Office
Social Statistics Division
New Delhi
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Preface

The Central Statistical Office, Ministry of Statistics and Programme Implementation is bringing out regular publication entitled "Compendium of Environment Statistics India" providing detailed statistics on five core parameters namely, bio-diversity, atmosphere, land/soil, water and human settlement suggested by the Framework for Development of Environment Statistics (FDES) published by United Nations Statistical Division in 1984. The Compendium is expected to serve the needs of Environment planners and policy makers as well as other government and non-government organizations and research institutions working in the field.

This issue is Fourteenth edition in the series. The data given in the Compendium is based on the information provided by the Union government Ministries/Departments/organizations from published records and websites of various agencies. The current Compendium is a compilation of latest data available from the source agencies.

I expect the Compendium will benefit all those who are involved in the field of policy, planning, management, administration, and research in the areas related to environment.

We welcome your suggestions/comments for further improvement of the Publication. Suggestions may be sent to adg-ssd@nic.in.

I wish to place on record my sincere thanks to the data source agencies for their support in bringing out this Publication, as without their support and cooperation it would not have been possible for us to organize and complete the Publication.

Shri Krishna Kumar, Deputy Director General, Shri James Mathew, Director, Shri Rakesh Kumar Maurya, Director, Ms. Avneet Kaur, Assistant Director and Shri Rajesh Kumar Panwar, Senior Statistical Officer have exhibited enormous commitment in preparing this Publication. I place on record my appreciation to the team of officers who have put hard work in bringing out this publication.

(Smt. S. Jeyalakshmi)
Director General

New Delhi
11th February,2014

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CHAPTER ONE

ENVIRONMENT STATISTICS: FRAME WORK AND INDICATORS

1.1 Introduction

The objective of environment statistics is to provide information about the environment, its most important changes over time and across locations, and the main factors that influence them. Ultimately, environment statistics aim at providing high quality statistical information to improve knowledge of the environment, to support evidence-based policy and decision making, and to provide information for the general public, as well as for specific user groups. Environment statistics are multidisciplinary and cross-cutting, involving numerous sources and stakeholders

Environment statistics aggregate, synthesize and structure environmental and other data according to statistical methods, standards and procedures. It is the role of environment statistics to process environmental data into meaningful statistics that describe the state and trends of the environment and the main processes affecting them. Not all environmental data are used in the production of environment statistics. The Framework for the Development of Environment Statistics (FDES) provides a framework that marks out environmental data that fall within its scope and then structures, synthesizes and aggregates them into meaningful statistics.

The scope of environment statistics covers biophysical aspects of the environment and those aspects of the human sub-system that directly influence and interact with the environment. Within this scope, environment statistics describe the state and changes of environmental conditions, the quality and availability of environmental resources, the impact of human activities and natural events on the environment, the impact of changing environmental conditions, as well as the social actions and economic measures taken by societies to avoid or mitigate these impacts and to restore and maintain the capacity of the environment to provide the services that are essential for life and human wellbeing

Environment statistics support evidence based policy making by enabling the identification of environmental policy issues and the objective quantification of measures and impacts of policy initiatives. They strengthen assessments through quantitative metrics, making analyses more robust through the use of timely and comparable data. The type, the level of thematic, spatial and temporal aggregation and the format of environment statistics depend on the type of the user and the intended purpose of use. The main products of environment statistics are detailed tabulated environment statistics series, environmental accounts and environmental indicators

Main uses and user groups of environment statistics

Different users need environment statistics at different levels of aggregation and depths of information. They may need cross-cutting environment statistics data sets, for instance regarding climate change. In other cases they may only be interested in particular topics and themes pertaining to specific sectoral analysis and policy making. Policy and decision makers, and the general public would tend to use environmental indicators, whereas researchers, analysts, and experts may be more inclined to look at extensive and detailed environment statistics.

Environment statistics serve a variety of users, including but not restricted to:

i. Policy and decision makers at all levels;
ii. The general public, including media and civil society;
iii. Analysts and researchers;
iv. Academia; and
v. International agencies

The field of environment statistics has no single, overarching, internationally agreed classification of the environment for statistical purposes. Instead, there are a number of coexisting and emerging classifications and categorizations for specific subject areas in environment statistics. These include standardized statistical classifications as well as less formalized groupings or categories. Some of the classifications and categories that have been used in the environmental field have not been developed specifically for statistical purposes, and therefore have to be linked to statistical classifications

UNSD developed and published in 1984 ‘A Framework for the Development of Environment Statistics (FDES).’ The FDES sets out the scope of environment statistics by relating the components of the environment to information categories that are based on the recognition that environmental problems are the result of human activities and natural events reflecting a sequence of action, impact, and reaction. Relevant information, therefore, refers to social and economic activities and natural events, their effects on the environment, and the responses to these effects by the society. The contents of the FDES are "statistical topics"; they are those aspects of environmental concerns that can be subjected to statistical description and analysis. It is a flexible framework that is used for developing and organizing environmental and related socio-economic information.

The scope of environment statistics include the media of the natural environment (air, water, land/soil), the biota found within these media, and human settlements. Within the broad range of subject areas, environment statistics describe the quality and availability of natural resources, human activities and natural events that affect the environment, the impacts of these activities and events, and social responses to these impacts.

1.2 Development versus Environment Degradation

Developmental 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.

Table 1.3.1 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 Production and consumption patterns Investment share in GDP	EDP/EVA per capita Capital accumulation (environmentally adjusted)	Environmental protection expenditure as % of GDP Environmental taxes and subsidies as % of government revenue	Produced capital stock
SOCIAL/ DEMO-GRAPHIC ISSUES	Population growth rate Population density Urban/rural migration rate Calorie supply per capita	% of urban population exposed to concentrations of SO_2, particulates, ozone, CO and Pb Infant mortality rate Incidence of environmentally related diseases		Population living in absolute poverty Adult literacy rate Combined primary and secondary school enrollment ratio Life expectancy at birth Females per 100 males in

				secondary school
AIR/CLIMATE	**Emissions of CO_2, SO_2 and NO_x** **Consumption of ozone depleting substances**	**Ambient concentrations of CO, SO_2, NO_x O_3 and TSP in urban areas** Air quality index	Expenditure on air pollution abatement Reduction in consumption of substances and emissions	**Weather and climate conditions**
LAND/SOIL	**Land use change** Livestock per km^2 of arid and semi-arid lands **Use of fertilizers** **Use of agricultural pesticides**	**Area affected by soil erosion** Land affected by desertification Area affected by salinization and water logging	**Protected area as % of total land area**	**Arable land per capita**
WATER Fresh water resources	Industrial, agricultural and municipal discharges directly into freshwater bodies **Annual withdrawals of ground and surface water** **Domestic consumption of water per capita** Industrial, agricultural water use per GDP	**Concentration of lead, cadmium, mercury and pesticides in fresh water bodies** **Concentration of fecal coliform in fresh water bodies** **Acidification of fresh water bodies** **BOD and COD in fresh water bodies** Water quality index by fresh water bodies	**Waste water treatment, total and by type of treatment (% of population served)** **Access to safe drinking water (% of population served)**	**Groundwater reserves**
Marine water resources	Industrial, agricultural and municipal discharges directly into marine water bodies	Deviation in stock from maximum sustainable yield		

	Discharges of oil into coastal waters	of marine species Loading of N and P in coastal waters		
OTHER NATURAL RESOURCES Biological resources Mineral (incl. energy) resources	**Annual roundwood production** **Fuelwood consumption per capita** **Catches of marine species** **Annual energy consumption per capita** **Extraction of other mineral resources**	**Deforestation rate** **Threatened, extinct species** **Depletion of mineral resources (% of proven reserves)** Lifetime of proven reserves	**Reforestation rate** **Protected forest area as % of total land area**	**Forest inventory** Ecosystems inventory Fauna and flora inventory Fish stocks **Proven mineral reserves** **Proven energy reserves**
WASTE	**Municipal waste disposal** Generation of hazardous waste **Imports and exports of hazardous wastes**	Area of land contaminated by toxic waste	Expenditure on waste collection and treatment Waste recycling	
HUMAN SETTLEMENTS	**Rate of growth of urban population** **% of population in urban areas** **Motor vehicles in use per 1000 habitants**	**Area and population in marginal settlements** Shelter index **% of population with sanitary services**	Expenditure on low-cost housing	Stock of shelter and infrastructure

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 1.3.2: 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 industrialization	Concentration of population in urban centers make huge demands on production 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 thei 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 1.4.1: 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 is caused 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 1.4.2: SOME MAJOR POLLUTANTS AND THEIR SOURCES

Pollutant	Source
Carbon monoxide	Incomplete fuel combustion (e.g. two/four stroke engines)
Sulphur dioxide	Burning of sulphur containing fuel like coal in Power Plants and emission by vehicles
Suspended particulate matter	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 1.4.3: 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 l.4.4.

Table 1.4.4: Water born disease and their causative factors

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

Revision of FDES

The Framework for the Development of Environment Statistics (FDES) was first published in 1984 by the United Nations Statistics Division (UNSD. The 1984 FDES and subsequent publications have been a useful framework for guiding countries in the development their environment statistics programmes. During the time since its publication there have been a number of scientific, political, technological, statistical and experience-based developments which suggested that the FDES was ready for revision.

As a consequence, the United Nations Statistical Commission, at its 41st session (23-26 February 2010), endorsed a work programme and the establishment of an Expert Group for the revision of the FDES. The members of the Expert Group represented producers and users of environment statistics of countries from all regions and at different stages of development, as well as international organizations, specialized agencies and non-governmental organizations. ADG (SSD) was a member of the Expert Group.

The revision process

The revision was based on an agreed set of criteria and has been supported by extensive international expert consultation. The 1984 FDES was used as the starting point. It was revised taking into account the lessons learned during its application in different countries as well as improved scientific knowledge about the environment and new requirements created by emerging environmental concerns and policy issues including major multilateral environmental agreements (MEAs). The revision has also taken into account the increasing prominence of environmental sustainability and sustainable development issues and concepts. Existing environment statistics and indicator frameworks were analyzed, including major developments in the field of environmental-economic accounting and selected thematic developments pertinent to environment statistics.

The revision was undertaken as part of UNSD's work programme on environment statistics, supported by the Expert Group on the Revision of the FDES. The drafts were reviewed in four face-to-face meetings of the Expert Group and in several rounds of electronic discussion. The Core Set of Environment Statistics was tested by 25 countries and two organizations. The final draft of the FDES was subjected to a Global Consultation, yielding feedback from 71 countries, areas and organizations and the FDES 2013 is the result of this wide consultation process. UN Statistical Commission at its 44th Session held in 2013 endorsed the revised framework as the framework for strengthening environment statistics programmes in countries and recognized it as a useful tool in the context of sustainable Development Goals and Post 2015 Development Agenda.

The revised FDES 2013 is a multipurpose conceptual and statistical framework that is comprehensive and integrative in nature. It provides an organizing structure to guide the collection and compilation of environment statistics and to synthesize data from various subject areas and sources. It is broad and holistic in nature, covering the issues and aspects of the environment that are relevant for analysis, policy and decision making. The FDES is structured in a way that allows links to economic and social domains. Its seeks to be compatible with other frameworks and systems, both statistical and analytical, such as for instance the System of Environmental-Economic Accounting (SEEA), the Driving force – Pressure – State – Impact – Response (DPSIR) framework, and the Millennium Development Goals (MDGs) indicator framework. As such, the FDES facilitates data integration within environment statistics and with economic and social statistics.

The FDES 2013 sets out a comprehensive (though not exhaustive)

list of statistics (the Basic Set of Environment Statistics) that can be used to measure the statistical topics relating to environment. The Basic Set is organized in three tiers, based on the level of relevance, availability of data and methodological development of the statistics.

Within this scope, a Core Set of Environment Statistics has been identified as Tier 1. The objective of the Core Set is to serve as an agreed, limited set of environment statistics that are of high priority and relevance to most countries. Harmonized international definitions, classifications and data collection methods for these statistics will be provided in subsequent methodological handbooks to facilitate their production in an internationally comparable manner.

The FDES 2013 is relevant to, and recommended for use by, countries at any stage of development. However, it is particularly useful to guide the formulation of environment statistics programmes in countries at early stages in the development of environment statistics by: (i) identifying the scope and constituent components, sub-components and statistical topics relevant for them; (ii) contributing to the assessment of data requirements, sources, availability and gaps; (iii) guiding the development of multipurpose data collection processes and databases; and (iv) assisting in the co-ordination and organization of environment statistics, given the inter-institutional nature of the domain.

The FDES organizes environment statistics into a structure consisting of components, subcomponents, statistical topics, and individual statistics using a multi-level approach. The first level of the structure consists of six fundamental components that follow the FDES conceptual framework.

The first component brings together statistics related to the conditions and quality of the environment and their change. The second component groups together statistics related to availability and use of environmental resources (ecosystem provisioning services, land and subsoil resources). The third component includes statistics related to the use of regulating services of the environment for the discharge of residuals from production and consumption processes. Statistics related to extreme events and disasters (both natural and technological) and their impacts are covered by the fourth component. The fifth component brings together statistics related to environmental conditions and impacts within human settlements. The sixth component groups statistics relevant to societal responses and economic measures aimed at protecting the environment and managing environmental resources.

Environmental conditions and quality (Component 1) are at the centre of the FDES. The other five components have been set up based on their relationship with the central Component 1. As presented in chart 1 below, all six components are intrinsically related with each other.

Chart1: Component of FDES 2013

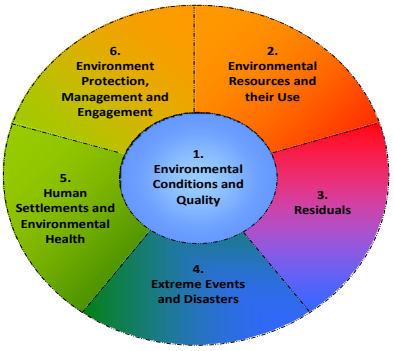

*Chart 1*shows the six components of the FDES. The dotted lines separating the components are an indication of the continuous interactions among them. These interactions are between and among all the components of the FDES. It should be noted that a two dimensional diagram can only provide a limited visualisation of the complex and interrelated nature of the relationships between humans and the environment.

The revised FDES uses a multi-level approach. The first level of the structure defines the six fundamental components. Each individual component is further broken down into its respective sub-components (second level) and statistical topics (third level). Each level uses numbering conventions. The final level contains the actual individual environment statistics.

The components, sub-components, statistical topics and individual statistics of the FDES define the scope and boundaries of environment statistics. They provide an organizing structure for synthesizing and presenting the information in a comprehensive, consistent and coherent manner.

Table 1: Components and Sub-components of the FDES

Component 1: Environmental Conditions and Quality	Sub-component 1.1: Physical Conditions Sub-component 1.2: Land Cover, Ecosystems and Biodiversity Sub-component 1.3: Environmental Quality
Component 2: Environmental Resources and their Use	Sub-component 2.1: Non-energy Mineral Resources Sub-component 2.2: Energy Resources Sub-component 2.3: Land Sub-component 2.4: Soil Resources Sub-component 2.5: Biological Resources Sub-component 2.6: Water Resources
Component 3: **Residuals**	Sub-component 3.1: Emissions to Air Sub-component 3.2: Generation and Management of Wastewater Sub-component 3.3: Generation and Management of Waste
Component 4: **Extreme Events and Disasters**	Sub-component 4.1: Natural Extreme Events and Disasters Sub-component 4.2: Technological Disasters
Component 5: **Human Settlements and Environmental Health**	Sub-component 5.1: Human Settlements Sub-component 5.2: Environmental Health
Component 6:	Sub-component 6.1:

Environment Protection, Management and Engagement	Environment Protection and Resource Management Expenditure Sub-component 6.2: Environmental Governance and Regulation Sub-component 6.3: Extreme Event Preparedness and Disaster Management Sub-component 6.4: Environmental Information and Awareness

India also participated in the Pilot of the Revised FDES 2013 and Global consultation during August-October 2012. The draft revised frame work was also discussed in a national workshop organised at Hyderabad in September 2012. United Nation Statistical Commission (UNSC) in its 44th Session recognized that revised FDES 2013 is a useful tool in the context of sustainable Development Goals and Post 2015 Development Agenda. The final version of revised FDES will be published by UNSD in 2014.The Compendium of Environment Statistics will be revised in consistent with the revised UN frame work.

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CHAPTER TWO

DEVELOPMENT OF ENVIRONMENT STATISTICS IN INDIA

2.1 Introduction

The whole world has now realized the threat to its precious environment due to depletion of natural resources and the growing pace of degradation of the environment. 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 and which join upon the citizens of India the special responsibility to protect and improve the environment. 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 and analyse data on these parameters and develop interrelationships 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 Conferences 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 Directorates of Economics and Statistics, and other concerned Central and State organisations and research institutions involved in the related subjects, was set up in CSO under the Chairmanship of its Director General 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 Statistics Office 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 Statistics Office brought out thirteenth issues of the publication entitled "Compendium of Environment Statistics" for the years 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2006, 2007, 2008-09, 2010, 2011 and 2012 presenting available data relating to environment of the country. The present issue is fourteenth in its series covering the data upto 2012. The issues for the years 2004 & 2005 could not be brought out due to unavoidable circumstances. The tenth issue was a combined issue for 2008 and 2009. 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. 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/Seminars on Environment Statistics

To disseminate information on the development of environment statistics in India and provide a forum for interaction between users and producers, fourteenth National Workshops/ Seminars on Environment Statistics have been organised so far since 1998.

- First one was organized on different aspects of Environment and its impact on land and soil degradation, health including data gaps in different sectors of environment in Goa during 12-13 January, 1998.
- Second, third and fourth workshop was held during 6-7 April, 2000, at Hyderabad, 8-9 February, 2001 at Thiruvananthapuram and 22-23 April, 2003 at Shillong respectively. In the third workshop, it was decided to organise Seminar on sector specific subject.

- Fifth Seminar on Statistical Accounting of Water Resources was organised during 24-25 June, 2005 at Institute for Social and Economic Change (ISEC) Bangalore.
- Sixth Seminar on Statistical Accounting of Land and Forestry Resources was organised during 29-30 April, 2006 at Indian Institute of Forest Management(IIFM), Bhopal.
- A brainstorming Workshop on Development of National Disaster Statistical System in India was organised by CSO in collaboration with National Institute of Disaster Management (NIDM) on 27th April, 2007 at NASC, Complex PUSA, New Delhi.
- A Dissemination Seminar to discuss the finding and other methodological issues in respect of the completed Natural Resource Accounting studies was organised at Shimla during 17-18 December, 2007.
- CSO in collaboration with Institute for Climate Change (ISEC) had organised another two day's National Seminar on 'Climate Change: Data Requirement and Availability' during 16-17 April, 2009 at ISEC, Bangalore.
- The two day Workshop for the DESs held at New Delhi on 21-22 July 2010 discussed 'Disaster Management Statistics'. Another Workshop conducted on 21-22 August 2010 at New Delhi in collaboration with M/o Environment and Forests and WWF to explore the possibilities of environment data flow between CSO and Envis Centres.
- A national seminar on 'Environmental Pollution: Data Availability and Gaps' was conducted at Institute of Development Studies (IDS), Jaipur during 24-25 March, 2011.
- A three day Workshop on 'Disaster Management Statistics' was jointly organised with National Institute of Disaster Management (NIDM) New Delhi during 21-23 September,2011 at National Academy of Statistical Administration (NASA), Greater Noida by inviting participants from DESs, State Disaster Management Commissionerats, and the Central Ministries.
- A two day workshop on Climate Change Statistics was organised in February 2012 at Hyderabad.
- In September 2012 a two days workshop on revision of FDES was organised in Hyderabad.

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 the National Workshops/Seminars are brought out regularly.

2.5 Training on Environment Statistics

Environment statistics being a multi- disciplinary emerging subject, the Statisticians working both at the Centre as well as State Governments are required to be fully familiar with the relevant terminologies, and concepts and definitions. To fulfil this need, the CSO organized an International Training Programme on Environment Statistics during 27 Jan-6 Feb, 1998 with financial support from Asian Development Bank. Twenty-two participants

from South and South East Asia, including nine from India, participated in this programme. Till date, ten such training programmes were organized in collaboration with different organizations working in the area of Environment at different parts of the India.

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. 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 the City Group formed by UNSD namely, London Group as “System for Environmental and Economic Accounting” (SEEA) taking into consideration the contributions of the environment to the economy and the impacts of the economy on the environment.

The United Nations, the European Commission , the International Monetary Fund, the Organisation for Economic Co-operation and Development and the World Bank undertook jointly the task of revision of the United Nations handbook of National Accounting-Integrated Environmental and Economic Accounting (commonly referred to as SEEA- 2003). Much of the work was done by the London Group on Environmental and Natural Resources Accounting, through a review process that started in 1998. SEEA 2003 provides a common framework for economic and environmental accounting, permitting a consistent analysis of contribution of environment to the economy and of the impact of the economy on the environment. It is intended to meet the needs of policy makers by providing indicators and descriptive statistics to monitor the interaction between the economy and the environment as well as serving as a tool for strategic planning and policy analysis to identify more sustainable development paths.

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, data pertaining to various natural resources are highly desirable for proper policy formulation for sustainable development.

2.7 Natural Resource Accounting in India System of Environmental Economic Accounting (SEEA) and Implementation of Natural Resource Accounting (NRA)/SEEA in India

The SEEA 2003, revision of SEEA 1993, represented a considerable step forward in terms of breadth of material and harmonization of concepts, definitions, and methods in environmental and economic accounting. Although SEEA 2003 was never formally adopted as an international statistical standard, it, however, provided a well accepted and robust framework for the compilation of environmental and economic accounts. Another revision process of SEEA 2003 was started in 2007 with the aim of adopting SEEA as an international statistical standard. This latest version comprise three parts, the main one being SEEA Central Framework.

The System of Environmental–Economic Accounting (SEEA) Central Framework is a multi-purpose, conceptual framework that describes the interactions between the economy and the environment, the stocks and changes in stocks of environmental assets. This is a system that has been developed under the aegis of the UN Statistical Commission to explicitly account for the environment at the macro level. The current version of the SEEA builds on previous 1993 and 2003 revisions. The 43rd Session of the UN Statistical Commission formally accepted the SEEA Central framework as an international statistical standard in 2012. The SEEA allows us to examine various issues at the macro level such as resource efficiency and productivity indicators, decomposition analysis, analysis of net wealth and depletion, sustainable production and consumption, structural input-output analysis and general equilibrium modeling, consumption based input-output analysis and footprint techniques, analysis using geospatially referenced data etc.

The SEEA Central Framework provides a structure to compare and contrast source data and allows the development of aggregates, indicators and trends across a broad spectrum of environmental and economic issues. Particular examples include the assessment of trends in the use and availability of natural resources, the extent of emissions and discharges to the environment resulting from economic activity, and the amount of economic activity undertaken for environmental purposes.

The SEEA Central Framework represents a melding of many disciplines and brings together, in a single measurement system, information on water, minerals, energy, timber, fish, soil, land and ecosystems, pollution and waste, production, consumption and accumulation. It is designed to be applicable across all countries, regardless of their level of economic and statistical development, their economic structure, or the composition of their environment.

In addition to the SEEA Central Framework, two related parts are being developed: SEEA Experimental Ecosystem Accounts, and SEEA Extensions and Applications. The SEEA Experimental Ecosystem Accounts (which is under preparation) describes both the measurement of ecosystems in physical terms, and the valuation of ecosystems in so far as it is consistent with market valuation principles, noting that only those issues for which broad consensus has emerged will be included. In accounting terms, many of the structures for ecosystem accounting will be drawn from the structures in the SEEA Central Framework and, in this regard, the accounting conventions of the SEEA Central Framework will be applied consistently. SEEA Extensions and Applications will present various monitoring and analytical approaches that could be adopted, and will describe ways in which SEEA data can be used to inform policy analysis which will be useful for official statisticians, researchers and policy makers. This part of SEEA will not be a statistical standard.

The SEEA Central Framework adopts slightly different terminology in relation to environmental assets compared to the SNA. In the SNA, the term "Natural Resources" is used to cover natural biological resources (e.g. timber and aquatic resources), mineral and energy resources, water resources and land, whereas in the SEEA Central Framework, land is separated from natural resources recognizing its distinct role in the provision of space. Further, in the SNA, land and soil resources are considered as a single asset type whereas in the SEEA Central Framework, these are recognized as separate assets highlighting the role of land in the provision of space. Soil resources are included as part of natural resources.

The valuation of environmental assets is a complex measurement task. The SEEA Central Framework adopts the same market price valuation principles as the SNA. However, since observable market prices are usually not available for environmental assets, the same need to be treated differently.

Both the SEEA Central Framework and the SNA recognize the change in the value of natural resources that can be attributed to depletion. In the SNA, the value of depletion is shown in the other changes in the volume of assets account alongside flows such as catastrophic losses and uncompensated seizures. Thus, it is not recognized as a cost against the income earned by enterprises extracting natural resources. In the SEEA Central Framework, the value of depletion of is considered to be a cost against income and hence, in the sequence of economic accounts, depletion adjusted balancing items and aggregates are defined which deduct depletion from the measures of value added, income and savings. The depletion deduction is made in addition to the deduction of CFC for the cost of using fixed assets which is already deducted from measures of value added, income and saving in the SNA. Depending on the arrangements underpinning the ownership of specific natural resource, this differing treatment of depletion in SEEA Central Framework may require additional entries in the sequence of economic accounts at an institutional sector level.

2.8 Towards Implementation of Natural Resource Accounting (NRA)/SEEA in India

As per the recommendations of a Technical Working Group on NRA constituted by CSO, a pilot project on NRA in the State of Goa was initiated during 1999-2000 which was

undertaken by The Energy and Resources Institute (TERI), Delhi. The findings of the study generated a lot of discussion among the academics as well as the National Statistical Commission. In order to develop sector-specific but uniform methodologies for resource accounting, the Ministry of Statistics and Programme Implementation (*MOSPI*) commissioned a set of studies on land, forests, air, water, and sub-soil resources in eight Indian states.

State-level studies on Natural Resource Accounting commissioned by the CSO

Name of study/Organization	Areas
Institute of Economic Growth, New Delhi	NRA of Air and Water Pollution in Andhra Pradesh & Himachal Pradesh
Indian Institute of Forest Management (IIFM), Bhopal	NRA of Land and Forestry for Madhya Pradesh & Himachal Pradesh
North East Hill University (NEHU), Shillong	Environmental Accounting of Land and Forestry of Meghalaya
Integrated Research and Action for Development (IREDe), Delhi	NRA in Goa
Madras School of Economics (MSE), Chennai	Environmental Accounting of Land and Water in Tamil Nadu
Jadavpur University, Kolkata	NRA for Air and Water Sectors in West Bengal
The Energy and Resources Institute (TERI), Delhi	Accounting for unsustainable mineral extraction in Madhya Pradesh & West Bengal
Centre for Multi-Disciplinary Development Research (CMDR), Dharwad, Karnataka	NRA for Land and Forestry (excluding mining) in Karnataka

SEEA prescribes two valuation methods viz., maintenance cost method and non-market valuation by stated and revealed preference methods. In fact, the projects undertaken by CSO provided case studies using both these methods. The non-market valuation methods used were hedonic prices method, household health production function method, travel cost method etc. Also some of these studies attempted to make estimates of maintenance cost at the sector and regional levels. The sectors covered were thermal power generation, urban transport, industrial management, forests and land and exhaustible resource of coal.

The efforts are on to build up a sector-wise framework for NRA through a Technical Advisory Committee under CSO headed by Dr. Kirit Parikh, Former Member, Planning Commission involving the Centre for Economic and Social Studies (CESS), Hyderabad.

The CSO also constituted a Technical Advisory Committee in the year 2010 under the Chairmanship of Dr. Kirit Parikh, Former Member, Planning Commission to bring out a Synthesis Report combining the findings of all the 8 studies commissioned by CSO with the help of Centre for Economic and Social Studies (CESS), Hyderabad. A synthesis report based

on those studies was developed by Technical Advisory Committee. The report recommended the preparation of a National Accounting Matrix that would include environmental accounts.

Subsequently, an 'Expert Group on Green National Accounting' was constituted in August, 2011 under the Chairmanship of Prof. Partha Dasgupta, Professor Emeritus, Cambridge University, UK with a mandate to (a) to develop a frame work for 'Green National Accounts' for India keeping in view of the previous work done on the subject, including the findings of the studies award to CESS, Hyderabad, (b) to identify the data requirements for the implementation of the recommended framework, and (c) to develop a road map for the implementation of the framework.

This Expert Group on Green National Accounting for India, held three meetings in August 2011, April 2012 and December 2012. Based on the suggestions emerged from the meeting, the Expert Group had prepared a report comprising **Conceptual Framework, Valuation Principles, System of National Accounts (SNA) in India and System of Environmental Economic Accounting (SEEA), and Implementing the Green Accounting Framework.**

The Report deals with the conceptual foundations of Green National Accounts. The conceptual framework lays out the conditions for sustainability under the assumption that information is not a serious constraint for evaluating and aggregating the diverse elements that compose an economy. It provides an outline for what would ideally be needed for a comprehensive set of national accounts.

The Report's central conclusion is that, adjusting for the population, the economic evaluation should be based on a comprehensive notion of wealth (adjusted for the distribution of wealth in the economy) and not on GDP and nor on the adhoc indicators of human well-being such as Human Development Index (HDI). Wealth means the social value of an economy's stock of capital assets, comprising (1) **Reproducible Capital** (commonly known as "manufactured capital": roads, ports, cables, building machinery, equipment and so forth), (2) **Human Capital** (population size and composition, education, health), and (3) **Natural Capital** (ecosystem, land, sub-soil resources and so on). In particular, changes in the circumstances of an economy should be judged on the basis of their effect on the economy's wealth per capita, adjusted for the distribution of wealth. In other words, wealth per capita tracks intergenerational well-being averaged across the generations, the former increases over a period of time if and only if the latter increase over that same period of time.

The report says that Green GDP is a misnomer in the sense that (i) Net Domestic Product (NDP) which is GDP – Depreciation of capital assets where depreciation should not only include wear and tear of buildings and equipment but also loss of human capital and physical depletion and quality degradation of natural capital and (ii) aggregate net investment per capita does not simply mean aggregate net investment divided by population but its social value of the change in per capita stocks of assets. The full report of the Expert Group is available in the Ministry of Statistics and Programme Implementation website. (https://www.mospi.gov.in)

An International Workshop was organized during 5-6 April 2013 in Delhi to discuss the report. Hon'ble Prime Minister inaugurated workshop and unveiled the report of the Expert Group.

Environmental Economic Accounting was discussed with State Directorates of Economic and Statistics in 21st Conference of the Central and State Statistical Organisations (COCSSO) which was held during January 23-24, 2014 at Panaji, Goa. During the conference, the following issues were discussed.

1. Availability of data at States/UTs level for preparation of asset accounts for land and forests.
2. Preparation of State-wise Assets Accounts so that National Level Asset Accounts can be generated based on consolidation of state-wise accounts.

2.9 Climate Change Statistics

As per the recommendations of 16th COCSSO, an Expert Committee on Climate Change Statistics was constituted by the CSO in 2009 to identify the indicators that are affecting climate change, adaptation and mitigation and examine the availability of data with a view to develop database on Climate Change Statistics. The Expert Committee constituted on Climate change data base has submitted their report during June 2010. The Ministry of Environment & Forest and others were consulted with recommendation of the report. Also a Workshop to discuss the framework for climate change statistics was held in Hyderabad on 3-4 February, 2012. Based on various inputs, the framework was finalized and data were collected as per the framework. The draft report on Climate Change Statistics was discussed in the National Workshop on 24-25th October 2013. The first report on 'Climate Change Statistics-India' was published by Central Statistics Office (CSO) on 29th November 2013.

**

CHAPTER THREE

BIODIVERSITY

3.1 Introduction

3.1.1 Biodiversity of any given area being a function of precipitation, temperature, soils, altitude etc, its distribution across the globe is quite uneven. For instance, terrestrial biodiversity is as much as 25 times higher than marine biodiversity. Within the terrestrial habitats, tropics are found to support much richer biodiversity than alpine or polar regions. India is considered very rich in biodiversity. It is estimated that about $1/6^{th}$ plant species of entire world belong to India. An area with a high concentration of endemic species is called a "hotspot". Out of the twelve hotspots of the world, two (North East and Western Ghat areas) are in India.

3.1.2. Biodiversity conservation efforts have many facets – scientific surveys, policy reforms, legislative initiatives, international co-operation, public participation etc. National agencies like the Forest Survey of India, Botanical Survey of India, Zoological Survey of India carry out extensive studies continuously to assess the extent of diversity and the change trends across habitats, flora and fauna. The country has enacted a number of legislations which have direct impact on biodiversity conservation efforts like the Indian Forest Act 1927, the Wildlife Protection Act 1972, the Forest (Conservation) Act 1980, the Environmental Protection Act 1988 and The *Biological Diversity Act 2002* being the most important among them. By amending the Constitution, protection of forests and wildlife has been made one of the Fundamental Duties. Because of being incorporated in the Concurrent List, Forests and Wildlife has been accorded a national perspective in policy making and legislation. India is signatory and zres and climatic situations have formed ecological habitats like forests, grasslands, wetlands, coastal and marine ecosystems and desert ecosystems, which harbour and sustain immense biodiversity and contribute to human well-being. an for Combating Climate Change.

3.1.3. The enormity and intensity of these efforts notwithstanding, there is hardly any room for complacency. Increase in population, urbanization, industrialization etc are often at the cost of destruction of habitats. The forces of development and that of conservation apparently bear adversarial relationships although this true only in the short term and both have commonalities in the long term. Rapid development at the cost of environmental degradation is doomed to be unsustainable. The country is endeavoring to balance the two.

3.1.4 Preventing a loss of biodiversity is important for mankind, given that humans depend on the natural richness of the planet for the food, energy, raw materials, clean air and clean water that make life possible and drive economies and societies. As such, a reduction or loss of biodiversity may not only undermine the natural environment but also economic and social goals. The challenges associated with preserving biodiversity have made this topic an international issue.

India's major biographic zones and their area are presented in table 3.1.1

3.2 Plant Biodiversity

3.2.1 Plant biodiversity as a national and global resource is extremely valuable but is poorly understood, inadequately documented and often wasted. The preservation of biodiversity is both a matter of investment and insurance to a) sustain and improve agricultural, forestry and fisheries production, b) act as a buffer against harmful environmental changes, c) provide raw materials for scientific and industrial innovations, and d) safe guard transferring biological richness to future generations.

Table 3.1.1. India's major biogeogrphic zones				
No.	Name	Biotic Province	Total Area (sq.km)	%
1	Trans Himalaya		174225	
		Ladakh	98618	3.3
		Tibetan Plateau	75607	2.3
2	Himalaya		210385	
		North-Western	69033	2.1
		Western	52596	1.6
		Central	6575	0.2
		Eastern	82182	2.5
3	Desert		213672	
		Kachchh	36160	1.1
		Thar	177512	5.4
4	Semi-Arid		545686	
		Central India	121629	3.7
		Gujarat-Rajputana	424057	12.9
5	Western Ghats		131491	
		Malabar coast	65745	2.0
		Western Ghat Mountains	65745	2.0
6	Deccan Peninsula		1377363	
		Deccan South Plateau	341875	10.4
		Deccan Central Plateau	410908	12.5
		Eastern Plateau	207098	6.3
		Chhota Nagpur	177512	5.4
		Central Highlands	239970	7.3
7	Gangetic Plain		355024	
		Upper Gangetic	207098	6.3
		Lower Gangetic	147927	4.5
	Coasts		82182	
8		East Coast	62458	1.9
		West Coast	19724	0.6
9	North East		170938	
		Brahmaputra Valley	65745	2.0
		North-Eastern Hills	105192	3.2
10	Island		12971	
		Andaman Islands	6575	0.2
		Nicobar Islands	3287	0.1
		Lakshadweep Islands	3110	0.1
	Marine Influenced Area:		10440	0.3
Grand Total			**3287263**	

Source: Wildlife Institute of India (Rodgers et al. 2002)/Zoological Survey of India

Table 3.2.1 : 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 Endemic Species		No. of ThreatenedSpecies	
		2010	2013	2010	2013	2010	2013	2010	2013	2010	2013
1	2	3	4	5	6	7	8	9	10	11	12
I	**Flowering Plants**										
1	Gymnosperms	1021	1021	69	74	7	7.25	8.00	8	7	7
2	Angiosperms	281821	268600	17643	17926	6	6.67	ca. 5725	ca. 4045	1700	1700
II	**Non-flowering Plants**										
1	Bryophytes	16236	16236	2852	2504	17.56	15.42	ca. 629	629	ca.80	ca.80
2	Pteridophytes	12000	12000	1236	1265	10.3	10.54	ca.47	47	ca. 414	414
III	**Others**										
1	Virus & Bacteria	11813	11813	903	986	7.64	8.35	Not Known	Not Known	Not Known	Not Known
2	Algae	40000	40000	7182	7244	17.95	18.11	ca.1924	1924	Not Known	Not Known
3	Fungi	98998	98998	14588	14756	14.73	14.91	ca4100	ca.4100	ca. 580	ca.580
4	Lichens	17000	17000	2303	2390	13.55	14.06	ca.520	ca.520	Not Known	Not Known

Source : Botanical Survey of India, Kolkata.

Source : World figures are based on the Second edition of the "Numbers of Living Species in Australia and the World" (Chapman, 2009); data on the number of species in India are taken from 'Plant Discoveries 2012- New Genera, Species and New Tecords' compiled and edited by Paramjit Singh, D.K. Singh and S.S. Dash, published by Botanical Survey of India in 2013.

3.2.2 Biodiversity the world over is in peril because the habitats are threatened due to development programmes such as creation of reservoirs, mining, forest clearing, laying of transport and communication networks, etc. It is estimated that in the world wide perspective, slightly over 1000 animal species and sub-species are threatened with an extinction rate of one per year, while 20,000 flowering plants are thought to be at risk.

The table 3.2.2 and chart 3.2.1depicts the enormous situation of plant species at risk. 73% of the total rare and threatened species are in the endangered category.

Table 3.2.2 : 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.

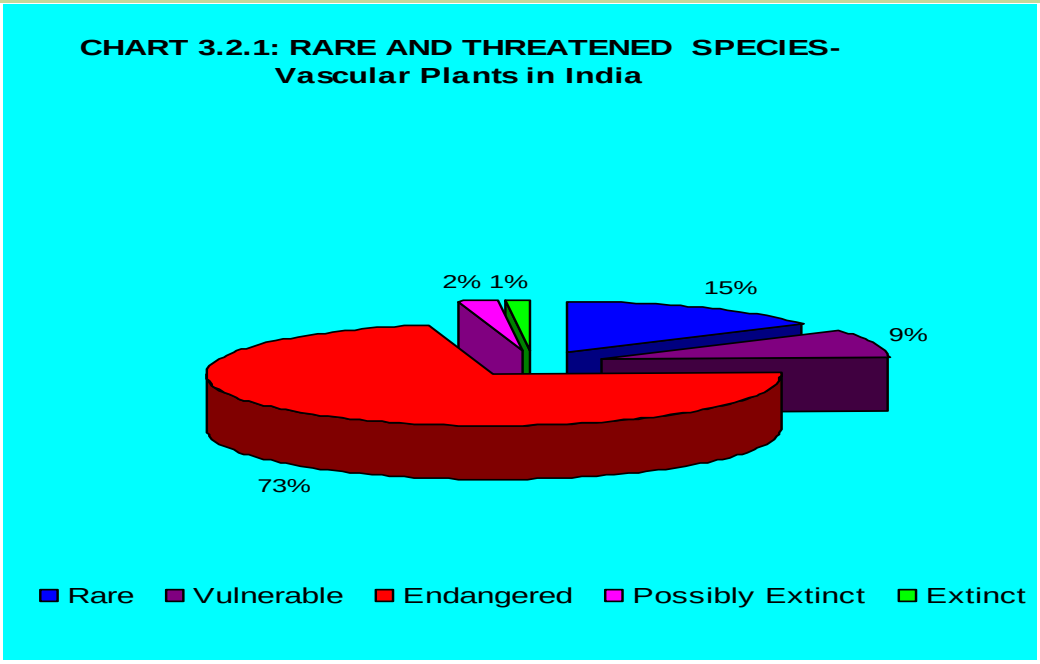


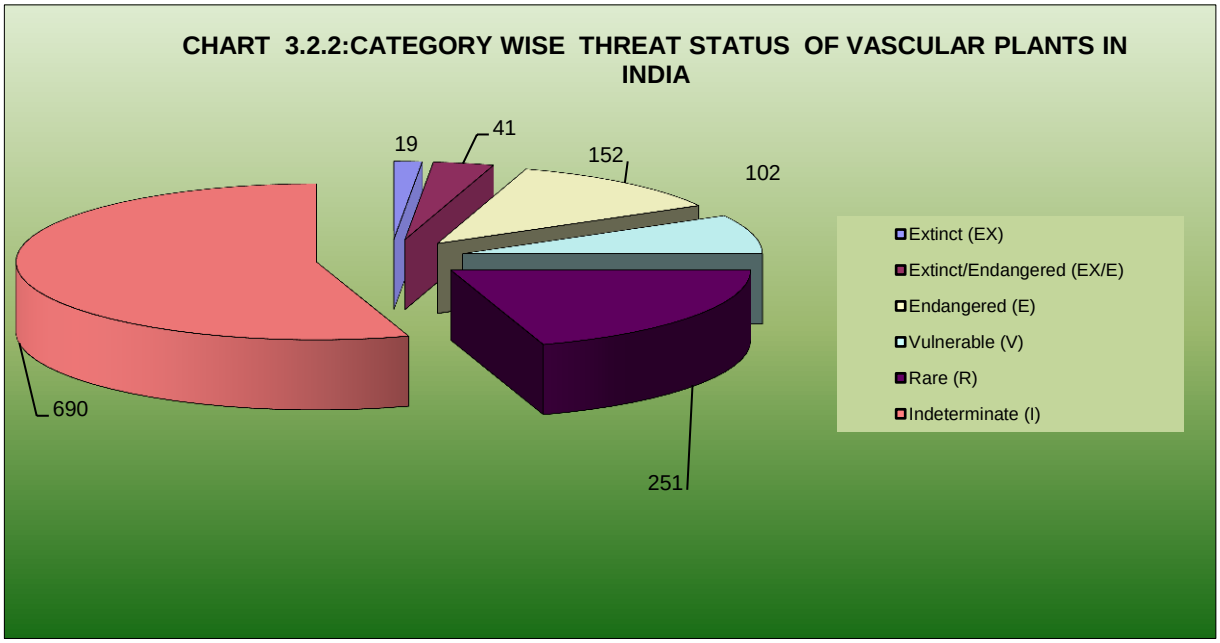
Table 3.2.3 : Threatened vascular plants

STATUS	GLOBAL	INDIA
Extinct (EX)	380	19
Extinct/Endangered (EX/E)	371	41
Endangered (E)	6522	152
Vulnerable (V)	7951	102
Rare (R)	14505	251
Indeterminate (I)	4070	690
Total under threat	33418	1236
Total number of species	242013	16000
Percentage under threat	13.8	7.7

Source : Botanical Survey of India, Kolkata.

Note : [Based on 'Red List of Threatened Vascular Plant Species in India' by C.K. Rao *et al*., 2003 published by BSI ENVIS Centre (compiled from the 1997 IUCN Red List of Threatened Plants)]

A comparison of the India Scenario vis –a vis the global situation shows 3.7 % of the World's threatened vascular plants are in India. In India, 7.7 % of vascular plant species are under threat, while at global level, 13.8% vascular plants are in a similar position.



Status Category summary by major taxonomic group of threatened plants in India is given in tables 3.2.4(a) & (b). Table 3.2.5 gives status category summary of treatened plants and species at global level

Table 3.2.4 (a): Status category summary by major taxonomic group (IUCN red list version 2013.1)

CLASS*	EX	EW	CR	EN	VU	LR/ cd	NT	DD	LC	Total
ANTHOCEROTOPSIDA	0	0	0	2	0	0	0	0	0	2
BRYOPSIDA	2	0	12	13	7	0	1	3	3	41
CHAROOHYACEAE	0	0	0	0	0	0	0	3	8	11
CHLOROPHYCEAE	0	0	0	0	0	0	0	1	0	1
CONIFEROPSIDA	0	0	27	96	79	0	98	7	297	604
CYCADOPSIDA	0	4	53	65	74	0	63	3	45	307
EQUISETOPSIDA	0	0	0	0	0	0	0	0	1	1
FLORIDEOPHYCEAE	1	0	6	0	3	0	0	44	4	58
GINKGOOPSIDA	0	0	0	1	0	0	0	0	0	1
GNETOPSIDA	0	0	0	1	3	0	7	10	76	97
ISOETOPSIDA	0	0	8	4	2	0	3	6	5	28
JUNGERMANNIOPSIDA	1	0	10	12	12	0	0	0	10	45
LILIOPSIDA	3	4	253	402	525	16	194	371	1135	2903
LYCOPODIOPSIDA	0	0	1	2	8	0	1	0	1	13
MAGNOLIOPSIDA	81	21	1514	2229	4255	195	1063	855	2990	13203
MARCHANTIOPSIDA	0	0	0	4	2	0	0	4	1	11
OPHIOGLOSSOPSIDA	0	0	0	0	0	0	0	0	3	3
OSMUNDOPSIDA	0	0	0	0	0	0	0	0	1	1
POLYPODIOPSIDA	2	0	35	42	64	0	15	50	58	266
SELLAGINELLOPSIDA	0	0	0	0	1	0	1	0	2	4
SPHAGNOPSIDA	0	0	0	0	2	0	0	0	0	2
TAKAKIOPSIDA	0	0	0	0	1	0	0	0	0	1
ULVOPHYCEAE	0	0	0	0	0	0	0	1	0	1
TOTAL	**90**	**29**	**1919**	**2873**	**5038**	**211**	**1446**	**1358**	**4640**	**17604**
OTHER GROUPS										
AGARICOMYCETES	0	0	1	0	0	0	0	0	0	1
LECANOROMYCETES	0	0	1	1	0	0	0	0	0	2
PHAEOPHYCEAE	0	0	4	1	1	0	0	9	0	15
TOTAL	**0**	**0**	**6**	**2**	**1**	**0**	**0**	**9**	**0**	**18**

Source : Botanical Survey of India, Kolkata.

*Anthocerotopsida (hornworts); Bryopsida, Sphagnopsida and Takakiopsida (true mosses); Chlorophyceae and Ulvophyceae (green algae); Coniferopsida (coniters); Cycadopsida (cycads); Florideophyceae (red algae); Ginkgoopsida (ginkgo); Isoetopsida (quillworts); Jungermanniopsida and Marchantiopsida (liverworts); Liliopsida (monocotyledons); Lycopodiopsida (club mosses); Magnoliopsida (dicotyledons); Ophioglossopsida, Osmundopsida and Polypodiopsida (true ferns); Sellaginellopsida (spike mosses).

Sellaginellopsida (spike mosses).

Other groups: Agaricomycetes (mushroom, etc.); Lecanoromyctes (discolichens); Phaeophyceae (brown algae).

EX - Extinct **EW** - Extinct in the Wild **CR** - Critically Endangered **EN** - Endangered

VU - Vulnerable **LR/cd** - Lower Risk/conservation dependent **NT** - Near Threatened

DD - Data Deficient **LC** - Least Concern (indudes **LR/lc** - Lower Risk, Least Concern).

Table 3.2.4 (b): Status category summary by major taxonomic group (IUCN red list version 2013.2)

CLASS*	EX	EW	CR	EN	VU	LR/ cd	NT	DD	LC	Total
ANTHOCEROTOPSIDA	0	0	0	2	0	0	0	0	0	2
BRYOPSIDA	2	0	12	13	7	0	1	3	3	41
CHAROOHYACEAE	0	0	0	0	0	0	0	3	8	11
CHLOROPHYCEAE	0	0	53	0	0	0	0	1	0	54
CYCADOPSIDA	0	4	0	65	74	0	63	3	45	254
EQUISETOPSIDA	0	0	6	0	0	0	0	0	1	7
FLORIDEOPHYCEAE	1	0	0	0	3	0	0	44	4	52
GINKGOOPSIDA	0	0	0	1	0	0	0	0	76	77
GNETOPSIDA	0	0	8	1	3	0	7	10	5	34
ISOETOPSIDA	0	0	10	4	2	0	3	6	10	35
JUNGERMANNIOPSIDA	1	0	273	11	12	0	1	0	1428	1726
LILIOPSIDA	3	4	1	468	551	16	215	396	4	1658
LYCOPODIOPSIDA	0	0	1527	2	9	0	3	0	3062	4603
MAGNOLIOPSIDA	81	21	1	2285	4290	195	1077	874	0	8824
MARCHANTIOPSIDA	0	0	1	0	0	0	0	0	1	2
OPHIOGLOSSOPSIDA	0	0	27	3	2	0	0	4	298	334
OSMUNDOPSIDA	0	0	38	96	79	0	98	7	63	381
POLYPODIOPSIDA	2	0	0	55	67	0	15	50	3	192
SELLAGINELLOPSIDA	0	0	0	0	0	0	0	0	0	0
SPHAGNOPSIDA	0	0	0	0	2	0	0	0	0	2
TAKAKIOPSIDA	0	0	0	0	1	0	0	0	0	1
ULVOPHYCEAE	0	0	0	0	0	0	0	1	0	1
TOTAL	**90**	**29**	**1957**	**3006**	**5102**	**211**	**1483**	**1402**	**5011**	**18291**
OTHER GROUPS										
AGARICOMYCETES	0	0	1	0	0	0	0	0	0	1
LECANOROMYCETES	0	0	1	1	0	0	0	0	0	2
PHAEOPHYCEAE	0	0	4	1	1	0	0	9	0	15
TOTAL	**0**	**0**	**6**	**2**	**1**	**0**	**0**	**9**	**0**	**18**

Source : Botanical Survey of India, Kolkata.

*Plants: Anthocerotopsida (hornworts); Bryopsida, Sphagnopsida and Takakiopsida (true mosses); Charophyaceae, Chlorophyceae and Ulvophyceae (green algae); Cycadopsida (cycads); Equisetopsida (horsetails); Florideophyceae (red algae); Ginkgoopsida (ginkgo); Gnetopsida (gnetums); Isoetopsida (quillworts); Jungermanniopsida and Marchantiopsida (liverworts); Liliopsida (monocotyledons); Lycopodiopsida (club mosses and spike mosses); Magnoliopsida (dicotyledons); Marattiopsida, Polypodiopsida and (ferns); Pinopsida (conifers).

Sellaginellopsida (spike mosses).

Other groups: Agaricomycetes (mushroom, etc.); Lecanoromyctes (discolichens); Phaeophyceae (brown algae).

EX - Extinct **EW** - Extinct in the Wild **CR** - Critically Endangered **EN** - Endangered

VU - Vulnerable **LR/cd** - Lower Risk/conservation dependent **NT** - Near Threatened

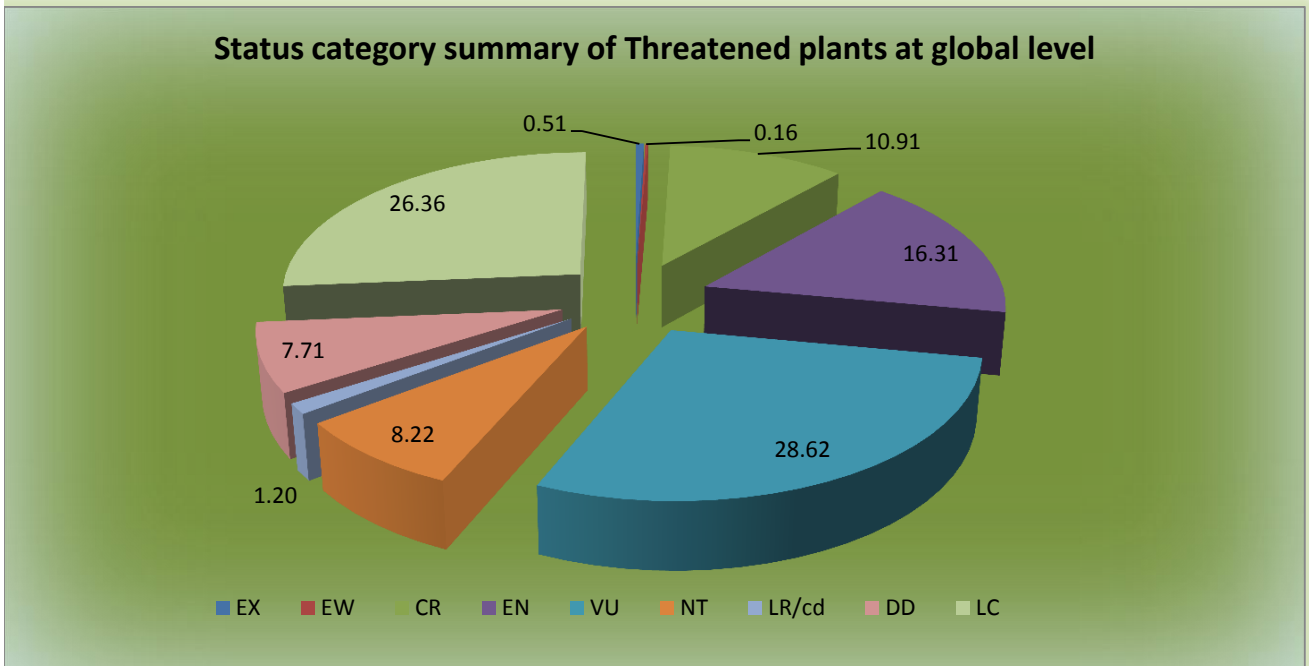
DD - Data Deficient **LC** - Least Concern (indudes **LR/lc** - Lower Risk, Least Concern).

Table 3.2.5: Status category summary at global level

STATUS	IUCN Red List version 2010	IUCN Red List version 2011.1	IUCN Red List version 2011.2	IUCN Red List version 2011.3
Extinct	86	87	**91**	90
Extinct in the Wild	28	31	**31**	29
Critically Endangered	1581	1716	**1752**	1920
Endangered,	2318	2528	**2572**	2871
Vulnerable,	4605	4854	**4869**	5038
Near Threatened (includes LR/nt - Lower Risk/near threatened)	1077	1230	**1246**	1447
Lower Risk/conservation dependent,	237	225	**224**	211
Data Deficient,	744	1011	**1070**	1358
Least Concern (includes LR/lc - Lower Risk, least concern).	1531	2507	**2727**	4640
TOTAL	**12207**	**14189**	**14582**	**17604**

Source : Botanical Survey of India, Kolkata.
Note : IUCN Red List Categories:

As evident from Chart 3.2.3, at global level, nearly 0.51% of the plant species are extinct, 10.91% critically endangered and 28.62% are in a vulnerable state.



3.3 Conservation Measures of Agro Biodiversity

3.3.1 There is a pressing need for the conservation of plant species. But it is largely impractical to conserve the very large number of crop species and their wild relatives in their natural habitats. National parks, seed banks etc are initiatives in this direction.

The details of total holdings collections and specimens of flora in India are shown at table 3.3.1.

Table 3.3.1 : Reference collections of flora

Sl. No.	Category	Total Number	Total Holdings of Collections and Specimens
1	2	3	4
1	Herbarium	65*	5594795
2	Museums	19	60500

Source : Botanical Survey of India, Kolkata.

* Index Herbariorum online

3.3.2 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.

Tables 3.3.2 to 3.3.5 present the various conservation measures for plants in India

Table 3.3.2 : Status of Ex-Situ conservation (base collection) of orthodox seeds at -180 °C

			(As on 30st November, 2010)	(as on 31st March 2012)
Sl. No.	**Crop Group**	**Species**	**Accessions***	**Accessions****
1	**2**	**3**	**4**	**5**
1	Cereals	90	150223	153183
2	Millets & Forages	178	55290	56067
3	Pseudo Cereals	30	6657	6785
4	Grain Legumes	69	57246	57744
5	Oilseeds	58	55803	56487
6	Fibre Crops	51	11535	11848
7	Vegetables	151	24377	24870
8	Fruits	35	530	530
9	Medicinal & Aromatic Plants & Narcotics	660	6404	6690
10	Spices & Condiments	17	2894	3212
11	Agro-Forestry	244	2442	2442
12	Duplicate Safety Samples	-	10235	10235
Total		**1583**	**383636**	390092

Source : National Bureau of Plant Genetic Resources

* : The figure includes 3777 released varieties and 2024 genetic stocks
No. of crop species conserved - 1583

** The figure includes 4074 released varieties and 2178 genetic stocks
No. of crop species conserved - 1584

Table 3.3.3 : Status of in-vitro conservation

(As on 31st March 2012)

Crop group	Genera (no.)	Species (no.)	Cultures* (no.)	Accessions (no.)
1	2	3	4	5
Tropical Fruits (banana, grape)	2	14	7600	416
Temperate and Minor Fruits (mulberry, strawberry, apple,pear,blackberry)	9	41	6140	327
Tuber crops (sweet potato, yam, taro)	5	12	9200	611
Bulbous and other crops (garlic, gladiolus)	4	12	3300	171
Medicinal and Aromatic Plants (species of bacopa, mentha, rauvolfia, tylophora)	21	28	4980	170
Spices and Industrial crops (ginger, turmeric, pepper, cardamom, hops, jojoba)	7	27	5880	380
Total	**48**	**134**	**37100**	**2075**

Source : National Bureau of Plant Genetic Resources, New Delhi

* data is for 2010

Table 3.3.4 : Status of cryopreservation of dormant buds & pollen grains

(As on 31 st December, 2010)

Dormant Buds	**337**
Pollen grains	**345**
Wild Relatives*	**997**
Rare & Endangered plants	**80**
Varieties*	**654**
Elite*	**4**
Registered germplasm*	**22**
Number of Species	**729**

Source : National Bureau of Plant Genetic Resources

* included in respective Categories stored as orthodox seeds.

Table 3.3.5 : Status of germplasm at national cryobank

Sl. No.	Category	No. of Accessions	
		2010 (As on 31st October)	2012 (As on 31st March)
1	2	3	4
I	**Intermediate & Recalcitrant**		
1	Fruits & Nuts	2618	2831
2	Spices & Condiments	148	151
3	Plantation Crops	22	22
4	Agroforestry & Forestry species	1640	1640
5	Industrial crops	1256	1325
6	Medicinal & Aromatic Plants	5	-
II	**Orthodox**		
1	Cereals	240	240
2	Millets and Forages	287	287
3	Pseudocereals	76	76
4	Grain Legumes	636	636
5	Oilseeds	471	471
6	Fibres	66	66
7	Vegetables	433	433
8	Medicinal & Aromatic Plants	849	923
9	Narcotics & dyes	34	34
10	Miscellaneous	16	16
	Total	**8797**	**9151**

Source : National Bureau of Plant Genetic Resources

There are 131 Botanical gardens in India exhibiting and protecting the Plant diversity of India.

3.4 Forest and Trees in India

3.4.1 Though more than one-fifth of India's geographic area is recorded as forest area, it is not known with certainty how much forest area actually bears forest cover. The National Forest Policy (1952 and 1988) aims at having one third of country's land area under forest and tree cover. India has 76.95 million hectares of recorded forest area in March 2007. This accounts for 23.41% of total geographic area. Per capita availability of forests in India is 0.06 ha which is much lower than the world average of 0.8 ha.

Table 3.3.6 : Conservation measures (in India)

Sl. No.	Category	Number	Total Geographical Area (Sq. Km.)
1	2	3	4
I	**Within Habitats (in situ)**		
1	Biosphere Reserves***	18	89,149.99
2	Conservation Reserves**	57	2,017.94
3	Community Reserves**	4	20.69
4	National Parks**	102	40,074.78
5	Wildlife Sanctuaries**	520	122,867.34
6	Reserve Forests+	NA	422,536
7	Protected Forests+	NA	213,982
8	Unclassed Forests+	NA	133,020
II	**Outside Habitats (ex situ)**		
1	Botanical Gardens*	131	NA
2	Gene Banks	NA	NA

Source : Botanical Survey of India, Kolkata.

\+ Source: FSI State of Forest Report, 2011

*** Source: Ministry of Environment & Forest Annual Report, 2012-13

** National Wildlife Database of Wildlife Institute of India

* BGCI Website

Note: Besides, there are 41 Tiger Reserves, 28 Elephant Reserves, 26 Ramsar Wetland Sites and 6 World Natural Heritage Sities in India(Source: MoEF Annual Report 2012-13). 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 one of the seventeen mega-diversity (eleventh among these in respect to number of endemic vascular plant species*) and tenth among the plant rich countries of the world as well as sixth among the centers of diversity and origin of agro-diversity. Out of the total thirty four biodiversity hot-spots in the world, India has four, viz. Himalaya, Indo-Burma, Western Ghats and Sri Lanka, and Sundaland (www.biodiversityhotspots.org). 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.

FOREST

Table 3.4.1 : Recorded forest area in States and UT's

(Sq.km)

Sl. No.	State/UT	Geographic Area	Recorded Forest Area				Percentage of Forest to Geo. Area
			Reserved Forests	Protected Forests	Unclassed Forests	Total Forest Area	
1	2	3	4	5	6	7	8
1	Andhra Pradesh	275069	50479	12365	970	63814	23.20
2	Arunachal Pradesh	83743	10546	9528	31466	51540	61.55
3	Assam	78438	17864	0	8968	26832	34.21
4	Bihar	94163	693	5779	1	6473	6.87
5	Chhattisgarh	135191	25782	24036	9954	59772	44.21
6	Delhi	1483	78	7	-	85	5.73
7	Goa	3702	253	845	126	1224	33.06
8	Gujarat	196022	14122	479	4326	18927	9.66
9	Haryana	44212	249	1158	152	1559	3.53
10	Himachal Pradesh	55673	1898	33130	2005	37033	66.52
11	Jammu & Kashmir	222236	17643	2551	36	20230	9.10
12	Jharkhand	79714	4387	19185	33	23605	29.61
13	Karnataka	191791	28690	3931	5663	38284	19.96
14	Kerala	38863	11123	142	-	11265	28.99
15	Madhya Pradesh	308245	61886	31098	1705	94689	30.72
16	Maharashtra	307713	49226	8195	4518	61939	20.13
17	Manipur	22327	1467	4171	11780	17418	78.01
18	Meghalaya	22429	1113	12	8371	9496	42.34
19	Mizoram	21081	7909	3568	5240	16717	79.30
20	Nagaland	16579	86	508	8628	9222	55.62
21	Odisha	155707	26329	15525	16282	58136	37.34
22	Punjab	50362	44	1137	1903	3084	6.12
23	Rajasthan	342239	12454	17416	2769	32639	9.54
24	Sikkim	7096	5452	389	-	5841	82.31
25	Tamil Nadu	130058	19388	2183	1306	22877	17.59
26	Tripura	10486	4175	2	2117	6294	60.02
27	Uttar Pradesh	240928	11660	1420	3503	16583	6.88
28	Uttarakhand	53483	24643	9885	123	34651	64.79
29	West Bengal	88752	7054	3772	1053	11879	13.38
30	Union Territories	9478	5843	1565	22	7430	78.39
Total		**3287263**	**422536**	**213982**	**133020**	**769538**	**23.41**

Source : India State of Forest Report 2011

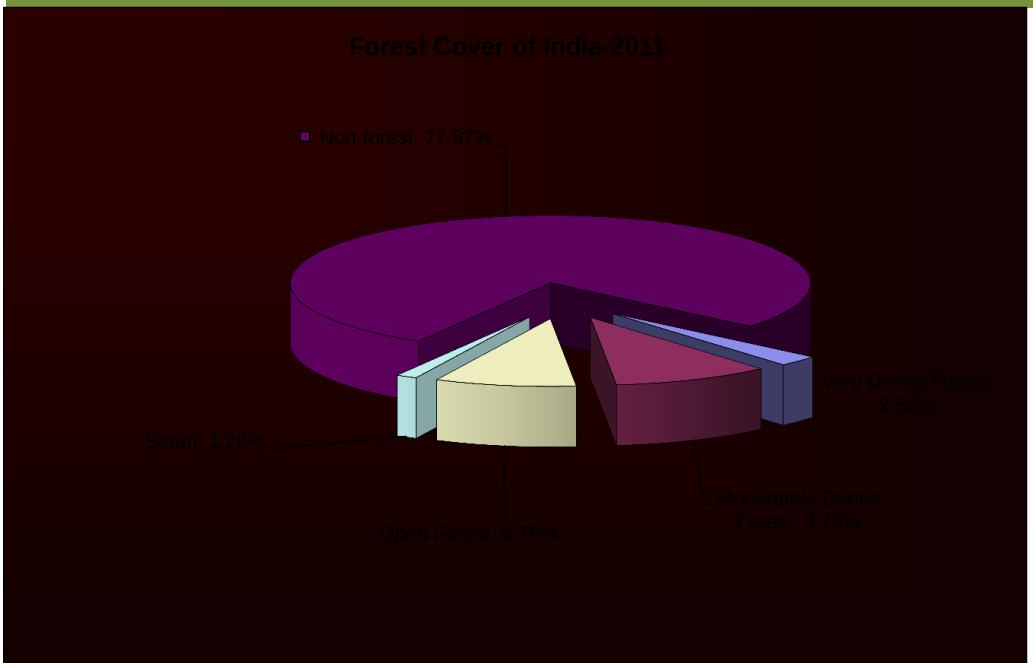


Table 3.4.2 : Forest area by ownership(during 2005-06)

(Sq.km)

Sl. No.	State/ Union Territory	Forest Department					Others		
		Reserved	Protected	Unclassed	Total	Area Under Sanctioned Working Plans	Revenue Department Forests	Corporate Bodies Forest/ Community Ownership	Private Forest
1	2	3	4	5	6	7	8	9	10
1	A&N Islands								
2	Andhra Pradesh	50478.63	12365.34	969.76	63813.73	63813.73	0.00	0.00	0.00
3	Arunachal Pradesh	10537.94	9535.79	31466.27	51540.00	15699.24	0.00	0.00	0.00
4	Assam	13870.00	3925.00	5865.00	23660.00	13870.00	0.00	0.00	0.00
5	Bihar								
6	Chandigarh								
7	Chhattisgarh	25782.17	24036.10	9954.13	59772.40	0.00	NA	NA	NA
8	Dadra & Nagar Haveli	198.76	4.82	0.00	203.58	198.76	0.00	0.00	0.00
9	Daman & Diu								
10	Delhi								
11	Goa								
12	Gujarat	14122.20	375.67	4426.65	18924.52	15497.76	NA	NA	NA
13	Haryana	249.07	1158.17	18.96	1426.20	1463.12	-	-	132.75
14	Himachal Pradesh	1896.00	33043.00	2094.00	37033.00	24909.00	NA	NA	NA
15	Jammu & Kashmir	20194.00	36.00	NA	20230.00	20230.00	NA	NA	NA
16	Jharkhand								
17	Karnataka								
18	Kerala								
19	Lakshadweep								
20	Madhya Pradesh	61886.00	31098.00	1704.00	94689.00	NA	NA	0.00	NA
21	Maharashtra	44476.00	7992.00	3459.00	55927.00	50590.00	2449.00	3563.00	NA
22	Manipur								
23	Meghalaya	712.74	12.39	399.48	1124.61	0.00	0.00	0.00	0.00
24	Mizoram	1657.28	2126.95	5834.44	9618.67	0.00	0.00	0.00	0.00
25	Nagaland	85.83	513.55	191.62	791.00	0.00	0.00	0.00	7621.07
26	Odisha	26329.12	15525.22	20.55	41874.89	877.81	16261.34	0.00	12.29
27	pondicherry								
28	Punjab	436.33	114929.96	19019.03	138285.32	305533.96	0.00	0.00	167320.07
29	Rajasthan	12801.32	17020.94	2805.68	32627.94	4710.18	NA	NA	NA
30	Sikkim								
31	Tamil Nadu								
32	Tripura	3588.18	589.23	2116.87	6294.29	1427.83	0.00	0.00	0.00
33	Uttar Pradesh	11609.00	1434.00	3411.00	16454.00	NA	-	72.65	14.31
34	Uttaranchal	24261.56	98.61	53.01	24413.19	0.00	4768.70	5449.64	158.69
35	West Bengal	7054.00	3772.00	1053.00	11879.00	395.29	0.00	0.00	0.00

Source : Indian Council of Forestry Research and Education

Note: Blank cell indicates information is not available

Table 3.4.3 presents the State/ UT wise details of forest area by composition (Coniferous forest, non- coniferous forest, mixed).

Table 3.4.2 : Forest area by ownership (during 2005-06)

(sq.km)

Sl. No.	State/ Union Territory	Coniferous forest			Non-coniferous Forest				Coniferous & Non-coniferus	Total
		Chir	Deodar	Others Conifers	Sal	Teak	Mangrove	Others		
1	2	3	4	5	6	7	8	9	10	11
1	A & N Islands									
2	Andhra Pradesh	0.00	0.00	0.00	47.16	9145.00	0.00	54621.57	0.00	63813.73
3	Arunachal Pradesh	243.00	NA	35.30	0.00	0.00	0.00	47767.00	0.00	51540.00
4	Assam	0.00	0.00	0.00	529.00	0.00	NA	NA	NA	529.00
5	Bihar									
6	Chandigarh									
7	Chhattisgarh	0.00	0.00	0.00	24244.88	5633.13	0.00	29894.39	0.00	59772.40
8	Dadra & Nagar	0.00	0.00	0.00	0.00	0.00	0.00	203.58	0.00	203.58
9	Daman & Diu									
10	Delhi									
11	Goa									
12	Gujarat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Haryana									
14	Himachal Pradesh	1364.00	1310.00	6328.00	190.00	0.00	0.00	7178.00	20663.00	37033.00
15	Jammu & Kashmir	1825.00	1075.00	5368.00	0.00	0.00	0.00	1885.00	10075.00	20230.00
16	Jharkhand									
17	Karnataka									
18	Kerala									
19	Lakshadweep									
20	Madhya Pradesh	0.00	0.00	0.00	NA	NA	NA	NA	0.00	94689.00
21	Maharashtra	0.00	0.00	0.00	0.00	10002.00	116.00	45809.00	0.00	55927.00
22	Manipur									
23	Meghalaya	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
24	Mizoram	0.00	0.00	0.00	0.00	150.00	0.00	3036.75	21.30	3208.05
25	Nagaland					0.00	0.00	0.00	0.00	
26	Odisha	0.00	0.00	0.00	16938.25	2030.64	203.00	38974.72	0.00	58146.61
27	Pondicherry									
28	Punjab	0.00	0.00	1090.25	0.00	0.00	0.00	3045150.14	305605.00	305605.39
29	Rajasthan	-	-	-	-	942.24	-	31685.70	-	32627.94
30	Sikkim									
31	Tamil Nadu									
32	Tripura	0.00	0.00	0.00	271.90	1567.51	0.00	4454.80	0.00	6294.29
33	Uttar Pradesh	-	-	-	173764.00	25967.00	-	1116698.00	-	1645406.00
34	Uttaranchal	3993.30	192.65	1205.87	3151.13	200.93	0.00	3420.24	12249.07	24413.19
35	West Bengal	-	-	89.00	-	-	1909.00	-	9881.00	11879.00

Source : Indian Council of Forestry Research and Education
Note: Blank cell indicates information is not available
Nonresponding States A & N Island, Assam, Bihar, Delhi, Manipur, Mizoram and Nagaland.

3.4.4 As per the latest State of Forest Report 2011, the forest cover in the country is 692,029 kmsq. and constitutes 21.05 % of its geographic area.

Table 3.4.4 : Forest cover in India 2011

Class	Area (Sq. Km)	Percentage of Geographic Area
1	2	3
Forest Cover		
Very Dense Forest	83471	2.54
Moderately Dense Forest	320736	9.76
Open Forest	287820	8.75
Total Forest Cover*	**692027**	**21.05**
Non-Forest Cover		
Scrub	42176	1.28
Non-forest	2553060	77.67
Total Geographic Area	**3287263**	**100**

Source : India State of Forest Report 2011

* Includes 4662 Sq km area under mangroves

3.4.5 In India, 40.79 % of the total forest area is in the hill districts and this covers 39.82% of the total geographic area of the hill districts. **The table 3.4.6 depicts the details of State / UT wise Forest Cover in Hill Districts of India.** It is pertinent to mention that, in India, 59.72 % of the total forest area is in tribal districts and covers 37.32% of total geographic area of tribal districts. **The table 3.4.7 depicts the details of State / UT wise Forest Cover in Tribal Districts of India.**

3.4.5 **State /UT wise Forest area covered and its percentage to total geographic area are presented in table 3.4.5.**

Table 3.4.5: Forest cover in states/Uts in India - 2011

(Area in Sq. km)

Sl. No.	State/UT	Geographic Area	Forest Cover Area				Percent of G.A.	Scrub
			Very Dense Forest	Moderate Dense Forest	Open Forest	Total Forest		
1	2	3	4		5	6	7	8
1	Andhra Pradesh	275069	850	26242	19297	46389	16.86	10372
2	Arunachal Pradesh	83743	20868	31519	15023	67410	80.50	111
3	Assam	78438	1444	11404	14825	27673	35.28	179
4	Bihar	94163	231	3280	3334	6845	7.27	134
5	Chhattisgarh	135191	4163	34911	16600	55674	41.18	107
6	Delhi	1483	7	50	120	177	11.94	1
7	Goa	3702	543	585	1091	2219	59.94	1
8	Gujarat	196022	376	5231	9012	14619	7.46	1463
9	Haryana	44212	27	457	1124	1608	3.64	145
10	Himachal Pradesh	55673	3224	6381	5074	14679	26.37	327
11	Jammu & Kashmir	222236	4140	8760	9639	22539	10.14	2036
12	Jharkhand	79714	2590	9917	10470	22977	28.82	683
13	Karnataka	191791	1777	20179	14238	36194	18.87	3176
14	Kerala	38863	1442	9394	6464	17300	44.52	58
15	Madhya Pradesh	308245	6640	34986	36074	77700	25.21	6401
16	Maharashtra	307713	8736	20815	21095	50646	16.46	4157
17	Manipur	22327	730	6151	10209	17090	76.54	1
18	Meghalaya	22429	433	9775	7067	17275	77.02	211
19	Mizoram	21081	134	6086	12897	19117	90.68	1
20	Nagaland	16579	1293	4931	7094	13318	80.33	2
21	Odisha	155707	7060	21366	20477	48903	31.41	4852
22	Punjab	50362	0	736	1028	1764	3.50	20
23	Rajasthan	342239	72	4448	11567	16087	4.70	4347
24	Sikkim	7096	500	2161	698	3359	47.34	356
25	Tamil Nadu	130058	2948	10321	10356	23625	18.16	1206
26	Tripura	10486	109	4686	3182	7977	76.07	75
27	Uttar Pradesh	240928	1626	4559	8153	14338	5.95	745
28	Uttarakhand	53483	4762	14167	5567	24496	45.80	271
29	West Bengal	88752	2984	4646	5365	12995	14.64	29
30	A. & N. Islands	8249	3761	2416	547	6724	81.51	53
31	Chandigarh	114	1	10	6	17	14.91	1
32	Dadra & Nagar Haveli	491	0	114	97	211	42.97	1
33	Daman & Diu	112	0	1	6	7	6.25	3
34	Lakshadweep	32	0	17	10	27	84.38	0
35	Puducherry	480	0	35	15	50	10.42	0
Total		**3287263**	**83471**	**320737**	**287821**	**692029**	**21.05**	**41525**

Source:India State of Forest Report 2011

Table 3.4.6 : State/UT wise forest cover in hill districts-2011

(Sq. km)

Sl. No.	Name of State/UT	Number of Hill Districts	Geographic Area	Forest Cover Area				Percent Forest Cover
				Very Dense Forest	Moderately Dense Forest	Open Forest	Total (2011)	
1	2	3	4	5	6	7	10	11
1	Arunachal Pradesh	13	83743	20868	31519	15023	67410	80.50
2	Assam	3	19153	741	5725	6519	12985	67.80
3	Himachal Pradesh	12	55673	3224	6381	5074	14679	26.37
4	Jammu & Kashmir (a)	14	101388	2814	6269	6953	16036	15.82
	(b)	*	120848	1326	2471	2686	6483	5.36
5	Karnataka	6	48046	1492	14920	6788	23200	48.29
6	Kerala	10	29572	1105	7305	5277	13687	46.28
7	Maharashtra	7	69905	318	7237	7947	15502	22.18
8	Manipur	9	22327	730	6151	10209	17090	76.54
9	Meghalaya	7	22429	433	9775	7067	17275	77.02
10	Mizoram	8	21081	134	6086	12897	19117	90.68
11	Nagaland	8	16579	1293	4931	7094	13318	80.33
12	Sikkim	4	7096	500	2161	698	3359	47.34
13	Tamil Nadu	5	22789	962	3370	2040	6372	27.96
14	Tripura	4	10486	111	4686	3182	7979	76.95
15	Uttaranchal	13	53483	4762	14167	5567	24496	45.80
16	West Bengal	1	3149	714	663	912	2289	72.69
	Total	**124**	**707747**	**41527**	**133817**	**105933**	**281277**	**39.74**

Source:India State of Forest Report, 2011

* : Refers to area outside LOC i.e. under illegal occupation of Pakistan and China.

Table 3.4.7: State/UT wise forest cover in tribal districts - 2011

(Sq. km)

Sl. No.	State/UT	Number of Tribal Districts	Geographic Area	Forest Cover				Percent Forest Cover
				Very Dense Forest	Moderately Dense Forest	Open Forest	Total	
1	2	3	4	5	6	7	10	11
1	Andhra Pradesh	8	87090	239	16613	8449	25301	29.05
2	Arunachal Pradesh	13	83743	20868	31519	15023	67410	80.50
3	Assam	16	50137	648	4599	6749	11996	23.93
4	Chhattisgarh	9	92656	3614	24477	11966	40057	43.23
5	Gujarat	8	48409	322	2944	3500	6766	13.98
6	Himachal Pradesh	3	26764	950	1067	1214	3231	12.07
7	Jharkhand	8	44413	1677	6067	6218	13962	31.44
8	Karnataka	5	26597	1248	7642	4249	13139	49.02
9	Kerala	9	27228	1073	7017	5006	13039	47.89
10	Madhya Pradesh	18	139448	5639	20275	16387	42301	30.33
11	Maharashtra	11	138272	7275	11389	10848	29512	21.34
12	Manipur	9	22327	730	6151	10209	17090	76.54
13	Meghalaya	7	22429	433	9775	7067	17275	77.02
14	Mizoram	8	21081	134	6086	12897	19117	90.68
15	Nagaland	8	16579	1293	4931	7094	13318	80.33
16	Odisha	12	86124	5268	14442	13588	33298	38.66
17	Rajasthan	5	38218	0	2442	3907	6349	16.61
18	Sikkim	4	7096	500	2161	698	3359	47.34
19	Tamil Nadu	6	30720	697	2392	3653	6742	21.95
20	Tripura	4	10486	109	4686	3182	7977	76.95
21	Uttar Pradesh	1	7680	409	475	435	1319	17.17
22	West Bengal	11	69403	2962	4475	4863	12300	17.72
23	Andaman & Nicobar	2	8249	3761	2416	547	6724	81.51
24	Dadra & Nagar Haveli	1	491	0	114	97	211	42.97
25	Daman & Diu	1	72	0	1	3	4	5.56
26	Lakshadweep	1	32	0	17	10	27	84.38
	Total	**188**	**1105744**	**59849**	**194173**	**157859**	**411881**	**37.25**

Source:India State of Forest Report 2011

Table 3.4.8 : State/UT wise forest area (1987-2011)														
Sl. No.	State/UT	Total Forest Area in Sq.Km												
		1987	1988	1989	1991	1995	1997	1999	2001	2003	2005	2007	2009	2011
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Andhra Pradesh	63771	63771	63771	63726	63814	63814	63814	63814	63821	63821	63814	63814	63814
2	Arunachal Pradesh	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540
3	Assam	30708	30708	30708	30708	30708	30708	30708	27018	27018	26832	26832	26832	26832
4	Bihar	29230	29230	29230	29226	29226	29226	29226	6078	6473	6473	6473	6473	6473
5	Chhattisgarh								59285	59772	59772	59772	59772	59772
6	Delhi	42		42	42	42	42	85	85	85	85	85	85	85
7	Goa	1053	1053	1053	1256	1424	1424	1424	1224	1224	1224	1224	1224	1224
8	Gujarat	18777	18777	18777	19388	19393	19393	19393	18999	19113	18962	18927	18927	18927
9	Haryana	1685	1685	1685	1687	1673	1673	1673	1551	1558	1559	1559	1559	1559
10	Himachal Pradesh	21325	21325	21325	37591	35407	35407	35407	37033	37033	37033	37033	37033	37033
11	Jammu & Kashmir	20892	20892	20892	20174	20182	20182	20182	20230	20230	20230	20230	20230	20230
12	Jharkhand								23605	23605	23605	23605	23605	23605
13	Karnataka	38644	38644	38644	38646	38724	38724	38724	38724	43084	38284	38284	38284	38284
14	Kerala	11222	11222	11222	11222	11221	11221	11221	11221	11268	11265	11265	11265	11265
15	Madhya Pradesh	155414	155414	155414	155414	154497	154497	154497	95221	95221	94689	94689	94689	94689
16	Maharashtra	64055	64055	64055	63861	63842	63842	63842	61939	61939	61939	61939	61939	61939
17	Manipur	15155	15155	15155	15154	15154	15154	15154	17418	17418	17418	17418	17418	17418
18	Meghalaya	8514	8514	8514	9496	9496	9496	9496	9496	9496	9496	9496	9496	9496
19	Mizoram	15935	15935	15935	15935	15935	15935	15935	15935	16717	16717	16717	16717	16717
20	Nagaland	8625	8625	8625	8625	8629	8629	8629	8629	8629	9222	9222	9222	9222
21	Odisha	59555	59555	59555	59555	57184	57184	57184	58135	58136	58136	58136	58136	58136
22	Punjab	2803	2803	2803	2842	2901	2901	2901	3059	3084	3084	3084	3058	3084
23	Rajasthan	31151	31151	31151	31559	31700	31700	31700	32494	32488	32488	32639	32639	32639
24	Sikkim	2650	2650	2650	2650	2650	2650	2650	5765	5841	5841	5841	5841	5841
25	Tamil Nadu	22319	22319	22319	22699	22628	22628	22628	22871	22877	22877	22877	22877	22877
26	Tripura	6280	6280	6280	6292	6293	6293	6293	6293	6293	6294	6294	6294	6294
27	Uttar Pradesh	51269	51269	51269	51502	51663	51663	51663	16826	16826	16796	16583	16583	16583
28	Uttarakhand								34662	34662	34651	34651	34651	34651
29	West Bengal	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879
30	A & N Islands	7144	7144	7144	7171	7171	7171	7171	7171	7171	7171	7171	7171	7171
31	Chandigarh	6	6	6	31	31	31	31	32	34	33	34	34	34
32	Dadra and Nagar Haveli	203	203	203	207	203	203	203	203	204	204	204	204	204
33	Daman & Diu	*	*	*	*	*	NA	0.7	1	1	6	8	8	8
34	Lakshadweep	nil	nil	nil	nil	nil	NA	0	0	0	0	0	0	0
35	Puducherry	nil	nil	nil	nil	nil	NA	0	0	0	0	13	13	13
	Total	**751846**	**751346**	**751846**	**770078**	**765210**	**765210**	**765253**	**768436**	**774740**	**769626**	**769538**	**769512**	**769538**

Source: Ministry of Environment & Forests

* Included in Goa

3.5 Changes in coverage of Forests, Trees and Mangroves

3.5.1 Multi-pronged pressures on forests come from population, cattle grazing, fuel and fodder collection, industry and forest fires, etc. The changes forest cover between 2009-2011 state wise is given in table 3.5.1.

Table3.5.1 : Change in forest cover of states/UTs between 2009 and 2011

State/UT	Geographical Area	2009				2011				Change			
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total Forest	Very Dense Forest	Mod. Dense Forest	Open Forest	Total Forest	VDF	MDF	Open	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Andhra Pradesh	275069	850	26377	19443	46670	850	26242	19297	46389	0	-135	-146	-281
Arunachal Pradesh	83743	20873	31574	15037	67484	20868	31519	15023	67410	-5	-55	-14	-74
Assam	78438	1461	11558	14673	27692	1444	11404	14825	27673	-17	-154	152	-19
Bihar	94163	231	3248	3325	6804	231	3280	3334	6845	0	32	9	41
Chattisgarh	135191	4163	34911	16604	55678	4163	34911	16600	55674	0	0	-4	-4
Delhi	1483	6.76	49.84	119.98	176.58	6.76	49.48	119.96	176.2	0	-0.4	0	0
Goa	3702	543	578	1091	2212	543	585	1091	2219	0	7	0	7
Gujarat	196022	376	5249	8995	14620	376	5231	9012	14619	0	-18	17	-1
Haryana	44212	27	463	1104	1594	27	457	1124	1608	0	-6	20	14
Himachal Pradesh	55673	3224	6383	5061	14668	3224	6381	5074	14679	0	-2	13	11
Jammu & Kashmir	222236	4140	8760	9637	22537	4140	8760	9639	22539	0	0	2	2
Jharkhand	79714	2590	9899	10405	22894	2590	9917	10470	22977	0	18	65	83
Karnataka	191791	1777	20181	14232	36190	1777	20179	14238	36194	0	-2	6	4
Kerala	38863	1443	9410	6471	17324	1442	9394	6464	17300	-1	-16	-7	-24
Madhya Pradesh	308245	6647	35007	36046	77700	6640	34986	36074	77700	-7	-21	28	0
Maharashtra	307713	8739	20834	21077	50650	8736	20815	21095	50646	-3	-19	18	-4
Manipur	22327	701	5474	11105	17280	730	6151	10209	17090	29	677	-896	-190
Meghalaya	22429	410	9501	7410	17321	433	9775	7067	17275	23	274	-343	-46
Mizoram	21081	134	6149	12900	19183	134	6086	12897	19117	0	-63	-3	-66
Nagaland	16579	1274	4897	7293	13464	1293	4931	7094	13318	19	34	-199	-146
Orissa	155707	7073	21394	20388	48855	7060	21366	20477	48903	-13	-28	89	48
Punjab	50362	0	733	931	1664	0	736	1028	1764	0	3	97	100
Rajasthan	342239	72	4450	11514	16036	72	4448	11567	16087	0	-2	53	51
Sikkim	7096	500	2161	698	3359	500	2161	698	3359	0	0	0	0
Tamil Nadu	130058	2926	10343	10282	23551	2948	10321	10356	23625	22	-22	74	74
Tripura	10486	109	4702	3174	7985	109	4686	3182	7977	0	-16	8	-8
Uttar Pradesh	240928	1626	4563	8152	12341	1626	4559	8153	14338	0	-4	1	-3
Uttarakhand	53483	4762	14165	5568	24495	4762	14167	5567	24496	0	2	-1	1
West Bengal	88752	2987	4644	5363	12994	2984	4686	5365	12995	-3	2	2	1
A & N Islands	8249	3762	2405	495	6662	3761	2416	547	6724	-1	11	52	62
Chandigarh	114	1	10	6	17	1.35	9.55	5.88	16.78	0.35	-0.4	-0.1	-0.22
Dadra and Nagar Haveli	491	0	114	97	211	0	114	97	211	0	0	0	0
Daman and DIU	112	0	0.62	5.03	5.65	0	0.62	5.53	6.15	0	0	0.5	0.5
Lakshwadeep	32	0	16.71	9.77	26.48	0	17.18	9.88	27.06	0	0.47	0.11	0.58
Puducharry	480	0	34.1	15.87	49.77	0	35.37	14.69	50.06	0	1.27	-1.2	0.09
India	**3287263**	**83428**	**320238**	**288728**	**692394**	**83471**	**320736**	**287820**	**692027**	**43**	**498**	**-908**	**-367**

Source: India State of Forest Report 2011

3.5.2 A significant decrease in the forest cover is reported from Andhra Pradesh, Arunachal Pradesh, Assam, Chhatisgarh, Nagaland and Tripura whereas the states of Jharkhand, Manipur, Meghalaya, Mizoram and Orissa have shown a significant increase in forest cover.

The table 3.5.2 exhibits the Changes in forest cover of the north-eastern region

Table 3.5.2: Changes in forest cover of the north-eastern region

Sl. No.	States/Uts	Forest Cover Assessment		Change in Forest Cover over assessment years						
		2011	2007	1995-97	1997-99	2001	2003	2005	2007	2011
1	2	3	4	5	6	7	8	9	10	11
1	Arunachal Pradesh	67410	67353	- 19	245	913	-2068	-220	-119	-74
2	Assam	27673	27692	- 237	- 136	1602	2445	23	-66	-19
3	Manipur	17090	17280	- 140	- 34	505	-630	-307	328	-190
4	Meghalaya	17275	17321	- 57	- 24	902	390	280	116	-46
5	Mizoram	19117	19240	199	- 437	-1941	2186	17	640	-66
6	Nagaland	13318	13464	- 70	- 57	-184	35	-350	-201	-146
7	Sikkim	3359								0
8	Tripura	7977	8073	8	199	3124	-746	50	-100	-8
Total		**173219**	**170423**	**- 316**	**- 244**	**4921**	**1612**	**-507**	**598**	-549

Source :India State of Forest Report, 2011

Note: Column 6 to 10 indicates change in the forest cover with respect to previous assesment year
(eg. Year X1 - X2 means Area in Year X2 - Area in Year X1)

3.5.3 It is very important to examine the details of changes in forest cover of the north eastern region of forest cover to total forest cover of the Country. The share of north-eastern region is only 7.98% of the geographical area of the country, but, it accounts for nearly one- fourth of its forest cover. The region has been identified as one of the 18 biodiversity hot-spots of the world.

Table 3.5.3: State/UT wise tree cover estimates

Sl. No.	State/UT	Geographic Area (Km^2)	Tree Cover	
			Area (Km^2)	% of Geog. Area
1	2	3	5	6
1	Andhra Pradesh	275069	7152	2.60
2	Arunachal Pradesh	83743	549	0.66
3	Assam	78438	1564	1.99
4	Bihar	94163	2369	2.52
5	Chhattisgarh	135191	3866	2.86
6	Delhi	1483	120	8.09
7	Goa	3702	286	7.73
8	Gujarat	196022	7837	4.00
9	Haryana	44212	1395	3.16
10	Himachal Pradesh	55673	623	1.12
11	Jammu & Kashmir	222236	6550	2.95
12	Jharkhand	79714	2914	3.66
13	Karnataka	191791	5733	2.99
14	Kerala	38863	2755	7.09
15	Madhya Pradesh	308245	7090	2.30
16	Maharashtra	307713	9079	2.95
17	Manipur	22327	193	0.86
18	Meghalaya	22429	578	2.58
19	Mizoram	21081	190	0.90
20	Nagaland	16579	322	1.94
21	Odisha	155707	4301	2.76
22	Punjab	50362	1699	3.37
23	Rajasthan	342239	8272	2.42
24	Sikkim	7096	25	0.35
25	Tamil Nadu	130058	4718	3.63
26	Tripura	10486	184	1.75
27	Uttar Pradesh	240928	7382	3.06
28	Uttarakhand	53483	642	1.20
29	West Bengal	88752	2335	2.63
30	A. & N. Islands	8249	39	0.47
31	Chandigarh	114	10	8.77
32	Dadra & Nagar Haveli	491	29	5.91
33	Daman & Diu	112	9	8.04
34	Lakshadweep	32	5	15.63
35	Puducherry	480	31	6.46
Total		**3287263**	**90844**	**2.76**

Source :India State of Forest Report, 2011

3.5.4 In India, only 2.76% of total geographical area is having tree cover. **The table 3.5.3 elaborates the State/ UT wise details of tree cover.**

Table 3.5.4 : Physiographic zone wise tree cover estimate

Sl. No.	Physiographic Zone	Geographic Area (Sq Km)	2009		2011	
			Tree Cover		Tree Cover	
			Area (Sq Km)	% of Geog. Area	Area (Sq Km)	% of Geog. Area
1	2	3	4	5	6	7
1	Western Himalayas	329255	8091	2.46	7859	2.39
2	Eastern Himalayas	74618	324	0.43	356	0.48
3	North East	133990	2243	1.67	2275	1.70
4	Northern Plains	295780	9473	3.20	9366	3.17
5	Eastern Plains	223339	5444	2.44	5168	2.31
6	Western Plains	319098	7497	2.35	7038	2.21
7	Central Highlands	373675	9150	2.45	9886	2.65
8	North Deccan	355988	7559	2.12	7007	1.97
9	East Deccan	336289	11157	3.32	10718	3.19
10	South Deccan	292416	8002	2.74	8012	2.74
11	Western Ghats	72381	3847	5.31	4083	5.64
12	Eastern Ghats	191698	4051	2.11	4420	2.31
13	West Coast	121242	9427	7.78	8863	7.31
14	East Coast	167494	6504	3.88	5791	3.46
Total		**3287263**	**92769**	**2.82**	**90844**	**2.76**

Source : India State of Forest Report-2011

3.5.5 The Country has been stratified into 14 physiographic zones. Among them, the zones with highest tree cover to its total geographic area are West Coast (7.31%) followed by Western Ghats (5.64%). The zone wise details are shown in the table 3.5.4.
The table 3.5.5 presents the details of growing stock according to physiographic zones.

Table 3.5.5: Physiographic zone wise growing stock

Sl. No.	Physiographic Zone	Area of Phy.Zone (Km^2)	Recorded Forest Area (Km^2)	Growing Stock (volume in million Cum)		
				In Forest	In Tree Outside Forest*	Total
1	2	3	4	5	6	7
1	W. Himalayas	329255	91073	1021.94	191.23	1213.03
2	E. Himalayas	74618	47965	473.2	67.11	542.55
3	North East Ranges	133990	79431	341.14	93.67	443.99
4	Northern Plains	295780	13992	142.6	101.96	246.87
5	Eastern Plains	223339	31709	240.53	102.36	337.96
6	Western Plains	319098	13694	7.93	66.10	82.29
7	Central Highlands	373675	80788	109.37	108.52	220.23
8	North Deccan	355988	87260	281.07	83.00	364.54
9	East Deccan	336289	128757	622.18	191.49	820.92
10	South Deccan	292416	49451	224.42	127.59	358.70
11	Western Ghats	72381	32399	461.78	117.47	580.46
12	Eastern Ghats	191698	74418	360.65	67.73	435.91
13	West Coast	121242	20736	106.21	141.98	254.08
14	East Coast	167494	17839	105.63	88.21	196.69
Total		**3287263**	**769512**	**4498.65**	**1548.42**	**6098.22**

Source :India State of Forest Report, 2009

3.5.6 The Forest Produce also has some role in the degradation of forests. Forest produce is defined under section 2(4) of the Indian Forest Act, 1927. Its legal definition includes timber, charcoal, wood-oil, resin, natural varnish, bark, lac, myrobalans, mahua flowers (whether found inside or brought from a forest or not), trees and leaves, flowers and fruit, plants (including grass, creepers, reeds and moss), wild animals, skins, tusks, horns, bones, cocoons, silk, honey, wax, other parts or produce of animals, and also includes peat, surface soil, rocks and minerals etc. when found inside or brought from a forest, among other things. Forest produce can be divided into several categories. From the point of view of usage, forest produce can be categorized into three types: Timber, Non Timber and Minor Minerals.

The tables 3.5.6 to 3.5.8 at presents the details of State wise Production of forest produce.

Table 3.5.6: State-wise production of forest produce (2004-05)

Sl. No.	State/ Union Territory	Round Wood		Wood Fuel	Saw logs & Veneer logs		Pulp wood		Other Industrial roundwood (poles & Posts)		Sawn wood		Chips & particles	Wood residues	Wood charcoal
		C	NC		C	NC	C	NC	C	NC	C	NC			
		(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	MT	MT	MT	MT	MT
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	A & N Islands														
2	Andhra Pradesh	2308.00	0.00	0.00	0.00	0.00	0.00	432331.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Arunachal Pradesh	19967.46	0.00	13320.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	191.55
4	Assam	0.00	6419.00	365.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	Bihar														
6	Chandigarh														
7	Chhattisgarh	0.00	0.00	97500MT	0.00	161000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Daman & Diu														
10	Delhi														
11	Goa	0.00	17352.72	29132.44	0.00	0.00	0.00	0.00	0.00	2727.00	0.00	0.00	0.00	0.00	345384 kgs
12	Gujarat	0.00	18293.85	146553.34(mt)	NA	0.00	NA	NA	NA	18013.16	0	957.16 cm	NA	NA	NA
13	Haryana														
14	Himachal Pradesh	8731.24	103.43	36874.67	13533.85	4482.59	3888.50	728.00	2324.00	0.00	74972.16	2.00	0.00	0.00	10591.60
15	Jammu & Kashmir	35600.00	0.00	24337.00	0.00	0.00	0.00	0.00	0.00	0.00	60650.00	0.00	0.00	0.00	0.00
16	Jharkhand														
17	Karnataka														
18	Kerala														
19	Lakshadweep														
20	Madhya Pradesh	0.00	265000.00	271000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Maharashtra	0.00	46000.00	130000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	Manipur														
23	Meghalaya														
24	Mizoram	200.00	0.00	236.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140.03	0.00	236.32
25	Nagaland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26	Odisha	0.00	10709.00	4798 MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	Punducherry														
28	Punjab	-	91308.00	-	-	-	-	-	-	-	-	-	-	-	-
29	Rajasthan	27715.26	0.00	36752.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	Sikkim														
31	Tamil Nadu														
32	Tripura	0.00	759.49	3717.92	0.00	0.00	0.00	0.00	0.00	1693.80	0.00	0.00	0.00	0.00	0.00
33	Uttar Pradesh	-	133827.00	16269.00	-	-	-	-	-	-	-	-	-	-	-
34	Uttarakhand	62336.00	120311.00	54371.00	-	-	-	53085.00	=	=	21265.35	39.81	-	-	366.63
35	West Bengal	85993.00		167321.00	-	-	156771.00	-	-	-	-	-	-	-	-
	Total	220575.50	703664.48	770011.74	13533.85	4482.59	160659.50	53813.00	2324.00	22433.96	156887.51	41.81	140.03	0.00	11194.55

Source:Indian Council of Forestry Research and Education, Dehradun

C- Coniferous NC-coniferous

* 1 bag=10 to 15 kg.

Table 3.5.7 : State-wise production of forest produce (2005-06)

Sl. No.	State/ Union Territory	Round Wood		Wood Fuel	Saw logs & Veneer logs		Pulp wood		Other Industrial		Sawn wood		Chips &	Wood	Wood
		C	NC		C	NC	C	NC	C	NC	C	NC			
		(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	(cum)	MT	MT	MT	MT	MT
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	A & N Islands														
2	Andhra Pradesh	23028.00	0.00	0.00	0.00	0.00	43323.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Arunachal Pradesh	40656.43	0.00	12878.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Assam	0.00	12064.00	510.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	Bihar														
6	Chandigarh														
7	Chhattisgarh	0.00	0.00	70000MT	0.00	123000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Daman & Diu														
10	Delhi														
11	Goa														
12	Gujarat	NA	16661.52	62636.24MT	NA	NA	NA	NA	NA	10160.83	NA	1630.97cum	NA	NA	NA
13	Haryana														
14	Himachal Pradesh	8089.46	66.00	22291.00	13423.06	3705.07	6430.50	0.00	2065.00	0.00	69259.49	0.00	0.00	0.00	7924.93
15	Jammu & Kashmir	51250.00	0.00	22924.00	0.00	0.00	0.00	0.00	0.00	0.00	35150.00	0.00	0.00	0.00	0.00
16	Jharkhand														
17	Karnataka														
18	Kerala														
19	Lakshadweep														
20	Madhya Pradesh	0.00	268000.00	296000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Maharashtra	56049.00	74332.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	Manipur														
23	Meghalaya														
24	Mizoram	250.00	0.00	1203.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	170.02	0.00	26.37
25	Nagaland	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
26	Odisha	0.00	15827.00	13216MT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	Puducherry														
28	Punjab	-	134553.00	-	-	-	-	-	-	-	-	-	-	-	-
29	Rajasthan	27125.47	0.00	38435.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	Sikkim														
31	Tamil Nadu														
32	Tripura	0.00	351.02	6462.36	0.00	0.00	0.00	0.00	0.00	2472.01	0.00	0.00	0.00	0.00	0.00
33	Uttar Pradesh	-	159837.00	10148.00	-	-	-	-	-	-	-	-	-	-	-
34	Uttarakhand	77775.00	168265.00	63898.00	-	-	-	85279.00	=	=	34262.42	75.52	-	-	353.30
35	West Bengal														
	Total	284223.36	849956.54	474750.31	13423.06	126705.07	49753.81	85279.00	2065.00	12632.84	138671.91	75.52	170.02	0.00	8304.60

Source:Indian Council of Forestry Research and Education, Dehradun

C- Coniferous NC-coniferous

* 1 bag=10 to 15 kg.

Table 3.5.8: State-wise production of forest produce --concld.

Sl. No.	State/Union Territory	Gums (Metric Tonne)				Resins (MetricTonne)			
		2002-03	2003-04	2004-05	2005-06	2002-03	2003-04	2004-05	2005-06
1	2	3	4	5	6	7	8	9	10
1	A & N Islands	NA	NA			NA	NA		
2	Andhra Pradesh	996.10	762.90	9546.00	6953.69	0.00	0.00	0.00	0.00
3	Arunachal Pradesh	0.00	0.00	0.00	0.00	8846.00	0.00	4040.00	141530.00
4	Assam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Bihar								
6	Chandigarh	-	-			-	-		
7	Chhattisgarh			128.31	67.68			0.00	0.00
8	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Daman & Diu								
10	Delhi								
11	Goa	0.00	0.00	0.00		0.00	0.00	0.00	
12	Gujarat	67.94	65.1	66.54	78.63	0.00	0.00	-	-
13	Haryana	-	-	-	-	-	-	-	-
14	Himachal Pradesh	7322.4	7257.4	NA	NA	8494.40	84227.00	8797.00	8508.00
15	Jammu & Kashmir	0.00	0.00	0.00	0.00	10783.00	10284.00	3941.00	6748.00
16	Jharkhand	0.00	0.00			0.00	0.00		
17	Karnataka	1.90	1.70			0.00	0.00		
18	Kerala								
19	Lakshadweep								
20	Madhya Pradesh			Quintals 422.0	Quintals 333.9			0.00	0.00
21	Maharashtra	975.00	941.00	Quintals 6954	Quintals 11004	0.00	0.00	0.00	0.00
22	Manipur								
23	Meghalaya	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	Mizoram	0.00	0.00	-	-	0.00	0.00	-	-
25	Nagaland			0.00	0.00			0.00	0.00
26	Odisha	0.07	6.10	0.00	0.00	0.00	0.00	0.00	0.00
27	Puducherry								
28	Punjab	0.00	0.00			0.00	0.00		
29	Rajasthan	0.00	0.00	NA	NA	0.00	0.00	NA	NA
30	Sikkim	0.00	0.00			0.00	0.00		
31	Tamil Nadu								
32	Tripura	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	Uttar Pradesh	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
34	Uttarakhand	0.00	0.00	-	-	15873.00	17146.00	17983.00	18349.00
35	West Bengal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source:Indian Council of Forestry Research and Education, Dehradun
Note: Blank cell indicates information is not available
C : Confiferous NC : Non- consferous 1 Std.bag= 0.5 Quintals (Approximately)

3.5.7 Mangrove cover assessment: Mangroves are various kinds of trees up to medium height and shrubs that grow in saline coastal sediment habitats. At the intersection of land and sea, mangrove forests support a wealth of life, from fish to people, and may be more important to the health of the planet than we ever realized.

3.5.8 **In India, the major mangrove areas are mainly in 10 State/ UTs of India and their details are given at table 3.5.9.**

Table 3.5.9: State-wise list of mangrove areas

Sl No.	State/UT	Mangrove Areas
1	2	3
1	West Bengal	Sunderbans.
2	Odisha	Bhaitarkanika, Mahandi, Subernarekha, Devi, Dharma, Mangrove Genetic Resource Centre, Chilka
3	Andhra Pradesh	Coringa, East Godavari, Krishna
4	Tamil Nadu	Pichavaram, Muthupet, Ramnad, Pulicat, Kazhuveli
5	Andman & Nicobar	North Andamans, Nicobar
6	Kerala	Vembanad, Kannur
7	Karnataka	Coondapur, Dakshin Kannada/Honnavar, Mangalore Forest Division, Karwar
8	Goa	Goa
9	Maharashtra	Achra-Ratnagiri, Devgarh-Vijay Durg, Veldur, Kundalika-Mumbra-Diva, Vikroli, Shreevardhan, Vaitarna, Vasasi-Manori, Malvan
10	Gujarat	Gulf of Kutch, Gulf of Khambat, Dumas-Ubhrat

Source : Annual Report 2012-13, Ministry of Environment & Forests

Table 3.5.10: State/UT wise mangrove cover assessment- Time Series

(Sq. km)

Sl No.	State/UT	Year											
		1987	1989	1991	1993	1995	1997	1999	2001	2003	2005	2009	2011
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Andhra Pradesh	495	405	399	378	383	383	397	333	329	354	353	352
2	Goa	0	3	3	3	3	5	5	5	16	16	17	22
3	Gujarat	427	412	397	419	689	901	1031	911	916	991	1046	1058
4	Karnataka	0	0	0	0	2	3	3	2	3	3	3	3
5	Maharashtra	140	114	113	155	155	124	108	118	158	186	186	186
6	Odisha	199	192	195	195	195	211	215	219	203	217	221	222
7	Tamil Nadu	23	47	47	21	21	21	21	23	35	36	39	39
8	West Bengal*	2076	2109	2119	2119	2119	2123	2125	2081	2120	2136	2152	2155
9	Andaman & Nicobar	686	973	971	966	966	966	966	789	658	635	615	617
10	Puducherry	0	0	0	0	0	0	0	1	1	1	1	1
11	Kerala	0	0	0	0	0	0	0	0	8	5	5	6
12	Daman & Diu	0	0	0	0	0	0	0	0	1	1	1	1.56
Total		**4046**	**4255**	**4244**	**4256**	**4533**	**4737**	**4871**	**4482**	**4448**	**4581**	**4639**	**4663**

Source: India State of Forest Report 2009 and 2011

*: As per the West bengal Forest Department, mangrove area in Sundarban is 4200 sq. km. which is almost double of the area estimated by FSI.

3.5.9 **There is an increase of 419 sq.km in mangrove cover assessment from 1991 to 2011 at all India level considering the States as shown in table 3.5.10 .**

3.5.10 The details of mangrove cover (2011) is given in Table 3.5.11.

Table 3.5.11 : State/UT wise mangrove cover, 2011

(Sq. km)

Sl No.	State/UT	Very Dense Mangrove	Moderately Dense Mangrove	Open Mangrove	Total	Change w.r.t. 2009 assessment
1	2	3	4	5	6	7
1	Andhra Pradesh	0	126	226	352	-1
2	Goa	0	20	2	22	5
3	Gujarat	0	182	876	1058	12
4	Karnataka	0	3	0	3	0
5	Kerela	0	3	3	6	1
6	Maharashtra	0	69	117	186	0
7	Odisha	82	97	43	222	1
8	Tamil Nadu	0	16	23	39	0
9	West Bengal	1038	881	236	2155	3
10	Andaman & Nicobar	283	261	73	617	2
11	Daman & Diu	0	0.12	1.44	1.56	0.56
12	Pudicherry	0	0	1	1	0
Total		**1403**	**1658.12**	**1601.44**	**4662.56**	**23.56**

Source:India State of Forest Report 2011

In India, very dense mangrove consists approximately of 30%, moderately dense 36% and open mangrove 34% of the total mangroves cover

3.6 Diversion of forest land for non-forest use

Forest Conservation Act of India-1980 with amendments in 1988, is to provide for conservation of forests and matters connected with protection of trees from illegal felling and destruction. This act covers all aspects of forests including reserve forests, protected forests or any forest land irrespective of its ownership. Main features of this act are,

- No part of a reserved forest land can be used for non - forest purpose by the state government without prior approval from the central government.

- State Government can not lease forest land or its portions to any private person or to any authority, corporation, agency or organization which are not managed or controlled by government.
- A forest land can be cleared of trees (which have grown naturally) only when this land is to be used for reforestation.

However, ground scenario as depicted at table 3.6.1 shows the alarming degree of the forest area diverted since the implementation of Forest conservation act 1980.

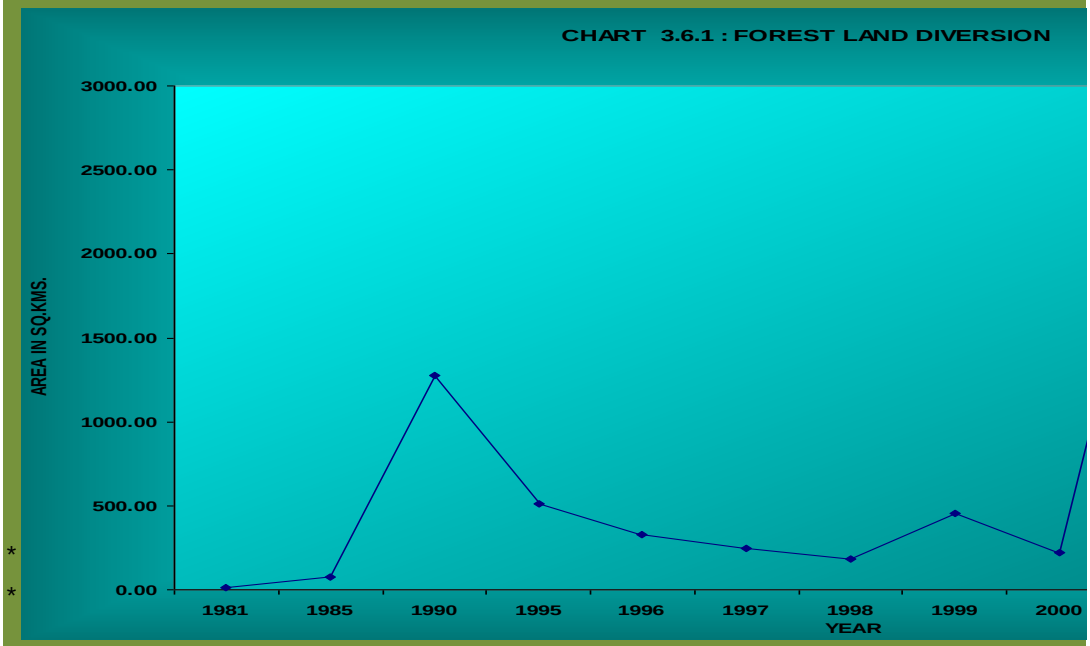
Table 3.6.1 : Diversion of forest land for non forest use since the enforcement of forest conservation act,1980

(Area in hectares)

Sl. No.	Year	Forest Area Diverted	Cumulative Area Diverted
1	1981	1331.70	1331.70
2	1982	3674.32	5006.02
3	1983	5100.51	10106.53
4	1984	9348.90	19455.43
5	1985	7676.83	27132.26
6	1986	9310.45	36442.71
7	1987	25925.97	62368.68
8	1988	4868.71	67237.39
9	1989	66768.09	134005.48
10	1990	127361.79	261367.27
11	1991	5065.35	266432.62
12	1992	21756.77	288189.39
13	1993	16182.51	304371.90
14	1994	59962.02	364333.92
15	1995	51428.98	415762.90
16	1996	32862.55	448625.45
17	1997	24738.43	473363.88
18	1998	18425.21	491789.09
19	1999	45784.41	537573.50
20	2000	22386.43	559959.93
21	2001	267897.61	827857.54
22	2002	51172.31	879029.85
23	2003	42729.68	921759.53
24	2004	33079.50	954839.03

Source : Forests & Wildlife Statistics, India, 2004,MOEF

The trend in forest area converted in various years is depicted below at chart 3.6.1.



3.7.2 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.

3.7.3 People's participation in the protection of forests: 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 Joint Forest Management (JFM) Programme. The JFM is being practiced through constitution of forest protection committees.

Table: 3.7.1 : Status of Joint Forest Management in India

Sl. No.	State	No. of JFM Committees	Approximate No. of JFMC members (in lakhs)	Area under JFM (in ha.)
1	2	3	4	5
1	Andhra Pradesh	7718	1421000	1519000
2	Bihar	675	14175	691578
3	Chhattisgarh	7887	2763100	3319000
4	Goa	21	315	92300
5	Gujarat	3044	1290864	397203
6	Haryana*	1075	167300	60000
7	Himachal Pradesh	1109	55000	424649
8	Jammu & Kashmir*	4861	268360	40000
9	Jharkhand	10903	218000	2186000
10	Karnataka	4850	421871	603507
11	Kerala	605	66022	173235
12	Madhya Pradesh	15228	10300000	6687300
13	Maharashtra	12653	2573000	2673568
14	Odisha	11521	1580709	1065772
15	Punjab*	1378	183145	198466
16	Rajasthan	5282	573000	780000
17	Tamil Nadu	3337	1057901	721294
18	Uttar Pradesh*	2096	155692	93857
19	Uttarakhand	1824	72421	100576
20	West Bengal	4368	505149	646084
NE & Sikkim		100435	23687024	22473389
1	Assam	1558	9348	53216
2	Arunachal Pradesh	447	30295	24116
3	Manipur	577	46713	78528
4	Meghalaya	359	28189	28972
5	Mizoram	529	151423	45870
6	Nagaland	771	552983	40929
7	Sikkim	155	52727	88518
8	Tripura	472	44882	128200
		4868	916560	488348
Union Territories				
1	A & N Islands	4	360	262
2	Chandigarh	Nil	Nil	Nil
3	D & N Haveli	16	1631	No forest area has been transferred for management purpose
4	Daman & Diu	Nil	Nil	Nil
5	Lakshadweep			
6	New Delhi	Nil	Nil	Nil
7	Puducherry			
Total		20	1991	262
	Grand Total	105323	24605575	22961999

Source : Ministry of Environment & Forests,Forest Protection Division

* Figures based on the year 2006

3.8 Waste lands

3.8.1 In India, waste lands constitute approximately 14.75 % of the total geographic area covered. **Table 3.8.1 depicts the State wise distribution of waste lands.** The chart 3.8.1 shows the State /UT wise percentage of wasteland to the total geographic area in India.

Table 3.8.1: State Category wise total area under wastelands (sq.km) during 2008-09 vis-a-vis 2005-06 and change in Wasteland during the period

State	No of Districts	Total Geographic Area (TGA)	Total Waste Land(WL)		Change	Total Reduction	Total Increase	% of WL to TGA		% Change over 2005-06
			2005-06	2008-09				2005-06	2008-09	
Andhra Pradesh	23	275068	38788.22	37296.62	-1491.60	1682.10	190.46	14.10	13.56	-0.54
Arunachal Pradesh	16	83743	5743.83	14895.24	9151.41	108.48	9259.89	6.86	17.79	10.93
Assam	23	78438	8778.02	8453.86	-324.16	862.56	538.04	11.19	10.78	-0.41
Bihar	37	94171	6841.09	9601.01	2759.92	1895.09	4654.41	7.26	10.20	2.93
Chhattisgarh	16	135194	11817.82	11482.18	-335.64	379.06	43.15	8.74	8.49	-0.25
Delhi	1	1483	83.34	90.21	6.87	3.62	10.27	5.62	6.08	0.46
Goa	2	3702	496.27	489.08	-7.19	11.48	3.99	13.41	13.21	-0.19
Gujarat	25	196024	21350.38	20108.06	-1242.32	2858.99	1616.67	10.89	10.26	-0.63
Haryana	21	44212	2347.05	2145.98	-201.07	232.20	31.92	5.31	4.85	-0.45
Himachal Pradesh	12	55673	22470.05	22347.88	-122.17	197.25	75.57	40.36	40.14	-0.22
Jammu & Kashmir *	14	101387	73754.38	75435.77	1681.39	1191.48	2872.78	72.75	74.40	1.66
Jharkhand	24	79706	11670.14	11017.38	-652.76	1183.50	531.16	14.64	13.82	-0.82
Karnataka	27	191791	14438.12	13030.62	-1407.50	1477.98	70.82	7.53	6.79	-0.73
Kerala	14	38863	2458.69	2445.62	-13.07	247.55	234.44	6.33	6.29	-0.03
Madhya Pradesh	48	308252	40042.98	40113.27	70.29	258.95	329.25	12.99	13.01	0.02
Maharashtra	35	307690	38262.81	37830.82	-431.99	469.93	38.22	12.44	12.30	-0.14
Manipur	9	22327	7027.47	5648.53	-1378.94	2391.10	1012.14	31.48	25.30	-6.18
Meghalaya	7	22429	3865.76	4127.43	261.67	93.86	355.13	17.24	18.40	1.17
Mizoram	8	21081	6021.14	4958.64	-1062.50	2669.27	1606.71	28.56	23.52	-5.04
Nagaland	7	16579	4815.18	5266.72	451.54	721.75	1172.60	29.04	31.77	2.72
Odisha	30	155707	16648.27	16425.76	-222.51	271.75	48.69	10.69	10.55	-0.14
Punjab	20	50362	1019.50	936.83	-82.67	112.70	30.56	2.02	1.86	-0.16
Rajasthan	32	342239	93689.47	84929.10	-8760.37	10264.60	1503.37	27.38	24.82	-2.56
Sikkim	4	7096	3280.88	3273.15	-7.73	11.83	4.29	46.24	46.13	-0.11
Tamil Nadu	30	130058	9125.56	8721.79	-403.77	426.78	22.74	7.02	6.71	-0.31
Tripura	4	10486	1315.17	964.64	-350.53	486.15	135.07	12.54	9.20	-3.34
Uttarakhand	13	53483	12790.06	12859.53	69.47	440.35	509.86	23.91	24.04	0.13
Uttar Pradesh	70	240928	10988.59	9881.24	-1107.35	1269.71	163.08	4.56	4.10	-0.46
West Bengal	19	88752	1994.41	1929.20	-65.21	92.98	28.46	2.25	2.17	-0.07
Union Territory	8	9490	337.30	315.00	-22.30	27.33	4.68	3.55	3.32	-0.23
Total	**599**	**3166414**	**472261.95**	**467021.16**	**-5240.79**	**32340.4**	**27098.4**	**14.91**	**14.75**	**-0.17**

Source: Wastelands Atlas of India 2011, Ministry of Rural Development Department of Land resources

* Unmapped areas (J&K) 120849.00

3.9 Animal Species in India

India, a megadiverse country with only 2.4 percent of the land area, accounts for 7-8% of the recorded species of the world, including over 45,000 species of plants and 91,000 species of animals. It is situated at the tri-junction of the Afro-tropical, the Indo-Malayan and the Paleo-Arctic realms, which display significantly rich biodiversity. Being one of the 17 identified megadiverse countries, with 10 biogeographic regions, it is home to 8.58% of the mammalian, 13.66% of avian, 7.91% of reptilian, 4.66% of the amphibian, 11.72% of fish and 11.60% of plant species documented so far. India also harbours four fo the 34 globally indentified biodiversity hotspots viz. Himalaya, Indo-Burma, Western Ghats-Sri Lanka and Sundaland. A crucial characteristic of Indian agrobiodiversity is its species richness, with more than 300 wild ancestors and close relatives of cultivated plants. India is also recognised as one of the nine Vavilovian centres of origin and diversity of crop plants. The diverse physical features and climatic situations have formed ecological habitats like forests, grasslands, wetlands, coastal and marine ecosystems and desert ecosystems, which harbour and sustain immense biodiversity and contribute to human well-being.

Table 3.9.1: 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	7.22
II	Parasitic	1330	550	41.35
2	**Mesozoa**	10	10	100.00
3	**Porifera**	500		
I	Freshwater	31	13	41.94
4	**Cnidaria**	842	10	1.19
5	**Platyhelminthes**	1650	1160	70.30
6	**Rotifera**	330	23	6.97
7	**Gastrotica**	100	64	64.00
8	**Kinorhyncha**	10	7	70.00
9	**Nematoda**	2902	400	13.78
10	**Acanthocephala**	229	203	88.65
11	**Mollusca**	5169		
I	Terrestrial	1487	498	33.49
II	Freshwater	183	77	42.08
12	**Echiura**	43	12	27.91
13	**Annelida**			
I	Oligochaeta	473	368	77.80
II	Hirudinea	59	25	42.37
14	**Arthropoda**			
I	Crustacea	2944	501	17.02
II	Insecta	61461	20765	33.79
III	Arachnida	5829	2623	45.00
15	**Phoronida**	11	1	9.09
16	**Bryozoa**	200	12	6.00
17	**Entoprocta**	10	1	10.00
18	**Chaetognatha**	30	3	10.00
19	**Chordata**			
I	Pisces	2662	341	12.81
II	Amphibia	314	233	74.20
III	Reptilia	464	197	42.46
IV	Aves	1300	81	6.23
V	Mammalia	397	45	11.34

Source :Zoological Survey of India-2013

Table 3.9.2 : Estimated number of described fauna from India			
Taxonomic group	***No. of species***		**% in India**
	World	India	
PROTISTA (Protozoa)	**31250**	**2577**	**8.24**
ANIMALIA			
Mesozoa	71	10	14.08
Porifera	4562	500	10.96
Cnidaria	9924	1042	10.50
Ctenophora	100	12	12.00
Platyhelminthes	17500	1650	9.43
Nemertinea		-	
Rotifera	2500	330	13.20
Gastrotricha	3000	100	3.33
Kinorhyncha	100	10	10.00
Nematoda	30040	2902	9.66
Nematomorpha		-	
Acanthocephala	800	229	28.63
Sipuncula	145	35	24.14
Mollusca	66537	5169	7.77
Echiura	127	43	33.86
Annelida	12701	842	6.63
Onychophora	100	1	1.00
Arthropoda	**999059**	**71480**	**7.15**
Crustacea	35538	2944	8.28
Insecta	867582	61461	7.08
Arachnida	73451	5829	7.94
Pycnogonida	600	17	2.83
Chilopoda	3001	101	3.37
Diplopoda	7500	162	2.16
Symphyla	120	4	3.33
Merostomata	4	2	50.00
Phoronida	11	3	27.27
Bryozoa (Ectoprocta)	4000	200	5.00
Entoprocta	60	10	16.67
Brachiopoda	300	3	1.00
Chaetognatha	111	30	27.03
Tardigrada	514	30	5.84
Echinodermata	6225	779	12.51
Hemichordata	120	12	10.00
Chordata	**46499**	**5163**	**11.10**
Protochordata	2106	119	5.65
Pisces	21753	2662	12.24
Amphibia	5187	314	6.05
Reptilia	5821	464	7.97
Aves	9027	1233	13.66
Mammalia	4629	397	8.58
Total (Animalia)	**1195887**	**89697**	**7.50**
Grand (Protista+ Animalia)	**1227137**	**92279**	**7.52**

Source: Zoological Survey of India.

Animal Discovery 2012, Compiled by ZSI, June,2013.

Table 3.9.3 : Recent addition in the list of threatened/ endangered species

As per the Gazette Notification in the Central Government (Ministry of Environment and Forests) has made following amendments in the Schedule of the Wild Life (Protection) Act, 1972 and included the following species in the Schedules of Threatened and endangered species (amended upto 2011).

1 **Schedule 1**
PART I

MAMMALS

42*. Wroughton's free tailed bat (Otomops wroughtoni)

PART IIA

****FISHES**

2. Shark and Ray

(i) Anoxypristis cuspidata
(ii) Carcharhinus hemiodon
(iii) Glyphis gangetics
(iv) Glyphius glyphius
(v) Himantura fluviatilis
(vi) Pristis microdon
(vii) Pristis zijsron
(viii) Rhychobatus djiddensis
(ix) Urogymnus asperrimus

PART III

BIRDS

*19. Swiftlets (Collocalia unicolor and Collacalia fusiphaga)

Part IV B- ****Mollusca

1 Cassis cornuta
2 Charonia tritonis
3 Conus milneedwardsi
4 Cypraecssis rufa
5 Hippopus hippopus
6 Nautilus Pompilius
7 Tridacna maxima
8 Tridacna squamosa
9 Tudicla Spirillus

Schedule II

PART II

*16. Mangooses (All species of genus Herpestes)

2 **Schedule IV**

* 6- A. Small Game - Omitted

19. ****Mollusca**

i. Cypraea lamanica
ii. Cypraea mappa
iii. Cypraea talpa
iv. Fasciolaria trapezium
v. Harpulina arausiaca
vi. Lambis chiragra
vii. Lambis chiragra arthitica
viii. Lambis crocea
ix. Lambis millepeda
x. Lambis scorpius
xi. Lambis truncata
xii. Placenta placenta
xiii. Strombus plicatus sibbaldii
xiv. Turbomarmoratus
xv. Turbo marmoratus Linnaeus

20 Horseshoe Crab (Tachypleus gigas and Carcinoscorpius rotundicauda)
(Ins. By S.O. 2293 (E), dated 4th September,2009 (w.e.f. 9-9-2009)
* (Vide Notification No. S.O. 1085 (E), dated 30th September 2002, published in the Gazetted of India, Extra., Pt. II, Sec. 3 (ii), dated 11th October, 2002)
** (Subs. By/Added by S.O. 1197 (E), dated 5th December, 2001 (w.e.f. 6-12-2001) and corrected by S.O. 233 (E), dated 19th February 2002).

Source :Ministry of Environment & Forests, Government of India/ Zoological Survey of India 2011.

3.9.2 The details of endemic animal species in India is presented in table 3.9.1. The Indian Scenario vis –a –vis the global in respect of the species wise existence of animal kingdom is elaborated in table 3.9.2 . The share of various animal species in India is 7.52%.

3.9.3 As reports from the various corners of the globe indicate many animal species have already become extinct/ threatened**. The recent addition in the list of threatened / endangered species is shown in table 3.9.3 .**

The approximate number of rare and threatened vertebrates species in India is presented below.

Table 3.9.4: Rare and threatened species (vertebrates)

Sl. No.	Category	Approximate Number				
		Mammalian	Aves	Reptilia	Amphibia	Pisces
1	2	3	4	5	6	7
1	Extinct	1	0	0	0	0
2	Critically Endangered	10	13	5	13	5
3	Endangered	39	10	9	31	6
4	Vulnerable	47	54	11	21	29
5	Near Threatened	26	59	10	9	25
Total		123	136	35	74	65

Source : Zoological Survey of India-2013

The definitions and other details are in Table 3.9.5

3.10 Animal Species –Conservation measures

3.10.1 Areas rich in biodiversity and encompassing unique and representative ecosystems are identified and designated as Biosphere Reserves. The goal is to facilitate conservation of representative landscape and India's immense biological diversity as described above. Till date, 15 Biosphere Reserves have been set up. The last one was set up in 29.01.2008 at Kachchh covering parts of Kachchh, Rajkot, Surendranagar and Patan civil districts of Gujarat State. The List of **Biosphere reserves set up in India are shown in Table 3.10.1 .**

3.10.2 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.

Table 3.9.5 : Definitions -rare and threatened species

As per the Guidelines of the IUCN Red List Categories and Criteria

Extinct (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropiate to the taxon's life cycles and life form.

Extinct in the Wild (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon,s life cycle and life form.

Critically Endangered (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endagered, and it is therefore considered to be facing an extermely high risk or extinction in the wild.

Endangered (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable (VU)

A taxon is Vunerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a very high risk of extinction in the wild.

Source: Zoological Survey of India

Table 3.10.1 : Biosphere reserves setup in India

Sl. No.	Name of Biosphere Reserve	Area (in sq.km.)	Date of Notification	Location in the States/UT
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 and valley of flowers (Uttarakhand)-West Himalayas
3	Nokrek	820.00	01.09.1988	Part of Garo Hills (Meghalaya)-East Himalayas
4	Manas	2837.00	14.03.1989	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamrup and Darang districts (Assam)-East Himalayas
5	Sunderbans	9630.00	29.03.1989	Part of Delta of Ganges & Barahamaputra river system (West Bengal)-Gigantic Delta
6	Gulf of Mannar	10500.00	18.02.1989	Indian part of Gulf of Mannar between India and Sri Lanka (Tamil Nadu)-Coasts
7	Great Nicobar	885.00	06.01.1989	Southern Most Islands of Andaman and Nicobar (A&N Islands)-Islands
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	5111.50	02.09.1998	Part of Siang and Debang Valley in Arunachal Pradesh-East Himalayas
11	Pachmarhi	4981.72	03.03.1999	Part of Betul, Hoshangabad and Chindwara Districts of Madhya Pradesh-Semi-Arid-Gujarat Rajputana
12	Kanchanjunga	2619.92	07.02.2000	Parts of North and West Sikkim
13	Agasthyamalai	3500.36	12.11.2001	Part of Thirunelvedi and Kanya Kumari Districts in Tamil Nadu and Thiruvananthapuram, Kollam and Pathanmthita of Kerala (Tamil Nadu & Kerala)
14	Achankmar-Amarkantak	3835.31	30.3.2005	Part of Anuppur and Dindori Distt.,of MP, part of Bilaspur distts., of Chhattisgarh State (Madhya Pradesh & Chattisgarh)
15	Kachchh	12454.00	29.01.2008	Parts of Kachchh, Rajkot, Surendranagar and Patan Civil Districts of Gujarat State
16	Cold Desert	7770.00	28.08.09	Pin Valley National Park and surroundings; Chandratal and Sarchu & Kibber Wildlife Sanctuary in Himachal Pradesh.
17	Seshachalam	4756.00	20.09.2010	Seshachalam hill range in Eastern Ghats encompsssing part of Chitoor and Kadapa district in Andhra Pradesh
18	Panna	2998.98	25.08.2011	Part of Panna and Chhattarpur district in Madhya Pradesh

Source: Ministry of Environment and Forests, Annual Report-2012-13

Table 3.10.2 - Summary of Protected Area Statistics in India(as on 05/09/2011)						
States/Uts	No. of NPS	Area Sq Km	No. of WLS	Area Sq Km	No. of PAs	Area Sq Km
Andhra Pradesh	6	1388.39	21	11618.12	27	13006.51
Arunchal Pradesh	2	2290.82	11	7487.75	13	9778.57
Assam	5	1977.79	18	1932.01	23	3909.80
Bihar	1	335.65	12	2851.67	13	3187.32
Chattisgarh	3	2899.08	11	3583.19	14	6482.27
Goa	1	107.00	6	647.91	7	754.91
Gujarat	4	479.67	23	16619.81	28	17326.48
Haryana	2	48.25	8	233.21	12	330.18
Himachal Pradesh	5	2271.38	32	7745.48	37	10016.86
Jammu and Kashmir	4	3925.00	15	10243.11	53	14997.86
Jharkhand	1	226.33	11	1955.82	12	2182.15
Karnataka	5	2472.18	22	4003.42	30	6482.52
Kerala	6	558.16	16	1822.86	23	2382.52
Madhya Pradesh	9	3656.36	25	7158.41	34	10814.77
Maharashtra	6	1273.60	35	14152.70	42	15429.79
Manipur	1	40.00	1	184.40	2	224.40
Meghalaya	2	267.48	3	34.20	5	301.68
Mizoram	2	150.00	8	1090.75	10	1240.75
Nagaland	1	202.00	3	20.34	4	222.36
Odisha	2	990.67	18	6969.15	20	7959.85
Punjab	0	0.00	12	323.70	15	344.72
Rajasthan	5	3947.07	25	5379.26	33	9548.60
Sikkim	1	1784.00	7	399.10	8	2183.10
Tamil Nadu	5	307.85	21	3521.95	27	3829.83
Tripura	2	36.71	4	566.93	6	603.64
Uttar Pradesh	1	490.00	23	5221.88	24	5711.88
Uttarakhand	6	4915.44	6	2418.61	14	7376.32
West Bengal	5	1693.25	15	1203.28	20	2896.53
Andaman & Nicobar	9	1153.94	96	389.39	105	1543.33
Chandigarh	0	0.00	2	26.01	2	26.01
Dadra and Nagar Haveli	0	0.00	1	92.16	1	92.16
Daman and Diu	0	0.00	1	2.19	1	2.19
Delhi	0	0.00	1	27.82	1	27.82
Lakshadweep	0	0.00	1	0.01	1	0.01
Puducherry	0	0.00	1	3.90	1	3.90
India	**102**	**39888.07**	**515**	**119930.50**	**668**	**161221.59**
NPs- National Parks : WLS- Wild Life Sanctury: PAs- Protected Areas.						
Source: India- State of the Forest Report , 2011.						

Table 3.10.3 : All India tiger population in tiger reserves

Sl. No.	Name of Reserve	Years							
		1972	1979	1984	1989	1993	1995	1997	2001-02 *
1	2	3	4	5	6	7	8	9	10
1	Bandipur (Karnataka)	10	39	53	50	66	74	75	82
2	Corbett(Uttaranchal)	44	84	90	91	123	128	138	137
3	Kanha(Madhya Pradesh)	43	71	109	97	100	97	114	127
4	Manas(Assam)	31	69	123	92	81	94	125	65*
5	Melghat (Maharashtra)	27	63	80	77	72	71	73	73
6	Palamu (Jharkhand)	22	37	62	55	44	47	44	32
7	Ranthombore (Rajasthan)	14	25	38	44	36	38	32	35
8	Similipal(Orissa)	17	65	71	93	95	97	98	99
9	Sunderbans (West Bengal)	60	205	264	269	251	242	263	245
10	Periyar (Kerala)	-	34	44	45	30	39	40	36
11	Sariska (Rajasthan)	-	19	26	19	24	25	24	22
12	Buxa (West Bengal)	-	-	15	33	29	31	32	31
13	Indravati (Madhya Pradesh)	-	-	38	28	18	15	15	29
14	Nagarkimasagar (Andhra Pradesh)	-	-	65	94	44	34	39	67
15	Namdhapa (Arunachal Pradesh)	-	-	43	47	47	52	57	61
16	Dudhwa (Uttar Pradesh)	-	-	-	90	94	98	104	76*
17	Kalalad (Tamil Nadu)	-	-	-	22	17	16	28	27
18	Valmiki (Bihar)	-	-	-	81	49	N.R	53	53
19	Pench (Madhya Pradesh)	-	-	-	-	39	27	29	40
20	Tadoba (Maharashtra)	-	-	-	-	34	36	42	38
21	Bandhavgarh (Madhya Pradesh)	-	-	-	-	41	46	46	56
22	Panna (Madhya Pradesh)	-	-	-	-	25	22	22	31
23	Dampha(Mizoram)	-	-	-	-	7	4	5	4
24	Pench (Maharashtra)	-	-	-	-	-	10 (1994)	-	14
25	Bhadra (Karnataka)	-	-	-	-	-	-	-	35
26	Pakhui- Nameri (Arunachal Pradesh)	-	-	-	-	-	-	-	26 Nameri
27	Bori-Satpura (Madhya Pradesh)	-	-	-	-	30			35
Total		**268**	**711**	**1121**	**1327**	**1366**	**1333**	**1498**	**1576**

Source: Project Tiger, Ministry of Environment & Forests

* : under compilation/vetting

The area of tiger reserves in Tiger range States are depicted in table 3.10.4 .

Table 3.10.4 : Area of tiger reserves in tiger range states

(As on 26th September,2011

Sl. No.	Year of Creation	Name of Tiger Reserve	State	Area of core/critical tigher habitat (In sq. Kms.)	Area of the buffer/peripheral (In Sq.Kms)	Total area
1	2	3	4	5		
1	1973-74	Bandipur	Karnataka	872.24	584.06	1456.3
2	1973-74	Corbett	Uttarakhand	821.99	466.32	1288.31
3	1973-74	Kanha	Madhya pradesh	917.43	1134.36	2051.79
4	1973-74	Manas	Assam	840.04	2310.88	3150.92
5	1973-74	Melghat	Maharashtra	1500.49	1268.03	2768.52
6	1973-74	Palamau	Jharkhand	414.08	Notification awaited	414.08
7	1973-74	Ranthambore	Rajasthan	1113.36	Notification awaited	1113.36
8	1973-74	Similipal	Odisha	1194.75	1555.25	2750
9	1973-74	Sunderbans	West Bengal	1699.62	885.27	2584.89
10	1978-79	Periyar	Kerala	881	44	925
11	1978-79	Sariska	Rajasthan	881.11	Notification awaited	881.11
12	1982-83	Buxa	West Bengal	390.58	367.32	757.9
13	1982-83	Indravati	Chhattisgarh	1258.37	1540.7	2799.07
14	1982-83	Nagarjunsagar	Andhra Pradesh	2527	Notification awaited	2527
15	1982-83	Namdapha	Arunachal Pradesh	1807.82	do	1807.82
16	1987-88	Dudhwa	Uttar Pradesh	693.7	do	693.7
	1999-2000	Katerniaghat (extension)		400.09	do	400.09
17	1988-89	Kalakad- Mundanthurai	Tamil Nadu	895	do	895
18	1989-90	Valmiki (not received)	Bihar	840*	do	840*
19	1992-93	Pench	Madhya Pradesh	411.33	768.3	1179.63
20	1993-94	Tadoba-Andheri	Maharashtra	625.82	1101.77	1727.59
21	1993-94	Bandhavgarh	Madhya Pradesh	716.9	820.03	1536.94
22	1994-95	Panna	Madhya Pradesh	576.13	Notification awaited	576.13
23	1994-95	Dampa	Mizoram	500	488	988
24	1998-99	Bhadra	Karnataka	492.46	571.83	1064.29
25	1998-99	Pench	Maharashtra	257.26	483.96	741.22
26	1999-2000	Pakke	Arunachal Pradesh	683.45	Notification awaited	683.45
27	1999-2000	Nameri	Assam	200	144	344
28	1999-2000	Satpura0	Madhya pradesh	1339.26	794.04	2133.31
Total						

continued..

Source : National Tiger Conservation Authority, Ministry of Environment and Forests

* Not yet notified

Table 3.10.4 : Area of tiger reserves in tiger range states

29	2008-09	Annamalai	Tamil Nadu	958	Notification awaited	958
30	2008-09	Udanti-Sita Nadi	Chattisgarh	851.09	991.45	1842.54
31	2008-09	Satkosia	Odisha	523.61	453.25*	976.86
32	2008-09	Kaziranga	Assam	625.58	548	1173.58
33	2008-09	Achanakmar	Chattisgarh	626.2	287.82	914.02
34	2008-09	Dandeli-Anshi	Karnataka	814.88	282.63	1097.51
35	2008-09	Sanjay-Dubri	Madhya Pradesh	812.57	861.93	1674.5
36	2008-09	Mudumalai	Tamil Nadu	321	Notification awaited	321
37	2008-09	Nagarahole	Karnataka	643.35	Notification awaited	643.35
38	2008-09	Parambikulam	Kerala	390.89	252.77	643.66
39	2008-09	Sanyadri(including Chandoli NP:317.67 and Koyna WLS:423.55)=741.22 Total Area	Maharashtra	741.22	Notification awaited	741.22
40	2011-2012	Biligiri Ranganatha Temple Tiger Reserve	Karnataka	359.1	215.72	574.82
41	2011-2012	Kawal**	Andhra Pradesh	-	-	-
		Total		**33418.78**	**19221.71**	**52640.5**

Source : National Tiger Conservation Authority, Ministry of Environment and Forests concluded

* Not yet notified

** Approval has been accorded by the NTCA for final notification, which has to be issued by the State Government.

Total core are notified 32578.78 sq.km

Total core are notified 18768.46 sq.km

Population of tigers –estimates by refined methodology is presented in the table 3.10.5. As per this data, the tiger population in India is approximately 1706 only.

Table 3.10.5 : Forest occupancy and population estimates of tiger

State	Tiger Population		Tiger Km^2	
	2006	2010	2006	2010
Shivalik-Gangetic Plain Landscape Complex				
Uttarakhand	178	227	1901	3476
Uttar Pradesh	109	118	2766	2511
Bihar	10	8	510	750
Shivalik Gangetic	**297**	**353**	**5177**	**6712**
Central Indian Landscape Complex and Eastern Ghats Landscape Complex				
Andhra Pradesh	95	72	14126	4495
Chhattisgarh	26	26	3609	3514
Madhya Pradesh	300	257	15614	13833
Maharashtra	103	168	4273	11960
Odisha	45	32	9144	3398
Rajasthan	32	36	356	637
Jharkhand	-	10	1488	1180
Central Indian	**601**	**601**	**48610**	**39017**
Western Ghats Landscape Complex				
Karnataka	290	300	**18715**	14414
Kerala	46	71	6168	6804
Tamil Nadu	76	163	9211	8389
Western Ghats	**412**	**534**	**34094**	**29607**
North East Hills and Brahmaputra Flood Plains				
Assam	70	143	1164	2381
Arunachal Pradesh	14	-	1685	1304
Mizoram	6	5	785	416
Northern West Bengal	10	-	596	799
North East Hills, and Brahmaputra	100	148	4230	4900
Sunderbans	-	70	1586	1645
Total Tiger Population	**1411**	**1706**	**93697**	**81881**

Source: National Tiger Conservation Authority, Project Tiger, 'Status of Tigers, Co- Predators, and Prey in India 2010', Ministry of Environment & Forests

India is famous for the majestic elephants of the Country. The protective measures adopted to save the elephant population of the country are very important. **The designated elephant reserves in India, the area, the number of elephants found are available in table 3.10.6**

Table 3.10.6 : Estimated population of wild elephants -2007-08					
REGION	STATE	ELEPHANT POPULATION			
		1993	1997	2002	2007-08
North-East	Arunachal	2102	1800	1607	1690
	Assam	5524	5312	5246	5281
	Meghalaya	2872	1840	1868	1811
	Nagaland	178	158	145	152
	Mizoram	15	22	33	12
	Manipur	50	30	12	Nil
	Tripura	100	70	40	59
	West Bengal (North)	186	250	292	300-350
Total for North-East		**11027**	**9482**	**9243**	**9305-9355**
East	West Bengal (South)	14	26	36	25
	Jharkhand	550*	618*	772	624
	Odisha	1750	1800	1841	1862
	Chhattisgarh	-	-	-	122
Total for East		**2314**	**2444**	**2649**	**2633**
North	Uttarakhand	828*	1130*	1582	1346
	U.P.	47	70	85	380
Total for North		**875**	**1200**	**1667**	**1726**
South	Tamil Nadu	2307	2971	3052	3867
	Karnataka	5500	6088	5838	4035
	Kerala	3500	3600	3850	6068
	Andhra Pradesh	46	57	74	28
	Maharashtra	-	-	-	7
Total for South		**11353**	**12716**	**12814**	**14005**
Islands	Andaman & Nicobar	35	35	40	NA
Grand Total		**25604**	**25877**	**26413**	**27669-27719 Mid value-**

Source: Project Elephant Division, Ministry of Environment and Forest.

***** As part of Bihar, Madhya Pradesh and Uttar Pradesh respectively

Table 3.10.7: State wise location of major zoos

Sl. No	State	Name of Zoo	Location
1	2	3	4
1	Andaman & Nicobar	Bilogical Park, Chidyatapu	Port Blair
2	Andhra Pradesh	Indira Gandhi Zoological Park	visakhapatnam
3	Andhra Pradesh	Nehru Zoological Park	Hyderabad
4	Andhra Pradesh	Sri Venkateswara Zoological Park	Tirupati
5	Arunachal Pradesh	Biological Park Itanagar	Itanagar
6	Assam	Assam State Zoo Cum Botanical Garden	Guwahati
7	Bihar	Sanjay Gandhi Biological Park	Patna
8	Chattisgarh	Kanan Pandari Zoo	Bilaspur
9	Chattisgarh	Maitri Baagh Zoo	Bhilai
10	Delhi	National Zoological Park	Delhi
11	Goa	Bondla Zoo	Usgao
12	Gujarat	Dr. Shyamaprasad Mukharjee Zoological Gard	Surat
13	Gujarat	Indoda Nature Park	Gandhi Nagar
14	Gujarat	Kamla Nehru Zoological Garden	Ahemdabad
15	Gujarat	Sakkarbaug Zoo	Junagarh
16	Gujarat	Sayaji Baug Zoo	Vadodara
17	Haryana	Rohtak Zoo	Rohtak
18	Himachal Pradesh	Himalayan Nature Park (Kufri)	Kufri
19	J&K	Jammu Zoo	Ram Nagar,(Jammu)
20	J & K	Kashmir Zoo	Srinagar
21	Jharkhand	Bhagwan Birsa Biological Park	Ranchi
22	Jharkhand	Jawaharlal Nehru Biological Park	Bokaro
23	Jharkhand	Tata Steel Zoological Park	Jamshedpur
24	Karnataka	Bellary Childrens Park-Cum-Zoo (Bellary Zoo)	Bellary
25	Karnataka	Children Park & Zoo (Gadag Zoo)	Gadag
26	Karnataka	Dr. K.Shivarma Karanth Pilikula Biological Park	Mangalore
27	Karnataka	National Park, Bannerghatta Zoological Garden	Bangalore
28	Karnataka	Sri Chamarajendra Zoological Gardens	Mysore
29	Karnataka	Tiger & Lion Safari, Thyyarekoppa	Shimoga
30	Kerala	State Museum & Zoo	Thrissur
31	Kerala	Thiruvananthapuram Zoo	Thiruvananthapuram
32	Madhya Pradesh	Gandhi Zoological Park	Gwalior
33	Madhya Pradesh	Kamla Nehru Prani Sanghrahalay Zoo	Indore
34	Madhya Pradesh	Van Vihar National Park	Bhopal
35	Maharashtra	Aurangabad Municipal Zoo	Aurangabad
36	Maharashtra	Mahatma Gandhi Rashtriya Udyan Zoo	Solapur
37	Maharashtra	Nisargakavl Bahlnabai Choudhary Pranisansangahralay	Pune

Table 3.10.7: State wise location of major zoos Concld.

Sl. No	State	Name of Zoo	Location
1	2	3	4
38	Maharashtra	Rajiv Gandhi Zoological Park And Wildlife Research Centre	Pune
39	Maharashtra	Veermata Jijabai Bhosale Udyan & Zoo	Mumbai
40	Manipur	Manipur Zoological Garden	Imphal
41	Meghalaya	Lady Hydari Park Animal	Shillong
42	Mizoram	Aizawl Zoo (Mizoram Zoo)	Aizwal
43	Orissa	Indira Gandhi Park Zoo & Deer Park	Rourkela
44	Orissa	Nandankanan Biological Park	Bhubaneswar
45	Orissa	Wild Animal Conservation Centre	Mothijharan Sambalpur
46	Punjab	Deer Park, Bir Moti Bagh (patiala Zoo)	Patiala
47	Punjab	Ludhiana Zoo	Ludhiana
48	Punjab	Mahendra Chaudhury Zoological Park	Chhatbir
49	Rajasthan	Bikaner Zoo	Bikaner
50	Rajasthan	Jaipur Zoo	Jaipur
51	Rajasthan	Jodhpur Zoo	Jodhpur
52	Rajasthan	Udaipur Zoo	Udaipur
53	Tamil Nadu	Amirdhi Zoo	Vellore
54	Tamil Nadu	Arignar Anna Zoological Park	Vandalur Chennai
55	Tamil Nadu	Chennai Snake Park Trust	Guindy
56	Tamil Nadu	Children's Corner	Guindy
57	Tamil Nadu	Madras Crocodile Bank Trust/Centre For Herpetology	Mahabalipuram
58	Tamil Nadu	V.O.C. Park Mini Zoo	Coimbatore
59	Tripura	Sepahijala Zoological Park	Sepahijala
60	Uttar Pradesh	Kanpur Zoological Park	Kanpur
61	Uttar Pradesh	Lucknow Prani Udyan	Lucknow
62	Uttaranchal	Pt Govind Ballabh Pant High Altitude Zoo	Nainital
63	West Bengal	Alipore Zoological Garden	Kolkata
64	West Bengal	Calcutta Snake Park	Badu
65	West Bengal	Jhargram Zoo	Jhargram
66	West Bengal	Marble Palace Zoo	Kolkata
67	West Bengal	Padmaja Naidu Himalayan Zoological Park	Darjeeling

Source : Central Zoo Authority, Ministry of Environment & Forests

The following table gives the progress achieved in setting up National Parks and Wildlife Sancturies in India.

Table 3.10.8 : National parks and wildlife sanctuaries of India

	National Parks		Wildlife Sanctuaries		Total Area
Year	Number	Area	Number	Area	
1995	80	34684.53	441	114164.58	148849.11
1999	87	34021.15	485	113163.03	147184.18
2004	90	36881.53	502	120051.88	156933.41
2006	100	38024.11	514	117913.77	155980.15
2010	102	39888.00	515	119930	159818.00

Source: M/o Environment & Forests

3.11 Livestock Population

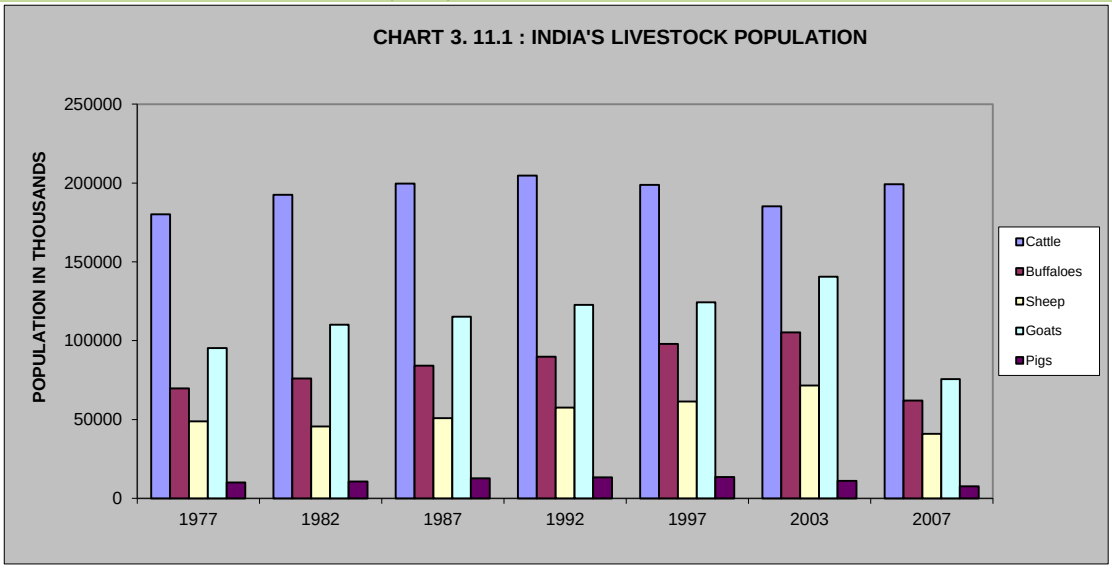
3.11.1 The livestock population in the country increased from 369 million in 1977 to the current estimate of 529 million (2007). Grazing by Livestock puts pressure on grasslands and forests. Because of excessive grazing, natural regeneration is either absent or inadequate in a significant portion of the forests in the country.(The nexet Livestock Census was conducted in 2012. The results are yet to be published.)

Table 3.11.1: India's livestock population

(Thousand)

Sl. No.	Livestock	Number of Animals						
		1977	1982	1987	1992	1997	2003	2007
1	2	3	4	5	6	7	7	8
1	Cattle	180.0	192.5	199.7	204.6	198.9	185.2	199.1
2	Buffaloes	62.0	69.8	76.0	84.2	89.9	97.9	105.3
3	Sheep	41	48.8	45.7	50.8	57.5	61.5	71.6
4	Goats	75.6	95.3	110.2	115.3	122.7	124.4	140.5
5	Horses & Ponnies	0.9	0.9	0.8	0.8	0.8	0.8	0.6
6	Pigs	7.6	10.1	10.6	12.8	13.3	13.5	11.1
7	Mules	0.1	0.1	0.2	0.2	0.2	0.2	0.1
8	Donkeys	1.1	1.0	1.0	1.0	0.9	0.7	0.4
9	Camels	1.068	1.1	1.0	1.0	0.9	0.6	0.5
II	**Other Livestock**				.			
1	Yaks	0.1	0.1	0.0	0.1	0.1	0.1	0.1
2	Mithuns	0.1	0.2	0.1	0.2	0.2	0.3	-
Total		**369.0**	**419.6**	**445.3**	**470.9**	**485.4**	**485.0**	**529.7**

Source : Live Stock Census, Ministry of Agriculture



The trend and extent in growth of livestock population from 1977 to 2007 at all India level are evident from the above table.

3.11.2 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.

The State / UT wise livestock population details as per 2007 census are in table 3.11.2

Table 3.11.2: Livestock population as per 2007 census — **Provisional**

Sr. No.	States/UTs	Cattle			Buffalos	Sheep	Goats	Pigs	Horses and ponies	Mules	Donkeys	Camel	Yaks	Mithun	Total Live-stock
		Cross bred	Indigenous	Total											
1	Andhra Pradesh	1898	9325	11223	13272	25539	9626	439	26	0	50	0		0	60175
2	Arunachal Pradesh	29	474	503	3	20	292	356	6	0	0	0	14	219	1413
3	Assam	410	9631	10041	500	354	4320	2000	11	0	0	0	0	0	17227
4	Bihar	1976	10583	12559	6690	218	10167	632	51	0	24	0	0	0	30342
5	Chhatisgarh	186	9305	9491	1604	140	2768	413	1	0	0	0	0	0	14418
6	Goa	16	55	71	37	0	11	58	0	0	0	0	0	0	177
7	Gujarat	1142	6834	7976	8774	2002	4640	22	14	0	50	38	0	0	23515
8	Haryana	566	986	1552	5953	601	538	134	26	11	5	39	0	0	8859
9	Himachal Pradesh	793	1476	2269	762	901	1241	2	13	19	7	0	2	0	5217
10	Jammu & Kashmir	1677	1766	3443	1050	4127	2068	1	167	42	24	2	62	0	10987
11	Jharkhand	191	8590	8781	1506	483	6592	732	5	0	1	0	0	0	18100
12	Karnataka	2193	8309	10503	4327	9558	6153	281	11	0	26	0	0	0	30859
13	Kerala	1621	119	1740	58	1	1729	59	0	0	0	0	0	0	3587
14	Madhya Pradesh	475	21441	21915	9129	390	9014	193	27	3	20	4	0	0	40696
15	Maharashtra	3122	13061	16184	6073	2909	10391	327	38	0	32	0	0	0	35954
16	Manipur	66	276	342	62	9	51	314	1	0	0	0	0	10	789
17	Meghalaya	27	860	887	23	21	365	524	2	0	0	0	0	0	1823
18	Mizoram	11	24	35	6	1	16	267	1	0	0	0	0	2	328
19	Nagaland	254	216	470	35	4	178	698	1	0	0	0	0	33	1419
20	Odisha	1703	10607	12310	1190	1818	7127	612	0	0	0	0	0	0	23057
21	Punjab	1278	498	1777	5062	208	290	26	33	6	5	2	0	0	7408
22	Rajasthan	816	11304	12120	11092	11190	21503	209	25	1	102	422	0	0	56663
23	Sikkim	73	62	135	0	3	92	35	0	0	0	0	5	0	270
24	Tamilnadu	7383	3806	11189	2009	7991	9275	284	7	0	5	0	0	0	30759
25	Tripura	79	875	954	14	4	633	264	0	0	0	0	0	0	1869
26	Uttar Pradesh	1945	16938	18883	23812	1188	14793	1350	122	31	84	9	0	0	60272
27	Uttarakhand	339	1896	2235	1220	290	1335	20	15	24	1	0	0	0	5141
28	West Bengal	2642	16546	19188	764	1577	15069	815	6	0	0	0	0	0	37419
29	A& Nicobar	14	36	49	10	0	67	48	0		0	0	0	0	174
30	Chandigarh	5	1	7	20	0	1	0	0	0	0	0	0	0	28
31	D & Nagar Haveli	1	55	57	4	0	25	0	0		0	0	0	0	87
32	Daman & Diu	0	3	3	1	0	3	0	0		0	0	0	0	7
33	Delhi	44	47	92	278	6	21	20	1	0	0	0	0	0	418
34	Lakshadweep	4	3	7	0	0	76	0	0		0	0	0	0	82
35	Pondicherry	78	6	84	3	4	69	1	0		0	0	0	0	162
	All India	33060	166015	199075	105343	71558	140537	11134	611	137	438	517	83	264	529698

Source: Department of Animal Husbandry and Dairying & Fisheries, M/O Agriculture (18th Livestock Census)
Provisional results derived from village level total.

3.12 FISHERY

3.12.1 India with a large number of inland water resources and had a long sea cost line is a rich source of fishery. **Table 3.12.1depicts the marine fishery resources in India.**

Table 3.12.1 : Marine fishery resources of India

Sl. No.	State/Union Territory	Approx length of coast line (Kms)	Continental Shelf ('000 Sq Kms.)	Number of Landing Centres	Number of Fishing Villages
1	Andhra Pradesh	974	33	353	555
2	Goa	104	10	33	39
3	Gujarat	1600	184	121	247
4	Karnataka	300	27	96	144
5	Kerala	590	40	187	222
6	Maharashtra	720	112	152	456
7	Odisha	480	26	73	813
8	Tamil Nadu	1076	41	407	573
9	West Bengal	158	17	59	188
10	Andaman & Nicobar Islands	1912	35	16	134
11	Daman & Diu	27	-	5	11
12	Lakshadweep	132	4	10	10
13	Puducherry	45	1	25	40
TOTAL		**8118**	**530**	**1537**	**3432**

Source: Annual report 2012-13, Department of Animal Husbandry and Dairying, Ministry of Agriculture (Marine Fisheries Census,2005)

3.12.2 **The fish production (marine & inland) at all India level over the years, is presented at Table 3.12.2**. It is pertinent to mention that, though the marine and inland fish production are showing an overall increasing trend, the marine fish production is lower than the inland production in recent years.

Table 3.12.2 : 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	25.06
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	28.30	31.26	59.56
26	2002-03	29.90	32.10	62.00
27	2003-04	29.41	34.58	63.99
28	2004-05*	27.79	35.25	63.05
29	2005-06	28.16	37.56	65.72
30	2006-07	30.24	38.45	68.69
31	2007-08	29.20	42.07	71.27
32	2008-09	29.78	46.38	76.16
33	2009-10	31.03	48.10	79.13
34	2010-11(P)	32.20	50.70	82.90

Source : Annual Report-2012-13, Department of Animal Husbandry and Dairying, Ministry of Agriculture*: Revised (P) : Provisional

Table 3.12.3 : State-wise fish production

Sl. No.	States/UT's	1997-98			2001-2002		
		Marine	Inland	Total	Marine	Inland	Total
1	2	3	4	5	3	4	5
1	Andhra Pradesh	146545	226314	372859	204940	471165	676105
2	Arunachal Pradesh	0	2130	2130	0	2600	2600
3	Assam	0	155132	155132	0	161450	161450
4	Bihar	0	208540	208540	0	240400	240400
5	Goa	88809	3240	92049	66550	3368	69918
6	Gujarat	745706	70798	816504	650829	50774	701603
7	Haryana	0	32050	32050	0	34568	34568
8	Himachal Pradesh	0	6685	6685	0	7215	7215
9	Jammu & Kashmir	0	18530	18530	0	18850	18850
10	Karnataka	189859	95275	285134	128415	121196	249611
11	Kerala	526342	57514	583856	593783	78039	671822
12	Madhya Pradesh	0	115161	115161	0	47457	47457
13	Maharashtra	453000	127000	580000	414268	122785	537053
14	Manipur	0	13700	13700	0	16450	16450
15	Meghalaya	0	3085	3085	0	4968	4968
16	Mizoram	0	2700	2700	0	3147	3147
17	Nagaland	0	3700	3700	0	5200	5200
18	Odisha	156081	153428	309509	113893	168056	281949
19	Punjab	0	36000	36000	0	58000	58000
20	Rajasthan	0	15100	15100	0	14269	14269
21	Sikkim	0	140	140	0	140	140
22	Tamil Nadu	355100	109500	464600	370998	114000	484998
23	Tripura	0	27906	27906	0	29450	29450
24	Uttar Pradesh	0	160017	160017	0	225371	225371
25	West Bengal	164000	786020	950020	184300	915800	1100100
26	A & N Islands	27225	40	27265	27021	61	27082
27	Chandigarh	0	4	4	0	44	44
28	Dadar & Nagar Haveli	0	15	15	0	55	55
29	Daman & Diu	18807	0	18807	21524	0	21524
30	Delhi	0	4200	4200	0	3200	3200
31	Lakshadweep	10550	0	10550	13650	0	13650
32	Pondicherry	38420	4104	42524	39600	4900	44500
33	Chattisgarh				0	95763	95763
34	Uttranchal				0	6422	6422
35	Jharkhand				0	101000	101000
Total		**2920444**	**2438028**	**5358472**	**2829771**	**3126163**	**5955934**

Continued..

Source : Department of Animal Husbandry and Dairying, Ministry of Agriculture

Table 3.12.3 : State-wise fish production

Sl. No.	States/UT's	2003-2004			2004-2005		
		Marine	Inland	Total	Marine	Inland	Total
1	2	6	7	8	9	10	11
1	Andhra Pradesh	263930	680710	944640	210733	642321	853054
2	Arunachal Pradesh	0	2650	2650	0	2704	2704
3	Assam	0	181000	181000	0	186314	186314
4	Bihar	0	266490	266490	0	267510	267510
5	Goa	83760	3600	87360	94813	4231	99044
6	Gujarat	609140	45480	654620	584779	50426	635205
7	Haryana	0	39130	39130	0	42050	42050
8	Himachal Pradesh	0	6530	6530	0	6901	6901
9	Jammu & Kashmir	0	19750	19750	0	19100	19100
10	Karnataka	187000	70000	257000	171227	80000	251227
11	Kerala	608520	76180	684700	601863	76451	678314
12	Madhya Pradesh	0	50820	50820	0	62060	62060
13	Maharashtra	420010	125120	545130	417769	130250	548019
14	Manipur	0	17600	17600	0	17800	17800
15	Meghalaya	0	5150	5150	0	5638	5638
16	Mizoram	0	3380	3380	0	3680	3680
17	Nagaland	0	5560	5560	0	4900	4900
18	Odisha	116880	190020	306900	121928	193657	315585
19	Punjab	0	83650	83650	0	77700	77700
20	Rajasthan	0	14300	14300	0	16391	16391
21	Sikkim	0	140	140	0	140	140
22	Tamil Nadu	373000	101140	474140	307693	151734	459427
23	Tripura	0	17980	17980	0	19838	19838
24	Uttar Pradesh	0	267000	267000	0	277074	277074
25	West Bengal	181600	988000	1169600	179500	1035500	1215000
26	A & N Islands	31060	90	31150	32600	83	32683
27	Chandigarh	0	80	80	0	84	84
28	Dadar & Nagar Haveli	0	50	50	0	48	48
29	Daman & Diu	13770	0	13770	12506	0	12506
30	Delhi		2100	2100	0	1410	1410
31	Lakshadweep	10030	0	10030	11964	0	11964
32	Pondicherry	42800	5200	48000	31500	5250	36750
33	Chattisgarh	0	111050	111050	0	120072	120072
34	Uttranchal	0	2560	2560	0	2566	2566
35	Jharkhand	0	75380	75380	0	22000	22000
Total		**2941500**	**3457890**	**6399390**	**2778875**	**3525883**	**6304758**

Continued..

Source : Department of Animal Husbandry and Dairying, Ministry of Agriculture

Table 3.12.3 : State-wise fish production

(Tonnes)

Sl. No.	States/UT's	2005-2006			2006-2007		
		Marine	Inland	Total	Marine	Inland	Total
1	2	12	13	14	15	16	17
1	Andhra Pradesh	21884	67225	89109	240.20	616.73	856.93
2	Arunachal Pradesh	0	275	275	0.00	2.77	2.77
3	Assam	0	18801	18801	0.00	181.48	181.48
4	Bihar	0	27953	27953	0.00	267.04	267.04
5	Goa	10091	404	10495	98.96	3.43	102.39
6	Gujarat	66388	6993	73381	670.51	76.82	747.33
7	Haryana	0	4820	4820	0.00	60.08	60.08
8	Himachal Pradesh	0	730	730	0.00	6.89	6.89
9	Jammu & Kashmir	0	1915	1915	0.00	19.20	19.20
10	Karnataka	17697	12060	29757	168.54	123.92	292.46
11	Kerala	55891	7798	63689	598.06	79.57	677.63
12	Madhya Pradesh	0	6108	6108	0.00	65.04	65.04
13	Maharashtra	44534	13520	58054	464.09	131.85	595.94
14	Manipur	0	1822	1822	0.00	18.61	18.61
15	Meghalaya	0	412	412	0.00	5.49	5.49
16	Mizoram	0	375	375	0.00	3.76	3.76
17	Nagaland	0	550	550	0.00	5.80	5.80
18	Odisha	12221	20324	32545	128.14	213.90	342.04
19	Punjab	0	8564	8564	0.00	86.70	86.70
20	Rajasthan	0	1850	1850	0.00	22.20	22.20
21	Sikkim	0	15	15	0.00	0.15	0.15
22	Tamil Nadu	30799	15504	46303	387.25	155.03	542.28
23	Tripura	0	2387	2387	0.00	28.63	28.63
24	Uttar Pradesh	0	28958	28958	0.00	306.73	306.73
25	West Bengal	16000	109000	125000	178.10	1181.00	1359.10
26	A & N Islands	1205	5	1210	28.60	0.08	28.68
27	Chandigarh	0	9	9	0.00	0.17	0.17
28	Dadar & Nagar Haveli	0	5	5	0.00	0.05	0.05
29	Daman & Diu	1772	7	1779	16.35	0.06	16.41
30	Delhi	0	70	70	0.00	0.61	0.61
31	Lakshadweep	1196	0	1196	11.75	0.00	11.75
32	Pondicherry	1927	218	2145	33.61	6.05	39.66
33	Chattisgarh	0	13175	13175	0.00	137.75	137.75
34	Uttranchal	0	279	279	0.00	3.03	3.03
35	Jharkhand	0	3427	3427	0.00	34.27	34.27
Total		**281605**	**375558**	**657163**	**3024.16**	**3844.89**	**6869.05**

Continued..

Source : Department of Animal Husbandry and Dairying, Ministry of Agriculture

Table 3.12.3 : State-wise fish production

Sl. No.	States/UT's	2007-2008			2008-2009		
		Marine	Inland	Total	Marine	Inland	Total
1	2	18	19	20	21	22	23
1	Andhra Pradesh	254892	755195	1010087	291159	961618	1252777
2	Arunachal Pradesh	0	2830	2830	0	2880	2880
3	Assam	0	190320	190320	0	206150	206150
4	Bihar	0	319100	319100	0	300650	300650
5	Goa	32262	1166	33428	83136	3078	86214
6	Gujarat	644531	77376	721907	623055	142847	765902
7	Haryana	0	67236	67236	0	76285	76285
8	Himachal Pradesh	0	7851	7851	0	7793	7793
9	Jammu & Kashmir	0	17330	17330	0	19270	19270
10	Karnataka	175566	122124	297690	218137	143717	361854
11	Kerala	586286	81041	667327	583150	102842	685992
12	Madhya Pradesh	0	63893	63893	0	68466	68466
13	Maharashtra	419815	136632	556447	395963	127138	523101
14	Manipur	0	18600	18600	0	18800	18800
15	Meghalaya	0	4000	4000	0	3959	3959
16	Mizoram	0	3760	3760	0	2891	2891
17	Nagaland	0	5800	5800	0	6175	6175
18	Odisha	130767	218716	349483	135487	239335	374822
19	Punjab	0	78730	78730	0	86207	86207
20	Rajasthan	0	25700	25700	0	24100	24100
21	Sikkim	0	175	175	0	168	168
22	Tamil Nadu	393266	166090	559356	365280	168885	534165
23	Tripura	0	36245	36245	0	36000	36000
24	Uttar Pradesh	0	325950	325950	0	349274	349274
25	West Bengal	182735	1264527	1447262	189290	1294710	1484000
26	A & N Islands	28600	85	28685	32335	157	32492
27	Chandigarh	0	214	214	0	244	244
28	Dadar & Nagar Haveli	0	48	48	0	50	50
29	Daman & Diu	26280	78	26358	14060	81	14141
30	Delhi	0	610	610	0	715	715
31	Lakshadweep	11042	0	11042	12592	0	12592
32	Pondicherry	33444	5569	39013	34550	5750	40300
33	Chattisgarh	0	139373	139373	0	158698	158698
34	Uttranchal	0	3092	3092	0	3163	3163
35	Jharkhand	0	67890	67890	0	75800	75800
Total		2919486	4207346	7126832	2978194	4637896	7616090

Continued..

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

Table 3.12.3 : State-wise fish production

concluded

Sl. No.	States/UT's	2009-2010		
		Marine	Inland	Total
1	2	24	25	26
1	Andhra Pradesh	293151	1000704	1293855
2	Arunachal Pradesh	0	2650	2650
3	Assam	0	218822	218822
4	Bihar	0	297400	297400
5	Goa	81927	3437	85364
6	Gujarat	687445	84071	771516
7	Haryana	0	100464	100464
8	Himachal Pradesh	0	7847	7847
9	Jammu & Kashmir	0	19300	19300
10	Karnataka	170992	237061	408053
11	Kerala	570013	93108	663121
12	Madhya Pradesh	0	66119	66119
13	Maharashtra	415767	122587	538354
14	Manipur	0	19200	19200
15	Meghalaya	0	4210	4210
16	Mizoram	0	3042	3042
17	Nagaland	0	6360	6360
18	Odisha	129332	241208	370540
19	Punjab	0	122860	122860
20	Rajasthan	0	26908	26908
21	Sikkim	0	168	168
22	Tamil Nadu	365280	168885	534165
23	Tripura	0	42268	42268
24	Uttar Pradesh	0	392926	392926
25	West Bengal	179004	1325996	1505000
26	A & N Islands	33000	159	33159
27	Chandigarh	0	236	236
28	Dadar & Nagar Haveli	0	50	50
29	Daman & Diu	15880		15880
30	Delhi	0	715	715
31	Lakshadweep	12372	0	12372
32	Pondicherry	36100	5849	41949
33	Chattisgarh	0	174245	174245
34	Uttranchal	0	3488	3488
35	Jharkhand	0	70500	70500
Total		2990263	4862843	7853106

concluded

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

The State wise fish production data is available in table 3.12.3

3.12.3 The inland fishery water resources contributes to the Country's fish production in a significant manner. **The table 3.12.4. presents the details of Inland water resources of water.**

Table 3.12.4 : Inland fishery water resources of India

Sl. No.	State/UTs	Rivers & Canals (Kms.)	Reservoirs (Lakh Ha)	Tanks & Ponds (Lakh Ha)	Floodplain Lakes & Derelict Water (Lakh Ha)	Brackish Water (Lakh Ha)
1	2	3	4	5	6	7
1	Andhra Pradesh	11,514	2.34	5.17	-	0.60
2	Arunachal Pradesh	2,000	-	2.76	0.42	-
3	Assam	4,820	0.02	0.23	1.10	-
4	Bihar	3,200	0.60	0.95	0.50	-
5	Chhattisgarh	3,573	0.84	0.63	-	1.47
6	Goa	250	0.03	0.03	-	Neg
7	Gujarat	3,865	2.43	0.71	0.12	1.00
8	Haryana	5,000	0.09	0.10	0.10	-
9	Himachal Pradesh	3,000	0.42	0.01	-	-
10	Jammu & Kashmir	27,781	0.07	0.17	0.06	-
11	**Jharkhand**	**4,200**	**0.94**	**0.29**	**-**	**-**
12	Karnataka	9,000	4.40	2.90	-	0.10
13	Kerala	3,092	0.30	0.30	2.43	2.40
14	Madhya Pradesh	17,088	2.27	0.60	-	-
15	Maharashtra	16,000	2.79	0.59	-	0.10
16	Manipur	3,360	0.01	0.05	0.04	-
17	Meghalaya	5,600	0.08	0.02	Neg	-
18	Mizoram	1,395	-	0.02	-	-
19	Nagaland	1,600	0.17	0.50	Neg	-
20	Odisha	4,500	2.56	1.14	1.80	4.30
21	Punjab	15,270	Neg	0.07	-	-
22	Rajasthan	5,290	1.20	1.80	-	-
23	Sikkim	900	-	-	0.03	-
24	Tamil Nadu	7,420	5.70	0.56	0.07	0.60
25	Tripura	1,200	0.05	0.13	-	-
26	Uttar Pradesh	28,500	1.38	1.61	1.33	-
27	Uttarakhand	2,686	0.20	0.01	0.00	-
28	West Bengal	2,526	0.17	2.76	0.42	2.10
29	Andaman & Nicobar Islands	115	0.01	0.03	-	1.20
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	Puducherry	247	-	Neg	0.01	Neg
Total		**195,210**	**29.07**	**24.14**	**7.98**	**12.40**

Source: Annual Report 2011-12, Department of Animal Husbandry and Dairying, Ministry of Agriculture
Neg - Negligible

3.12.4 Though, the livestock population in the country is increasing over the years, the incidence of livestock and poultry diseases are also increasing which has causes in environmental changes and serious impacts on environmental balance. **Table 3.12.5 at gives a summary of the incidence of various livestock and poultry diseases in 2010**

Table 3.12.5: Incidence of livestock and poultry diseases in India

(Jan-Dec.,2011)

Sl. No.	Disease Name	Species	Number of		
			Outbreak	Attack	Death
1	**Foot and mouth disease**	Bovine	653	10959	207
		Buffalo	8	1358	11
		Ovine/Caprine	31	485	0
		Swine	9	45	0
		Canine	0	0	0
		Total	**701**	**12847**	**218**
2	**Hamorrhagic septicaemia**	Bovine	172	1807	466
		Ovine/Caprine	14	265	100
		Buffalo	129	846	246
		Swine	0	0	0
		Total	**315**	**2918**	**812**
3	**Black quarter**	Bovine	412	2605	875
		Ovine/Caprine	4	25	1
		Buffalo	1	46	24
		Total	**417**	**2676**	**900**
4	**Anthrax**	Bovine	33	165	165
		Ovine/Caprine	15	197	158
		Buffalo	0	0	0
		Total	**48**	**362**	**323**
5	**Fascioliasis**	Bovine	195	509195	31
		Ovine/Caprine	5	51	7
		Cannine	2	10	0
		Swine	0	1	0
		Buffalo	32	1755	10
		Equine	0	4	0
		Total	**234**	**511016**	**48**
6	**Enterotoxaemia**	Ovine/Caprine	67	866	242
		Bovine	4	250	0
		Total	**71**	**1116**	**242**
7	**Sheep pox and goat pox**	Ovine/Caprine	**197**	**3861**	**698**
8	**Blue Tongue**	Ovi/Cap	**38**	**2212**	**136**
9	**CCPP**	Ovi/Cap	**1**	**22**	**5**
10	**Amphistomiasis**	Bovine	132	14996	29
11	**Swine Fever**	Swine	**284**	**4018**	**1371**
12	**Salmonellosis**	Avian	**123**	**113451**	**4439**
		Bovine	**1**	**3002**	**207**
		Swine	**0**	**0**	**0**
		Canine	**0**	**0**	**0**
		Total	**124**	**116453**	**4646**
13	**Coccidiosis**	Bovine	81	15194	739
		Ovi/Cap	7	18	0
		Avian	635	168693	25262
		Swine	14	70	0
		Buffalo	0	3	0
		Cannine	1	1	0
		Total	**738**	**183979**	**26001**

Table 3.12.5: Incidence of livestock and poultry diseases in India

(Jan-Dec.,2011)

Sl. No.	Disease Name	Species	Number of		
			Outbreak	Attack	Death
14	**Ranikhet (New Castle) Disease**	Avian	886	240438	24016
15	**Fowl Pox**	Avian	235	19122	1682
16	**Fowl cholera**	Avian	143	7999	2276
17	**Marks Disease**	Avian	1	100	50
18	**I.B.D.**	Avian	338	86381	24199
19	**Duck Plague**	Avian	87	2232	497
20	**Chronic respiratory disease**	Avian	291	133808	59642
21	**Canine Disetmper**	Canine	100	1509	123
22	**Rabies**	Bovine	56	168	168
		Canine	23	163	163
		Buffalo	9	75	75
		Ovi/Caprine	3	8	8
		Avian	1	3	3
		Total	**92**	**417**	**417**
23	**Babesiosis**	Bovine	120	3177	22
		Buffalo	6	282	3
		Equine	2	6	0
		Canine	3	13	0
		Total	131	3478	25
24	**Mastitis**	Bovine	186	9072	2
		Ovi/Caprine	1	17	0
		Total	**187**	**9089**	**2**
25	**Trypanismiasis**	Bovine	84	1334	16
		Canine	1	1	0
		Equine	1	171	7
		Buffalo	91	1922	23
		Total	**177**	**3428**	**46**
26	**Mange**	Bovine	43	541	0
		Ovi/Caprine	40	1739	0
		Swine	14	321	0
		Canine	7	246	0
		Total	**104**	**2847**	**0**
27	**Peste Des Petits Ruminants(PPR)**	Ovine/Caprine	197	6976	1707
28	**Anaplasmosis**	Bovine	27	90	9
29	**Brucellosis**	Bovine	1	1	0
		Buffalo	1	16	0
		Total	**2**	**17**	**0**
30	**Coryza**	Avian	8	37505	37
31	**Avian Influenza (HPAI)**	Avian	4	6299	4863
		Fau	1	1143	1143
		Total	5	7442	6006
32	**Glanders**	Equine	3	3	2

Source: Annual Report-2011-12,Department of Animal Husbandry and Dairying, Ministry of Agriculture

*** Figure pertains to number of poulty destroyed.**

 # 1702 samples tested out of which 23 found postive and destroyed

+ Figure pertains to number of animals destroyed

$ Total does not include animals attacked by Glander disease

**** The total does not include poultry destroyed due to HPAI and equine destroyed due to Glander disease.**

4.1 Introduction

4.1.1 The atmosphere of Earth is a layer of gases surrounding the planet Earth that is retained by Earth's gravity. The atmosphere protects life on Earth by absorbing ultraviolet solar radiation, warming the surface through heat retention (greenhouse effect), and reducing temperature extremes between day and night.

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	20.946000	209460.00
3	Argon	0.934000	9340.00
4	Carbon dioxide	0.039000	390.00
5	Neon	0.001818	18.18
6	Helium	0.000524	5.24
7	Methane	0.000179	1.79
8	Kryton	0.000114	1.14
9	Hydrogen	0.000055	0.55
10	Xenon	0.000009	0.09
11	Ozone	Variable	~0.001- 0.3 (variable)

Source : Envis centre of Indian Institute of Tropical Meteorology, Pune.

4.2 Atmospheric Pollution – Main Sources

4.2.1 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.

4.2.2 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.

4.2.3 **National Air Quality Monitoring Programme:** Central Pollution Control Board has laid down national air quality monitoring network with the help of State Pollution Control Boards. The network is consisting of 346 stations covering 130 Cities, 26 States and 4 Union Territories. The parameters are Sulpher Dioxide, Oxides of Nitrogen and Respirable Suspended Particulate Matter. It is expected that there will be 104 observations in a year taken twice a week, 24 hourly at uniform level.

4.2.4 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. **The national ambient air quality standards (NAAQS) is available in table 4.2.1**

4.2.5 The details of State level air quality monitored under National Ambient Air Quality Monitoring Programme (NAMP) during 2008 in residential areas is presented in table 4.2.2. A Summary of the Observations are as follows:

a. With respect to Sulpher dioxide it is observed that annual average is well within the limit in all States. There are some occasional pulses in the States of Andhra Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal.

b. With respect to NO_2 Values, the annual average are well with in limit except in some Cases. The maximum value indicates that of Andhra Pradesh, Delhi, Bihar, Maharashtra, Tamil Nadu and West Bengal are higher.

c. In case of RSPM average value indicates that except few States such as Goa, Kerala, Mizoram, and Pondicherry, Tamil Nadu all are exceeding the limit. The maximum value indicates that except Mizoram all are high. States like Rajasthan also is high as 829 micro gram per metre cube.

d. With respect to industrial area sulpher dioxide are again within the limit and so is the with Nitrogen Oxide.

e. With respect to RSPM the trend shows that 13 States are exceeding the limits.

The

Table 4.2.1 : National ambient air quality standards (NAAQS)

Sl. No.	Pollutant	Sulphur Dioxide (SO_2)		Oxides of Nitrogen (NO_2)		Suspended Particulate Matter (SPM)		Respirable Particulate Matter (RPM) (size less than 10 µm)		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 2. Ultraviolet Fluorescence		1. Jacob & Hochheiser Modified (Na- arsenic) 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 EPM 2000 or 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.

µm : Micometer µg : Microgram

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.

Table 4.2.2 : State wise level of SO_2, NO_2 and RSPM in residential areas under national ambient air quality monitoring programme (NAMP) during 2008.

Sl	Name of the State	SO_2 µg/m^3 (Annual)			NO_2 µg/m^3 (Annual)			RSPM µg/m^3 (Annual)		
		Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.
1	Andhra Pradesh	74	2	8	108	7	26	425	12	85
2	Assam	21	2	6	33	5	13	450	16	89
3	Bihar	14	2	7	93	8	39	402	25	120
4	Chandigarh	2	2	2	49	5	14	217	21	89
5	Chhattisgarh	28	3	16	63	13	28	261	68	126
6	Delhi	31	2	5	138	23	55	630	18	209
7	Goa	11	2	2	30	4.5	13	197	14	57
8	Gujarat	45	4	12	40	4.5	18	293	33	83
9	Haryana	24	4	9	36	5	13	293	45	121
10	Himachal Pradesh	20	2	2	25	5	12	218	15	71
11	Jharkhand	30	11	19	66	20	38	454	31	152
12	Karnataka	49	2	10.5	66	8	27	381	28	77
13	Kerala	31	2	5	72	5	20	280	11	48
14	Madhya Pradesh	38	2	9	47	5	19	609	7	110
15	Maharashtra	90	2	16	159	5	31	579	3	101
16	Meghalaya	22	2	2	37	5	34	113	29	73
17	Mizoram	2	2	2	10	5	15	61	15	37
18	Manipur	6	2	3	38	14	19	125	34	84
19	Nagaland	5	2	2	62	7	14	133	16	72
20	Odisha	13	2	4	41	6	16	203	14	80
21	Punjab	64	5	10	158	57	30	387	62	193
22	Puducherry	10	2	4	21	5	10	182	25	45
23	Rajasthan	18	2	7	74	5	28	829	10	122
24	Tamil Nadu	80	2	12	106	5	20	302	11	58
25	Uttar Pradesh	68	4	12	64	5	30	442	50	170
26	Uttarakhand	61	21	27	31	23	28	159	73	126
27	West Bengal	70	2	9	137	5	66	514	6	101

Source : Central Pollution Control Board

Note : Data available as on date 15.04.09 µg/m3 : Micrograms per metre cube

4.3 Industrial Emissions

4.3.1 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 (SO2, NOx, 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, 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.

Table 4.3.1: State wise level of SO2, NO2 and RSPM in industrial areas under national ambient air quality monitoring programme (NAMP) during 2008.

Sl	Name of the State	SO_2 µg/m^3 (Annual)			NO_2 µg/m^3 (Annual)			RSPM µg/m^3 (Annual)		
		Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.
1	Andhra Pradesh	2	83	6	6	121	27	9	493	87
2	Chandigarh	2	5	2	4.5	52	20	22	254	123
3	Chhattisgarh	12	22	17	33	51	42	129	288	212
4	Delhi	2	66	8	20	139	61	49	633	225
5	Goa	2	11	3	4.5	28	11	10	212	52
6	Gujarat	9	30	16	12	89	26	43	598	127
7	Haryana	7	23	15	12	89	28	102	598	267
8	Himachal Pradesh	2	6	2	4.5	21	12	17	649	134
9	Jharkhand	12	78	28	30	71	47	44	517	170
10	Karnataka	2	20	10	4.5	69	25	7	442	85
11	Kerala	2	43	6	4.5	48	11	6	320	45
12	Maharashtra	2	104	24	4.5	121	41	3	802	108
13	Madhya Pradesh	2	52	15	4.5	47	18	16	507	160
14	Odisha	2	21	8	10	37	21	19	276	95
15	Punjab	48	35	11	11	66	35	99	666	229
16	Puducherry	3	10	6	4.5	18	13	33	95	54
17	Rajasthan	4	24	8	11	72	31	10	538	135
18	Tamil Nadu	2	90	13	4.5	73	21	14	364	81
19	Uttar Pradesh	5	71	17	4.5	75	27	60	575	197
20	Uttarakhand	16	21	20	19	27	21	88	98	93
21	West Bengal	2	65	10	4.5	162	73	16	604	119

Source : Central Pollution Control Board

Note : Data available as on date 15.04.09 µg/m3 : Micrograms per metre cube

Table 4.3.3: Year wise ambient air quality in major cities

(µg/m3)

Sulphur dioxide (SO_2)

City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008(P)
Ahmedabad	32.0	25.0	15.1	-	12.2	8.4	10	12.3	16	15.7	12.3
Banglore	-	20.7	27.9	20.3	38.2	20.7	20	13.4	12	8.5	15.2
Chennai	21.7	8.1	15.9	12.6	11.9	12.5	17	19.9	15	12.2	9.5
Delhi	23.5	17.3	16.3	15.4	17.5	15.2	13	11.3	10	9.89	6.6
Hyderabad	17.2	16.8	16.4	11.8	14	12.4	10	7.27	6	5.63	5.5
Kolkata	35.7	21.3	0	34.3	44.5	17.4	18	11.4	17	9.33	7.7
Mumbai	31.1	18	25.1	11.5	14.9	12.1	16	9.07	8	6.67	8.7

(µg/m3)

Oxides of Nitrogen (NO_x)

City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008(P)
Ahmedabad	18.8	14.8	20	-	33	28.6	39	31.8	25	24.3	20.0
Banglore	-	28	20.4	25	27.1	40.2	23	25.5	35	51.8	40.8
Chennai	17.5	9	13	16.7	10.7	14.4	18	18.4	26	16.8	15.4
Delhi	47.2	39.7	34	33.9	35.7	39.9	37	37.3	42	46.1	56.7
Hyderabad	37.8	25	30.7	30.8	24.3	25.2	31	25.5	26	30.3	26.2
Kolkata	29.9	29.3	0	32	30.5	34.8	74	81.7	71	59.7	64.0
Mumbai	64.2	35.3	34.3	19.5	29.6	25.5	23	17.4	21	18.3	39.3

(µg/m3)

Suspended Particulate Matter (SPM)

City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008(P)
Ahmedabad	251	254	235	-	351	393	343	281	256	244	220
Banglore	-	176	187	153	146	153	148	149	163	153	273
Chennai	127	115	107	127	88	92	98	132	155	136	142
Delhi	411	402	343	379	388	381	346	427	355	374	433
Hyderabad	178	177	144	213	209	163	157	161	164	196	225
Kolkata	354	498	0	279	308	315	251	256	251	266	225
Mumbai	210	213	298	187	221	252	231	225	224	247	260

(µg/m3)

Respirable Suspended Particulate Matter (RSPM)

City	1999	2000	2001	2002	2003	2004	2008(P)
Ahmedabad	161	237	198	169	154	152	88
Banglore	0	89.7	68	64.3	76	69	100
Chennai	71.7	65	77.6	74.8	86	60	63
Delhi	172	155	146	158	151	149	214
Hyderabad	127	98	68.8	71	64	71	85
Kolkata	140	145	117	128	121	134	103
Mumbai	115	107	67.2	68.7	70	78	127

Source: Central Pollution Control Board

SPM : Suspended particulate matter; (P) : Provisional

RSPM : Respirable suspended particulate matter

SO_2 : Sulphur dioxide NOx : Oxides of nitrogen µg/m3 : Micrograms per metre cube

The ambient air quality in major cities is presented at table 4.3.2.

Table 4.3.2 : Ambient air quality in major cities (2008)*

(µg/m3)

City	SO_2	NO_x	SPM	RSPM
Ahmedabad	12.3	20.0	220	88
Banglore	15.2	40.8	273	100
Chennai	9.5	15.4	142	63
Delhi	6.6	56.7	433	214
Hyderabad	5.5	26.2	225	85
Kolkata	7.7	64.0	225	103
Mumbai	8.7	39.3	260	127

Source: Central Pollution Control Board

SPM : Suspended particulate matter; RSPM : Respirabl

SO_2 : Sulphur dioxide No_x : Oxides of nitrogen

* Provisional

The trend in ambient air quality in major cities (pollutant wise) over time is presented in table 4.3.3

4.3.2 **Industries and Air pollution:** Industrialization and urbanization have resulted in a profound deterioration of India's air quality. Sources of air pollution, India's most severe environmental problem, come in several forms, including vehicular emissions and untreated industrial smoke. Apart from rapid industrialization, urbanization has resulted in the emergence of industrial centers without a corresponding growth in civic amenities and pollution control mechanisms.

4.3.3 There is a growth of 54.85 % in the number of registered factories in India from 1987-88 to 2009-10. **The details of registered factories sector wise are in Table 4.3.4.**

Table 4.3.4 below shows the growth in number of registered factories in India from 1987 to 2011.

Table 4.3.4 : 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
14	2000-01*	127036	163	4069	131268
15	2001-02*	124099	170	4279	128548
16	2002-03*	123401	182	4374	127957
17	2003-04	124277	219	4578	129074
18	2004-05	131232	275	4846	136353
19	2005-06	134669	259	5232	140160
20	2006-07	138968	313	5429	144710
21	2007-08	140355	385	5645	146385
22	2008-09	145727	504	9090	155321
23	2009-10	149130	496	9251	158877
24	2010-11	161458	585	10134	172177

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

Note: Factories registered under Factory Act 1948

Source : Central Statistics Office

4.3.4 **The detail of Indian standards for maximum permissible limits for Industrial effluent discharges is shown in the table 4.3.5.**

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)	On land for Irrigation Indian Standards: 3307 (1974)	Marine Coastal Area
1	2	3	4	5	6
1	pH	5.5-9.0	5.5-9.0	5.5-9.0	5.5-9.1
2	Biological oxygen demand (for 5 days at $20^{o}C$)	30.00	350.00	100.00	100.00
3	Chemical oxygen demand	250.00	-	-	250
4	Suspended solids	100.00	600.00	200.00	
5	Total dissolved solids (inorganic)	2100.00	2100.00	2100.00	-
6	Temperature (^{o}C)	40.00	45.00	-	45.00
7	Oil and grease	10.00	20.00	10.00	20.00
8	Phenolic Compounds	1.00	5.00	-	5.00
9	Cyanides	0.20	2.00	0.20	0.20
10	Sulphides	2.00	-	-	5.00
11	Fluorides	2.00	15.00	-	15.00
12	Total residual chlorine	1.00	-	-	1.00
13	Pesticides	-	-	-	-
14	Arsenic	0.20	0.20	0.20	0.20
15	Cadmium	2.00	1.00	-	2.00
16	Chromium (hexavalent)	0.10	2.00	-	1.00
17	copper	3.00	3.00	-	3.00
18	Lead	0.10	1.00	-	1.00
19	Mercury	0.01	0.01	-	0.01
20	Nickel	3.00	3.00	-	5.00
21	Selenium	0.05	0.05	-	0.05
22	Zinc	5.00	15.00	-	15.00
23	Chlorides	1000.00	1000.00	600.00	-
24	Boron	2.00	2.00	2.00	-
25	Sulphates	1000.00	1000.00	1000.00	-
26	Sodium (%)	-	60.00	60.00	-
27	Ammoniacal nitrogen	50.00	50.00	-	50
28	Radioactive materials				
29	Alpha emitters (milli curie/millilitre)	10^{-7}	10^{-7}	10^{-8}	10^{-7}
30	Beta emitters (μ curie/millilitre)	10^{-6}	10^{-6}	10^{-7}	10^{-6}

Source : Central Pollution Control Board, Standard (1974), Agriculture research data book-2002

4.4 Important industries and the effluent standards in India

4.4.1 Sugar industry: India has been known as the original home of sugar and sugarcane. India is the second largest producer of sugarcane next to Brazil. **The effluent standards for sugar industry is at table 4.4.1.**

Table 4.4.1 : 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 20^0C)	100	30
2	Suspended Solids	100	30

Source : Environment Protection Rules-1986.

4.4.2 Paper Industry: The Indian Paper Industry is among the top 15 global players today**. The existing effluent for large pulp and paper industries is available at table 4.4.2.**

Table 4.4.2 : 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 20^0C	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 : Central Polution Control Board

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

4.4.3 Oil Refineries: There are a total of 18 oil refineries in the country comprising 17 in the Public Sector, one in the private sector in India. The following table presents the elluent standards for oil refineries.

Table 4.4.3 : 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 20^0C)	15.0	10.50
5	Suspended Solids	20.0	14.00
6	pH	--	6.00-8.50

Environment protection rule, 1986
Source : Central Polution Control Board

4.4.4 Aluminum Industry: Aluminum industry is one of the leading metal industries in the Indian economy. The effluent standards for aluminum industry in India are shown in table 4.4.4.

Table 4.4.4: Effluent standards for aluminium industry

Sl. No.	Plant	Parameters	Permissible Limits
1	2	3	4
1	**Aluminium 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 : Central Polution Control Board
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.

4.4.5 Petro chemical Industry: The petrochemical industry in India has been one of the fastest growing industries in the country. This industry also has immense importance in the growth of economy of the country and the growth and development of manufacturing industry as well. It provides the foundation for manufacturing industries like construction, packaging, pharmaceuticals, agriculture, textiles etc. **The effluent standards for Petro – Chemical industries in India is shown at 4.4.5.**

TABLE 4.4.5: 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 20^0C)[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	100.0
9	Hexavalent Chromium	0.1
10	Total Chromium (as Cr)[d]	2.0

Source : Central Polution Control Board, Environment protection rules, 2986

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

4.5 In addition to air pollution, industries cause water pollution also. **The table 4.5.1 shows that at all India level, 68.14% grossly polluting industries discharging their effluents into rivers and lakes are complying with the norms.**

Table 4.5.1: Summary status of pollution control in grossly polluting industries discharging their effluents into rivers and lakes

(As on 31.03.2010)

Sl. No.	Name of the State/Union Territory	Total	Complying	Closed	Defaulting
1	2	3	4	5	6
1	Andhra Pradesh	17	11	6	0
2	Assam	9	9	0	0
3	Bihar	22	16	6	0
4	Chattisgarh	1	1	0	0
5	Gujarat	17	12	4	1
6	Haryana	76	71	1	4
7	Jharkhand	38	38	0	0
8	Karnataka	10	8	1	1
9	Kerala	36	18	7	11
10	Madhya Pradesh	1	0	0	1
11	Maharashtra	214	139	2	73
12	Odisha	20	6	5	9
13	Puducherry	1	0	0	1
14	Punjab	20	9	4	7
15	Tamil Nadu	366	248	118	0
16	Uttar Pradesh	432	294	89	49
17	Uttarakhand	45	25	4	16
18	West Bengal	31	19	3	9
19	Daman Diu & Dadar Nagar Haveli	2	2	0	0
	Total	**1358**	**926**	**250**	**182**

Source : Ministry of Environment & Forests,(CPCB)

4.6 Measures Taken for Controlling Air Pollution from Industries

4.6.1 The measures taken for controlling air pollution from industries are as follows:

a. Emission standards have been notified under the Environment (Protection) Act, 1986 to check pollution

b. Industries have been directed to install necessary pollution control equipment in a time bound manner and legal action has been initiated against the defaulting units.

c. 24 critically polluted areas have been identified. Action Plan has been formulated for restoration of environmental quality in these areas.

d. Environmental guidelines have evolved for citing of industries.

e. Environmental clearance is made compulsory for 29 categories of development projects involving public hearing/NGO participation as an important component of Environmental Impact Assessment process.

f. Environmental audit in the form of environmental statement has been made mandatory for all polluting industries.

g. Preparation of zoning Atlas for setting of industries based on environmental considerations in various districts of the country has been taken up.

h. Power plants (coal based) located beyond 1000 kms from the pit-head are required to use low ash content coal (not exceeding 34%) with effect from 1.6.2002. Power plants located in the sensitive areas are also required to use low ash coal irrespective of their distance from the pit head.

4.6.2 Up-coming initiatives

a. Monitoring using automatic analysers is being initiated in 16 polluted cities identified by Hon'ble Supreme Court.

b. Action Plan are being formulated and implemented by the Central/ States Pollution Control Boards in 16 cities identified by Hon'ble Supreme Court as polluted cities.

c. Road map given by Auto fuel policy for vehicular pollution control is being implemented.

d. Corporate Responsibility for Environmental protection (CREP) is being implemented by industries for controlling industrial pollution.

e. Source apportionment studies have been imitated and it is planned to carry out such studies initially in six cities.

f. Monitoring of hazardous air pollutants such as benzene, PAHs etc. has been initiated and it is proposed to carry out there monitoring in other cities also.

4.7 Road Transport

4.7.1 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. 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.

Table 4.7.1 : Total registered motor vehicles in India by states/UTs

(in number)

Sl. No.	States/UT	Transport													
		Multi-axled/Articulated Vehicles/Trucks & Lorries							Light Motor Vehicles (Goods)						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Andhra Pradesh	181,832	196,703	218,733	233,415	236,211	241,663	253,415	85,112	131,782	165,918	194,746	219,332	257,147	302,124
2	Arunachal Pradesh*	2,355	2,355	2,355	2,355	2,355	..	..	601	601	601	601	601	..	..
3	Assam	91,801	97,790	105,565	114,485	124,132	136,090	144,183	19,371	22,587	25,451	29,703	32,473	35,788	47,296
4	Bihar	50,016	52,005	54,414	58,012	66,485	73,472	83,191	0	48,123	54,153	62,576	..	..	…
5	Chhattisgarh	51,716	59,112	67,634	73,843	78,488	83,674	91,068	21,858	25,515	29,803	33,948	38,434	43,936	50,373
6	Goa (c)	34,043	33,120	33,596	35,495	37,040	39,422	42,395	0	4,220	6,316	7,260	8,218	9,402	11,447
7	Gujarat	204,362	223,022	239,404	247,772	259,231	276,290	301,533	253,340	285,858	314,388	338,826	367,113	402,514	448,958
8	Haryana	176,046	200,977	220,470	230,858	249,991	275,162	292,735	74,494	83,921	90,793	96,558	102,541	114,384	124,897
9	Himachal Pradesh	31,803	27,239	30,409	47,339	49,582	51,899	53,763	20,623	21,738	24,097	39,058	42,877	47,395	43,092
10	Jammu & Kashmir	33,174	35,697	38,977	41,696	35,109	35,414	38,482	16,843	20,004	22,674	24,768	43,238	46,792	51,412
11	Jharkhand	68,915	97,967	106,463	116,835	156,196	172,371	191,253	0	53,866	59,451	66,160	160,778	180,934	202,638
12	Karnataka	210,432	181,587	198,955	205,497	200,316	217,113	233,422	65,581	130,685	145,809	161,100	177,179	198,378	221,160
13	Kerala	264,262	64,454	65,707	66,868	68,777	72,534	76,330	0	247,799	271,763	291,514	251,471	288,447	323,891
14	Madhya Pradesh	83,293	88,755	94,661	99,242	105,025	112,954	121,916	39,943	46,754	55,057	62,984	72,029	82,673	95,702
15	Maharashtra	287,230	316,502	344,267	366,642	374,705	389,941	411,418	334,741	383,854	436,725	478,975	521,692	583,847	656,407
16	Manipur	6,746	7,078	7,216	7,216	7,639	8,249	8,599	1,854	2,005	2,245	2,245	2,871	3,207	4,054
17	Meghalaya	17,060	17,937	18,572	19,747	21,372	23,064	25,451	2,565	3,222	3,781	4,425	4,955	6,058	7,210
18	Mizoram	4,475	3,000	3,167	3,343	3,507	3,844	4,285	5	2,566	2,981	3,397	4,003	4,862	6,194
19	Nagaland	47,089	51,466	55,974	60,684	65,729	77,968	84,008	11,804	13,319	14,043	15,068	16,345	25,158	17,799
20	Odisha	74,432	83,093	91,154	100,279	109,804	119,145	130,030	47,843	56,534	66,429	78,370	86,729	100,546	109,719
21	Punjab	68,154	119,630	129,797	139,065	149,367	149,367	125,898	59,566	20,186	20,186	20,186	20,186	20,186	75,860
22	Rajasthan	206,381	152,223	169,486	179,631	198,089	222,959	362,028	22,966	116,861	127,937	138,487	148,892	162,837	69,509
23	Sikkim	1,915	2,270	2,490	2,755	3,214	3,457	3,930	489	585	605	750	795	823	947
24	Tamil Nadu	315,564	340,950	366,658	387,336	404,652	433,579	467,225	231,491	243,904	254,321	261,800	280,388	311,084	353,883
25	Tripura	8,138	8,593	9,000	9,524	10,432	10,934	11,166	2,535	3,336	4,037	4,819	6,199	7,568	8,452
26	Uttarakhand	12,092	14,816	17,014	17,354	18,026	19,474	23,786	8,336	7,086	8,481	10,453	16,393	19,695	26,670
27	Uttar Pradesh	106,760	107,559	115,552	122,520	137,436	150,670	162,813	77,668	85,906	100,273	117,913	131,181	156,388	176,164
28	West Bengal	235,269	256,072	253,389	251,120	222,716	248,776	281,995	--	$	$	$	$	$	$
	Union Territory:	**2,875,355**	**2,841,972**	**3,061,079**	**3,240,928**	**3,395,626**	**3,649,575**	**4,026,318**	**1,399,629**	**2,062,817**	**2,308,318**	**2,546,690**	**2,756,913**	3,110,049	3,435,858
1	A & N Islands	1,716	2,152	2,303	2,355	2,366	2,429	2,484	76	0	0	0	.	..	…
2	Chandigarh	1,766	1,775	1,865	1,952	2,210	2,490	2,689	8,039	8,455	8,725	9,586	15,466	21,841	23,015
3	Dadra & Nagar Haveli	6,072	6,537	7,123	7,604	8,048	8,591	8,935	1,750	2,043	2,298	2,496	2,761	3,036	3,380
4	Daman & Diu	2,223	2,568	2,791	2,934	3,112	3,646	3,818	2,316	2,670	2,854	2,973	3,130	3,274	3,434
5	Delhi	57,682	82,525	83,770	84,114	85,384	86,301	4,792	67,144	91,698	105,331	124,180	140,872	156,030	124,547
6	Lakshadweep	0	0	0	0	0	0	0	347	419	452	452	494	590	728
7	Puducherry	6,965	7,517	7,622	7,671	7,745	7,832	7,849	4,903	5,732	6,407	6,989	7,799	8,811	10,544
	UTs	**76,424**	**103,074**	**105,474**	**106,630**	**108,865**	**111,289**	**30,567**	**84,575**	**111,017**	**126,067**	**146,676**	**170,522**	**193,582**	**165,648**
	Total	**2,951,779**	**2,945,046**	**3,166,553**	**3,347,558**	**3,504,491**	**3,760,864**	**4,056,885**	**1,484,204**	**2,173,834**	**2,434,385**	**2,693,366**	**2,927,435**	**3,303,631**	**3,601,506**

Source : Motor Transport Statistics of India,Transport Research Wing, Ministry of Road Transport & Highways

Included in Tractors ^^ : Included other vehicles not covered in 'transport vehicles'

$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries

(c) : LMV (passengers) includes 6538 Motorcycles on hire also.

* : includes Motor cycles on hire ^ :included in Cars

$$ Incudes Omni Buses (Note: for website:http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf.)

Table 4.7.1 : Total registered motor vehicles in India by states/UTs

(in number)

Sl. No.	States/UT	Transport													
		Buses							Taxies						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Andhra Pradesh	18,368	45,359	49,480	53,820	56,664	60,622	70,075	113,693	71,559	84,150	95,554	103,290	114,923	129,322
2	Arunachal Pradesh*	682	682	682	682	682	…	..	343	343	343	343	343	…	..
3	Assam	11,378	11,936	12,570	13,257	13,859	14,741	15,787	12,671	14,343	16,382	19,680	24,088	28,161	33,999
4	Bihar	16,271	17,192	18,533	19,654	21,209	22,703	24,097	22,698	24,024	27,066	30,857	38,204	43,623	52,218
5	Chhattisgarh	24,955	33,033	36,814	41,098	7,658	8,596	12,049	5,036	5,241	5,811	6,589	7,499	8,723	13,515
6	Goa (c)	5,689	6,376	6,770	7,644	8,332	8,907	9,513	9,361	10,241	11,901	12,768	13,143	13,306	14,338
7	Gujarat	54,446	54,214	56,214	58,253	60,023	62,386	67,546	47,914	53,237	58,412	62,915	67,740	74,512	83,038
8	Haryana	19,986	22,101	26,906	29,516	33,520	35,646	39,153	16,344	17,738	13,869	14,791	15,081	19,978	23,793
9	Himachal Pradesh	6,859	3,265	3,681	5,398	5,714	6,186	14,592	14,542	14,407	15,718	20,582	21,993	23,791	25,030
10	Jammu & Kashmir	21,435	22,161	23,149	24,051	23,480	25,858	25,765	13,656	14,715	16,815	18,971	15,939	21,307	25,577
11	Jharkhand	10,238	10,792	11,270	11,699	12,256	12,847	13,561	24,693	34,464	37,439	41,828	259,542	296,771	333,420
12	Karnataka	40,819	45,211	49,586	44,308	53,874	58,012	62,501	67,385	85,064	137,064	147,489	115,410	129,272	142,700
13	Kerala	127,574	396,980	414,678	430,162	383,229	390,430	396,826	119,753	63,992	69,263	75,313	84,792	96,666	108,877
14	Madhya Pradesh	27,997	29,177	30,516	31,520	35,105	36,647	40,551	72,760	77,723	85,295	94,199	99,241	110,730	122,969
15	Maharashtra	66,754	71,187	77,042	79,073	83,816	89,861	100,097	122,389	133,309	149,526	157,916	168,307	168,496	175,797
16	Manipur	2,570	2,634	2,727	2,727	2,769	2,776	2,868	377	407	412	412	1,595	1,896	2,567
17	Meghalaya	3,497	3,639	3,779	3,905	4,007	4,116	4,323	8,432	9,579	10,385	11,352	12,607	14,507	16,205
18	Mizoram	704	907	954	1,003	1,036	1,088	1,141	4,988	5,323	5,763	5,992	6,465	7,246	8,183
19	Nagaland	4,060	4,262	4,422	4,694	5,041	5,573	5,542	5,004	5,246	5,435	5,921	6,428	6,716	6,970
20	Odisha	15,996	16,951	17,694	18,464	19,335	20,616	21,917	30,426	33,540	36,123	38,716	41,828	44,585	56,464
21	Punjab	21,136	22,373	24,457	25,682	27,146	27,146	30,160	9,937	12,940	13,538	14,314	15,837	15,837	18,539
22	Rajasthan	60,979	63,320	65,605	69,298	73,257	77,980	83,345	42,679	47,701	54,321	60,941	67,542	76,317	89,053
23	Sikkim	365	429	434	294	524	586	613	6,052	6,499	6,745	7,108	7,569	8,011	8,816
24	Tamil Nadu	89,991	97,396	105,897	114,671	123,999	134,887	144,251	134,580	149,774	170,377	188,795	209,689	243,425	278,005
25	Tripura	1,961	2,079	2,182	2,223	2,194	2,295	2,312	1,316	1,370	1,373	1,380	3,199	3,468	3,530
26	Uttarakhand	5,949	2,780	3,745	4,032	7,527	8,066	8,504	16,069	11,458	15,008	17,058	18,660	20,896	25,415
27	Uttar Pradesh	26,549	25,134	25,339	26,331	28,124	31,922	34,428	28,443	25,762	39,274	34,107	38,629	47,364	59,379
28	West Bengal	43,599	42,737	35,924	35,023	31,996	34,184	35,603	68,926	72,702	65,153	66,240	73,696	80,012	84,591
	Union Territory:	**730,807**	**1,054,307**	**1,111,050**	**1,158,482**	1,126,376	1,184,677	1,267,120	**1,020,467**	**1,002,701**	**1,152,961**	**1,252,131**	**1,538,356**	**1,720,539**	**1,942,310**
1	A & N Islands	658	757	775	811	825	846	903	246	439	439	489	489	489	489
2	Chandigarh	2,307	2,141	2,252	2,375	3,062	3,684	5,170	1,771	2,273	2,606	2,810	3,017	3,275	3,491
3	Dadra & Nagar Haveli	176	214	262	278	295	314	321	123	126	129	133	142	146	151
4	Daman & Diu	420	422	439	451	461	474	512	43	43	44	44	45	46	49
5	Delhi	25,963	38,500	39,622	41,142	43,250	45,757	20,142	15,569	35,041	43,887	50,351	55,530	62,839	62,335
6	Lakshadweep	13	15	19	19	0	0	0	0	0	0	0	105	140	207
7	Puducherry	1,997	2,066	2,149	2,235	2,373	2,493	2,596	1,626	1,724	1,796	1,847	**1,892**	1,943	1,990
	Uts	**31,534**	**44,115**	**45,518**	**47,311**	50,266	53,568	29,644	**19,378**	**39,646**	**48,901**	**55,674**	**61,220**	**68,878**	**68,712**
	Total	**762,341**	**1,098,422**	**1,156,568**	**1,205,793**	**1,176,642**	**1,238,245**	**1,296,764**	**1,039,845**	**1,042,347**	**1,201,862**	**1,307,805**	**1,599,576**	**1,789,417**	**2,011,022**

Source : Motor Transport Statistics of India,Transport Research Wing, Ministry of Road Transport & Highways

Included in Tractors ^^ : Included other vehicles not covered in 'transport vehicles'

$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries

(c) : LMV (passengers) includes 6538 Motorcycles on hire also.

* : includes Motor cycles on hire ^ :included in Cars

$$ Incudes Omni Buses (Note: for website:http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf.)

Table 4.7.1 : Total registered motor vehicles in India by states/UTs

(Number) (in number)

Sr. No.	States/UT	Transport													
		Light Motor Vehicles (Passengers)							Total Transport						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1	Andhra Pradesh	299,776	275,124	323,293	381,488	434,448	513,266	576,480	4,284,790	720,527	841,574	959,023	1,049,945	1,187,621	1,331,416
2	Arunachal Pradesh*	1,449	1,449	1,449	1,449	1,449	…	..	21,358	5,430	5,430	5,430	5,430	…	..
3	Assam	34,906	37,691	41,267	45,266	51,185	59,742	67,921	1,304,479	184,347	201,235	222,391	245,737	274,522	309,186
4	Bihar	45,365	0	0	0	74,968	92,390	113,088	1,026,169	141,344	154,166	171,099	200,866	232,188	272,594
5	Chhattisgarh	9,194	10,669	12,245	13,589	15,047	17,566	17,913	975,223	133,570	152,307	169,067	147,126	162,495	184,918
6	Goa (c)	10,035	11,667	12,826	14,863	4,238	4,309	3,853	450,310	65,624	71,409	78,030	84,134	90751*	100,749 *
7	Gujarat	336,695	371,792	396,828	426,616	464,862	511,270	561,740	5,360,170	988,123	1,065,246	1,134,382	1,218,969	1,326,972	1,462,815
8	Haryana	45,858	52,620	63,914	73,134	83,745	94,770	103,995	2,708,123	377,357	415,952	444,857	484,878	539,940	584,573
9	Himachal Pradesh	2,825	2,459	2,611	2,744	2,771	2,805	3,963	715,515	69,108	76,516	115,121	122,937	132,076	140,440
10	Jammu & Kashmir	15,919	16,562	18,440	19,673	10,958	12,420	13,759	793,098	109,139	120,055	129,159	128,724	141,791	154,995
11	Jharkhand	46,834	0	0	0	160,778	180,934	202,638	2,791,503	197,089	214,623	236,522	766,936	863333*	965,287 *
12	Karnataka	213,721	214,574	243,034	247,077	237,295	259,429	285,408	3,939,654	657,121	774,448	805,471	887,999	973110^^	1,062,081 ^^
13	Kerala	342,527	381,872	410,637	448,649	491,879	544,485	601,507	5,854,905	1,155,097	1,232,048	1,312,506	1,394,162	1507041*^^	1,622,543 * ^
14	Madhya Pradesh	51,049	54,561	57,395	60,751	67,488	76,207	86,068	2,106,495	296,970	322,924	348,696	378,888	419,211	467,206
15	Maharashtra	534,535	555,118	574,625	598,013	626,332	640,700	640,040	8,065,081	1,459,970	1,582,185	1,680,619	1,774,852	1,872,845	1,983,759
16	Manipur	2,721	3,787	4,071	4,071	7,266	9,954	11,854	100,714	15,911	16,671	16,671	22,140	26,082	29,942
17	Meghalaya	3,569	4,081	4,433	4,842	5,348	6,000	6,744	35,123	38,458	40,950	44,271	48,290	53746*	59,934 *
18	Mizoram	1,534	1,758	1,931	2,105	2,219	2,477	2,955	101,992	13,554	14,796	15,840	17,230	19,517	22,758
19	Nagaland	9,548	10,408	12,939	13,143	13,403	14,284	14,429	641,354	84,701	92,813	99,510	106,946	129,699	128,748
20	Odisha	34,360	38,436	43,265	49,896	57,456	62,830	74,313	1,701,162	228,554	254,665	285,725	315,152	347,722	392,443
21	Punjab	43,280	46,399	50,428	53,670	57,879	57,879	66,734	1,439,998	221,528	238,406	252,917	270,415	270,415	317,191
22	Rajasthan	79,576	88,509	95,899	103,270	112,986	123,328	134,345	3,290,244	468,614	513,248	551,627	600,766	663,421	738,280
23	Sikkim	0	0	0	0	..	..	…	79,116	9,783	10,274	10,907	12,102	12,967	14,306
24	Tamil Nadu	174,646	186,290	202,995	215,542	238,682	291,605	301,982	7,013,266	1,018,314	1,100,248	1,168,144	1,257,410	1,414,580	1,545,346
25	Tripura	13,237	14,544	15,829	16,968	15,749	18,074	19,203	148,902	29,922	32,421	34,914	37,773	42,339	44,663
26	Uttarakhand	7,906	9,641	10,971	12,755	11,622	13,820	13,004	392,801	45,781	55,219	61,652	72,229	81,951	97,379
27	Uttar Pradesh	91,346	97,696	87,549	105,096	123,706	146,351	175,649	2,310,988	342,057	367,987	405,967	459,076	532,695	608,433
28	West Bengal	40,315	42,195	37,121	42,312	48,370	58,633	63,424	2,560,094	413,706	391,587	394,695	376,778	421,605	465,613
	Union Territory:	**2,492,726**	**2,529,902**	**2,725,995**	**2,956,982**	**3,422,129**	3,815,528	**4,163,009**	**60,466,137**	**9,491,699**	**10,359,403**	**11,155,213**	**12,487,890**	**13,740,635**	15,107,598
1	A & N Islands	2,997	2,441	2,705	2,884	2,950	3,248	3,803	27,535	5,789	6,222	6,539	6,630	7,012	7,679
2	Chandigarh	2,000	0	0	0	..	..	0	152,112	14,644	15,448	16,723	23,755	31,290	34,365
3	Dadra & Nagar Haveli	539	557	568	579	605	620	632	74,029	9,477	10,380	11,090	11,851	12,707	13,419
4	Daman & Diu	976	1,091	1,120	1,151	1,173	1,216	1,230	46,220	6,794	7,248	7,553	7,921	8668*	9,043
5	Delhi	96,149	158,242	168,073	179,640	182,784	190,693	68,653	1,970,457	406,006	440,683	479,427	507,820	541,620	280,469
6	Lakshadweep	273	291	321	321	321	366	420	4,285	725	792	792	920	1,096	1,355
7	Puducherry	4,665	4,925	5,039	5,062	5,124	5,217	5,221	137,792	21,964	23,013	23,804	24,933	26,296	28,200
	Uts	**107,599**	**167,547**	**177,826**	**189,637**	**192,957**	**201,360**	**79,959**	**2,412,430**	**465,399**	**503,786**	**545,928**	**583,830**	**628,689**	**374,530**
	Total	**2,600,325**	**2,697,449**	**2,903,821**	**3,146,619**	**3,615,086**	**4,016,888**	**4,242,968**	**62,878,567**	**9,957,098**	**10,863,189**	**11,701,141**	**13,071,720**	**14,369,324**	**15,482,128**

Source : Motor Transport Statistics of India,Transport Research Wing, Ministry of Road Transport & Highways

Included in Tractors ^^ : Included other vehicles not covered in 'transport vehicles'

$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries

(c) : LMV (passengers) includes 6538 Motorcycles on hire also.

* : includes Motor cycles on hire ^ :included in Cars

$$ Incudes Omni Buses (Note: for website:http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf.)

Table 4.7.1 : Total registered motor vehicles in India by states/UTs

(in number)

Sl. No.	States/UT	Non-Transport													
		Two Wheelers							Cars						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	45	46	47	48	49	50	51	52	53	54	55	56	57	58
1	Andhra Pradesh	5,707,383	4,686,543	5,262,086	5,851,893	6,514,593	7,488,771	9,291,132	576,329	535,649	619,092	701,920	777,746	880,817	1,058,184
2	Arunachal Pradesh*	11,112	11,112	11,112	11,112	11,112	…	..	2,595	2,595	2,595	2,595	2,595	…	..
3	Assam	541,275	610,529	667,788	740,420	830,836	958,935	1,101,265	145,029	165,255	184,088	203,000	232,546	269,605	311,917
4	Bihar	964,594	1,077,579	1,197,875	1,364,757	1,606,613	1,899,017	2,230,069	76,896	84,305	92,528	103,077	188,031	136,845	160,340
5	Chhattisgarh	1,247,658	1,395,935	1,553,104	1,686,424	1,964,769	2,232,929	2,503,781	59,591	69,080	79,616	92,437	108,326	131,862	154,529
6	Goa	375,571	408,269	436,662	467,827	502,042	541,934	589,377	89,547	99,191	109,215	120,425	133,717	149,869	167,544
7	Gujarat	6,352,109	7,003,860	7,579,457	8,087,416	8,716,981	9,507,556	10,512,304	703,968	784,686	869,808	952,400	1,057,383	1,218,030	1,411,898
8	Haryana	1,881,174	2,172,669	2,463,672	2,768,197	2,975,418	3,370,426	3,755,349	373,659	449,285	541,380	618,942	720,441	855,596	989,519
9	Himachal Pradesh	187,883	188,166	200,163	249,994	283,081	331,418	384,832	58,005	61,928	69,482	80,224	95,791	116,176	171,382
10	Jammu & Kashmir	297,656	320,754	341,834	363,029	407,928	446,791	480,815	98,309	112,135	128,398	145,060	172,071	198,238	230,328
11	Jharkhand	1,164,854	1,302,967	1,428,934	1,570,575	1,738,566	1,947,572	1,851,060	113,500	126,179	139,053	154,803	174,320	201,269	227,386
12	Karnataka	4,512,910	3,755,719	4,230,864	4,796,587	6,404,905	7,033,045	7,737,366	635,205	694,252	791,014	892,160	1,005,291	1,131,201	1,269,430
13	Kerala	2,099,652	2,056,472	2,367,602	2,612,341	2,900,238	3,294,953	3,811,343	498,472	533,494	603,842	692,628	826,538	985,736	1,151,566
14	Madhya Pradesh	3,526,416	3,895,557	4,292,649	4,691,218	5,165,023	5,783,120	6,411,155	185,700	208,052	237,022	272,009	314,464	366,674	424,644
15	Maharashtra	7,691,856	8,573,679	9,394,869	10,212,360	11,181,762	12,429,011	13,921,763	1,165,365	1,308,088	1,462,518	1,603,728	1,790,259	2,027,080	2,307,841
16	Manipur	86,931	93,595	105,465	105,465	139,650	145,286	148,942	11,233	11,475	12,077	12,077	15,113	17,019	17,299
17	Meghalaya	31,008	36,112	40,953	45,747	51,709	56,790	65,712	22,351	25,268	28,335	32,995	37,981	43,901	49,728
18	Mizoram	24,737	27,776	30,062	32,267	39,902	47,978	60,278	6,286	8,061	8,716	9,326	10,382	11,583	13,839
19	Nagaland	42,851	45,961	48,976	52,119	55,208	61,085	61,546	37,513	40,574	43,129	45,549	47,984	50,249	53,074
20	Odisha	1,530,295	1,701,981	1,874,644	2,052,980	2,302,694	2,614,980	2,946,118	82,686	90,258	99,350	112,490	133,529	161,024	186,323
21	Punjab	2,975,198	3,173,433	3,385,088	3,581,837	3,956,279	3,956,279	4,729,594	335,284	367,655	406,966	444,465	484,064	484,064	616,549
22	Rajasthan	3,393,916	3,833,746	4,261,695	4,715,835	5,230,454	5,859,719	6,629,743	269,561	310,101	355,122	402,239	455,924	520,385	591,069
23	Sikkim	5,282	5,549	5,793	5,956	6,308	6,843	7,447	3,053	3,759	4,226	5,704	8,905	12,264	13,933
24	Tamil Nadu	7,936,778	8,689,876	9,446,469	10,223,233	11,156,048	12,393,788	13,846,378	840,433	911,752	996,220	1,091,231	1,204,156	1,350,722	1,504,735
25	Tripura	61,968	69,830	76,952	85,455	97,895	117,486	129,343	6,656	7,798	8,836	9,966	10,095	11,224	12,390
26	Uttarakhand	486,734	474,666	533,443	570,359	583,927	708,595	897,651	59,368	74,101	84,706	98,355	119,859	147,591	188,152
27	Uttar Pradesh	6,083,655	7,138,789	7,737,237	8,521,198	9,493,677	10,563,850	12,410,064	615,739	641,939	703,071	775,569	873,251	10,563,850	1,108,100
28	West Bengal	1,833,820	2,081,355	1,748,253	2,017,198	1,864,861	2,260,657	2,717,713	556,230	602,420	547,738	560,875	435,352	492,454	575,085
	Union Territory:	**61,055,276**	**64,832,479**	**70,723,701**	**77,483,799**	**86,182,479**	**96,058,814**	**109,232,140**	**7,628,563**	**8,329,335**	**9,228,143**	**10,236,249**	**11,436,114**	**12,956,415**	**14,966,784**
1	A & N Islands	23,079	34,458	37,993	42,386	43,762	48,819	54,220	2,441	5,803	6,785	8,263	10,988	12,863	14,632
2	Chandigarh	454,308	474,595	493,380	511,568	686,316	711,007	737,263	176,387	188,786	203,052	218,857	239,014	265,135	286,584
3	Dadra & Nagar Haveli	23,607	27,541	31,424	35,059	38,635	43,010	48,550	11,820	13,402	15,728	17,210	17,507	19,687	21,762
4	Daman & Diu	33,379	38,751	42,373	42,861	43,991	47,247	52,339	15,007	15,952	17,191	18,297	19,332	20,501	22,175
5	Delhi	2,851,920	3,377,073	3,616,417	3,846,721	4,107,912	4,395,086	4,661,714	1,222,706	1,536,897	1,668,880	1,802,251	1,956,574	2,116,107	2,172,069
6	Lakshadweep	4,822	5,227	5,639	5,639	6,206	6,888	7,698	38	44	48	48	64	87	122
7	Puducherry	296,735	338,638	385,090	434,072	488,490	**553,711**	625,251	52,593	56,249	60,315	64,631	69,813	76,678	85,418
		3,687,850	**4,296,283**	**4,612,316**	**4,918,306**	**5,415,312**	**5,805,768**	**6,187,035**	**1,480,992**	**1,817,133**	**1,971,999**	**2,129,557**	**2,313,292**	**2,511,058**	**2,602,762**
	Total	**64,743,126**	**69,128,762**	**75,336,017**	**82,402,105**	**91,597,791**	**101,864,582**	**115,419,175**	**9,109,555**	**10,146,468**	**11,200,142**	**12,365,806**	**13,749,406**	**15,467,473**	**17,569,546**

Source : Motor Transport Statistics of India,Transport Research Wing, Ministry of Road Transport & Highways Source : Motor Transport Statistics of India,Transport Research Wing, Ministry of Road Transport & High

Included in Tractors ^^ : Included other vehicles not covered in 'transport vehicles'

$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries

(c) LMV (passengers) includes 6538 Motorcycles on hire also. (

* : includes Motor cycles on hire ^ :included in Cars * : includes Motor cycles o

$$ Incudes Omni Buses (Note: for website:http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf.)

Table 4.7.1 : Total registered motor vehicles in India by states/UTs

(in number)

Sl. No.	States/UT	Non-Transport													
		Jeeps							Omni Buses						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	59	60	61	62	63	64	65	66	67	68	69	70	71	72
1	Andhra Pradesh	65,377	27,500	28,476	29,494	29,587	29,652	30,400	45,214	38,722	41,959	45,421	49,130	53,531	60,897
2	Arunachal Pradesh*	2,284	2,284	2,284	2,284	2,284	…	..	0	0	0	0	0	…	..
3	Assam	15,080	15,230	15,347	18,131	20,742	20,861	20,968	0	1,155	1,162	1,203	1,225	1,243	1,248
4	Bihar	41,863	46,293	50,522	56,270	66,132	75,878	84,949	0	0	0	0	…	…	…
5	Chhattisgarh	8,575	9,392	10,395	11,637	13,277	15,062	16,561	0	0	0	0	30,879	33,739	33,739
6	Goa	@	357	730	1,065	^	…	^	**0**	**0**	**0**	0	0	0	0
7	Gujarat	122,864	128,247	135,014	141,565	152,985	160,800	167,991	0	0	0	0	…	…	…
8	Haryana	95,450	101,735	108,885	111,602	115,852	113,384	121,202	0	0	0	0	0	0	0
9	Himachal Pradesh	9,544	13,497	14,589	18,932	20,693	22,756	12,704	402	201	259	262	634	949	…
10	Jammu & Kashmir	11,058	11,222	11,295	11,402	11,601	118,301	24,920	219	219	219	219	1,219	1,818	2,687
11	Jharkhand	30,962	35,762	40,269	45,455	52,155	59,892	67,139	0	0	0	0	…	…	…
12	Karnataka	41,989	36,739	38,319	39,669	40,225	41,229	42,179	54,808	53,991	60,972	70,708	105,503	109,075	113,204
13	Kerala	73,158	120,300	128,082	137,547	137,547	137,547	137,547	0	3,252	3,559	3,712	3,748	3,798	3,798
14	Madhya Pradesh	38,291	37,449	38,181	39,652	41,396	49,566	51,197	0	0	0	0	…	…	…
15	Maharashtra	300,023	322,053	341,782	356,986	373,958	394,647	423,305	0	18,238	18,158	18,477	18,752	18,677	19,021
16	Manipur	8,568	8,937	9,146	9,146	11,472	11,901	12,241	801	915	1,250	1,250	1,524	1,600	1,605
17	Meghalaya	11,300	12,229	12,917	13,652	14,328	15,011	15,682	0	0	0	0	1	1	3
18	Mizoram	3,712	7,486	7,888	8,233	8,813	9,211	4,082	0	0	0	0	0	0	0
19	Nagaland	22,481	23,372	24,433	25,211	25,888	26,313	27,083	350	421	474	478	497	501	505
20	Odisha	30,547	31,555	32,591	34,111	36,726	41,966	44,396	2,567	2,784	2,989	3,220	3,451	3,668	3,668
21	Punjab	41,670	46,957	49,555	52,193	54,798	54,798	63,527	0	0	0	0	…	…	…
22	Rajasthan	147,840	157,574	169,601	182,922	203,692	227,910	254,840	0	0	0	0	…	…	….
23	Sikkim	3,769	4,177	4,310	4,557	4,869	5,251	6,086	1,070	1,380	1,384	1,389	1,393	1,399	1,484
24	Tamil Nadu	55,673	56,461	56,825	57,207	57,417	58,080	58,718	19,957	19,957	19,957	19,957	19,957	19,957	19,957
25	Tripura	4,358	4,485	4,733	4,977	12,340	14,434	15,542	13	18	18	18	…	…	…
26	Uttarakhand	6,944	4,526	4,269	4,385	8,103	8,876	9,762	1,629	1,292	5,612	1,651	1,289	1,302	1,903
27	Uttar Pradesh	112,837	109,981	122,120	135,149	159,128	*984,937*	200,316	19,015	16,982	20,240	19,305	18,740	984,937	23,473
28	West Bengal	@	@	@	#	^	**^**	^	0	0	0	0	…	**…**	…
	Union Territory:	**1,306,217**	**1,375,800**	**1,462,558**	**1,553,434**	**1,676,008**	**1,889,724**	**1,913,337**	**146,045**	**159,527**	**178,212**	**187,270**	**257,942**	**272,817**	**287,192**
1	A & N Islands	779	1,948	2,181	2,235	^	…	^	335	0	0	0	^	…	^
2	Chandigarh	0	0	0	0	…	…	^	51	71	104	119	130	287	..
3	Dadra & Nagar Haveli	460	471	0	447	549	561	568	6	6	0	0	20	22	0
4	Daman & Diu	307	342	401	78,884	477	499	542	38	38	38	38	42	42	51
5	Delhi	65,028	77,847	78,711	94	79,418	79,488	68,648	80,277	89,320	89,345	89,367	89,367	89,368	89,373
6	Lakshadweep	88	90	94	3,881	95	99	121	73	87	87	87	0	0	0
7	Puducherry	3,865	3,866	3,880		3,881	3,882	3,882	2,918	2,784	2,867	2,931	2,958	3,045	3,123
		70,527	**84,564**	**85,267**	**85,541**	**84,420**	**84,529**	**73,761**	**83,698**	**92,306**	**92,441**	**92,542**	**92,517**	**92,764**	**92,547**
	Total	**1,376,744**	**1,460,364**	**1,547,825**	**1,638,975**	**1,760,428**	**1,974,253**	**1,987,098**	**229,743**	**251,833**	**270,653**	**279,812**	**350,459**	**365,581**	**379,739**

ıways

Included in Tractors ^^ : Included other vehicles not covered in 'transport vehicles'

$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries

c) : LMV (passengers) includes 6538 Motorcycles on hire also.

ın hire ^ :included in Cars

$$ Incudes Omni Buses (Note: for website:http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf.)

Table 4.7.1 : Total registered motor vehicles in India by states/UTs

Sr. No	States/UT	Non- Transport																				
		Tractors							Trailers							Others						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
1	Andhra Pradesh	66,613	184,441	212,904	242,305	261,509	292,427	342,416	51,881	167,206	193,524	218,860	229,149	242,270	289,422	6,617	6,268	8,331	10,032	11,480	14,258	20,461
2	Arunachal Pradesh*	345	345	345	345	345	…	..	155	155	155	155	155	…	..	180	180	180	180	180	…	..
3	Assam	11,270	12,231	13,170	14,586	16,177	18,714	19,655	9,050	9,386	9,830	10,307	10,805	11,620	15,290	22,192	22,903	23,802	24,713	25,653	26,628	27,591
4	Bihar	130,477	136,637	144,801	156,004	175,500	196,555	219,509	75,594	80,875	86,233	93,743	104,272	115,214	126,618	8,569	10,350	13,015	14,603	15,572	17,512	18,801
5	Chhattisgarh	58,733	66,077	73,489	82,175	91,621	102,699	115,524	50,684	56,248	61,412	67,077	72,839	78,940	85,129	2,849	3,507	4,548	5,772	6,936	8,311	9,857
6	Goa	..	0	0	20	2,562	2,890	3,114	..	0	0	0	…	…	#	4,773	5,310	5,943	6,542	4,587	4,631	4,825
7	Gujarat	311,385	336,986	362,799	386,951	410,516	442,737	495,136	217,790	232,509	248,751	263,807	278,921	294,885	317,509	17,417	22,926	27,981	32,130	36,818	42,155	46,064
8	Haryana	382,581	405,605	430,365	473,438	490,828	487,321	516,658	0	0	0	0	0	0	0	21,434	21,646	13,030	8,185	4,408	10,336	10,809
9	Himachal Pradesh	0	7,424	8,197	9,039	9,292	9,576	20,916	0	1,423	1,689	1,834	1,836	1,853	220	1,042	0	0	18,992	4,077	6,910	6,110
10	Jammu & Kashmir	12,818	14,109	15,615	16,640	11,640	13,538	15,574	587	610	622	633	2,861	3,242	3,289	1,869	2,114	2,209	2,303	2,861	3,242	4,290
11	Jharkhand	20,968	23,977	26,785	30,665	35,431	41,116	47,114	16,819	0	0	0	…	…	…	7,268	0	0	0	…	…	…
12	Karnataka	166,685	132,142	142,521	152,964	318,844	341,559	363,993	167,622	122,749	138,919	143,629	215,575	233,297	251,553	43,213	33,343	40,318	51,363	65,634	67,967	69,795
13	Kerala	15,162	9,644	10,207	10,641	10,665	11,209	11,602	2,264	3,196	3,503	3,653	3,653	3,656	3,656	15,880	75,837	81,386	86,890	121,101	128,079	151,259
14	Madhya Pradesh	376,771	394,356	411,424	432,618	458,445	498,997	545,115	192,742	200,719	206,640	210,903	215,333	219,731	224,033	13,665	13,990	14,618	15,595	17,027	18,403	20,809
15	Maharashtra	229,362	250,950	276,438	302,249	331,694	371,075	419,291	204,733	220,284	238,080	252,409	270,078	293,576	324,824	29,446	17,729	21,331	24,080	27,066	27,188	32,557
16	Manipur	1,446	1,604	1,686	1,686	3,155	3,185	3,326	612	626	664	664	680	715	394	270	423	435	435	718	714	774
17	Meghalaya	487	516	525	567	609	665	751	2,607	2,613	2,649	2,680	2,713	2,765	2,794	1,240	1,339	1,660	1,965	2,482	2,858	3,234
18	Mizoram	246	199	209	216	227	252	274	264	70	70	86	90	92	79	4,925	3,758	3,914	3,914	3,812	4,015	520
19	Nagaland	1,891	1,998	2,073	2,163	2,260	2,340	2,482	772	786	821	943	1,020	1,023	1,072	353	12,273	13,044	13,900	929	1,443	1,908
20	Odisha	42,189	47,327	52,070	57,384	64,354	74,439	83,079	34,679	39,577	44,318	48,771	55,370	65,016	73,110	5,975	6,278	9,805	12,680	20,556	29,223	29,393
21	Punjab	472,873	478,057	485,044	491,358	497,551	497,551	517,743	481	564	737	862	966	966	1,172	7,581	5,662	6,783	7,899	10,181	10,181	17,163
22	Rajasthan	464,443	504,002	537,735	569,807	605,539	644,305	699,881	59,564	62,086	65,088	67,134	69,287	70,525	71,665	5,822	0	0	0	…	…	…
23	Sikkim	24	34	38	38	49	59	76	…	0	0	0	0	0	2	…	0	0	0	…	…	…
24	Tamil Nadu	102,744	115,260	126,358	137,829	150,432	167,066	186,670	44,015	49,607	54,652	58,175	62,260	66,269	71,403	108,041	119,441	128,814	135,221	153,853	167,783	179,041
25	Tripura	89	97	127	189	976	1,010	1,015	100	101	102	103	326	349	357	5,397	7,310	7,723	8,201	714	831	908
26	Uttarakhand	34,155	29,215	30,934	32,271	42,921	46,164	41,847	1,401	2,710	3,228	3,536	1,508	839	5,883	2,802	10,910	13,440	15,143	1,536	1,843	1,465
27	Uttar Pradesh	791,411	797,990	847,329	893,683	953,959	176,398	1,064,284	14,579	9,549	10,245	10,696	15,373	176,398	15,278	21,132	28,412	17,902	17,245	15,145	21,559	15,326
28	West Bengal	58,828	#	#	@	51,233	**57,505**	70,980	#	63,430	59,298	54,516	…	#	…	34,812	37,391	15,008	16,335	18,914	28,403	31,350
	Union Territory:	**3,753,996**	**3,951,223**	**4,213,188**	**4,497,831**	**4,998,334**	5,303,581	**5,808,025**	**1,148,995**	**1,327,079**	**1,431,230**	**1,515,176**	**1,615,070**	1,721,969	**1,884,752**	**394,764**	**469,300**	**475,220**	**534,318**	**572,240**	**636,954**	**704,310**
1	A & N Islands	229	0	0	0	^	…	^	22	0	0	0	^	…	^	8,237	97	107	306	394	406	532
2	Chandigarh	0	0	0	0	149	173	196	0	0	0	0	0	0	#	0	0	0	0	…	…	…
3	Dadra & Nagar Haveli	57	86	0	0	152	177	36	46	46	0	0	77	77	186	0	0	0	0	41	116	0
4	Daman & Diu	224	248	273	287	300	313	352	138	165	176	186	195	205	213	31	31	31	69	84	113	141
5	Delhi	4,706	5,027	5,091	5,206	5,294	5,384	1,343	99	99	99	99	99	99	…	169	187	195	212	364	519	76,504
6	Lakshadweep	63	72	78	78	72	84	102	0	0	0	0	0	0	0	546	495	497	497	498	499	499
7	Puducherry	478	567	705	793	900	**993**	1,077	1,655	1,683	1,702	1,722	1,732	1,759	1,781	5,850	6,330	6,427	6,414	6,422	6,439	6,544
		5,757	**6,000**	**6,147**	**6,364**	**6,867**	**7,124**	**3,106**	**1,960**	**1,993**	**1,977**	**2,007**	**2,103**	**2,140**	**2,180**	**14,833**	**7,140**	**7,257**	**7,498**	**7,803**	**8,092**	**84,220**
	Total	**3,759,753**	**3,957,223**	**4,219,335**	**4,504,195**	**5,005,201**	**5,310,705**	**5,811,131**	**1,150,955**	**1,329,072**	**1,433,207**	**1,517,183**	**1,617,173**	**1,724,109**	**1,886,932**	**409,597**	**476,440**	**482,477**	**541,816**	**580,043**	**645,046**	**788,530**

Source : Motor Transport Statistics of India,Transport Research Wing, Ministry of Road Transport & Highways

Included in Tractors ^^ : Included other vehicles not covered in 'transport vehicles'

$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries

(c) LMV (passengers) includes 6538 Motorcycles on hire also.

* : includes Motor cycles on hire ^ :included in Cars

$$ Incudes Omni Buses (Note: for website:http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf.)

Table 4.7.1 : Total registered motor vehicles in India by states/UTs

(Number) (in number)

Sr. No.	States	Total Non- Tpt.							Grand Total (Transport +Non- Tpt.)						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	94	95	96	97	98	99	100	101	102	103	104	105	106	107
1	Andhra Pradesh	53,529,044	5,646,329	6,366,372	7,099,925	7,873,194	9,001,726	11,092,912	57,813,834	6,366,856	7,207,946	8,058,948	8,923,139	10,189,347	12,424,328
2	Arunachal Pradesh*	82,639	16,671	16,671	16,671	16,671	...	..	103,997	22,101	22,101	22,101	22,101	144,534	151,279
3	Assam	7,300,372	836,689	915,187	1,012,360	1,137,984	1,307,606	1,497,934	8,604,851	1,021,036	1,116,422	1,234,751	1,383,721	1,582,128	1,807,120
4	Bihar	13,455,042	1,436,039	1,584,974	1,788,454	2,156,120	2,441,021	2,840,286	14,481,211	1,577,383	1,739,140	1,959,553	2,356,986	2,673,209	3,112,880
5	Chhattisgarh	14,528,803	1,600,239	1,782,564	1,945,522	2,288,647	2,603,542	2,919,120	15,504,026	1,733,809	1,934,871	2,114,589	2,435,773	2,766,037	3,104,038
6	Goa	469,891	513,127	552,550	595,879	642,908	699,324	764,860	920,201	578,751	623,959	673,909	727,042	790,075	865,609
7	Gujarat	70,385,435	8,509,214	9,223,810	9,864,269	10,653,604	11,666,163	12,950,902	75,745,605	9,497,337	10,289,056	10,998,651	11,872,573	12,993,135	14,413,717
8	Haryana	27,912,083	3,150,940	3,557,332	3,980,364	4,306,947	4,837,063	5,393,537	30,620,206	3,528,297	3,973,284	4,425,221	4,791,825	5,377,003	5,978,110
9	Himachal Pradesh	2,668,306	272,639	294,379	379,277	415,404	489,638	596,164	3,383,821	341,747	370,895	494,398	538,341	621,714	736,604
10	Jammu & Kashmir	4,063,412	461,163	500,192	539,286	610,181	785,170	761,903	4,856,510	570,302	620,247	668,445	738,905	926,961	916,898
11	Jharkhand	12,722,837	1,488,885	1,635,041	1,801,498	2,000,472	2,249,849	2,192,699	15,514,340	1,685,974	1,849,664	2,038,020	2,767,408	3,113,182	3,157,986
12	Karnataka	48,673,848	4,828,935	5,442,927	6,147,080	8,155,977	8,957,373	9,847,520	52,613,502	5,486,056	6,217,375	6,952,551	9,043,976	9,930,483	10,909,601
13	Kerala	25,447,089	2,802,195	3,198,181	3,547,412	4,003,490	4,564,978	5,270,771	31,301,994	3,957,292	4,430,229	4,859,918	5,397,652	6,072,019	6,893,314
14	Madhya Pradesh	40,670,955	4,750,123	5,200,534	5,661,995	6,211,688	6,936,491	7,676,953	42,777,450	5,047,093	5,523,458	6,010,691	6,590,576	7,355,702	8,144,159
15	Maharashtra	91,708,775	10,711,021	11,753,176	12,770,289	13,993,569	15,561,254	17,448,602	99,773,856	12,170,991	13,335,361	14,450,908	15,768,421	17,434,099	19,432,361
16	Manipur	1,022,728	117,575	130,723	130,723	172,312	180,420	184,581	1,123,442	133,486	147,394	147,394	194,452	206,502	214,523
17	Meghalaya	687,929	78,077	87,039	97,606	109,823	121,991	137,904	723,052	116,535	127,989	141,877	158,113	175,737	197,838
18	Mizoram	387,953	47,350	50,859	54,042	63,226	73,131	79,072	489,945	60,904	65,655	69,882	80,456	92,648	101,830
19	Nagaland	885,860	125,385	132,950	140,363	133,786	142,954	147,670	1,527,214	210,086	225,763	239,873	254,483	272,653	291,438 &
20	Odisha	1,728,938	1,919,760	2,115,767	2,321,636	2,616,680	2,990,316	3,366,087	3,430,100	2,148,314	2,370,432	2,607,361	2,931,832	3,338,038	3,758,530
21	Punjab	32,713,801	4,072,328	4,334,173	4,578,614	5,003,839	5,003,839	5,945,748	34,153,799	4,293,856	4,572,579	4,831,531	5,274,254	5,274,254	6,262,939
22	Rajasthan	4,341,446	4,867,509	5,389,241	5,937,937	6,564,896	7,322,844	8,247,198	7,631,690	5,336,123	5,902,489	6,489,564	7,165,662	7,986,265	8,985,478
23	Sikkim	137,906	14,899	15,751	17,644	21,524	25,816	29,028	217,022	24,682	26,025	28,551	33,626	38,783	43,334
24	Tamil Nadu	83,632,728	9,962,354	10,829,295	11,722,853	12,804,123	14,223,665	15,866,902	90,645,994	10,980,668	11,929,543	12,890,997	14,061,533	15,638,245	17,412,248
25	Tripura	777,218	89,639	98,491	108,909	122,346	145,334	159,555	926,120	119,561	130,912	143,823	160,119	187,673	204,218
26	Uttarakhand	5,368,516	597,420	675,632	725,700	759,143	915,210	1,146,663	5,761,317	643,201	730,851	787,352	831,372	997,161	1,244,042
27	Uttar Pradesh	85,955,507	8,743,642	9,458,144	10,372,845	11,529,273	21,559	14,836,841	88,266,495	9,085,699	9,826,131	10,778,812	11,988,349	978,627	15,445,274
28	West Bengal	18,744,669	2,784,596	2,370,297	2,648,924	2,370,360	2,839,019	3,395,128	21,304,763	3,198,302	2,761,884	3,043,619	2,747,138	3,260,624	3,860,741
	Union Territory:	**650,003,730**	**80,444,743**	**87,712,252**	**96,008,077**	**106,738,187**	**118,840,274**	**134,796,540**	**710,216,357**	**89,936,442**	**98,071,655**	**107,163,290**	**119,239,828**	**132,725,443**	**150,070,437**
1	A & N Islands	362,460	42,306	47,066	53,190	55,144	62,088	69,384	389,995	48,095	53,288	59,729	61,774	69,100	77,063
2	Chandigarh	5,647,536	663,452	696,536	730,544	925,609	976,602	1,024,043	5,799,648	678,096	711,984	747,267	949,364	1,007,892	1,058,408
3	Dadra & Nagar Haveli	368,998	41,552	47,152	52,716	56,981	63,650	71,102	443,027	51,029	57,532	63,806	68,832	76,357	84,521
4	Daman & Diu	514,449	55,527	60,483	140,622	64,421	68,920	75,813	560,669	62,321	67,731	148,175	72,342	77,588	84,856
5	Delhi	40,430,802	5,086,450	5,458,738	5,743,950	6,239,028	6,686,051	7,069,651	42,401,259	5,492,456	5,899,421	6,223,377	6,746,848	7,227,671	7,350,120
6	Lakshadweep	48,479	6,015	6,443	10,230	6,935	7,657	8,542	52,764	6,740	7,235	11,022	7,855	8,753	9,897
7	Puducherry	3,654,977	410,117	460,986	510,563	574,196	646,507	727,076	3,792,769	432,081	483,999	534,367	599,129	672,803	755,276
		51,027,701	**6,305,419**	**6,777,404**	**7,241,815**	**7,922,314**	**8,511,475**	**9,045,611**	**53,440,131**	**6,770,818**	**7,281,190**	**7,787,743**	**8,506,144**	**9,140,164**	**9,420,141**
	Total	**701,031,431**	**86,750,162**	**94,489,656**	**103,249,892**	**114,660,501**	**127,351,749**	**143,842,151**	**763,656,488**	**96,707,260**	**105,352,845**	**114,951,033**	**127,745,972**	**141,865,607**	**159,490,578**

Source : Motor Transport Statistics of India,Transport Research Wing, Ministry of Road Transport & Highways

Included in Tractors ^^ : Included other vehicles not covered in 'transport vehicles'

$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries ## : Category wise break up not reported

(c) : LMV (passengers) includes 6538 Motorcycles on hire also. & : Includes 15020 Government Vehicles (for which category wise break up is not available)

* : includes Motor cycles on hire ^ :included in Cars

$$ Incudes Omni Buses (Note: for website:http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf.)

4.7.2 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.

Table 4.7.2 : Number of motor vehicles registered in india (taxed and tax-exempted)

(In thousand)(In thousand)

Sl. No.	Year	All Vehicles	Two-Wheelers*	Car, Jeeps and Taxis	Buses#	Goods Vehicles	Others*
1	2	3	4	5	6	7	8
1	1992	23507	15661	3205	358	1514	2769
2	1993	25346	17060	3344	380	1592	2970
3	1994	27660	18899	3569	392	1691	3109
4	1995	30295	20831	3841	423	1794	3406
5	1996	33786	23252	4204	449	2031	3850
6	1997	37332	25729	4672	484	2343	4104
7	1998	41368	28642	5138	538	2536	4514
8	1999	44875	31328	5556	540	2554	4897
9	2000	48857	34118	6143	562	2715	5319
10	2001	54991	38556	7058	634	2948	5795
11	2002	58924	41581	7613	635	2974	6121
12	2003	67007	47519	8599	721	34921	6676
13	2004	72718	51922	9451	768	3749	6828
14	2005	81449	58799	10320	892	4031	7457
15	2006	89618	64743	11526	992	4436	7921
16	2007	96707	69129	12649	1350	5119	8460
17	2008	105353	75336	13950	1427	2601	9039
18	2009	114951	82402	15313	1486	6041	9710
19	2010	127746	91598	17109	1527	6432	11080
20	2011	141866	101865	19231	1604	7064	12102
21	2012	159491	115419	21568	1677	7658	13169

Source: Transport Research Wing, Ministry of Road Transport & Highways .Road transport year book-2011-12

* Auto-rickshaws, tractors, trailers, three wheelers (passenger vehicles)/LML and other miscellaneous vehicles which are not separately classified.

: Includes omni buses since 2001.

4.7.3 With the increasing urbanization and industrialization, the transport demand has also increased consequently. This has increased the vehicular pollution in manifold. The different factors of the pollution 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 4.7.3: Total registered motor vehicles in Million plus cities of India

(in number)

Sl. No.	Name of City	2010			2011		
		Total Transport	Total Non-Transport	Total	Total Transport	Total Non-Transport	Total
1	2	3	4	5	6	7	8
1	Agra	27462	552934	580396	29994	610064	640058
2	Allahabad	23439	509914	533353	23711	659303	683014
3	Aurangabad	25811	207305	233116	27317	225482	252799
4	Bengaluru#	342584	3147981	3490565	368953	3422365	3791318
5	Bhopal	46776	627280	674056	51714	703369	755083
6	Chennai	347485	2801215	3148700	382592	3073197	3455789
7	Coimbatore	44462	1065303	1109765	52470	1188626	1241096
8	Delhi	507820	6239028	6746848	541620	6686051	7227671
9	Dhanbad*	18674	12363	31037	25100	15812	40912
10	Ghaziabad	32810	375767	408577	37673	432408	470081
11	Greater Mumbai	250551	1517423	1767974	232766	1637545	1870311
12	Gwalior	32720	378913	411633	35666	413591	449257
13	Hyderabad	317093	2411086	2728179	347143	2685596	3032739
14	Indore	109451	988741	1098192	122399	1090566	1212965
15	Jabalpur	34196	481867	516063	37914	521242	559156
16	Jaipur	129704	1418888	1548592	143346	1550626	1693972
17	Jamshedpur*	36865	18884	55749	43423	23465	66888
18	Jodhpur	65183	512235	577418	70645	565496	636141
19	Kanpur	34089	905737	939826	37693	964091	1001784
20	Kochi	46687	275579	322266	58633	349889	408522
21	Kolkata**	63873	347152	411025	67670	377048	444718
22	Kota	30543	409093	439636	32406	440743	473149
23	Lucknow	34394	1073061	1107455	35401	1175488	1210889
24	Madurai	45327	484517	529844	53950	548902	602852
25	Meerut	10045	377454	387499	11177	411965	423142
26	Nagpur	55648	1023553	1079201	58830	1098204	1157034
27	Nasik	33528	324653	358181	35623	362202	397825
28	Patna	87077	494236	581313	97758	559898	657656
29	Pune	171457	1736254	1907711	183313	1910577	2093890
30	Raipur	42790	426669	469459	46058	481249	527307
31	Srinagar	41445	130111	171556	43438	140334	183772
32	Tiruchirapalli	30485	369687	400172	35632	421111	456743
33	Varanasi	34224	463141	497365	39234	498782	538016
34	Vijayawada	61574	461712	523286	70394	395890	466284
35	Visakhapatnam	54426	531351	585777	63085	553553	616638
	Total	**3270698**	**33101087**	**36371785**	**3544741**	**36194700**	**39739441**

Source: Transport Research Wing, Ministry of Road Transport & Highways .Transport year book-2011-12

Includes other vehicles which are not covered in 'Transport Vehicles'

* Includes motor cycles on hire

** Live vehicles after cancellation of vehicles registered prior to 1.1.1993

Table :4.7.3 Total registered motor vehicles in Million plus cities of India

Sl. No.	Name of City	2012		
		Total Transport	Total Non-Transport	Total
1	Agra	32,528	671,233	703,761
2	Ahmedabad	184,123	1,497,988	1,682,111
3	Allahabad	28,211	709,529	737,740
4	Amritsar	42,589	760,418	803,007
5	Aurangabad	28,918	251,697	280,615
6	Bengaluru	398,939 ^^	3,757,193	4,156,132
7	Bhopal	56,612	771,957	828,569
8	Chandigarh	34,365	1,024,043	1,058,408
9	Chennai	405,421	3,361,873	3,767,294
10	Coimbatore	61,065	1,325,064	1,386,129
11	Delhi	280,469	7,069,651	7,350,120
12	Dhanbad	118,468 *	343,455	461,923
13	Durg Bhilai	19,621	425,064	444,685
14	Ghaziabad	42,790	482,181	524,971
15	Greater Mumbai	238,730	1,789,770	2,028,500
16	Gwalior	38,975	450,541	489,516
17	Hyderabad	403,448	2,983,127	3,386,575
18	Indore	135,057	1,202,899	1,337,956
19	Jabalpur	41,975	563,513	605,488
20	Jaipur	160,299	1,710,750	1,871,049
21	Jamshedpur	154,921 *	527,156	682,077
22	Jodhpur	103,868	764,583	868,451
23	Kanpur	28,069	1,039,371	1,067,440
24	Kochi	68,798	411,540	480,338
25	Kolkata**	70,787	425,519	496,306
26	Kota	53,281	899,250	952,531
27	Lucknow	37,623	1,277,082	1,314,705
28	Ludhiana	73,872	1,262,994	1,336,866
29	Madurai	59,241	620,269	679,510
30	Meerut	13,817	406,124	419,941
31	Nagpur	62,700	1,174,399	1,237,099
32	Nashik	37,809	406,580	444,389
33	Patna	82,469	660,420	742,889
34	Pune	151,581	2,115,542	2,267,123
35	Raipur	50,292	528,227	578,519
36	Rajkot	56,771	702,802	759,573
37	Ranchi	208,398	520,748	729,146
38	Srinagar	45,740	155,266	201,006
39	Surat	96,542	1,048,950	1,145,492
40	Tiruchirapalli	39,910	481,468	521,378
41	Varanasi	44,710	542,823	587,533
42	Vijayawada	29,379	524,034	553,413
43	Vadodara	76,899	761,851	838,750
44	Visakhapatnam	72,533	610,822	683,355
	TOTAL	**4,472,613**	**49,019,766**	**53,492,379**

Source: Transport year book- 2011-12

... : not $: Included in Multiaxled/Articulated vehicles ^ : Included in cars

^^ : Includes other vehicles which are not covered in 'Transport Vehicles' # : Included in Trailers

* Includes motor cycles on hire **:Live vehicles after cancellation of vehicles registered prior to 1.1.1993

4.8 Harmful Effects of Emissions

4.8.1 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-dioxide emitted from neighbouring industries, has had limestone slowly 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 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.

4.9 Areas of Concern

a) Air pollution is existed in major cities where vehicles are the major sources.
b) There are 24 critically polluted areas where industrial pollution is predominant. Action plan have been formulated and implemented by the Central/ States Pollution Control Board in these problem areas.

4.10 Non-attainment Cities

CPCB has identified list of polluted cities in which the prescribed National Ambient Air Quality Standards (NAAQS) are violated. Action plans are being formulated and implemented to control air pollution in non-attainment cities by respective states.

4.11 Measures taken for Control of Air Pollution from Vehicles

A) Vehicular Emission Norms

The vehicle emission norms in India are detailed below.

a) During 1990-91 India for the first time notified mass emission norms for the vehicles at the manufacturing stage as well as for in-use vehicles. These norms were notified under EPA, more vehicles rules and Air Act.

b) The emission norms introduced in 1996 have been crucial in controlling vehicular pollution because of stringency of emission norms along with specifications on fuel quality in 1996. for the first time crankcase emission norms and evaporative emission norms were introduced.

c) From April 1995 passenger cars were allowed to register only if they are fitted with a catalytic converter in four metros-Delhi, Mumbai, Kolkata and Chennai. Emission norms for such vehicles were stricter by 50 percent compared to 1996 norms.

d) The testing method for passenger car norms were changed from hot start to cold start, which is also a stringent measure, compared to the earlier one.

e) More stringent norms were introduced for the year 2000. These norms were notified under Motor Vehicle Rules during 1997. Automobile manufacturers have to undergo major modification to meet these norms.

f) The expert committee on Auto Oil Policy was constituted during September 2001. The interim report of the committee was submitted to Govt. on 1.1.2000, recommending Bharat Stage-III emission norms for all category of 4-wheelers in 7 mega cities from 2005 and rest of the country by 2010. Final report of the committee has been submitted in September 2002 which includes road map for control of vehicular pollution up to 2010.

g) Final report of the inter-Ministerial Task Force constituted by Ministry of Petroleum & Natural Gases at the instance of the Committee of Secretaries to evolve a long term policy for vehicular emission and auto fuel policy has been submitted which recommended introduction of Bharat Stage-II norms for 4-wheelers and next stage emission norms for 2/3 wheelers throughout the country from 2005 and introduction of Bharat stage III norms for four wheelers in 7-mega cities from 2005.

B) Fuel Quality Specifications

For the first time diesel and gasoline fuel quality with respect to environment related parameters has been notified under EPA during April 1996.

C) Lubricants Quality:

Specifications of 2T oil for two stroke engine with respect to smoke has been notified under EPA during September 1998 for implementation from 1.4.1999 throughout the country. Pre-mix 2T oil dispenser has been installed at all petrol filling stations in Delhi so that excessive oil is not being used by the vehicle owners. Sale of loose 2T oil has been banned from December 1998 in Delhi.

D) Alternate Fuels:

a) Custom duly on CNG kit has been exepted for promotion of CNG vehicles.

b) Emission norms for CNG vehicles have been notified under Motor Vehicles Rule Vide GSR 853 (E) dated 19.11.2001.

c) LPG is now being used as alternate fuel for motor vehicles after making amendments in CMVR. Emission norms for LPG vehicles have been notified vide GSR 284 (E) dated 24.4.2001.

d) Battery driven vehicles have been introduced in few corridors in

E) Restriction of Grossly polluting Vehicles

a. Registration of new auto rickshaws with conventional engine has been banned from May 1996 and registration of Defense Service and Govt. auctioned vehicles has been banned from April 1994 in Delhi.

b. 20 years old commercial vehicles were phased out from October 1998, 17 year old commercial vehicles has been phased out from November 1998 and 15 year old commercial vehicle from December 1998 in Delhi.

c. Registration on alternation of vehicles by replacing petrol engine with diesel has been banned from 1.4.1998 in Delhi.

F) Traffic Management

a. Restriction has been imposed on goods vehicles during day time from August 1999 in Delhi.

b. Left lane has been made exclusive to buses and other HMV in Delhi.

c. Time clocks have been installed in important red lights to enable the drivers to switch off their vehicles depending on the time left in the time clocks.

d. More fly over and subways have been constructed and T-Junctions have been closed for better traffic flow.

G) Public Transport Systems:

a. Number of buses has been increased to discourage use of individual vehicles by allowing private sectors for operation.

b. A number of Metro Rail Projects for Delhi –NCR have been commissioned.

H) Technology

a. Fitment of catalytic converter for new petrol passenger cars has been made compulsory from 1.4.1995 in four metros and 45 cities from 1.9.1998.

b. Two wheeler scooters with four stroke engine are being introduced in the market from October 1998.

c. Registration of only rear engine auto rickshaws is being allowed from May 1996 onwards.

d. More four stroke two wheelers are being registered in Delhi.

I) Mass Awareness

a. Messages/articles related to vehicular emissions are disseminated through newsletters, pamphlets, newspapers, magazines, Television, Radio, internet, Workshops and Summer Exhibitions.

b. Display of ambient air quality data through display system near ITO, Newspapers, daily news and internet.

c. NGOs working on vehicular pollution control are being encouraged for mass awareness companies.

4.12 Environment Pollution due to Energy Use

4.12.1 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. More than 60 percent of Indian households depend on traditional sources of energy like fuel wood, dung and crop residue for meeting their cooking and heating needs. Out of total rural energy consumption about 65 per cent is met from fuel wood. Fuel wood consumption during 2001-02 was estimated at 223 million tones, 180 millions tones of which is for household consumption and the balance for cottage industry, big hotels etc. 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.

4.12.2 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.

4.12.3 In India, Lignite production is mainly in Tamil nadu, Gujrat and Rajasthan. 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 State wise Lignite and Coal production over the last ten years is presented in table 4.12.1**

4.12.5 **The State wise production of raw coal by types (coking, non - coking) over the years is depicted in table 4.12.3**

4.12.6 Coal production increased rapidly after the nationalisation of coal mines. From about 296.7 million ton in 1997-98, it raised to 492.9 million ton in 2008-2009 making India, one of the major coal producers of the world. The increase is predominantly in non-coking coal production.

4.12.7 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. **The productivity in Coal mines in the year 2007 can be viewed in Table 4.12.4**

4.12.8 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. **The detail of production of Coal and Lignite from opencast working by mechanization and overburden removed during the year 2007 is presented in table 4.12.5**

4.12.9 The consumption of petroleum products in vehicles, industries and domestic cooking activities results in the emission of pollutants in large quantities. **The domestic production of Petroleum Products in India from 1970-71 is in table 4.12.6**

4.7.4 The quantum of road transport is an indicator of pollution caused by vehicles.

The category wise details of motor vehicles in major metropolitan cities of India is available in table 4.7.4

Table 4.7.4 : Total registered motor vehicle in million plus cities of India

(as on 31st March, 2010) **Contd.**

(Number)

Sl. No.	Name of City	Transport					
		Multi-axled/Articulated Vehicles Trucks & Lorries	Light Motor Vehicles (Goods)	Buses	Taxies	Light Motor Vehicles (Passengers-Auto)	Total Transport
1	2	3	4	5	6	7	8
1	Agra	3803	11116	1620	2899	8024	27462
2	Allahabad	7942	6388	1159	440	7510	23439
3	Augangabad	3219	9300	2661	895	9736	25811
4	Bengaluru#	68401	63782	26283	40407	110578	342584
5	Bhopal	6149	9563	3387	15810	11867	46776
6	Chennai	92054	72326	36205	63738	83162	347485
7	Coimbatore	7055	10505	4932	11718	10252	44462
8	Delhi	85384	140872	43250	55530	182784	507820
9	Dhanbad*	3752	4446	246	4464	3593	18674
10	Ghaziabad	4584	10305	1664	2522	13735	32810
11	Greater Mumbai	16877	52261	13281	60278	107853	250550
12	Gwalior	7268	4585	5962	6726	8179	32720
13	Hyderabad	106968	76137	22602	26351	85035	317093
14	Indore	40227	20397	6919	29029	12879	109451
15	Jabalpur	9106	8650	1512	8759	6169	34196
16	Jaipur	57549	13361	20714	17589	20491	129704
17	Jamshedpur*	4380	5676	246	17862	6528	36865
18	Jodhpur	33301	6758	5935	7189	12000	65183
19	Kanpur	20079	6738	283	240	6749	34089
20	Kochi	3393	15954	5160	7592	14588	46687
21	Kolkata**	14210	0	4009	27914	17740	63873
22	Kota	15687	801	2926	2384	8745	30543
23	Lucknow	6666	12333	2930	5055	7410	34394
24	Madurai	10177	6939	4875	11632	11704	45327
25	Meerut	4067	1979	1296	490	2213	10045
26	Nagpur	15077	17542	4583	2388	16058	55648
27	Nasik	4366	9508	950	1800	16904	33528
28	Patna	22643	0	5366	7911	51157	87077
29	Pune	35132	46433	14030	14331	61531	171457
30	Raipur	24599	9918	1586	1877	4810	42790
31	Srinagar	12022	7247	6701	5587	9888	41445
32	Tiruchirapalli	8233	10079	2463	4526	5184	30485
33	Varanasi	8008	10105	2252	2904	10955	34224
34	Vijayawada	25818	10920	2760	5266	16810	61574
35	Visakhapatnam	12267	7890	1434	7119	25716	54426
	Total	**800463**	**700814**	**262182**	**481223**	**988537**	**3270698**

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways

\# Includes other vehicles which are not covered in 'Transport Vehicles'

* Includes motor cycles on hire

** Live vehicles after cancellation of vehicles registered prior to 1.1.1993

Table 4.7.4 : Total registered motor vehicle in million plus cities of India (as on 31st March, 2011) Contd.

(Number)

Sl. No.	Name of City	Transport					
		Multi-axled/Articulated Vehicles Trucks & Lorries	Light Motor Vehicles (Goods)	Buses	Taxies	Light Motor Vehicles (Passengers-Auto)	Total Transport
1	2	3	4	5	6	7	8
1	Agra	3895	12476	1752	3370	8501	29994
2	Allahabad	8316	5847	1404	679	7465	23711
3	Augangabad	3311	10500	2921	768	9817	27317
4	Bengaluru#	71983	69758	28261	41190	121241	368953
5	Bhopal	6707	10742	3627	17945	12693	51714
6	Chennai	94395	76678	37205	72446	101868	382592
7	Coimbatore	8483	12303	5744	14220	11720	52470
8	Delhi	86301	156030	45757	62839	190693	541620
9	Dhanbad*	4174	6383	514	6816	4779	25100
10	Ghaziabad	4851	11083	1831	2872	17036	37673
11	Greater Mumbai	8079	52217	12841	50914	108715	232766
12	Gwalior	8013	5166	6056	7440	8991	35666
13	Hyderabad	114544	84736	25311	29548	93004	347143
14	Indore	43230	24096	7215	32215	15643	122399
15	Jabalpur	9834	9865	1537	9938	6740	37914
16	Jaipur	64809	13733	22143	20421	22240	143346
17	Jamshedpur*	4900	6383	386	22249	7071	43423
18	Jodhpur	37184	7184	6304	7778	12195	70645
19	Kanpur	21703	8044	464	270	7212	37693
20	Kochi	4375	20264	6105	9445	18444	58633
21	Kolkata**	13773	0	4249	30840	18808	67670
22	Kota	16204	1027	2979	2580	9616	32406
23	Lucknow	6869	12825	3035	5354	7318	35401
24	Madurai	11186	8401	5214	12799	16350	53950
25	Meerut	4071	2355	1456	535	2760	11177
26	Nagpur	15829	19040	4883	2661	16417	58830
27	Nasik	4731	10920	1110	1925	16937	35623
28	Patna	25525	0	5668	9092	57473	97758
29	Pune	38863	50664	15008	15911	62867	183313
30	Raipur	25424	11177	1714	2148	5595	46058
31	Srinagar	12334	7989	6822	6311	9982	43438
32	Tiruchirapalli	9288	11181	3021	5854	6278	35622
33	Varanasi	8564	11676	2347	3561	13086	39234
34	Vijayawada	28416	12854	3135	5845	20144	70394
35	Visakhapatnam	13661	9083	1536	7954	30851	63085
	Total	**843825**	**772680**	**279560**	**526739**	**1080557**	3544741

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways

Includes other vehicles which are not covered in 'Transport Vehicles'

* Includes motor cycles on hire

** Live vehicles after cancellation of vehicles registered prior to 1.1.1993

Table 4.7.4 : Total registered motor vehicle in million plus cities of India (as on 31st March, 2012) Contd.

Sl. No.	Name of City	Transport					
		Multi-axled/Articulated Vehicles Trucks & Lorries	Light Motor Vehicles (Goods)	Buses	Taxies	Light Motor Vehicles (Passengers-Auto)	Total Transport
1	2	3	4	5	6	7	8
1	Agra	3,866	14,294	1,791	3,853	8,724	32,528
2	Ahmedabad	22,741	43,408	25,961	8,261	83,752	184,123
3	Allahabad	8,929	8,010	1,344	976	8,952	28,211
4	Amritsar	11,200	7,715	2,850	1,198	19,626	42,589
5	Aurangabad	3,572	11,733	2,930	845	9,838	28,918
6	Bengaluru	76,843	73,888	29,160	46,235	134,343	398,939 ^^
7	Bhopal	7,390	11,795	3,849	20,032	13,546	56,612
8	Chandigarh	2,689	23,015	5,170	3,491	...	34,365
9	Chennai	97,996	82,457	38,107	82,473	104,388	405,421
10	Coimbatore	10,632	15,406	6,281	16,654	12,092	61,065
11	Delhi	4,792	124,547	20,142	62,335	68,653	280,469
12	Dhanbad	28,664	28,731	1,396	27,654	28,731	118,468 *
13	Durg Bhilai	8,395	6,587	815	2,674	1,150	19,621
14	Ghaziabad	5,243	11,982	1,949	3,667	19,949	42,790
15	Greater Mumbai	8,160	53,969	12,958	54,148	109,495	238,730
16	Gwalior	8,633	5,945	11,993	2,266	10,138	38,975
17	Hyderabad	120,718	96,642	27,686	32,917	125,485	403,448
18	Indore	46,760	27,741	7,541	35,366	17,649	135,057
19	Jabalpur	10,637	11,236	10,135	2,627	7,340	41,975
20	Jaipur	75,359	14,116	23,294	23,349	24,181	160,299
21	Jamshedpur	20,005	50,420	1,766	27,389	50,420	154,921 *
22	Jodhpur	56,454	8,901	8,164	13,511	16,838	103,868
23	Kanpur	18,135	2,102	696	386	6,750	28,069
24	Kochi	5,290	24,635	7,005	10,346	21,522	68,798
25	Kolkata**	15,235	$	4,316	31,807	19,429	70,787
26	Kota	27,431	2,565	5,398	5,351	12,536	53,281
27	Lucknow	6,683	14,452	3,098	6,195	7,195	37,623
28	Ludhiana	24,741	26,855	3,045	3,139	16,092	73,872
29	Madurai	12,070	9,983	5,547	13,899	17,742	59,241
30	Meerut	4,231	3,125	1,661	600	4,200	13,817
31	Nagpur	16,481	21,027	5,136	2,907	17,149	62,700
32	Nashik	5,215	12,348	1,260	2,044	16,942	37,809
33	Patna	28,776	$	6,020	10,666	37,007	82,469
34	Pune	24,877	53,002	17,825	11,904	43,973	151,581
35	Raipur	27,039	12,354	1,788	2,532	6,579	50,292
36	Rajkot	15,100	23,018	3,227	3,302	12,124	56,771
37	Ranchi	42,192	57,276	4,376	36,694	63,090	208,398
38	Srinagar	12,627	8,937	6,846	7,160	10,170	45,740
39	Surat	15,342	26,435	2,380	1,926	50,459	96,542
40	Tiruchirapalli	10,439	12,478	3,446	6,952	6,595	39,910
41	Varanasi	9,381	13,869	2,703	4,626	14,131	44,710
42	Vijayawada	3,397	2,398	366	559	22,659	29,379
43	Vadodara	17,029	20,574	1,816	5,961	31,519	76,899
44	Visakhapatnam	14,586	10,348	1,931	8,958	36,710	72,533
	TOTAL	**995,975**	**1,090,319**	**335,168**	**649,835**	**1,349,863**	**4,472,613**

Source: Transport year book- 2011-12

... : not reported $: Included in Multiaxled/Articulated vehicles ^ : Included in cars

^^ : Includes other vehicles which are not covered in 'Transport Vehicles' # : Included in Trailers

* Includes motor cycles on hire **:Live vehicles after cancellation of vehicles registered

Table 4.7.4 : Total registered motor vehicle in million plus cities of India

(as on 31st March, 2010) Contd.

(Number)

Sl. No.	Name of City	Non-Transport								
		Two Wheelers	Cars	Jeeps	Omni Buses	Tractors	Trailers	Others	Total Non-Transport	Grand Total (Transport +Non Transport)
1	2	9	10	11	12	13	14	15	16	17
1	Agra	466981	44581	2744	2837	34056	113	1622	552934	580396
2	Allahabad	444551	49431	6094	3	7299	59	2477	509914	533353
3	Augangabad	177593	11595	6649	294	6095	4085	994	207305	233116
4	Bengaluru#	2431372	634730	7114	45557	6887	5284	17037	3147981	3490565
5	Bhopal	540622	68564	1482	0	11047	4516	1049	627280	674056
6	Chennai	2182794	543999	12236	8769	2459	11709	39249	2801215	3148700
7	Coimbatore	920489	119543	5290	303	7330	486	11862	1065303	1109765
8	Delhi	4107912	1956574	79418	89367	5294	99	364	6239028	6746848
9	Dhanbad*	7824	3486	522	0	531	.	0	12363	31037
10	Ghaziabad	289248	67515	1075	1866	16063	0	0	375767	408577
11	Greater Mumbai	967479	514591	23840	3931	1362	985	5235	1517423	1767973
12	Gwalior	323885	25301	4784	0	15913	6503	2527	378913	411633
13	Hyderabad	1928897	436641	8551	22982	6194	1472	6349	2411086	2728179
14	Indore	845528	112422	4383	0	15088	8974	2346	988741	1098192
15	Jabalpur	428862	33093	2080	0	11304	2967	3561	481867	516063
16	Jaipur	1144561	185762	46316	0	39166	3028	55	1418888	1548592
17	Jamshedpur*	11735	5230	1565	0	354	0	0	18884	55749
18	Jodhpur	404487	40309	16097	0	42240	7875	1227	512235	577418
19	Kanpur	802414	88245	6060	3497	5521	0	0	905737	939826
20	Kochi	170326	90673	5832	5346	176	8	3218	275579	322266
21	Kolkata**	165799	180644	0	0	0	81	628	347152	411025
22	Kota	341885	29250	8730	0	20218	8363	647	409093	439636
23	Lucknow	390442	145996	14910	667	16464	1182	3400	573061	607455
24	Madurai	435924	32406	1542	77	5245	1836	7487	484517	529844
25	Meerut	275668	40773	645	485	57958	0	1925	377454	387499
26	Nagpur	905327	79641	26183	842	5292	5166	1102	1023553	1079201
27	Nasik	272293	29791	7978	44	8448	5464	635	324653	358181
28	Patna	397187	72127	0	0	12277	8475	4170	494236	581313
29	Pune	1418582	246215	39520	950	17234	9831	3922	1736254	1907711
30	Raipur	365943	30202	710	5084	6205	15979	2546	426669	469459
31	Srinagar	74974	48286	3772	0	1748	0	1331	130111	171556
32	Tiruchirapalli	331333	29315	990	70	3387	1241	3351	369687	400172
33	Varanasi	397458	36179	6423	336	13060	9322	363	463141	497365
34	Vijayawada	413323	34144	1187	1547	6062	4823	626	461712	523286
35	Visakhapatnam	461552	54923	3387	2073	2942	4908	1566	531351	585777
	Total	**25245259**	**6122180**	**358109**	**196927**	**410919**	**134834**	**132871**	**33101087**	**36371785**

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways

Includes other

* Includes motor cycles on hire

** Live vehicles after cancellation of vehicles registered prior to 1.1.1993

Table 4.7.4 : Total registered motor vehicle in million plus cities of India
(as on 31st March, 2011)

Contd *(Number)*

Sl. No.	Name of City	Non-Transport								
		Two Wheelers	Cars	Jeeps	Omni Buses	Tractors	Trailers	Others	Total Non-Transport	Grand Total (Transport +Non Transport)
1	2	9	10	11	12	13	14	15	16	17
1	Agra	515154	51168	3103	3219	35616	120	1654	610034	640028
2	Allahabad	584248	56027	7653	18	8682	64	2611	659303	683014
3	Augangabad	193878	12494	7168	134	6494	4294	1022	225484	252801
4	Bengaluru#	2624707	710852	7254	46344	7424	5738	20046	3422365	3791318
5	Bhopal	602793	81360	1482	0	12001	4527	1206	703369	755083
6	Chennai	2398366	598708	12358	8769	2526	11727	40743	3073197	3455789
7	Coimbatore	1023414	137728	5379	303	7709	663	13430	1188626	1241096
8	Delhi	4395086	2116107	79488	89368	5384	99	519	6686051	7227671
9	Dhanbad*	8765	5327	898	0	822	0	0	15812	40912
10	Ghaziabad	332101	79822	1270	2067	17148	0	0	432408	470081
11	Greater Mumbai	1044829	562526	23892	3943	639	204	1512	1637545	1870311
12	Gwalior	353490	29102	5208	0	16636	6576	2579	413591	449257
13	Hyderabad	2144410	491361	8746	25904	6704	1579	6892	2685596	3032739
14	Indore	930223	127644	4397	0	16390	9316	2596	1090566	1212965
15	Jabalpur	462632	37955	2081	0	11923	2996	3655	521242	559156
16	Jaipur	1248076	208475	49668	0	41324	3028	55	1550626	1693972
17	Jamshedpur*	13145	7102	2396	0	822	0	0	23465	66888
18	Jodhpur	446131	47803	17333	0	44886	7884	1459	565496	636141
19	Kanpur	849098	98194	6310	3856	6630	0	3	964091	1001784
20	Kochi	221157	113269	5832	5353	249	8	4021	349889	408522
21	Kolkata**	182087	194178	0	0	0	82	701	377048	444718
22	Kota	367900	33276	9595	0	20855	8391	726	440743	473149
23	Lucknow	970897	165589	15513	850	17809	1318	3512	1175488	1210889
24	Madurai	493575	38412	1550	77	5652	1953	7683	548902	602852
25	Meerut	306202	45940	639	494	58690	0	0	411965	423142
26	Nagpur	967838	89479	28244	842	5385	5263	1153	1098204	1157034
27	Nasik	300877	34151	8132	44	11406	6835	757	362202	397825
28	Patna	448104	84620	0	0	13660	9314	4200	559898	657656
29	Pune	1551968	285235	40192	950	17883	9887	4462	1910577	2093890
30	Raipur	412707	35894	710	5318	6705	17075	2840	481249	527307
31	Srinagar	79146	54196	3827	0	1753	0	1412	140334	183772
32	Tiruchirapalli	376887	34431	991	70	3898	1306	3528	421111	456733
33	Varanasi	426522	40132	8411	357	13631	9329	400	498782	538016
34	Vijayawada	340614	39764	1204	1731	6745	5108	724	395890	466284
35	Visakhapatnam	469784	63137	3434	2268	2960	10016	1954	553553	616638
	Total	**28086811**	**6811458**	**374358**	**202279**	**437041**	**144698**	**138055**	**36194700**	**39739441**

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways

Includes other vehicles which are not covered in 'Transport Vehicles'

* Includes motor cycles on hire

** Live vehicles after cancellation of vehicles registered prior to 1.1.1993

Table 4.7.4 : Total registered motor vehicle in million plus cities of India

(as on 31st March, 2012) Contd.

Sl. No.	Name of City	Non-Transport								
		Two Wheelers	Cars	Jeeps	Omni Buses	Tractors	Trailers	Others	Total Non-Transport	Grand Total (Transport +Non Transport)
1	2	9	10	11	12	13	14	15	16	17
1	Agra	568,470	56,817	3,647	3,503	36,987	134	1,675	671,233	703,761
2	Ahmedabad	1,213,454	239,558	18,254	…	13,073	7,694	5,955	1,497,988	1,682,111
3	Allahabad	626,716	61,057	8,878	29	10,198	66	2,585	709,529	737,740
4	Amritsar	623,329	92,108	3,745	…	39,945	9	1,282	760,418	803,007
5	Aurangabad	217,410	13,869	7,988	…	6,685	4,507	1,238	251,697	280,615
6	Bengaluru	2,867,646	800,866	7,313	46,888	7,875	6,151	20,454	3,757,193	4,156,132
7	Bhopal	657,590	94,389	1,232	…	12,771	4,531	1,444	771,957	828,569
8	Chandigarh	737,263	286,584			196			1,024,043	1,058,408
9	Chennai	2,630,752	653,270	12,420	8,769	2,584	11,739	42,339	3,361,873	3,767,294
10	Coimbatore	1,137,785	157,977	5,443	303	8,104	880	14,572	1,325,064	1,386,129
11	Delhi	4,661,714	2,172,069	68,648	89,373	1,343	…	76,504	7,069,651	7,350,120
12	Dhanbad	279,839	46,440	7,485	1,328	2,710	2,481	3,172	343,455	461,923
13	Durg Bhilai	385,079	29,748	1,469	7,179	325	175	1,089	425,064	444,685
14	Ghaziabad	367,327	93,934	1,366	1,914	17,630	0	10	482,181	524,971
15	Greater Mumbai	1,139,363	617,556	26,496	3,957	680	206	1,512	1,789,770	2,028,500
16	Gwalior	385,142	32,722	5,676		17,773	6,600	2,628	450,541	489,516
17	Hyderabad	2,370,955	558,081	8,975	28,855	7,019	1,691	7,551	2,983,127	3,386,575
18	Indore	1,021,757	146,433	4,379	…	17,870	9,634	2,826	1,202,899	1,337,956
19	Jabalpur	499,044	43,000	2,055	…	12,570	3,014	3,830	563,513	605,488
20	Jaipur	1,374,316	235,310	53,496	…	44,594	3,034	…	1,710,750	1,871,049
21	Jamshedpur	438,285	56,429	13,787	1,628	3,408	2,646	10,973	527,156	682,077
22	Jodhpur	607,449	60,747	24,808	…	62,954	8,625	…	764,583	868,451
23	Kanpur	907,649	112,445	6,658	4,432	8,185	2	0	1,039,371	1,067,440
24	Kochi	262,258	132,628	6,228	5,456	276	27	4,667	411,540	480,338
25	Kolkata**	202,602	222,069	^	…	#	46	802	425,519	496,306
26	Kota	744,548	50,313	20,518	…	67,499	16,372	…	899,250	952,531
27	Lucknow	1,052,717	183,288	16,932	181	19,012	1,361	3,591	1,277,082	1,314,705
28	Ludhiana	1,017,038	181,023	12,772	…	49,996	368	1,797	1,262,994	1,336,866
29	Madurai	557,828	44,802	1,551	77	6,095	2,044	7,872	620,269	679,510
30	Meerut	294,357	51,578	630	0	59,559	0	0	406,124	419,941
31	Nagpur	1,032,607	99,233	29,727	842	5,402	5,348	1,240	1,174,399	1,237,099
32	Nashik	335,145	39,818	9,184	73	14,163	7,462	735	406,580	444,389
33	Patna	505,940	98,425	26,604	…	15,070	10,160	4,221	660,420	742,889
34	Pune	1,705,573	332,293	41,327	877	18,213	11,514	5,745	2,115,542	2,267,123
35	Raipur	452,257	42,262	712	5,758	7,095	17,115	3,028	528,227	578,519
36	Rajkot	613,766	63,613	2,932	…	9,902	9,374	3,215	702,802	759,573
37	Ranchi	405,459	69,794	22,393	4,376	11,001	6,135	1,590	520,748	729,146
38	Srinagar	85,752	62,423	3,850	0	1,755	0	1,486	155,266	201,006
39	Surat	897,366	132,559	8,985	…	5,129	3,169	1,742	1,048,950	1,145,492
40	Tiruchirapalli	431,016	39,557	992	70	4,547	1,396	3,890	481,468	521,378
41	Varanasi	463,952	43,953	9,921	382	14,332	9,341	942	542,823	587,533
42	Vijayawada	462,507	43,964	1,221	1,873	7,634	5,760	1,075	524,034	553,413
43	Vadodara	644,069	92,057	9,737	…	8,331	4,877	2,780	761,851	838,750
44	Visakhapatnam	516,577	72,939	3,471	2,443	2,960	10,478	1,954	610,822	683,355
	TOTAL	**38,401,668**	**8,760,000**	**523,905**	**220,566**	**663,450**	**196,166**	**254,011**	**49,019,766**	**53,492,379**

Source: Transport year book- 2011-12

... : not reported $: Included in Multiaxled/Articulated vehicles ^ : Included in cars

^^ : Includes other vehicles which are not covered in 'Transport Vehicles' # : Included in Trailers

prior to 1 * Includes motor cycles on hire **:Live vehicles after cancellation of vehicles registered prior to 1.1.1993

A glance at the working of State Transport undertaking in various States and all India (time series) can be obtained in table 4.7.5

Table: 4.7.5 : Working of States Transport Undertaking

Name of State Road Transport Undertaking	Fuel Efficiency(km/litre)			Passenger kms performed(Lakh)			Passenger carried (Lakhs)		
	2010-11	2011-12	2012-13	2010-11	2011-12	2012-13	2010-11	2011-12	2012-13
Ahmedabad MTS	3.5	3.5	3.3	21021	21288	19023	2904	2935	2396
Andhra Pradesh SRTC	5.2	5.1		973944	1001924	1017163	46388	50014	51675
Andaman & Nicobar ST		26.2	25.8					117	133
Assam STC		3.8	4		5928	7128		45	55
BEST Undertaking	2.9	2.9	2.9	123071	123353	144458	15352	14395	14096
Bangalore Metropolitan TC	4	4	3.8	197604	232759	214586	15603	15920	17112
Bihar SRTC	4.2	4.3	4.3	4317	4075	3575	55	53	53
Calcutta STC	3.4	3	3	12108	11996	12175	1686	1164	1077
Chandigarh TU	4.1	3.8	3.6	20216	19614	17165	788	794	672
Delhi TC		2.5	2.4	138011	90237	93152	11066	16177	17072
Gujarat SRTC	5.5	5.5	5.5	325907	351240	351240	8053	8559	8411
Haryana ST	4.8	4.8	4.8	134796	139868	166982	4183	4028	4527
Himachal RTC		3.6	3.6	72840	71619	72111	39044	40413	
J&K SRTC		4.2	4.2					57	51
Kadamba TC Ltd.		4.4	4.5		1150	1224		306	301
Karnataka SRTC	4.9	4.9	4.8	329638	351240	368842	8476	8867	9391
Kerala SRTC	4.3	4.2	4.3	6331	6558			12579	12156
Maharashtra SRTC	4.9	4.9	4.9	543987	556295	535597	25380	26004	26137
Meghalaya STC	4	4.5	3.6	514	352	275	6	4	3
Metro TC (Chennai) Limited	4.4	4.4	4.3	217963	213249	187962	20145	19769	14544
Mizoram ST	3.5	3.5	3.5	204	176	165	2	1	1
Nagaland ST	3.8	3.7	3.9	1715	2560	2271	0	18	17
Navi Mumbai MT		3	3	232			812	856	858
North Bengal STC	4.2	4.1	4	13951	13427	15614	575	589	672
North Eastern Karnataka RTC	5.3	5.3	5.2	137650	153477	160516	4563	4745	4605
North Western Karnataka RTC	5	5.1	5.1	167753	151141	171826	6753	7686	8213
Odisha SRTC Odisha SRTC	4.5	4.6	4.6	10588	11161	10545	48	57	57
Pune Mahamandal	3.4	3.3	3.3	36395	38690	39076	4500	4497	4605
Rajasthan SRTC	5.1	5	4.9	222004	303312	295212	3391	3308	3129
South Bengal STC	4.1	4.1	4.2	14916	14875	15044	927	944	948
State Exp.TC TN Ltd.	5	5.1	5.1	67286	61070	67143	270	235	242
TN STC (Coimbatore) Ltd.	2.7	5.1	5.2	249006	233316	223705	10656	9963	9142
TN STC (Kumbakonam) Ltd.	5	5.5	5.6	303226	296609	264658	11822	11528	10617
TN STC (Madurai) Ltd.	5.5	5.4	5.4	306149	222214	188091	12289	7696	6797
TN STC (Salem) Ltd.	5.5	5.4	5.4	178818	169389	145878	6966	6941	5880
TN STC (Villupuram) Ltd.	5.5	5.5	5.6	322239	309167	280069	10746	9718	8568
Tripura RTC	5.5	4.1	5	501	464	393		9	9
Uttar Pradesh SRTC	5.3	5.2	5.2	337453	372918	382145	4705	4911	5265
Total				**5494355**	**5556712**	**5455287**	**278154**	**295902**	**252716**

Source: Ministry of Road Transport and Highways

The phased tightening of exhaust emission standards for Indian Automobiles is elaborated in table 4.11.1

Table 4.11.1 : Phased tightening of exhaust emission standards for Indian automobiles

Sl. No.	Category	1991	1996	2000 (Euro II)	2005 (Euro III)	2008
1	2	3	4	5	6	7
1	**Petrol Vehicles : (in grams/km)**					
I.	**Two wheelers**					
	(a) CO	12-30	4.5	2.0	1.5	1
	(b) HC	8-12	-	-	-	-
	(c) ($HC+NO_X$)	-	3.6	2.0	1.5	1
II.	**Three Wheelers**					
	(a) CO	12-30	6.75	4.0	2.25	1.25
	(b) HC	8-12	-	-	-	-
	(c) ($HC+NO_X$)	-	5.40	2.0	2.0	1.25
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 Resources Institute.

CO : Carbon Monoxide CC : Catalytic Converter

HC : Hydrocarbon PM : Particulate matter

NO_X : Oxides of Nitrogen

* : 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.

Table 4.12.1(a) : Statewise production of coal and lignite

(Million tonnes)

Sl. No.	States	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12(P)
1	2	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
I.	**Coal**	**296.7**	**296.5**	**304.1**	**313.7**	**327.8**	**341.2**	**361.2**	**382.6**	**407**	**430.8**	**457**	**492.8**	**532.1**	**532.7**	**539.907**
1	Andhra Pradesh	28.9	27.3	29.6	30.3	30.8	33.2	33.9	35.3	36.1	37.7	40.6	44.5	50.4	51.3	52.21
2	Arunachal Pradesh	—	—	—	—	—	—	—	—	—	—	—	0.1	0.2	0.3	0.22
3	Assam	0.7	0.6	0.6	0.7	0.6	0.6	0.7	0.6	1.1	1.1	1.1	1.2	1.1	1.1	0.6
4	Chhatisgarh	—	—	—	50.2	53.6	56.8	61.5	69.3	76.4	83	90.2	101.9	110	113.8	113.95
5	Jharkhand	81	76.2	76.5	75.4	76.8	78.6	79.5	78	85.4	88.8	90.9	96.3	105.9	108.9	109.56
6	Meghalaya	-	4.2	4.1	4.1	5.1	4.4	5.4	5.3	5.6	5.8	6.5	5.7	5.8	7	7.206
7	Madhya Pradesh	84.4	84.9	87.9	42.5	44.2	45.7	49.8	52.5	55.6	60	67.8	71.3	74.07	71.1	71.123
8	Maharashtra	26.2	25.3	27.7	28.8	30.8	31.4	32.9	34.5	36.1	36.2	36.4	38.7	41	39.3	39.158
9	Odisha	42	43.5	43.6	44.8	47.8	52.2	60.1	66.6	70.5	81.2	89.5	98.4	106.4	102.6	105.475
10	Uttar Pradesh	15.7	15.6	16.2	16.9	16.5	17.8	15.8	16.8	15.7	12.2	11.4	12	14	15.5	16.178
11	West Bengal	17.5	18.8	18	20.1	21.4	20.5	21.5	23.6	24.5	24.9	22.5	22.9	23.1	21.7	24.227
II.	**Lignite**	**23.1**	**23.4**	**22.2**	**24.2**	**24.8**	**26**	**28**	**30.5**	**30.1**	**31.1**	**34**	**32.4**	**34.1**	**37.7**	**43.105**
1	Gujarat	4.9	5	4.4	5.9	6.2	6.9	6.7	8.3	8.9	9.7	11.8	10.1	10.5	13.1	14.779
2	Rajasthan	-	0.2	0.2	0.2	0.3	0.5	0.7	0.5	0.7	0.5	0.6	1	1.2	1.5	3.735
3	Tamilnadu	18.1	18.2	17.6	18.2	18.4	18.6	20.6	21.6	20.4	21	21.6	21.3	22.3	23.1	24.591

Source : Coal Directory of India, Office of Coal Controller, Kolkata

(P): Provisional

Table 4.12.1(b): Share of lignite production by states in last ten years

(in Million Tonnes)

Year	State									All India	
	Tamil Nadu			Gujarat			Rajasthan				
	Quantity	Share(%)	Growth %	Quantity	Share(%)	Growth %	Quantity	Share(%)	Growth %	Quantity	Growth %
2000-01	18.17	74.90	3.5	5.858	24.20	24.6	0.217	0.90	-2.3	24.247	7.9
2001-02	18.37	74.00	1.1	6.167	24.90	5.3	0.277	1.10	27.6	24.813	2.3
2002-03	18.62	71.60	1.4	6.921	26.60	12.2	0.473	1.80	70.8	26.018	4.9
2003-04	20.56	73.50	10.4	6.724	24.10	-2.8	0.678	2.40	43.3	27.958	7.5
2004-05	21.57	71.10	4.9	8.222	27.10	22.3	0.548	1.80	-19.2	30.337	8.5
2005-06	20.44	68.00	-5.2	8.944	29.70	8.8	0.687	2.30	25.4	30.066	-0.9
2006-07	20.01	67.20	2.8	9.808	31.40	9.7	0.463	1.50	-32.6	31.285	4.1
2007-08	21.59	63.50	2.7	11.788	34.70	20.2	0.606	1.80	30.9	33.980	8.6
2008-09	21.31	65.70	-1.3	10.114	31.20	-14.2	0.999	3.10	64.9	32.421	-4.6
2009-10	22.34	65.60	4.8	10.526	30.90	4.1	1.207	3.50	20.8	34.071	5.1
2010-11	23.14	61.30	3.6	13.064	34.60	24.1	1.525	4.10	26.3	37.733	10.7
2011-12	24.59	58.09	6.3	14.779	34.30	13.1	2.963	7.00	94.3	42.332	12.2
2012-13(P)	26.22	56.28	6.6	14.673	31.49	-0.7	5.701	12.23	92.4	46.597	10.1

Source : Office of the Coal Controller, Kolkata, Ministry of Coal (P): Provisional

Table 4.12.1(c): Stateswise production of raw coal by types in last five years

(in Million Tonnes)

State	2005-06	2006-07	2007-08	2008-09	2009-10 (P)	2010-11	2011-12	2012-13(P)
Coking								
Chattisgarh	0.150	0.157	0.159	0.146	0.150	0.163	0.189	0.157
Jharkhand	30.295	31.098	33.566	33.877	43.666	48.945	51.108	51.317
Madhya Pradesh	0.932	0.775	0.676	0.730	0.545	0.403	0.319	0.330
West Bengal	0.134	0.067	0.054	0.056	0.052	0.036	0.044	0.030
Total Coking	**31.511**	**32.097**	**34.455**	**34.809**	**44.413**	**49.547**	**51.660**	**51.834**
Non-Coking								
Andhra Pradesh	36.138	37.707	40.604	44.546	50.429	51.333	52.211	53.19
Arunachal Pradesh			0.079	0.142	0.251	0.299	0.221	0.073
Assam	1.101	1.05	1.101	1.009	1.113	1.101	0.602	0.605
Chhatisgarh	76.208	83.084	90.013	101.776	109.803	113.661	113.769	117.673
Jammu & Kashmir	0.019	0.016	0.017	0.011	0.023	0.024	0.02	0.019
Jharkhand	55.128	57.666	57.329	62.395	62.251	60.004	58.458	59.886
Madhya Pradesh	54.647	58.951	67.165	70.595	73.529	70.701	70.804	76.948
Maharashtra	36.119	36.215	36.403	38.705	41.005	39.336	39.159	39.003
Meghalaya	5.566	5.787	6.541	5.489	5.767	6.974	7.206	7.137
Odisha	70.54	81.16	89.482	98.402	106.409	102.565	105.476	110.131
Uttar Pradesh	15.721	12.228	11.426	12.029	13.968	15.526	16.178	14.76
West Bengal	24.341	24.871	22.467	22.849	23.081	21.623	24.186	26.448
Total Non-Coking	**375.528**	**398.735**	**422.627**	**457.948**	**487.629**	**483.147**	**488.290**	**505.873**

Source : Office of the Coal Controller, Kolkata, Ministry of Coal (P): Provisional

Table 4.12.2 (a) : Statewise 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 (Gondawana)**	1-1-2003	7944	6122	2518	16584
		1-1-2004	8091	6092	2514	16697
		1-1-2005	8263	6079	2584	16926
		1-1-2006	8403	6158	2585	17146
		1-4-2007	8791	6266	2658	17715
		1-4-2008	9007	6711	2979	18697
		1-4-2009	9194	6748	2985	18927
		1-4-2010	9257	9730	3029	22016
		1-4-2011	9297	9728	3029	22054
		1-4-2012	9567	9554	3034	22155
2	**Arunachal Pradesh (Tertiary)**	1-1-2003	31	40	19	90
		1-1-2004	31	40	19	90
		1-1-2005	31	40	19	90
		1-1-2006	31	40	19	90
		1-1-2007	31	40	19	90
		1-1-2008	31	40	19	90
		1-1-2009	31	40	19	90
		1-1-2010	31	40	19	90
		1-1-2011	31	40	19	90
		1-1-2012	31	40	19	90
3	**Assam (Tertiary)**	1-1-2003	279	27	34	340
		1-1-2004	279	27	34	340
		1-1-2005	279	24	34	337
		1-1-2006	315	24	34	373
		1-1-2007	315	24	34	373
		1-1-2008	315	24	34	373
		1-1-2009	349	33	3	385
		1-1-2010	349	33	3	385
		1-1-2011	465	43	3	511
		1-1-2012	465	43	3	511
4	**Assam (Gondawana)**	1-1-2005	0	3	0	3
		1-1-2006	0	3	0	3
		1-1-2007	0	3	0	3
		1-4-2008	0	3	0	3
		1-4-2009	0	3	0	3
		1-4-2010	0	3	0	3
		1-4-2011	0	3	0	3
		1-4-2012	0	3	0	3

Sl No.	State	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
5	**Jharkhand (Gondawana)**	1-1-2003	35266	29552	6326	71144
		1-1-2004	35305	30211	6348	71864
		1-1-2005	35417	30438	6348	72203
		1-1-2006	36148	31411	6338	73897
		1-4-2007	36960	31094	6338	74392
		1-4-2008	37493	31629	6338	75460
		1-4-2009	39479	30894	6338	76711
		1-4-2010	39633	30992	6338	76963
		1-4-2011	39761	32592	6584	78937
		1-4-2012	40163	33609	6584	80356
6	**Bihar (Gondawana)**	1-1-2003	0	0	160	160
		1-1-2004	0	0	160	160
		1-1-2005	0	0	160	160
		1-1-2006	0	0	160	160
		1-4-2007	0	0	160	160
		1-4-2008	0	0	160	160
		1-4-2009	0	0	160	160
		1-4-2010	0	0	160	160
		1-4-2011	0	0	160	160
		1-4-2012	0	0	160	160
7	**Madhya Pradesh (Gondawana)**	1-1-2003	7100	7888	3217	18205
		1-1-2004	7503	8233	2924	18660
		1-1-2005	7513	8815	2904	19232
		1-1-2006	7566	9258	2934	19758
		1-1-2007	7842	9723	2782	20347
		1-1-2008	7896	9882	2782	20560
		1-1-2009	8041	10295	2645	20981
		1-1-2010	8505	11267	2216	21988
		1-1-2011	8871	12192	2063	23126
		1-1-2012	9309	12291	2777	24377
8	**Chhatisgarh (Gondawana)**	1-1-2003	8561	25410	4165	38136
		1-1-2004	8771	26419	4355	39545
		1-1-2005	9373	26191	4411	39975
		1-1-2006	9570	27433	4439	41442
		1-1-2007	9973	27035	4443	41451
		1-1-2008	10419	29272	4443	44134
		1-1-2009	10911	29192	4381	44484
		1-1-2010	12441	30230	4011	46682
		1-1-2011	12789	32390	4011	49190
		1-1-2012	13988	33448	3410	50846

Sl No.	State	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
9	**Maharashtra (Gondawana)**	1-1-2003	4508	2151	1534	8193
		1-1-2004	4652	2156	1605	8413
		1-1-2005	4652	2309	1620	8581
		1-1-2006	4652	2432	1992	9076
		1-1-2007	4856	2822	1992	9670
		1-1-2008	5004	2822	1992	9818
		1-1-2009	5255	2907	1992	10154
		1-1-2010	5360	2984	1965	10309
		1-1-2011	5490	3094	1950	10534
		1-1-2012	5667	3104	2110	10881
10	**Meghalaya (Tertiary)**	1-1-2003	118	41	301	460
		1-1-2004	118	41	301	460
		1-1-2005	118	41	301	460
		1-1-2006	118	41	301	460
		1-1-2007	118	41	301	460
		1-1-2008	89	70	301	460
		1-1-2009	89	17	471	577
		1-1-2010	89	17	471	577
		1-1-2011	89	17	471	577
		1-1-2012	89	17	471	577
11	**Nagaland (Tertiary)**	1-1-2003	3	1	15	19
		1-1-2004	4	1	15	20
		1-1-2005	4	1	15	20
		1-1-2006	4	1	15	20
		1-1-2007	3	1	15	19
		1-1-2008	3	1	15	19
		1-1-2009	9	0	13	22
		1-1-2010	9	0	307	316
		1-1-2011	9	0	307	316
		1-1-2012	9	0	307	316
12	**Odisha (Gondawana)**	1-1-2003	14301	29516	15285	59102
		1-1-2004	14613	31239	15135	60987
		1-1-2005	15161	30976	14846	60983
		1-1-2006	16911	30793	14297	62001
		1-1-2007	17465	31455	14314	63234
		1-1-2008	19222	31728	14314	65264
		1-1-2009	19944	31484	13799	65227
		1-1-2010	21507	32074	12726	66307
		1-1-2011	24492	33987	10680	69159
		1-1-2012	25548	36466	9434	71448
13	**Sikkim (Gondawana)**	1-1-2007	0	55	18	73
		1-1-2008	0	58	43	101
		1-1-2009	0	58	43	101
		1-1-2010	0	58	43	101
		1-1-2011	0	58	43	101
		1-1-2012	0	58	43	101

Sl No.	State	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
14	**Uttar Pradesh (Gondawana)**	1-1-2003	766	296	0	1062
		1-1-2004	766	296	0	1062
		1-1-2005	766	296	0	1062
		1-1-2006	766	296	0	1062
		1-1-2007	766	296	0	1062
		1-1-2008	766	296	0	1062
		1-1-2009	766	296	0	1062
		1-1-2010	866	196	0	1062
		1-1-2011	866	196	0	1062
		1-1-2012	884	178	0	1062
15	**West Bengal (Gondawana)**	1-1-2003	11207	11570	1062	23839
		1-1-2004	11383	11523	4488	27394
		1-1-2005	11383	11876	4553	27812
		1-1-2006	11383	11879	4553	27815
		1-1-2007	11454	11810	5071	28335
		1-1-2008	11584	11680	5071	28335
		1-1-2009	11653	11603	5071	28327
		1-1-2010	11753	13030	5071	29854
		1-1-2011	11753	13132	5071	29956
		1-1-2012	12425	13358	4832	30615
16	**Gondawana**	1-1-2008	101391	124081	38121	263593
		1-1-2009	105243	123480	37415	266138
		1-1-2010	109320	130564	35559	275443
		1-1-2011	114002	137471	34390	285863
		1-1-2012	118145	142169	33183	293497
17	**Tertiary Coalfields**	1-1-2005	432	106	369	907
		1-1-2006	468	106	369	943
		1-1-2007	467	106	369	942
		1-1-2008	438	135	369	942
		1-1-2009	478	90	506	1074
		1-1-2010	478	90	799	1367
		1-1-2011	594	99	799	1492
		1-1-2012	594	99	799	1492
India (Total)		**1-1-2003**	**90085**	**112613**	**38050**	**240748**
		1-1-2004	**91516**	**116281**	**37901**	**245698**
		1-1-2005	**92960**	**117090**	**37796**	**247846**
		1-1-2006	**95867**	**119769**	**37667**	**253303**
		1-1-2007	**98573**	**120665**	**38144**	**257382**
		1-1-2008	**101829**	**124216**	**38490**	**264535**
		1-1-2009	**105720**	**123570**	**37921**	**267211**
		1-1-2010	**109798**	**130654**	**36359**	**276811**
		1-1-2011	**114002**	**137471**	**34390**	**285863**
		1-1-2012	**118145**	**142169**	**33183**	**293497**

Note: (i) Data may not add up to respective total due to rounding off.
(ii) Singrimari coalfield of Assam (Non- coking) is included in Gondawana coalfield, not considered in Gondawana coalfield, not considered in Tertiary coalfields.
Source : Geological Survey of India

Table 4.12.2(b) : 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	1-1-2003	4614	699	0	**5313**
		1-1-2004	4614	699	0	**5313**
		1-1-2005	4614	699	0	**5313**
		1-1-2006	4614	699	0	**5313**
		1-4-2007	4614	699	0	**5313**
		1-4-2008	4614	699	0	**5313**
		1-4-2009	4614	699	0	**5313**
		1-4-2010	4614	699	0	**5313**
		1-4-2011	4614	699	0	**5313**
		1-4-2012	4614	699	0	**5313**
		1-4-2013	4614	699	0	**5313**
	II. Medium coking	1-1-2003	11325	11839	1889	**25053**
		1-1-2004	11325	11839	1889	**25053**
		1-1-2005	11417	11765	1889	**25070**
		1-1-2006	11445	11751	1881	**25077**
		1-4-2007	11853	11601	1880	**25334**
		1-4-2008	12308	12136	1880	**26324**
		1-4-2009	12448	12064	1880	**26393**
		1-4-2010	12573	11940	1880	**26393**
		1-4-2011	12573	12001	1880	**26454**
		1-4-2012	12837	11951	1800	**26669**
		1-4-2013	13269	11893	1879	**27041**
	III. Blendable/semi-coking	1-1-2003	482	907	222	**1610**
		1-1-2004	482	1003	222	**1707**
		1-1-2005	482	1003	222	**1707**
		1-1-2006	482	1003	222	**1707**
		1-4-2007	482	1003	222	**1707**
		1-4-2008	482	1003	222	**1707**
		1-4-2009	482	1003	222	**1707**
		1-4-2010	482	1003	222	**1707**
		1-4-2011	482	1003	222	**1707**
		1-4-2012	482	1003	222	**1707**
		1-4-2013	482	1003	222	**1707**
2	**Non-coking** (Including High Sulphur)	1-1-2003	73664	99168	35940	**208772**
		1-1-2004	75096	102736	35787	**213619**
		1-1-2005	76447	103623	35686	**215756**
		1-1-2006	78858	106210	35195	**220263**
		1-4-2007	81624	107362	36042	**225027**
		1-4-2008	84425	110378	36388	**231191**
		1-4-2009	88175	109804	35819	**233798**
		1-4-2010	92129	117012	34257	**243398**
		1-4-2011	96333	123768	32287	**252388**
		1-4-2012	100211	128515	31082	**259808**
		1-4-2013	104816	129037	30999	**264852**
	Total	**1-1-2003**	**90085**	**112613**	**38050**	**240748**
		1-1-2004	**91517**	**116277**	**37898**	**245692**
		1-1-2005	**92960**	**117090**	**37797**	**247847**
		1-1-2006	**95399**	**119663**	**37298**	**252360**
		1-4-2007	**98573**	**120665**	**38144**	**257382**
		1-4-2008*	**101829**	**124216**	**38490**	**264535**
		1-4-2009 *	**105720**	**123570**	**37921**	**267211**
		1-4-2010*	**109798**	**130654**	**36359**	**276811**
		1-4-2011 *	**114002**	**137471**	**34389**	**285862**
		1-4-2012*	**118145**	**142169**	**33183**	**293497**
		1-4-2013*	**123182**	**142632**	**33100**	**298914**

Source : Office of the Coal Controller, Kolkata

* Including Sikkim

Table 4.12.3:Estimated potential for renewable energy technologies in india

Sl. No.	Resource	Estimated Potential (In $MW_{eq.}$)
1	Solar Energy	20 MW/sq.km
2	Wind Power	48,500[2]
3	Small Hydro Power (up to 25 MW)	15,000[3]
4	Bio Power	
	Agro- Residues	16,000[4]
	Cogeneration-Bagasse	5,000[5]
	Waste to Enegry	
	- Municipal Solid Waste to Energy	1700[6]
	-Industrial Waste to Energy	1,000
	Total	87,200[7]

Source: Ministry of Non-Conventional Energy Sources

(1): Not all of this potential may be suitable for grid -interactive power for technical and/or economic reasons.

(2): Potential based on areas having wind power denisty (wpd) greater than 200 W/m^2 assuming land availablity in potential areas @ 1% and requirement of wind farms @ 12 ha/MW. The lower end of the potential might be suitable for off-grid applications.

(3): Technically feasible hydro potential of all sites upto 25 MW station capacity.

(4): Based on surplus agro-residues,

(5): With new sugar mills and modernization of existing ones, technically feasible potential is assessed at 5000Mwe.

(6): With expansion of urban population post census 2001, current technically feasible municipal waste-to energy potential is assessed at 1700 Mwe,

(7): Estimates do not include potential for solar power that is dependent on future developments that might make solar technology cost-competitive for grid -interactive power generation applications.

4.12.4 The State wise inventory of geological reserves of coal is in table 4.12.2 according to types over a period from 2003- 2010

Table 4.12.4 :Productivity in coal mines

(Tonnes)

Sl. No.	State	2007						2008						2009						2010					
		Output Per Man Year			Output Per Manshift			Output Per Man Year			Output Per Manshift			Output Per Man Year			Output Per Manshift			Output Per Man Year			Output Per Manshift		
		Belowground	Open cast	Overall	Belowground	Open cast	Overall	Belowground	Opencast	Overall	Belowground	Opencast	Overall	Belowground	Open cast	Overall	Belowground	Open cast	Overall	Belowground	Opencast	Overall	Belowground	Open cast	Overall
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
I	**COAL**	**331**	**5409**	**1219**	**1.05**	**16.31**	**3.8**	355	**5861**	**1328**	**1.12**	**17.54**	**4.12**	**359**	**6358**	**1459**	**1.15**	**19.25**	**4.55**	**385**	**6702**	**1592**	**1.21**	**20.29**	**4.94**
1	Andhra Pradesh	363	4404	818	1.19	13.54	2.66	370	4023.00	835.00	1.21	12.20	2.69	378	3873	976	1.26	12.75	3.24	475	4146	1074	1.57	12.91	3.49
2	Assam	87	1170	363	0.27	3.82	1.15	66	1258.00	400.00	0.21	4.10	1.29	x	1324	578	x	4.19	1.85	1	1231	503	0.00	3.95	1.61
3	Chhattisgarh	538	12735	2578	1.57	37.06	7.53	622	16087.00	2920.00	1.82	46.43	8.52	615	16522	3237	1.80	48.05	9.50	656	20285	3835	1.89	59.74	11.14
4	Jharkhand	200	2882	776	0.66	8.80	2.48	329	3647.00	980.00	0.79	11.07	3.11	257	4091	1089	0.85	12.35	3.45	215	4515	1213	0.71	13.71	3.84
5	Jammu & Kashmir	28	2	21	0.09	0.01	0.07	25	x	19.00	0.08	x	0.06	35	x	28	0.12	x	0.09	40	x	32	0.13	x	0.14
6	Madhya Pradesh	505	4938	1149	1.54	14.43	3.47	516	5107.00	1291.00	1.56	14.88	3.86	523	6003	1296	1.60	17.50	3.91	532	6094	1353	1.61	18.04	4.09
7	Maharashtra	422	4691	1286	1.26	14.38	3.87	428	4926.00	1262.00	1.27	14.62	3.75	376	5279	1323	1.11	15.37	3.86	391	5643	1491	1.17	16.65	4.39
8	Odisha	486	12844	5068	1.51	36.43	14.83	535	12283.00	5227.00	1.68	35.80	15.64	530	12113	5447	1.66	35.08	16.22	549	11986	5502	1.68	35.31	16.42
9	Uttar Pradesh	x	5241	3421	x	16.59	10.79	x	5920.00	3906.00	x	18.08	11.99	x	7472	4128	x	23.48	12.73	x	5822	3630	x	18.14	11.27
10	West Bengal	216	3297	339	0.68	10.08	1.06	212	3222.00	351.00	0.67	9.86	1.10	219	3664	369	0.70	11.36	1.18	214	3287	369	0.67	10.23	1.16
11	Meghalaya	x	13067	11876	x	36.6	33.27	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II	**LIGNITE**	**x**	**3700**	**2658**	**x**	**11.49**	**8.30**	x	**4236**	**2575**	**x**	**13.28**	**7.94**	**x**	**3988**	**2470**	**x**	**13.00**	**7.83**	**x**	**4201**	**2592**	**x**	**13.35**	**8.04**
1	Gujarat	x	9838	5949	x	33.85	20.62	x	11047	6292	x	35.44	20.37	x	7994	4869	x	25.56	15.70	x	6178	4810	x	19.33	15.08
2	Rajasthan	x	2991	1795	x	9.91	5.95	x	4561	3176	x	14.81	10.32	x	4097	2842	x	13.34	9.82	x	3769	3035	x	11.03	9.07
3	Tamil Nadu	x	2829	2098	x	8.66	6.43	x	3187	1947	x	9.94	5.95	x	3222	1994	x	10.54	6.28	x	3535	2005	x	11.35	6.22

Source : Directorate General of Mines Safety, Dhanbad, Ministry of Labour & Employment

Table 4.12.5 : Production of coal from opencast working by mechanisation and overburden removed

(Tonnes)

Sl. No.	States	2007				2010			
		Total Opencast Output	Output by Mechanisation		Overburden Removed (in '000 Cubic metres)	Total Opencast Output	Output by Mechanisation		Overburden Removed (in '000 Cubic metres)
			Fully Mechanised	Manual/ Semi Mechanised			Fully Mechanised	Manual/ Semi Mechanised	
1	2	3	4	5	6	7	8	9	10
I	**COAL**	**384811855**	**384433804**	**378051**	**4417028**	**494324349**	**494324349**	**c**	**984529**
1	Andhra Pradesh	30619998	30619998	x	905890	52367817	52367817	x	263924
2	Assam	892569	892569	x	640634	1063456	1063456	x	10587
3	Chhattisgarh	75723917	75723917	x	55692	109416349	109416349	x	91162
4	Jharkhand	78441157	78441157	x	965546	105490071	105490071	x	224933
5	Jammu & Kashmir	101	x	101	x	x	x	x	x
6	Madhya Pradesh	39614889	39512889	102000	119826	46683235	46683235	x	135354
7	Maharashtra	31234651	30958701	275950	404209	35480221	35480221	x	82989
8	Odisha	82072022	82072022	x	55692	101553878	101553878	x	65088
9	Uttar Pradesh	23040000	23040000	x	65672	28405000	28405000	x	80784
10	West Bengal	13137283	13137283	x	1197407	13864322	13864322	x	29708
11	Meghalaya	10035268	10035268	x	6460	x	x	x	x
II	**LIGNITE**	**34009726**	**34009726**	x	**200746**	**37333796**	**37333796**	x	220789
1	Gujarat	11195637	11195637	x	43664	13611067	13611067	x	**56878**
2	Rajasthan	493509	493509	x	8494	1496274	1496274	x	11218
3	Tamilnadu	22320580	22320580	x	148588	22226455	22226455	x	152693

Source : Directorate General of Mines Safety, Dhanbad

Table 4.12.6 : Domestic production of petroleum products in India

('000 Tonne)

Sl. No.	Year	Light Distillates			Middle Distillates			
		Liquified Petroleum Gas @	Motor Gasoline (Petrol)	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	39052	1481
32	2001-02	4778	9699	9180	9681	2595	39899	1703
33	2002-03	4903	10361	9650	10028	3053	40207	2079
34	2003-04	5348	10999	11317	10187	4289	43316	1659
35	2004-05	5570	11057	14100	9298	5201	45903	1546
36	2005-06	5525	10502	14509	9078	6196	47572	923
37	2006-07	6315	12539	16660	8491	7805	53465	803
38	2007-08*	6732	14167	16440	7794	9107	58361	671
39	2008-09	6996	16020	14826	8223	8071	62889	606
40	2009-10	8091	22537	17105	8545	9296	73281	472
41	2010-11	7541	26138	17535	7702	9570	78040	590
42	2011-12(P)	7335	26890	17176	7475	10057	81901	502

@ : Excludes LPG production from natural gas. (contd…)

Source : Ministry of Petroleum & Natural Gas. Basic statistics on Indian petroleum & natural gas 2011-12

* : Estimated from calendar year figures

(P) : Provisional

Table 4.12.6 : Domestic production of petroleum products in India - concluded

('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	17860
4	1973-74	3931	318	131	1093	1072	19495
5	1974-75	4243	387	137	873	668	19611
6	1975-76	5083	342	160	697	436	20829
7	1976-77	4728	368	163	945	511	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	4518	95614
32	2001-02	12227	651	2784	2561	4246	100004
33	2002-03	12167	684	2659	2941	5408	104140
34	2003-04	13372	666	2743	3397	6170	113463
35	2004-05	14970	646	3162	3349	3777	118579
36	2005-06	14305	677	3182	3576	3705	119750
37	2006-07	15697	825	3779	3891	4990	135260
38	2007-08*	15804	881	4129	4507	6337	144930
39	2008-09	17684	874	4241	4713	5373	150516
40	2009-10	18346	950	4889	3709	12547	179768
41	2010-11	NA	884	2711	4476	NA	
42	2011-12 (P)	NA	994	4480	4610	NA	

Source : Ministry of Petroleum & Natural Gas.

* : Estimated from calendar year figures

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

(P) : Provisional N.A: Not available

Table 4.12.7: 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	22946	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	32160	20699	52859	48562	6012	54574
22	1991-92	30345	23994	54339	48349	6509	54858
23	1992-93	26950	29247	56197	50359	7564	57923
24	1993-94	27026	30822	57848	51084	8042	59126
25	1994-95	32494	27349	59843	52927	10697	63624
26	1995-96	35168	27342	62510	55081	16900	71981
27	1996-97	32900	33906	66806	59005	17103	76108
28	1997-98	33858	34493	68351	61308	20589	81897
29	1998-99	32722	39808	72530	64544	23052	87596
30	1999-00	31949	57805	89754	79411	15862	95273
31	2000-01	32426	74097	106523	95614	902	96516
32	2001-02	32032	78706	110738	100004	-3056	96948
33	2002-03	33044	81989	115033	104140	-3061	101079
34	2003-04	33373	90434	123807	113463	-6619	106844
35	2004-05	33981	95861	129842	118579	-9383	109196
36	2005-06	32190	99409	131599	119750	-10020	109730
37	2006-07	33988	11502	145490	135260	-15758	119296
38	2007-08	34118	121672	155791	144930	-18377	126612
39	2008-09	33508	132775	166283	150516	-20378	132271
40	2009-10	33690	159259	192949	179768	-36309	143456
41	2010-11	37684	163595	201306	190316	-42262	148570
42	2011-12(P)	38090	17129	20961	196707	-45840	150867

Source : Ministry of Petroleum & Natural Gas.

(P) : Provisional

'@ :Excludes LPG production from natural gas.

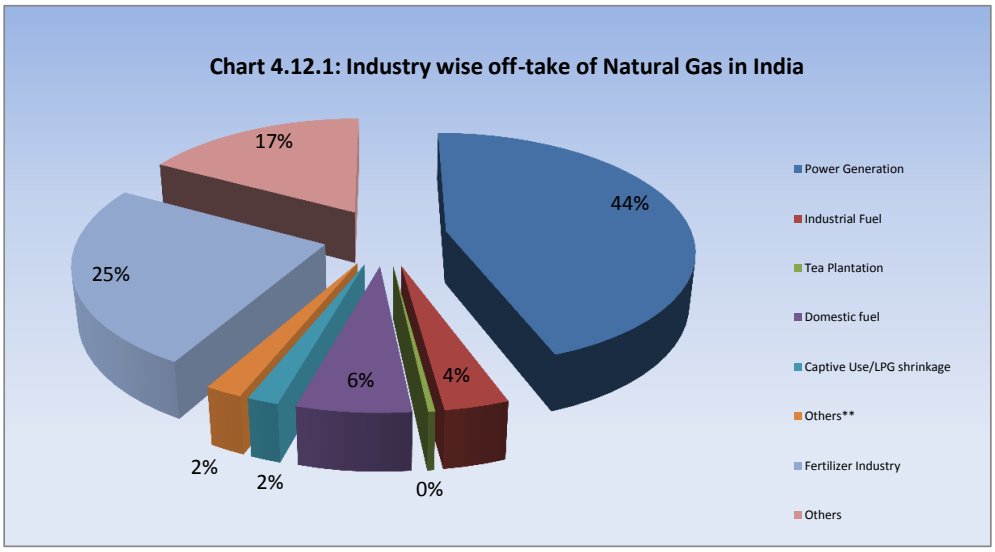
In addition to the domestic production, Crude oil and Petroleum products are imported also, the details of which over the years is shown in table 4.12.7

4.12.10 **Natural gas is also an important fuel in India as evident from the following table 4.12.8.**

Source: Basic Statistics on Indian Petroleum amd natural gas , Ministry of petroleum and natural gas

The details of production and utilization of Natural Gas in India from 1970-71 to 2008-09 is depicted in Table 4.12.8

As evident from the chart 4.12.1 in India, 38.2% of natural gas is being utilized by power generation sector followed by fertilizer industry (27.53%) and as industrial fuel (17.92%).



The time series data of Industry wise off –take of Natural gas in India is available in table 4.12.9.

Table 4.12.8 : Gross and net production & utilisation of natural gas in India

(Million cubic metre)

Sl. No.	Year	Gross Production	Re-injected	Flarred	Net Production (Utilisation)
1	2	3	4	5	6
1	1970-71	1445	36	744	667
2	1971-72	1535	49	768	718
3	1972-73	1565	141	653	771
4	1973-74	1713	115	836	762
5	1974-75	2041	139	951	951
6	1975-76	2368	160	1084	1124
7	1976-77	2428	190	857	1381
8	1977-78	2839	184	1191	1464
9	1978-79	2812	148	953	1711
10	1979-80	2767	127	964	1676
11	1980-81	2358	43	793	1522
12	1981-82	3851	110	1519	2222
13	1982-83	4936	91	1888	2957
14	1983-84	5961	45	2515	3401
15	1984-85	7241	48	3052	4141
16	1985-86	8134	66	3118	4950
17	1986-87	9853	63	2715	7075
18	1987-88	11467	54	3445	7968
19	1988-89	13217	84	3883	9250
20	1989-90	16988	96	5720	11172
21	1990-91	17998	102	5131	12765
22	1991-92	18644	132	4072	14410
23	1992-93	18061	90	1854	16117
24	1993-94	18336	71	1924	16341
25	1994-95	19468	23	2108	17337
26	1995-96	22642	0	1710	20932
27	1996-97	23256	0	1932	21354
28	1997-98	26401	0	1856	24545
29	1998-99	27428	0	1722	25706
30	1999-00	28446	0	1561	26886
31	2000-01	29477	0	1617	27860
32	2001-02	29714	0	1677	28037
33	2002-03	31389	0	1426	29963
34	2003-04	31962	0	1056	30906
35	2004-05	31763	0	988	30775
36	2005-06	32202	0	877	31325
37	2006-07	31747	0	956	30791
38	2007-08	32417	0	938	31479
39	2008-09	32845	0	1099	31746
40	2009-10	47496	0	990	46521
41	2010-11	52219	0	970	51248
42	2011-12(P)	47559	0	970	46482

Source : Ministry of Petroleum & Natural Gas.
(P) : Provisional

Table 4.12.9 : Industry-wise off-take of natural gas in India

(Million Cubic Metre)

Sl No.	Year	Energy Purposes							Non-Energy Purposes		Grand Total
		Power Generation	Industrial Fuel	Tea Plantation	Domestic fuel	Captive Use/LPG shrinkage	Others**	Total	Fertilizer Industry	Others	
1	2	3	4	5	6	7	8	9	10	11	12
1	1970-71	261	116	15	-	68	-	460	187	-	647
2	1971-72	313	129	19	-	61	-	522	196	-	718
3	1972-73	339	148	20	Neg	63	-	570	201	-	771
4	1973-74	323	157	22	Neg	81	-	583	179	-	762
5	1974-75	354	164	29	6	80	-	633	318	-	951
6	1975-76	368	143	33	13	104	-	661	463	2	1126
7	1976-77	344	155	38	15	142	-	694	663	24	1381
8	1977-78	372	165	39	13	171	-	760	673	31	1464
9	1978-79	560	175	43	13	176	-	967	721	23	1711
10	1979-80	514	158	39	16	174	-	901	755	25	1681
11	1980-81	492	163	45	14	176	-	890	611	21	1522
12	1981-82	612	166	47	15	364	-	1204	991	27	2222
13	1982-83	1025	185	51	14	499	-	1774	1155	28	2957
14	1983-84	1209	230	58	16	572	-	2085	1283	33	3401
15	1984-85	1454	250	62	18	721	-	2505	1603	33	4141
16	1985-86	1299	223	78	21	795	-	2416	2500	34	4950
17	1986-87	2041	257	96	25	1295	-	3714	3335	26	7075
18	1987-88	2721	281	99	34	1313	-	4448	3490	30	7968
19	1988-89	1823	526	87	42	1329	-	3807	5334	109	9250
20	1989-90	2140	695	78	41	1526	-	4480	6578	114	11172
21	1990-91	3634	827	89	50	1775	-	6375	5612	779	12766
22	1991-92	4774	766	108	72	2165	-	7885	5509	1048	14442
23	1992-93	4967	1450	105	187	1916	-	8625	6672	819	16116
24	1993-94	4785	1794	121	189	2277	-	9166	6499	675	16340
25	1994-95	5229	1927	134	190	2230	-	9710	6936	691	17337
26	1995-96 $	6836	2301	111	178	589	-	10015	7602	474	18091
27	1996-97 $	6935	2631	130	184	618	-	10498	7625	509	18632
28	1997-98 $	8114	3106	117	206	569	-	12112	8752	649	21513
29	1998-99 $	8714	3005	147	193	911	-	12970	8869	650	22489
30	1999-00	8829	2329	140	250	4840	36	16424	8592	1869	26885
31	2000-01	8801	2870	151	335	5004	38	17199	8480	2181	27860
32	2001-02	9214	2979	147	485	5339	70	18234	7957	1846	28037
33	2002-03	10510	2939	119	654	5409	136	19767	7955	2242	29964
34	2003-04	11478	3099	142	93	4865	1263	20940	7889	2077	30906
35	2004-05	12099	3569	142	343	4944	231	21328	8173	1274	30775
36	2005-06	11878	3780	151	75	5048	1120	22052	7762	1211	31025
37	2006-07	11963	3205	170	443	5034	40	20855	8497	2016	31368
38	2007-08	12037	3324	160	38	1804	1324	18687	9822	2070	30579
39	2008-09	12603	5912	154	102	1885	1535	22191	9082	1716	32989
40	2009-10	21365	2322	167	246	5433	1838	31371	13168	1967	46506
41	2010-11	27415	2317	193	29	4543	1222	35719	13429	2281	51429
42	2011-12(P)	20333	1618	175	2845	784	934	26689	11330	7846	45905

Source : Ministry of Petroleum & Natural Gas.

$: Sales of City Gas Distribution Companies like IGL, MGL, Bhagyanagar Gas, TNGCL, BMC Green Gas, CUGL & GGCL . Includes Industrial sale, domestic sale and CNG sale.

(P) :Provisional ** Sponge iron use.

Table 4.13.1 : Installed capacity of power utilities on 31st March, 2013

Sl.	State/Union Territory	Thermal			Total Thermal	Nuclear	Hydro Renewable	RES** (MNRE)	Grand Total
		Coal	Gas	Diesel					
1	2	3	4	5	6	7	8	9	10
I	**Northern Region**	**32413.5**	**4781.26**	**12.99**	**37207.75**	**1620**	**15467.75**	**5589.25**	**59884.75**
1	Delhi	135	1550.4	0	1685.4	0	0	0	1685.4
1	Haryana	3160	25	3.92	3188.92	0	884.51	70.1	4143.53
3	Himachal Pradesh	0	0	0.13	0.13	0	393.6	587.91	981.64
4	Jammu & Kashmir	0	175	8.94	183.94	0	780	130.53	1094.47
5	Punjab	2630	25	0	2655	0	2230.23	244.5	5129.73
6	Rajasthan	3615	553.8	0	4168.8	0	987.96	30.25	5187.01
7	Uttar Pradesh	4923	0	0	4923	0	524.1	25.1	5472.2
8	Uttaranchal	0	0	0	0	0	1252.15	174.82	1426.97
9	Chandigarh	0	0	0	0	0	0	0	0
10	Private sector	6450	108	0	6558	0	2148	4326.04	13032.04
11	Central sector	11500.5	2344.06	0	13844.56	1620	6267.2	0	21731.76
II	**Western Region**	**49257.01**	**8988.31**	**17.48**	**58262.8**	**1840**	**7447.5**	**8986.93**	**76537.23**
1	Goa	0	0	0	0	0	0	0.05	0.05
2	Daman & Diu	0	0	0	0	0	0	0	0
3	Gujarat	4470	1594.72	17.28	6082	0	772	32.9	6886.9
4	Madhya Pradesh	2995	0	0	2995	0	1703.66	86.16	4784.82
5	Chhatisgharh	2280	0	0	2280	0	120	52	2452
6	Maharashtra	8400	672	0	9072	0	2884.84	303.75	12260.59
7	Dadra & Nagar Haveli	0	0	0	0	0	0	0	0
8	Private sector	19374	3188	0.2	22562.2	0	447	8512.07	31521.27
9	Central sector	11738.01	3533.59	0	15271.6	1840	1520	0	18631.6
III	**Southern Region**	**25032.5**	**4962.78**	**939.32**	**30934.6**	**1320**	**11353.03**	**12251.85**	**55859.48**
1	Andhra Pradesh	5092.5	0	0	5092.5	0	3734.53	223.03	9050.06
2	Karnataka	2720	0	127.92	2847.92	0	3599.8	901.35	7349.07
3	Kerala	0	0	234.6	234.6	0	1881.5	174.73	2290.83
4	Tamil Nadu	4170	523.2	0	4693.2	0	2137.2	118.55	6948.95
5	NLC	0	0	0	0	0	0	0	0
6	Puducherry	0	32.5	0	32.5	0	0	0	32.5
7	Private sector	2910	4047.5	576.8	7534.3	0	0	10834.19	18368.49
8	Central sector	10140	359.58	0	10499.58	1320	0	0	11819.58
IV	**Eastern Region**	**23457.88**	**190**	**17.2**	**23665.08**	**0**	**3981.12**	**454.91**	**28101.11**
1	Bihar	430	0	0	430	0	0	70.7	500.7
2	Jharkhand	1190	0	0	1190	0	130	4.05	1324.05
3	West Bengal	4970	100	12.06	5082.06	0	977	143.4	6202.46
4	D.V.C.	0	0	0	0	0	0	0	0
5	Odisha	420	0	0	420	0	2061.92	64.3	2546.22
6	Sikkim	0	0	5	5	0	0	52.11	57.11
7	Private sector	5771.38	0	0.14	5771.52	0	0	120.35	5891.87
8	Central sector	10676.5	90	0	10766.5	0	812.2	0	11578.7
V	**North-Eastern Region**	**60**	**1187.5**	**142.74**	**1390.24**	**0**	**1242**	**252.68**	**2884.92**
1	Assam	60	276.2	20.69	356.89	0	100	31.11	488
2	Arunachal Pradesh	0	0	15.88	15.88	0	0	103.91	119.79
3	Meghalaya	0	0	2.05	2.05	0	282	31.03	315.08
4	Tripura	0	148.5	4.85	153.35	0	0	16.01	169.36
5	Manipur	0	0	45.41	45.41	0	0	5.45	50.86
6	Nagaland	0	0	2	2	0	0	28.67	30.67
7	Mizoram	0	0	51.86	51.86	0	0	36.47	88.33
8	Private sector	0	24.5	0	24.5	0	0	0.03	24.53
9	Central sector	0	738.3	0	738.3	0	860	0	1598.3
	State	**0**	**0**	**70.02**	**70.02**	**0**	**0**	**6.1**	**76.12**
	Andaman & State	0	0	40.05	40.05	0	0	5.25	45.3
	lakshadweep State	0	0	9.97	9.97	0	0	0	9.97
	Private sector	0	0	20	20	0	0	0.85	20.85
	Central sector	0	0	0	0	0	0	0	0
	All INDIA	**130220.9**	**20109.85**	**1199.75**	**151530.5**	**4780**	**39491.4**	**27541.72**	**223343.6**

Renewable Energy Sources (RES) include SHP, BP, U&I,Solar and Wind Energy

Table 4.13.1 : Installed capacity of power utilities on 31st March, 2012

Sl.	State/Union Territory	Thermal			Total Thermal	Nuclear	Hydro Renewable	RES** (MNRE)	Grand Total
		Coal	Gas	Diesel					
1	2	3	4	5	6	7	8	9	10
I	**Northern Region**	**28357.5**	**4421.26**	**12.99**	**32791.75**	**1620**	**15122.75**	**4391.4**	**53925.9**
1	Delhi	135	1300.4	0	1435.4	0	0	0	1435.4
1	Haryana	3160	25	3.92	3188.92	0	884.51	70.1	4143.53
3	Himachal Pradesh	0	0	0.13	0.13	0	393.6	527.66	921.39
4	Jammu & Kashmir	0	175	8.94	183.94	0	780	130.53	1094.47
5	Punjab	2630	25	0	2655	0	2230.23	244.5	5129.73
6	Rajasthan	3615	443.8	0	4058.8	0	987.96	30.25	5077.01
7	Uttar Pradesh	4267	0	0	4267	0	524.1	25.1	4816.2
8	Uttaranchal	0	0	0	0	0	1252.15	170.82	1422.97
9	Chandigarh	0	0	0	0	0	0	0	0
10	Private sector	4050	108	0	4158	0	2078	3192.44	9428.44
11	Central sector	10500.5	2344.06	0	12844.56	1620	5992.2	0	20456.76
II	**Western Region**	**38924.5**	**8254.81**	**17.48**	**47196.79**	**1840**	**7447.5**	**7909.95**	**64394.24**
1	Goa	0	0	0	0	0	0	0.05	0.05
2	Daman & Diu	0	0	0	0	0	0	0	0
3	Gujarat*	4220	1243.72	17.28	5481	0	772	32.9	6285.9
4	Madhya Pradesh	2807.5	0	0	2807.5	0	1703.66	86.76	4597.92
5	Chhatisgharh	2060	0	0	2060	0	120	20.25	2200.25
6	Maharashtra	8650	672	0	9322	0	2884.84	286.73	12493.57
7	Dadra & Nagar Haveli	0	0	0	0	0	0	0	0
8	Private sector	12389	2805.5	0.2	15194.7	0	447	7483.26	23124.96
9	Central sector	8798	3533.59	0	12331.59	1840	1520	0	15691.59
III	**Southern Region**	**22882.5**	**4690.78**	**939.32**	**28512.6**	**1320**	**11338.03**	**11569.3**	**52739.93**
1	Andhra Pradesh	5092.5	0	0	5092.5	0	3734.53	221.83	9048.86
2	Karnataka	2720	0	127.92	2847.92	0	3599.8	823.65	7271.37
3	Kerala	0	0	234.6	234.6	0	1881.5	162.66	2278.76
4	Tamil Nadu	2970	523.2	0	3493.2	0	2122.2	118.55	5733.95
5	NLC	0	0	0	0	0	0	0	0
6	Puducherry	0	32.5	0	32.5	0	0	0	32.5
7	Private sector	2460	3775.5	576.8	6812.3	0	0	10242.61	17054.91
8	Central sector	9640	359.58	0	9999.58	1320	0	0	11319.58
IV	**Eastern Region**	**21797.88**	**190**	**17.2**	**22005.08**	**0**	**3882.12**	**398.71**	**26285.91**
1	Bihar	430	0	0	430	0	0	64.3	494.3
2	Jharkhand	1190	0	0	1190	0	130	4.05	1324.05
3	West Bengal	5030	100	12.06	5142.06	0	977	143.4	6262.46
4	D.V.C.	0	0	0	0	0	0	0	0
5	Odisha	420	0	0	420	0	2061.92	64.3	2546.22
6	Sikkim	0	0	5	5	0	0	52.11	57.11
7	Private sector	4551.38	0	0.14	4551.52	0	0	70.55	4622.07
8	Central sector	10176.5	90	0	10266.5	0	713.2	0	10979.7
V	**North-Eastern Region**	**60**	**824.2**	**142.74**	**1026.94**	**0**	**1200**	**228**	**2454.94**
1	Assam	60	276.2	20.69	356.89	0	100	31.11	488
2	Arunachal Pradesh	0	0	15.88	15.88	0	0	79.23	95.11
3	Meghalaya	0	0	2.05	2.05	0	240	31.03	273.08
4	Tripura	0	148.5	4.85	153.35	0	0	16.01	169.36
5	Manipur	0	0	45.41	45.41	0	0	5.45	50.86
6	Nagaland	0	0	2	2	0	0	28.67	30.67
7	Mizoram	0	0	51.86	51.86	0	0	36.47	88.33
8	Private sector	0	24.5	0	24.5	0	0	0.03	24.53
9	Central sector	0	375	0	375	0	860	0	1235
	State	**0**	**0**	**70.02**	**70.02**	**0**	**0**	**6.1**	**76.12**
	Andaman & State	0	0	40.05	40.05	0	0	5.25	45.3
	lakshadweep State	0	0	9.97	9.97	0	0	0	9.97
	Private sector	0	0	20	20	0	0	0.85	20.85
	Central sector	0	0	0	0	0	0	0	0
	ALL INDIA	**112022.38**	**18381.05**	**1199.75**	**131603.18**	**4780.00**	**38990.40**	**24503.46**	**199877.04**

Renewable Energy Sources (RES) include SHP, BG, BP, U&I,Solar and Wind Energy

4. 13 Power Sector

4.13.1 Though electricity is a major factor of development in all sectors, the role of power generating plants on environmental pollution can not be ignored at all. In the following sections, data depicting the growth of power generation sector in India are discussed.

4.13.2 **The State /UT wise installed capacity of power utilities (thermal, nuclear, hydro renewable, Renewable Energy Sources) in India as on 31st March 2010 is exhibited in Table 4.13.1. The table 4.13.2 shows the electricity generation in Public and Private Sector over the years.**

Table 4.13.2 : Electricity generation

(Gigawatt)

Parameter	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-2011	2011-12
1	2	3	5	6		7	8	9
Total (Utilities)	**594456.20**	**623819.53**	**670654.16**	**722625.50**	**741167.36**	**799850.60**	**844748.21**	**922451.19**
Public sector	535839.94	562056.45	603851.13	641693.47	651369.69	679932.71	703870.97	723051.66
Private sector	58616.26	61763.08	66803.03	80932.03	89797.67	119917.89	140877.24	199399.53

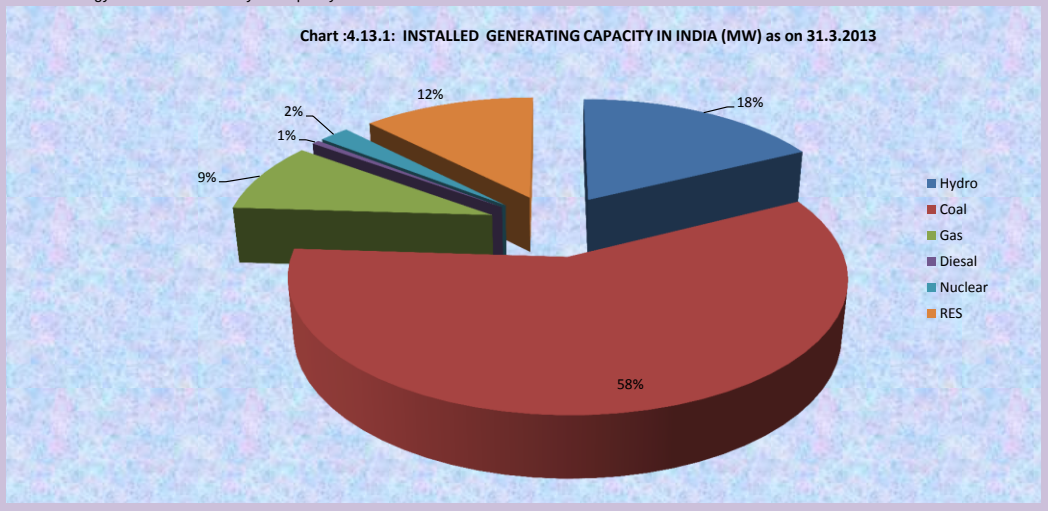
Source : Central Electricity Authority

Table 4.13.3 : Growth of installed generating capacity in India

(Megawatt)

Sr. No.	As on	Hydro	Thermal			Total	Nuclear	RES	Total
			Coal $	Gas	Diesel				
1	31.12.47	508	756	0	98	854	0	0	1362
2	31.12.50	560	1004	0	149	1153	0	0	1713
3	31.03.56	1061	1597	0	228	1825	0	0	2886
4	31.03.61	1917	2436	0	300	2736	0	0	4653
5	31.03.66	4124	4417	134	352	4903	0	0	9027
6	31.03.69	5907	6640	134	276	7050	0	0	12957
7	31.03.74	6966	8652	165	241	9058	640	0	16664
8	31.03.79	10833	14875	168	164	15207	640	0	26680
9	31.03.80	11384	15991	268	165	16424	640	0	28448
10	31.03.85	14460	26311	542	177	27030	1095	0	42585
11	31.03.90	18307	41236	2343	165	43744	1565	0	63616
12	31.03.92	19194	44791	3095	168	48054	1785	32	69065
13	31.03.97	21658	54154	6562	2947	63663	2225	902	88448
14	31.03.02	26269	62131	11163	1135	74429	2720	1628	105046
15	31.03.03	26767	63951	11633	1178	76762	2720	1628	107877
16	31.03.04	29507	64957	11840	1172	77969	2720	2488	112684
17	31.03.05	30942	67791	11910	1202	80903	2770	3811	118426
18	31.03.06	32326	68518	12690	1202	82410	3360	6191	124287
19	31.03.07	34654	71121	13692	1202	86015	3900	7760	132329
20	31.03.08	35909	76049	14656	1202	91907	4120	11125	143061
21	31.03.09	36846	77649	14876	1200	93725	4120	13242	147933
22	31.03.10 *	36863	84198	17056	1200	102454	4560	15521	159398
23	31.03.12	38990	112022	18381	1200	131603	4780	24504	199877
24	31.03.13	39491	130221	20110	1200	151531	4780	27542	223344

: RES:- Renewable Energy Sources includes Hydro capacity of 25.00 MW and below



4.13.4 **The growth of installed power generating capacity (hydro, thermal, nuclear and RES) over the years can be seen in table 4.13.3 at annexure 4.**

4.13.5 It is well known that, India is facing power shortage problem. **The region /state wise data of requirement and availability of electricity is presented in table 4.13.4 at annexure 4. The time series data of annual gross generation of power by source is available in table 4.13.5 at annexure 4.**

4.13.6 Significant efforts have gone into improving the power generation and electrification of villages in India since independence. **The progress achieved in various five year plans is depicted in table 4.13.6 at annexure 4.**

The Plan wise growth of installed capacity of power plants in India is exhibited in Chart 4.13.2.

Table 4.13.4 : Cumulative comparison of power supply position

Sl. No.	Region/ State/ System	April 2011 to March 2012			
		Requirement (MU)	Availability (MU)	Supply/ Deficit	Shortage
				(MU)	%
1	2	3	4	5	6
I.	**Northern Region**	**276121**	**258382**	**-17739**	**-6.4**
1	Chandigarh	1568	1564	-4	0.0
2	Delhi	26751	26674	-77	-0.3
3	Haryana	36874	35541	-1333	-3.6
4	Himachal Pradesh	8161	8107	-54	-0.7
5	Jammu & Kashmir	14250	10889	-3361	-23.6
6	Punjab	45191	43792	-1399	-3.1
7	Rajasthan	51474	49491	-1983	-3.9
8	Uttar Pradesh	81339	72116	-9223	-11.3
9	Uttaranchal	10513	10208	-305	-2.9
II.	**Western Region**	**290421**	**257403**	**-33018**	**-11.4**
1	Chhatisgarh	15013	14615	-398	-2.7
2	Gujarat	74696	74429	-267	-0.4
3	Madhya Pradesh	49785	41392	-8393	-16.9
4	Maharashtra	141382	117722	-23660	-16.7
5	Daman & Diu	2141	1915	-226	-10.6
6	Dadar Nagar Haveli	4380	4349	-31	-0.7
7	Goa	3024	2981	-43	-1.4
III.	**Southern Region**	**260302**	**237480**	**-22822**	**-8.8**
1	Andhra Pradeash	91730	85149	-6581	-7.2
2	Karnataka	60830	54023	-6807	-11.2
3	Kerala	19890	19467	-423	-2.1
4	Tamil Nadu	85685	76705	-8980	-10.5
5	Pondicherry	2167	2136	-31	-1.4
	Lakshedweep#	37	37	0	0.0
IV.	**Eastern Region**	**99344**	**94657**	**-4687**	**-4.7**
1	Bihar	14311	11260	-3051	-21.3
2	D.V.C.	16648	16009	-639	-3.8
3	Jharkhand	6280	6030	-250	-4.0
4	Odisha	23036	22693	-343	-1.5
	West Bengal	38679	38281	-393	-1.0
	Sikkim	390	384	-6	-1.5
	A&N Island#	244	204	-40	-16.0
V.	**North-Eastern Region**	**11011**	**9964**	**-1047**	**-9.5**
1	Arunachal Pradesh	600	553	-47	-7.8
2	Assam	6034	5696	-338	-5.6
3	Manipur	544	499	-45	-8.3
4	Meghalaya	1927	1450	-477	-24.8
5	Mizoram	987	355	-42	-10.6
6	Nagaland	560	511	-49	-8.8
7	Tripura	949	900	-49	-5.2
	All India	**937199**	**857886**	**-79313**	**-8.5**

Source : Central Electricity Authority Concluded

MU : Million Units

: Lakshadweep and Andaman & Nicobar Islands are stand-alone systems, power supply position of these does not form part of regional requirement and availability

Note : Both peak met and energy availability represent the net consumption (including the transmssion losses) in the various States. Net export has been accounted for in the comsumption of importing states.

Table 4.13.4 : Cumulative comparison of power supply position

Sl. No.	Region/ State/ System	April 2010 to March 2011			
		Requirement (MU)	Availability (MU)	Supply/ Deficit	Shortage
				(MU)	%
1	2	3	4	5	6
I.	**Northern Region**	**258780**	**237985**	**-20795**	**-8.0**
1	Chandigarh	1519	1519	0	-0.3
2	Delhi	25625	25559	-66	-5.6
3	Haryana	34552	32626	-1926	-3.4
4	Himachal Pradesh	7626	7364	-262	-25.0
5	Jammu & Kashmir	13571	10181	-3390	-6.0
6	Punjab	44484	41799	-2685	-0.9
7	Rajasthan	45261	44836	-425	-15.0
8	Uttar Pradesh	76292	64846	-11446	-6.0
9	Uttaranchal	9850	9255	-595	-6.5
II.	**Western Region**	**268488**	**232871**	**-35617**	**-13.3**
1	Chhatisgarh	10340	10165	-175	-1.7
2	Gujarat	71651	67534	-4117	-5.7
3	Madhya Pradesh	48437	38644	-9793	-20.2
4	Maharashtra	128296	107018	-21278	-16.6
5	Daman & Diu	2181	1997	-184	-8.4
6	Dadar Nagar Haveli	74429	4424	-5	-0.1
7	Goa	3154	3089	-65	-2.1
III.	**Southern Region**	**229904**	**217981**	**-11923**	**-5.2**
1	Andhra Pradeash	78970	76450	-2520	-3.2
2	Karnataka	50474	46624	-3850	-7.6
3	Kerala	18023	17767	-256	-1.4
4	Tamil Nadu	80314	75101	-5213	-6.5
5	Pondicherry	2123	2039	-84	-4.0
	Lakshedweep#	25	25	0	0.0
IV.	**Eastern Region**	**94558**	**90526**	**-4032**	**-4.3**
1	Bihar	12384	10772	-16121	-13.0
2	D.V.C.	16590	15071	-1519	-9.2
3	Jharkhand	6195	5985	-210	-3.4
4	Odisha	22506	22449	-57	-0.3
	West Bengal	36481	35847	-634	-1.7
	Sikkim	402	402	0	0.0
	A&N Island#	240	180	-60	-25.0
V.	**North-Eastern Region**	**9861**	**8992**	**-869**	**-8.8**
1	Arunachal Pradesh	511	436	-75	-14.7
2	Assam	5403	5063	-340	-6.3
3	Manipur	568	505	-63	-11.1
4	Meghalaya	1545	1352	-193	-12.5
5	Mizoram	369	315	-54	-14.6
6	Nagaland	583	520	-63	-10.8
7	Tripura	882	801	-81	-9.2
All India		**861591**	**788355**	**-73236**	**-8.5**

Source : Central Electricity Authority

Continued

MU : Million Units

: Lakshadweep and Andaman & Nicobar Islands are stand-alone systems, power supply position of these does not form part of regional requirement and availability

Note : Both peak met and energy availability represent the net consumption (including the transmssion losses) in the various States. Net export has been accounted for in the comsumption of importing states.

Table 4.13.4 : Cumulative comparison of power supply position

Sl. No.	Region/ State/ System	April 2009 to March 2010			
		Requirement (MU)	Availability (MU)	Supply/ Deficit	Shortage
				(MU)	%
1	2	3	4	5	6
I.	**Northern Region**	**254231**	**224661**	**-29570**	**-11.6**
1	Chandigarh	1576	1528	-48	-3.0
2	Delhi	24277	24094	-183	-0.8
3	Haryana	33441	32023	-1418	-4.2
4	Himachal Pradesh	7047	6769	-278	-3.9
5	Jammu & Kashmir	13200	9933	-3267	-24.8
6	Punjab	45731	39408	-6323	-13.8
7	Rajasthan	44109	43062	-1047	-2.4
8	Uttar Pradesh	75930	59508	-16422	-21.6
9	Uttaranchal	8921	8338	-583	-6.5
II.	**Western Region**	**258528**	**223127**	**-35401**	**-13.7**
1	Chhatisgarh	11009	10739	-270	-2.5
2	Gujarat	70369	67220	-3149	-4.5
3	Madhya Pradesh	43179	34973	-8206	-19.0
4	Maharashtra	124936	101512	-23424	-18.7
5	Daman & Diu	1934	1802	-132	-6.8
6	Dadar Nagar Haveli	4007	3853	-154	-3.8
7	Goa	3092	3026	-66	-2.1
III.	**Southern Region**	**220576**	**206544**	**-14032**	**-6.4**
1	Andhra Pradeash	78996	73765	-5231	-6.6
2	Karnataka	45550	42041	-3509	-7.7
3	Kerala	17619	17196	-423	-2.4
4	Tamil Nadu	76293	71568	-4725	-6.2
5	Pondicherry	2119	1975	-144	-6.8
	Lakshedweep#	24	24	0	0.0
IV.	**Eastern Region**	**87927**	**84017**	**-3910**	**-4.4**
1	Bihar	11587	9914	-1673	-14.4
2	D.V.C.	15199	14577	-622	-4.1
3	Jharkhand	5867	5407	-460	-7.8
4	Odisha	21136	20955	-181	-0.9
	West Bengal	33750	32819	-931	-2.8
	Sikkim	388	345	-43	-11.1
	A&N Island#	240	180	-60	-25.0
V.	**North-Eastern Region**	**9332**	**8296**	**-1036**	**-11.1**
1	Arunachal Pradesh	399	325	-74	-18.5
2	Assam	5122	4688	-434	-8.5
3	Manipur	524	430	-94	-17.9
4	Meghalaya	1550	1327	-223	-14.4
5	Mizoram	352	288	-64	-18.2
6	Nagaland	530	466	-64	-12.1
7	Tripura	855	771	-84	-9.8
	All India	**830594**	**746644**	**-83950**	**-10.1**

Source : Central Electricity Authority

Continued ../-

MU : Million Units

: Lakshadweep and Andaman & Nicobar Islands are stand alone systems, power supply position of these does not form part of regional,requirement and availability

Table 4.13.4 : Cumulative comparison of power supply position

Sl. No.	Region/ State/ System	April 2008 to March 2009			
		Requirement (MU)	Availability (MU)	Supply/ Deficit	Shortage
				(MU)	%
1	2	3	4	5	6
I.	**Northern Region**	**227104**	**201951**	**-25153**	**-11.1**
1	Chandigarh	1414	1414	0	0.0
2	Delhi	22398	227273	-125	-0.6
3	Haryana	29085	26625	-2460	-8.5
4	Himachal Pradesh	6260	6241	-19	-0.3
5	Jammu & Kashmir	11467	8698	-2769	-24.1
6	Punjab	41635	37238	-4397	-10.6
7	Rajasthan	37797	37388	-409	-1.1
8	Uttar Pradesh	69207	54309	-14898	-21.5
9	Uttaranchal	7841	7765	-76	-1.0
II.	**Western Region**	**254475**	**213715**	**-40760**	**-16.0**
1	Chhatisgarh	14866	14475	-391	-2.6
2	Gujarat	67482	60851	-6631	-9.8
3	Madhya Pradesh	42054	34841	-7213	-11.2
4	Maharashtra	121901	95761	-26140	-21.4
5	Daman & Diu	1797	1576	-221	-12.3
6	Dadar Nagar Haveli	3574	3457	-117	-3.3
7	Goa	2801	2754	-47	-1.7
III.	**Southern Region**	**204012**	**188794**	**-15218**	**-7.5**
1	Andhra Pradeash	71511	66673	-4838	-6.8
2	Karnataka	43168	40578	-2590	-6.0
3	Kerala	17645	15562	-2083	-11.8
4	Tamil Nadu	69668	64208	-5460	-7.8
5	Pondicherry	2020	1773	-247	-12.2
	Lakshedweep#	24	24	0	0.0
IV.	**Eastern Region**	**82041**	**78444**	**-3597**	**-4.4**
1	Bihar	10527	8801	-1726	-16.4
2	D.V.C.	14002	13699	-303	-2.2
3	Jharkhand	5361	5110	-251	-4.7
4	Odisha	20519	20214	-305	-1.5
	West Bengal	31289	30290	-999	-3.2
	Sikkim	343	330	-13	-3.8
	A&N Island#	236	184	-52	-22.0
V.	**North-Eastern Region**	**9407**	**8134**	**-1273**	**-13.5**
1	Arunachal Pradesh	426	271	-155	-36.4
2	Assam	5107	4567	-540	-10.4
3	Manipur	556	477	-79	-14.2
4	Meghalaya	1713	1386	-327	-19.1
5	Mizoram	330	269	-61	-18.5
6	Nagaland	475	436	-39	-8.2
7	Tripura	800	728	-72	-9.0
	All India	**777039**	**691038**	**-86001**	**-11.1**

Source : Central Electricity Authority

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MU : Million Units

: Lakshadweep and Andaman & Nicobar Islands are stand alone systems, power supply position of these does not form part of regional,requirement and availability

Table 4.13.4 : Cumulative comparison of power supply position

Sl. No.	Region/ State/ System	April 2007 to March 2008			
		Requirement (MU)	Availability (MU)	Supply/ Deficit	Shortage
				(MU)	%
1	2	3	4	5	6
I.	**Northern Region**	**219797**	**196147**	**-23650**	**-10.8**
1	Chandigarh	1446	1446	0	0.0
2	Delhi	22439	22301	-138	-0.6
3	Haryana	29353	25652	-3701	-12.6
4	Himachal Pradesh	5992	5814	-178	-3.0
5	Jammu & Kashmir	11782	8362	-3420	-29.0
6	Punjab	42372	38795	-3577	-8.4
7	Rajasthan	36738	35597	-1141	-3.1
8	Uttar Pradesh	62628	51335	-11293	-18.0
9	Uttaranchal	7047	6845	-202	-2.9
II.	**Western Region**	**247173**	**208228**	**-38945**	-15.8
1	Chhatisgarh	14079	13409	-670	-4.8
2	Gujarat	68747	57614	-11133	-16.2
3	Madhya Pradesh	41560	35700	-5860	-14.1
4	Maharashtra	114885	93846	-21039	-18.3
5	Daman & Diu	1774	1580	-194	-10.9
6	Dadar Nagar Haveli	3388	3372	-16	-0.5
7	Goa	2740	2707	-33	-1.2
III.	**Southern Region**	**187743**	**181820**	**-5923**	**-3.2**
1	Andhra Pradeash	64139	61511	-2628	-4.1
2	Karnataka	40320	39230	-1090	-2.7
3	Kerala	15663	15284	-379	-2.4
4	Tamil Nadu	65780	63954	-1826	-2.8
5	Pondicherry	1841	1841	0	0.0
	Lakshedweep#	24	24	0	0.0
IV.	**Eastern Region**	**75831**	**72099**	**-3732**	**-4.9**
1	Bihar	9155	7933	-1222	-13.3
2	D.V.C.	13387	13039	-348	-2.6
3	Jharkhand	5139	4458	-681	-13.3
4	Odisha	18846	18500	-346	-1.8
	West Bengal	29020	27902	-1118	-3.9
	Sikkim	284	267	-17	-6.0
	A&N Island#	240	180	-60	-25.0
V.	**North-Eastern Region**	**8799**	**7713**	**-1086**	**-12.3**
1	Arunachal Pradesh	391	302	-89	-22.8
2	Assam	4816	4412	-404	-8.4
3	Manipur	530	501	-29	-5.5
4	Meghalaya	1620	1232	-388	-24.0
5	Mizoram	288	246	-42	-14.6
6	Nagaland	377	334	-43	-11.4
7	Tripura	777	686	-91	-11.7
	All India	**739343**	**666007**	**-73336**	**-9.9**

Source : Central Electricity Authority

Continued …/-

MU : Million Units

: Lakshadweep and Andaman & Nicobar Islands are stand alone systems, power supply position of these does not form part of regional,requirement and availability

Table 4.13.4 : Cumulative comparison of power supply position

Sl. No.	Region/ State/ System	April 2006 to March 2007			
		Requirement (MU)	Availability (MU)	Supply Deficit (MU)	Shortage %
1	2	3	4	5	6
I.	**Northern Region**	**202125**	**179986**	**-22139**	**-11.0**
1	Chandigarh	1343	1341	-2	-0.1
2	Delhi	22397	22012	-385	-1.7
3	Haryana	26249	23132	-3117	-11.9
4	Himachal Pradesh	5136	4996	-140	-2.7
5	Jammu & Kashmir	11725	7983	-3742	-31.9
6	Punjab	38641	34839	-3802	-9.8
7	Rajasthan	33236	31715	-1521	-4.6
8	Uttar Pradesh	57441	48370	-9071	-15.8
9	Uttaranchal	5957	5599	-358	-6.0
II.	**Western Region**	**232391**	**196117**	-36274	-15.0
1	Chhatisgarh	14063	13169	-894	-6.4
2	Gujarat	62464	54083	-8381	-13.4
3	Madhya Pradesh	38710	32834	-5876	-15.2
4	Maharashtra	110005	89138	-20867	-19.0
5	Daman & Diu	1602	1408	-194	-12.1
6	Dadar Nagar Haveli	2923	2879	-44	-1.5
7	Goa	2624	2606	-18	-0.7
III.	**Southern Region**	**180091**	**175197**	**-4894**	**-2.7**
1	Andhra Pradeash	60964	58280	-2684	-4.4
2	Karnataka	40797	39948	-849	-2.1
3	Kerala	15023	14716	-307	-2.0
4	Tamil Nadu	61499	60445	-1054	-1.7
5	Pondicherry	1808	1808	0	0.0
	Lakshedweep	25	25	0	0.0
IV.	**Eastern Region**	**68198**	**66183**	**-2015**	**-3.0**
1	Bihar	8425	7741	-684	-8.1
2	D.V.C.	11542	11308	-234	-2.0
3	Jharkhand	4369	4154	-215	-4.9
4	Odisha	17101	16796	-305	-1.8
	West Bengal+ Sikkim	26538	25966	-572	-2.2
	Sikkim	223	218	-5	-2.2
	A&N Isnd	240	190	-50	-20.8
V.	**North-Eastern Region**	**7782**	**7012**	**-770**	**-9.9**
1	Arunachal Pradesh	286	259	-27	-9.4
2	Assam	4297	3984	-313	-7.3
3	Manipur	451	429	-22	-4.9
4	Meghalaya	1368	1063	-305	-22.3
5	Mizoram	235	221	-14	-6.0
6	Nagaland	343	328	-15	-4.4
7	Tripura	802	728	-74	-9.2
		7782	7012	-770	-9.9
	All India	**690587**	**624495**	**-66092**	**-9.6**

Source : Central Electricity Authority

MU : Million Units

Continued …/-

Table 4.13.4 : Cumulative comparison of power supply position

Sl. No.	Region/ State/ System	April 2005 to March 2006			
		Requirement (MU)	Availability (MU)	Supply/ Deficit (MU)	Shortage %
1	2	3	4	5	6
I.	**Northern Region**	**188591**	**168611**	**-19980**	**-10.6**
1	Chandigarh	1260	1258	-2	0
2	Delhi	21602	21281	-321	-1.5
3	Haryana	23791	21631	-2160	-9.1
4	Himachal Pradesh	4302	4258	-44	-1.0
5	Jammu & Kashmir	9065	7672	-1393	-15.4
6	Punjab	35682	32591	-3091	-8.7
7	Rajasthan	32052	30879	-1173	-3.7
8	Uttar Pradesh	55682	44033	-11649	-20.9
9	Uttaranchal	5155	5008	-147	-2.9
II.	**Western Region**	**215983**	**186904**	**-29079**	**-13.5**
1	Chhatisgarh	13012	12540	-472	-3.6
2	Gujarat	57137	52436	-4701	-8.2
3	Madhya Pradesh	36846	31619	-5227	-14.2
4	Maharashtra	102765	84117	-18648	-18.1
5	Daman & Diu	1346	1323	-23	-1.7
6	Dadar Nagar Haveli	2539	2531	-8	-0.3
7	Goa	2338	2338	0	0
III.	**Southern Region**	**157179**	**155790**	**-1.389**	**-0.9**
1	Andhra Pradeash	53030	52332	-698	-1.3
2	Karnataka	34601	34349	-252	-0.7
3	Kerala	13674	13578	-96	-0.7
4	Tamil Nadu	54194	53853	-341	-0.6
5	Pondicherry	1678	1678	0	0
	Lakshedweep	24	24	0	0
IV.	**Eastern Region**	**62347**	**60706**	**-1641**	**-2.6**
1	Bihar	7955	7218	-737	-9.3
2	D.V.C.	10003	9891	-112	-1.1
3	Jharkhand	4033	3868	-165	-4.1
4	Odisha	15208	15010	-198	-1.3
	West Bengal+ Sikkim	24936	24509	-427	-1.7
	Sikkim	212	210	-2	-0.9
	A&N Isnd	240	168	-72	-30
V.	**North-Eastern Region**	**7534**	**6888**	**-646**	**-8.6**
1	Arunachal Pradesh	208	206	-2	-1.0
2	Assam	4051	3778	-273	-6.7
3	Manipur	510	489	-21	-4.1
4	Meghalaya	1382	1144	-238	-17.2
5	Mizoram	230	216	-14	-6.1
6	Nagaland	408	389	-19	-4.6
7	Tripura	745	666	-79	-10.6
	All India	**631554**	**578819**	**-52735**	**-8.4**

Source : Central Electricity Authority

MU : Million Units

Continued…/-

Table 4.13.5: 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	73579.9	370883.5	6402.7	47098.6	19474.6	424385.8	517439.2
15	2002-03	64014.0	389550.3	7052.4	52686.6	19390.0	449289.3	532693.3
16	2003-04	75242.5	407283.8	6867.0	57928.4	17780.0	472079.2	565101.7
17	2004-05	84495.3	424083.2	2518.7	59473.6	16845.3	486075.5	587416.1
18	2005-06	103057.3	435096.6	1987.7	60128.0	17238.9	497214.3	617510.4
19	2006-07	116368.9	461340.0	2488.8	63718.6	18606.8	527547.4	662523.0
20	2007-08	128702.1	486763.2	3297.3	68930.6	16776.9	558990.1	704469.0
21	2008-09	118980.7	512527.1	4708.6	72865.1	14712.6	590100.8	723793.6
22	2009-10	112038.2	539982.4	4243.4	96650.6	18636.4	640876.5	771551.1
23	2010-11	119868.3	561757.0	2993.9	100257.2	26266.4	665008.1	811142.8
24	2011-12	135794.0	612880.2	2461.3	93464.4	32286.6	708805.9	876886.5
25	2012-13	118514.7	691555.1	2284.7	66835.9	32866.1	760715.8	912056.7

Source: Monthly Generation Report of Central Electricity Authority

* : Including Coal, Lignite, Diesel & Gas based stations

@' : CEA is not monitoring Captive Power Plants, Wind & Generation of small mini stations & micro Hydel stations and thermal stations of less than 25 MW capacity.

$: Includes generation from liquid fired Gas Turbine stations.

MU : Million Units

** : Includes imports from Bhutan

Table 4.13.6 : Plan wise growth of electricity sector in India

Sr. No.	As on during financial year ending with	Installed capacity (MW)	No. of Villages electrified +	Length of T & D lines (Ckt. Kms)@	Annual Per capita consumption $ (KWh)
1	2	3	4	5	6
1	31.12.47	1,362	NA	23,238	16.3
2	31.12.50	1,713	3,061	29,271	18.2
3	31.03.56 (End of the 1st Plan)	2,886	7,294	85,427	30.9
4	31.03.61 (End of the 2nd Plan)	4,653	21,754	157,887	45.9
5	31.03.66 (End of the 3rd Plan)	9,027	45,148	541,704	73.9
6	31.03.69 (End of the 3rd Annual Plans)	12,957	73,739	886,301	97.9
7	31.03.74(End of the 4th Plan)	16,664	156,729	1,518,884	126.2
8	31.03.79(End of the 5th Plan)	26,680	232,770	2,145,919	171.6
9	31.03.80 (End of the Annual Plan)	28,448	249,799	2,351,609	172.4
10	31.03.85 (End of the 6th Plan)	42,585	370,332	3,211,956	228.7
11	31.03.90 (End of the 7th Plan)	63,636	470,838	4,407,501	329.2
12	31.03.92(End of the 2nd Annual PlanPlans)	69,065	487,170	4,574,200	347.5
13	31.03.97(End of the 8th Plan)	85,795	498,836	5,141,413	464.6
14	31.03.02(End of the 9th Plan)	105,046	512,153	6,030,148	559.2
15	31.03.03 (End of 1st year of the 10th Plan)	107,877	492,325	6,551,737	566.7
16	31.03.04 (End of 2st year of the 10th Plan)	112,684	495,031	6,345,421	592.0
17	31.03.05 (End of 3st year of the 10th Plan)	118,426	439,800	6,570,823	612.5
18	31.03.06 (End of 4st year of the 10th Plan)	124,287	441,347	6,778,359	631.4
19	31.03.07 (End of 10th Plan)	132,329	482,864	6,939,529	671.9
20	31.03.08 (1 year of 11th Plan)	143,061	487,347	7,287,413	717.1
21	31.03.2009(2nd year 0f 11th Plan)	147,965	497,236	7487977^	733.3
22	31.03.2010 (3rd year 0f 11th Plan)	159,398	500,920	7846496*	778.7
23	31.03.2011(4th year of 11th Plan)	173,626	537,947	7951486*	813.3*
24	31.03.2012 (End of 11th Plan)	199,877	556,633	8,726,092	883.6
25	31.03.2013 (End of Ist year of 12th Plan)	223,344	593132*	8970112*	917.2*

.Source: Central Electricity Authority , 2013

* Provisional N.A. : Not available.

\+ Figures 10th Plan onwards are as per revised definition of village electrification.

$ As per UN methodology (Gross Electrical Energy Availability/Population)

@: Includes 440 Volts Distribution Lines ^ Figure have been reconciled

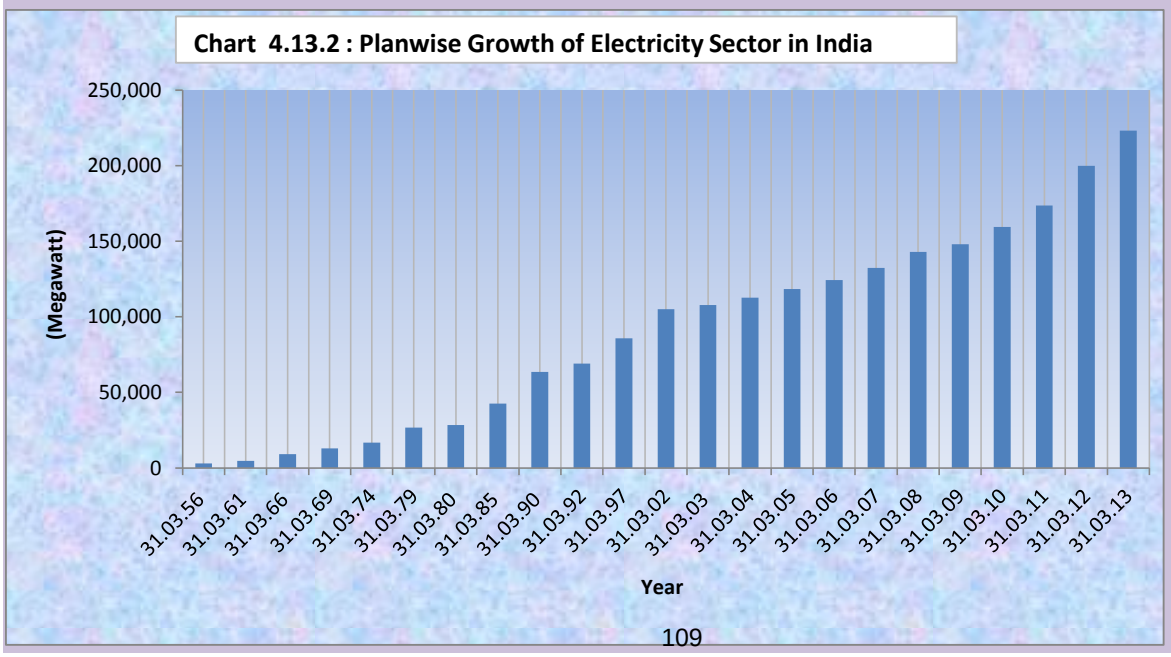


Table 4.13.7 : Plan wise progress of village electrification

Period	No of villages electrified upto the period ending
Upto August 1947	1500
Upto August 1951	3061
First Plan (1951-56	7294
Second Plan (1956-61)	21754
Third Plan (1961-66)	45148
Annual Plan (1996-69)	73739
Fourth Plan (1969-74	156729
Fifth Plan (1974-78)	216863
Annual Plan (1978-80)	249799
Sixth Plan (1980-85)	370332
Seventh Plan (1985-90)	470838
Annual Plan (1990-91)	481124
Annual Plan (1991-92)	487170
Eight Plan (1992-97)	498836$
Ninth Plan (1997-2002)	489699*
Tenth Plan (2002-2007)	482864#
Eleventh Plan (2007-12)	557439
31.3.2013 (1st year or the 12th Plan)	560552

Source : Central Electricity Authority

* : Cumulative achievement were recast as per definition of village electrification notified by Govt. of India in October,1997. As a result there has been a downward revision from the earlier figure of 512245 (Which was based on old definition)to 489699

: Cumulative achievement of villages electrified has been revised as per list of villages as per 2001 census and new definition.

$: Cumulative achievement of villages electrifieid has been revised as per list of villages as per 1991 census from the earliar figure of 505674 to 498836

Table 4.13.8 : Number of towns and villages electrified in India

(As on 31.03.2013)

Sl. No.	State/Union Territory	Towns		Villages	
		Total (as per 2001 Census)	Electrified 2011-12	Total (as per 2001 Census)	Electrified as on 31.03.2013*
1	2	3	4	5	6
I.	**Northern Region**	**1470**	**1470**	**196591**	**184457**
1	Haryana	106	106	6764	6764
2	Himachal Pradesh	57	57	17495	17480
3	Jammu & Kashmir	75	75	6417	6304
4	Punjab	157	157	12278	12278
5	Rajasthan	222	222	39753	38771
6	Uttar Pradesh	704	704	97942	87086
7	Uttarakhand	86	86	15761	15593
8	Chandigarh	1	1	23	23
9	Delhi	62	62	158	158
II.	**Western Region**	**1159**	**1159**	**131462**	**129574**
1	Gujarat	242	242	18066	18031
2	Madhya Pradesh	394	394	52117	50863
3	Chhattisgharh	97	97	19744	19181
4	Maharashtra	378	378	41095	41059
5	Goa	44	44	347	347
6	Daman & Diu	2	2	23	23
7	Dadra & Nagar Haveli	2	2	70	70
III.	**Southern Region**	**1480**	**1480**	**70958**	**70945**
1	Andhra Pradesh	210	210	26613	26613
2	Karnataka	270	270	27481	27468
3	Kerala	159	159	1364	1364
4	Tamil Nadu	832	832	15400	15400
5	Puducherry	6	6	92	92
6	Lakshadweep	3	3	8	8
IV.	**Eastern Region**	**807**	**807**	**154794**	**139164**
1	Bihar	130	130	39015	36744
2	Jharkhand	152	152	29354	26190
3	Odisha	138	138	47529	37500
4	West Bengal	375	375	37945	37941
5	A & N Islands	3	3	501	339
6	Sikkim	9	9	450	450
V.	**North-Eastern Region**	**245**	**245**	**39927**	**36412**
1	Assam	125	125	25124	24156
2	Manipur	33	33	2315	1997
3	Meghalaya	16	16	5782	4988
4	Nagaland	9	9	1278	896
5	Tripura	23	23	858	797
6	Arunachal Pradesh	17	17	3863	2917
7	Mizoram	22	22	707	661
	Total (All India)	**5161**	**5161**	**593732**	**560552**

Source : Central Electricity Authority

* Based on information furnished by State Government/Discoms

The State /UT wise details of Towns and villages electrified is presented in table 4.13.8

4.13.7 The generation of electric power produces more pollution than any other single industry. The energy sources most commonly used for electricity production – fossil fuels such as coal, oil and natural gas –are known as non-renewable resources. They take millions of years to be formed in the crust of the earth by natural processes. Once burned to produce electricity, they are gone forever. Burning fossil fuels such as coal or oil creates unwelcome by-products that pollute when released into our environment, changing the planet's climate and harming ecosystems.

The table 4.13.9 (a), (b) & (c) depict the enormous situation of harmful emissions by power sector.

Table 4.13.9 a: Total absolute emissions of CO_2 from the power sector by region for the year 2005-06 TO 2011-12

(Million tonne CO_2)

Grid	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
NEWNE	368.2	385.7	406.9	430.5	453.1	468.4	491.7
Southern	101.6	109	113.6	117.9	126.8	129.1	145.3
India	**469.7**	**494.7**	**520.5**	**548.4**	**579.9**	**597.5**	**637.0**

Table 4.13.9 (b): Emission factors of CO_2 for 2011-12

(in tonne CO_2/MWh)

Grid	Average	OM	BM	CM
NEWNE	0.78	0.97	0.92	0.94
Southern	0.76	0.96	0.85	0.91
India	**0.78**	**0.97**	**0.90**	**0.93**

Note: Average is the average emission of all stations in the grid, weighted by net generation.
OM is the average emission from all stations excluding the low cost/must run sources.
BM is the average emission of the 20% (by net generation) most recent capacity addition in the grid.

CM is a weighted average of the OM and BM (here weighted 50:50)
OM: operating margin
BM: build margin
CM: combined margin

Table 4.13.9 (c): Specific emissions (weighted average) of CO_2 for fossil fuel -fired stations in 2011-12

(tCO_2/MWh)

Grid	Coal	Diesel	Gas	Lignite	Naphtha	Oil
NEWNE	1.06	1.07	0.45	1.42	0.38	0.65
Southern	1.00	0.58	0.43	1.43	0.72	0.62
India	**1.05**	**0.59**	**0.45**	**1.42**	**0.38**	**0.64**

Source : Central Electricity Authority
Note: NEWNE Grid : Integrated Grid of Northern, Eastern, Western and North Eastern Region.

4.13.8 Carbon dioxide and other air polluting particles are collecting in the atmosphere like a thickening blanket trapping the Sun's heat and causing the earth to warm up. **The table 4.13.10 at presents the details of global average temperature and atmospheric concentrations of CO_2**

Table 4.13.10 : Global average temperature and atmospheric concentrations of CO2

Sl. No.	Year	Temperature (^{0}C)	Carbon Dioxide (Parts Per Million)	Emissions from Fossil Fuel Burning (Million Tonnes of Carbon)
1	2	3	4	5
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	14.09	336.70	5249
19	1980	14.16	338.50	5177
20	1981	14.22	339.80	5004
21	1982	14.06	341.00	4961
22	1983	14.25	342.60	4944
23	1984	14.07	344.20	5116
24	1985	14.03	345.70	5277
25	1986	14.12	347.00	5439
26	1987	14.27	348.70	5561
27	1988	14.29	351.30	5774
28	1989	14.19	352.70	5882
29	1990	14.37	354.00	5953
30	1991	14.32	355.50	6023
31	1992	14.14	356.40	5907
32	1993	14.14	357.00	5904
33	1994	14.25	358.90	6055
34	1995	14.37	360.90	6187
35	1996	14.23	362.60	6326
36	1997	14.40	363.80	6422
37	1998	14.56	366.60	6407
38	1999	14.32	368.30	6239
39	2000	14.31	369.40	6315
40	2001	14.36	370.90	6378
41	2002	14.52	372.90	6443

Source: The Energy and Resources Institute
P : Provisional

4.14 Renewable energy

4.14.1 Renewable energy sources are important to tackle the pollution as well the exhaustion problems of other energy sources. 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. **The estimated potential and cumulative achievements of various renewable energy programmes in India is depicted in table 4.14.1**

Table 4.14.1 : Estimated potential and cumulative achievements

(Data as on 31.3.2012)

Sl. No.	Renewable Energy Programmes/ Systems	Estimated Potential	Achivements
A.	A. Grid-interactive renewable power		
1	Wind Power	49,130 MW	17352.66
2	Small Hydro Power (up to 25 MW)	15,384 MW	3395.31
3	Biomass Power (Agro-wastes/ residues)	17,536 MW	1150.10
4	Bagasse Cogeneration	5,000 MW	1985.23
5	Waste to Power	27,000 MW	
	Urban		36.20
	Industrial		53.48
6	Solar Power		941.28
	Total	89,750 **MW**	**24914.26 MW**
B	**Off -grid/ Distributed renewable power**		
7	Biomass Power / Cogen.(non-bagasse)	-	382.50
8	Biomass Gasifier	-	
	Rural	-	16.12
	Urban	-	134.09
9	Waste-to- Energy		101.75
10	Solar PV Power Plants and Street Lights (>1kW)	-	85.21
11	Aero-generator /Hybrid Systems	-	1.64
	ii. Home Lighting System Hi. Solar Lantern iv. Solar Power Plants		
III	**Decentralized Energy Systems**		
13	Family Type Biogas Plants	120 lakh	45.09
	Solar Photovoltaic (SPV) Nos.	30-50MW/sq k.m.	
14	SPV Street Lighting Systems		220156.00
15	SPV Home Lighting Systems		803045.00
16	SPV Lanterns		866266.00
17	SPV Pumps		7698.00
18	Solar Water Heating-collector area		5.46

Source: Ministry of New and Renewable Energy, (Planning & Coordination Division)

Note: MWe = Megawatt equivalent; MW = Me| kW = kilowatt; kW_p = kilowatt peak; sq. m. = square meter

1. Although the potential is based on surplus agro-residues, in practice biomass power generation units prefer to use fuelwood for techno-economic reasons. A potentional of 45,000 MW $_e$ from around 20 mha of wastelands asumed to be yielding 10 MT /ha/annuam of woody biomass having 4000 k-cal/kg with system efficiency of 30% and 75% PLF has not been taken into account. In order to realize this potential a major inter-Ministrerial initiative involving, among others, Environmment & Forests, Agriculture, Rural Development, and Panchayati Raj would be required. Further, a Biomass Atlas is under preparation which is expepcted to more accurately assess states-wise

2. Potential based on areas having wind power density (wpd) greater than 200 W/m ^{2} assuming land availability in potential areas @ 1 per cent and requirement of wind farms @ 12 ha/MW, all of which may not be ytechnically feasible or economically viable for grid-interactive wind power. This economically viable potential could get enhanced with higher level of land availability than what has been assumed. Areas having lower wpds might be suitable for off-grid applications. Further, preliminary surveys do not at this juncture suggest a sizeable grid-interactive off-shore wind power potential.

3. Technically feasible hydro potential of all sites upto 25 MW station capacity, all of which may not be economically viable. Techincally reasible potential of identified sites is placed at around 10,500 MW.

4. With new sugar mills and modernization of existing ones, technically feasible potential is assessed at 5000 MW furthermore, serveral sugar companies/cooperatives are unable to develop bankable projects on account of their financial and liquidity positions.

5. Technically feasible municipal waste-to energy potential is assessed at 2700 MW $_e$, all of which may not be economically viable. However, subsidy disbursement under the Minicipal Solid Waste (MSW) programme has been kept in a abeyance on the orders of the Supreme Court until final disposal of a PIL seeking composting as the preferred route for MSW disposal.

6. Not all of this renewable energy potential may be suitable for grid-interactive power for technical and /or economica reasons. Further, estimate excludes potential for solar power which is dependent on future developments that might make solar technology cost-competitive for grid-interactive power generation applications. However, insolation in the country varies between 4- 7 kWh/m^2/day.

4.14.2 Wind Power: The development of wind power in India began in the 1990s, and has significantly increased in the last few years. Although a relative newcomer to the wind industry, India has the fifth largest installed wind power capacity in the world. A total Capacity of 18550 MW has been established upto 31.03.2012 in the country. The short gestation periods for installing wind turbines, and the increasing reliability and performance of wind energy machines has made wind power a favored choice for capacity addition in India, wind power plants are mainly spread in 9 States.

The State wise wind power installed capacity over the years is presented in table 4.14.2.

Table 4.14.2 : State wise wind power installed capacity (MW)

Sl No.	State	as on 31-12-11	as on 31-03-12
1	2	3	4
1	Andhra Pradesh	213	435
2	Gujarat	2641	3093
3	Karnataka	1852	2113
4	Kerala	35	35
5	Madhya Pradesh	330	386
6	Maharashtra	2560	2976
7	Rajasthan	1830	2355
8	Tamil Nadu	6613	7153
9	Others	4	4
Total		**16078**	**18550**

Source : Ministry of New And Renewable Energy, Annual report 2012-13

4.14.3 Bio mass Power Plants

In India, Grid interactive Bio mass power plants are installed in 15 States. The total installed capacity of bio mass plants are 3135.33 MW till 31.3.2012.

Table 4.14.3: The status of biomass projects

Sl. No.	Project Status	Biomass Power		Cogeneration		Total	
		MW	Nos	MW	Nos	MW	Nos
1	2	3	4	5	6	7	8
1	Commissioned	1150.1	145	1985	182	3135.3	327

Source :Ministry of New and Renewable Energy

Table 4.14.4(a) : State wise grid-interactive biomass power installed capacity

Sr. No	State	Cumulative Installed
1	Andhra Pradesh	363.25
2	Bihar	15.50
3	Chattisgarh	249.90
4	Gujarat	20.50
5	Haryana	35.80
6	Karnataka	441.18
7	Madhya Pradesh	8.50
8	Maharashtra	605.70
9	Odisha	20.00
10	Punjab	90.50
11	Rajasthan	81.30
12	Tamil Nadu	532.70
13	Uttar Pradesh	644.50
14	Uttrtakhand	10.00
15	West Bengal	16.00
	Total	**3135.33**

Source: Ministry of New and Renewable Energy

4.14.4 **Small Hydro power Projects: as on 31.3.2012** In India, nearly 868 small hydro power projects (capacity upto 25 MW) have been already set up and 338 are under implementation. The total capacity of the existing power plants is nearly 3300.15 MW and the total capacity of the projects under implementation is 972.30 MW. **The State wise details of small hydro power projects set up and under implementation are shown in table 4.14.5**

4.14.5 The total capacity of all the grid interactive renewable power projects (small hydro power, wind power, bio power and solar power) installed in India is approximately 24,914.03 MW **till 31.03.2012. The State- wise details of cumulative installed capacity of grid interactive renewable power projects in India is depicted in table 4.14.6.**

The details of decentralized / off –grid renewable systems devices installed in various States of India is depicted in table 4.14.7

4.14.5 Bio –gas plants: Bio gas plants are a very viable and suitable fuel generating technology for households in Indian villages. The bio gas plants are cost effective and reduce the indoor pollution in households.

The distribution of family –type biogas plants in various States of India are exhibited in Table 4.14.8

Table 4.14.4(b) : Statewise and yearwise composition of commissioned biomass power projects (as on 31-03.2012)

S.No	Source /System	Estimated potential	Achivement
1	**Power from renewables**		
A	Grid-interactive renewable power	**(MW)**	**(MW)**
1	Solar photovoltaic power	-	2.12
2	Wind power	45195	7230.99
3	Small hydro power (up to 25 MW)	15000	2013.17
4	Biomass power	16881	542.8
5	Bagasse cogeneration	5000	634.83
6	Energy recovery from waste (MW)	2700	43.45
	Sub total (A)	84776	10 467.36
B	**Distributed renewable power**		(MW)
7	Biomass/cogenentation (non-bagasse)	-	45.8
8	Biomass gasifier	-	86.53
9	Energy recovery from waste	-	19.76
	Sub total (B)	-	152.09
	Total (A+B)	-	10619.45
II	**II Remote village electrification**		**3651 villages/hamlets**
III	**Decentralized energy systems**		
10	Family-type biogas plants	120 lakh	38.90 lakh
11	Solar photovoltaic programme	20 MW/km^2	
	i. Solar street lighting system	-	61 321 nos
	ii. Home lighting system	-	313 859 nos
	iii. Solar lantern	-	565 658 nos
	iv. Solar power plants	-	1867.80 kW_p
12	Solar thermal programme		
	i. Solar water heating systems	140 million m^2 collector	1.95 million m^2 collector
	ii. Solar cookers		6.17 lakh
13	Wind pumps		1180 nos
14	Aero generator/hybrid systems		608.27 kW
15	Solar photovoltaic pumps		7068 nos
IV	**Other programmes**		
16	Energy parks		494 nos
17	Akshay Urja shops		165 nos
18	Battery operated vehicles		256 nos
19	Research, design, and development		600 projects
20	Renewable energy clubs		521 nos
21	District Advisory Committees		560 nos

Source: Ministry of New and Renewable Energy

MW - megawatt MWp - megawatt peak;

kW - kilowatt; m^2 - square metre;

km^2 - kilometre square

TABLE 4.14.5 : State wise details of small hydro power projects (upto 25 MW) setup & under implementation (as on 31.03.2012)

Sr. No	States	Projects set-up		Project under Implementation	
		No.s	Capacity (MW)	No	Capacity (MW)
1	Andhra Pradesh	64	192.63	18	62.05
2	Arunachal Pradesh	104	79.54	117	46.97
3	Assam	5	31.11	4	15.00
4	Bihar	21	61.30	7	22.60
5	Chhattisgarh	7	20.25	6	147.00
6	Goa	1	0.05	-	-
7	Gujarat	5	15.60	-	-
8	Haryana	7	70.10	2	3.40
9	Himachal Pradesh	132	481.37	28	106.85
10	Jammu & Kashmir	35	130.59	5	6.65
11	Jharkhand	6	4.05	8	34.85
12	Karnataka	127	879.25	13	126.18
13	Kerala	22	143.17	12	59.25
14	Madhya Pradesh	11	86.16	3	4.90
15	Maharashtra	45	281.33	21	7.00
16	Manipur	8	5.45	3	2.75
17	Meghalaya	4	31.03	3	1.70
18	Mizoram	18	36.47	1	0.50
19	Nagaland	10	28.67	4	4.20
20	Odisha	9	64.30	4	3.60
21	Punjab	46	154.50	12	21.15
22	Rajasthan	10	23.85	-	-
23	Sikkim	17	52.11	1	0.20
24	Tamil Nadu	20	111.69	-	18.00
25	Tripura	3	16.01	-	-
26	Uttar Pradesh	9	25.10	-	-
27	Utrakhand	98	170.82	49	193.25
28	West Bengal	23	98.40	17	84.25
29	Andaman and Nicobar Islands	1	5.25	-	-
	Total	**868**	**3300.15**	**338**	**972.30**

Source: Ministry of New And Renewable Energy

Table 4.14.6: State wise and source wise installed capacity of grid interactive renewable power as on 31.03.2012

Sr. No.	State/UT	Small Hydro power	Wind Power	Bio-Power		Solar Power	Total Capaicty
				Biomass Power	Waste to Energy		
		(MW)	(MW)	(MW)	(MW)	(MWp)	(MW)
1	Andhra Pradesh	217.83	245.55	363.25	43.16	21.75	891.54
2	Arunachal Pradesh	79.23				0.03	79.26
3	Assam	31.11					31.11
4	Bihar	64.30		15.50			79.80
5	Chhattisgarh	20.25		249.90		4.00	274.15
6	Goa	0.05					0.05
7	Gujarat	15.60	2966.28	20.50		604.89	3607.27
8	Haryana	70.10		35.80		16.80	122.70
9	Himachal Pradesh	527.66					527.66
10	Jammu & Kashmir	130.53					130.53
11	Jharkhand	4.05				4.00	8.05
12	Karnataka	882.45	1933.50	441.18	1.00	9.00	3267.13
13	Kerala	149.67	35.10			0.03	184.80
14	Madhya Pradesh	86.16	376.40	8.50	3.90	2.10	477.06
15	Maharashtra	281.33	2733.30	603.70	5.72	20.00	3644.05
16	Manipur	5.45					5.45
17	Meghalaya	31.03					31.03
18	Mizoram	36.47					36.47
19	Nagaland	28.67					28.67
20	Odisha	64.30		20.00		13.00	97.30
21	Punjab	154.50		90.50	9.25	9.33	263.58
22	Rajasthan	23.85	2070.65	83.30		197.65	2375.45
23	Sikkim	52.11					52.11
24	Tamil Nadu	123.05	6987.58	532.70	5.65	15.05	7664.03
25	Tripura	16.01					16.01
26	Uttar Pradesh	25.10		644.50	5.00	12.38	686.98
27	Uttarakhand	170.82		10.00		5.05	185.87
28	West Bengal	98.40		16.00		2.05	116.45
29	Andaman and Nicobar Islands	5.25				0.10	5.35
30	Chandigarh						0.00
31	Dadar & Nagar Haveli						0.00
32	Daman & Diu						0.00
33	Delhi				16.00	2.53	18.53
34	Lakshwadeep					0.75	0.75
35	Pondicherry					0.03	0.03
36	Others		4.00			0.81	4.81
	Total (MW)	**3395.33**	**17352.36**	**3135.33**	**89.68**	**941.33**	**24914.03**

Source : Planning & Coordination Division, Ministry of New and Renewable Energy

MW - Megawatt MWp - Megawatt peak;

Table 4.14.7:Decentralised/off-grid renewable energy systems devices

(as on 31.03.2012)

Sr. No.	State/UT	Biogas Plants	Biomass-Gasifiers		Biomass (non-bagasse)	Waste to Energy	Solar Photovoltaic (SPV) Systems				SPV Pumps	Waterpumping	Aerogen/ hybrid System	Remote Village Electrification	
			Industrial	Rural			SLS	HLS	SL	PP		Windmills		Village	Hamlet
		(Nos.)	(kw)	(kw)	(MW)	(MW)	(nos.)	(nos.)	(kWp.)	(kWp)	(Nos.)	(nos.)	(kW)	(nos)	(nos)
1	Andhra Pradesh	489559	20514		45.10	6.55	4186	2662	41360	776.97	613	6	16.00		
2	Arunachal Pradesh	3282		750			1071	10349	14433	17.10	18		6.80	297	13
3	Assam	95209	1883				98	5870	1211	510.00	45	3	6.00	1856	
4	Bihar	129523	5434	3826	3.20		955	6528	50117	775.60	139	46			
5	Chhattisgarh	40661	1210		2.50	0.33	2042	7254	5311	6632.72	240	1		568	
6	Goa	3976					707	393	1093	1.72	15		163.80		
7	Gujarat	420686	19780	1450		10.79	2004	9231	31603	374.60	85	879	10.00	38	
8	Haryana	57281	1963		20.95	4.00	22018	50275	93853	676.05	469		10.00		286
9	Himachal Pradesh	46587			7.20		7430	22586	23909	201.50	6			21	
10	Jammu & Kashmir	2739	200				5806	42133	43822	308.85	39		15.80	160	
11	Jharkhand	6596	500		1.20		620	7312	16374	335.90				493	
12	Karnataka	445586	6297	1150	7.15	3.00	2694	43313	7334	254.41	551	28	39.20	16	14
13	Kerala	133887			0.72		1735	32327	54367	57.70	810	79	8.00		607
14	Madhya Pradesh	324737	8147	761	12.35	0.11	7158	3304	9444	575.00	87		24.00	381	
15	Maharashtra	824203	7150		8.40	6.81	8420	3442	68683	913.70	239	26	1033.90	338	
16	Manipur	2128					928	3865	4787	216.00	40		110.00	237	3
17	Meghalaya	9326	250		13.80		1273	7840	24875	50.50	19		15.00	149	
18	Mizoram	4020		250			431	6801	9589	241.00	37			20	
19	Nagaland	6649		2100			271	868	6317	144.00	3			11	
20	Odisha	253054	270		2.47	0.02	5834	5156	9882	84.52	56			602	
21	Punjab	143162			70.74	1.81	5354	8620	17495	181.00	1857		50.00		
22	Rajasthan	68121	2431	33	2.00	3.00	6852	126199	4716	3530.80	1667	222	14.00	292	
23	Sikkim	8326					489	9542	22020	35.00			15.50		13
24	Tamil Nadu	219392	9590	2172	13.15	6.14	6350	7804	16818	609.77	829	60	24.50		101
25	Tripura	2999		1050			1199	32723	64282	35.00	151		2.00	60	715
26	Uttar Pradesh	431631	22650	880	137.80	24.91	100406	185388	61932	3179.72	575			98	86
27	Utrakhand	14704	1100		19.50	3.07	8568	91307	64023	180.03	26		4.00	472	34
28	West Bengal	355496	24718	1450	14.27		8726	135067	17662	829.00	48		74.00	1177	2
29	Andaman and Nicobar Islands	137					390	468	6296	167.00	5	2			
30	Chandigarh	97					898	275	1675	0.00	12				
31	Dadar & Nagar Haveli	169					0	0		0.00					
32	Daman & Diu						0	0		0.00					
33	Delhi	681					301	0	4807	82.00	90				
34	Lakshwadeep			250			1725	0	5289	100.00					
35	Pondicherry	578					417	25	1637	0.00	21		5.00		
36	Others*						9150	24047	125797	1354.00					
	Total	**4545182**	**134087**	**16122**	**382.50**	**70.54**	**226506**	**892974**	**932813**	**23431.16**	**8792**	**1352**	**1647.50**	**7286**	**1874**

Source: Ministry of New and Renewable Energy (Planning & Coordination Division)

SLS : Street Lighting System SL: Solar Lanterns kWp: Kilowatt peak

HLS : Home Lighting System MW : Mega Watt PP: Power plants

Table 4.14.8 :Distribution of family -type biogas plants (number of installations)

Sl. No.	State/UT	Estimated Potential	Cumulative Achievement as on (31-03-2011)	Achievements during (2011-12)		Achievement till (31.03.2012)
				Target	Achs.	
1	2	3	4	5		6
1	Andhra Pradesh	1065000	474213	16000	15346	489559
2	Arunachal Pradesh	7500	3132	100	150	3282
3	Assam	307000	88324	4900	6885	95209
4	Bihar	733000	126238	1000	3285	129523
5	Goa	8000	3911	50	65	3976
6	Gujarat	554000	418055	7000	2631	420686
7	Haryana	300000	55462	1700	1819	57281
8	Himachal Pradesh	125000	46161	500	426	46587
9	Jammu & Kashmir	128000	2603	200	136	2739
10	Karnataka	680000	433223	13000	12363	445586
11	Kerala	150000	130404	2600	3483	133887
12	Madhya Pradesh	1491000	312322	14000	12415	324737
13	Maharashtra	897000	801983	13000	22220	824203
14	Manipur	38000	2128	50	0	2128
15	Meghalaya	24000	7936	1000	1390	9326
16	Mizoram	5000	3920	200	100	4020
17	Nagaland	6700	5324	1000	1325	6649
18	Odisha	605000	245868	7000	7186	253054
19	Punjab	411000	128989	18000	14173	143162
20	Rajasthan	915000	67623	500	498	68121
21	Sikkim	7300	7691	200	635	8326
22	Tamil Nadu	615000	218009	1000	1383	219392
23	Tripura	28000	2882	200	117	2999
24	Uttar Pradesh	1938000	426872	5000	4759	431631
25	West Bengal	695000	335510	16000	19986	355496
	Union Territory					
26	Andaman and Nicobar Islands	2200	137			137
27	Chandigarh	1400	97			97
28	Dadra and Nagar Haveli	2000	169			169
29	Delhi	12900	680		1	681
30	Pondicherry	4300	578	100		578
31	Chhattisgarh	400000	35882	4000	4779	40661
32	Jharkhand	100000	5846	500	750	6596
33	Uttaranchal	83000	12590	2000	2114	14704
34	KVIC and others					
	Total	**12339300**	**4404762**	**130800**	**140420**	**4545182**

Source : Annual Report 2011-12, Ministry of New and Renewable Energy
KVIC : Khadi and Village Industries Commission

4.14.6 Energy Parks: Energy parks are set up to demonstrate the applications and after sale services of various renewable energy devices. In India, there are 484 energy parks at district level and 30 at State level. **The State wise details of energy parks is shown below in table 4.14.9.**

Table 4.14.9 : State -wise break-up of the energy parks as on 31.03.2012

No.	State/UT	Energy Parks in Nos.	
		District Level	State Level
1	Andhra Pradesh	27	
2	Arunachal Pradesh	6	1
3	Assam	22	1
4	Bihar	11	
5	Chhattisgarh	15	2
6	Delhi	8	1
7	Goa	2	1
8	Gujarat	14	1
9	Haryana	21	1
10	Himachal Pradesh	9	2
11	Jammu & Kashmir	15	2
12	Jharkhand	7	1
13	Karnataka	34	1
14	Kerala	16	1
15	Madhya Pradesh	27	
16	Maharashtra	52	1
17	Manipur	10	
18	Meghalaya	7	1
19	Mizoram	7	1
20	Nagaland	6	1
21	Odisha	11	1
22	Punjab	20	1
23	Rajasthan	12	1
24	Sikkim	7	
25	Tamil Nadu	21	1
26	Tripura	9	1
27	Uttar Pradesh	56	1
28	Uttarakhand	11	1
29	West Bengal	11	1
30	A&N Islands	5	1
31	Chandigarh	3	1
32	Pondicherry	2	1
	Total	**484**	**30**

Source : Annual Report , Ministry of New and Renewable Energy

4.14.7 **Renewable energy clubs** are set up in India to create awareness about new and renewable sources of energy among students especially Engineering students. There are 481 renewable energy clubs functioning in all over India. **The State wise detail of Energy clubs is presented below in 4.14.10.**

Table 4.14.10 : State wise renewable energy club

as on 31.03.2012

S. No	State	No. of Renewable Energy Clubs
1	Andhra Pradesh	40
2	Bihar	6
3	Chandigarh Administration	4
4	Chhattisgarh	8
5	Goa	1
6	Gujrat	27
7	Haryana	14
8	Himachal Pradesh	2
9	Jammu & Kashmir	3
10	Karnataka	89
11	Madhya Pradesh	31
12	Maharashtra	66
13	Odisha	13
14	Pondicherry	5
15	Punjab	15
16	Rajasthan	10
17	Tripura	8
18	Tamil Nadu	124
19	Uttar Pradesh	64
20	West Bengal	24
	Total	**554**

Source : Annual Report , Ministry of New and Renewable Energy

4.15 Noise Pollution

4.15.1 Of late, noise has been recognized as a pollutant which until recently was considered only as a nuisance. 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 notified the ambient noise standards in 1987 under section 20 of the Air (Prevention and Control of Pollution) Act, 1981.

4.15.2 The noise standards are specified separately for Industrial Commercial, Residential and Silent zones for Day and Night time. **Table 4.15.1shows the ambient air quality standards in respects of noise.**

Table 4.15.1 : 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.

4.15.2 The increasing noise pollution may be attributed to increase in no. of vehicles, urbanization and industrialization. **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 as evident from table 4.15.2.**

Table 4.15.2 : 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	--
5	Hardwar*	Day	-	77	66	71
		Night	-	75	58	66
6	Kanpur*	Day	-	79	75	75
		Night	-	78	72	66

Source : Central Polution Control Board
* : 2003 Figures

Table 4.15.3 : 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

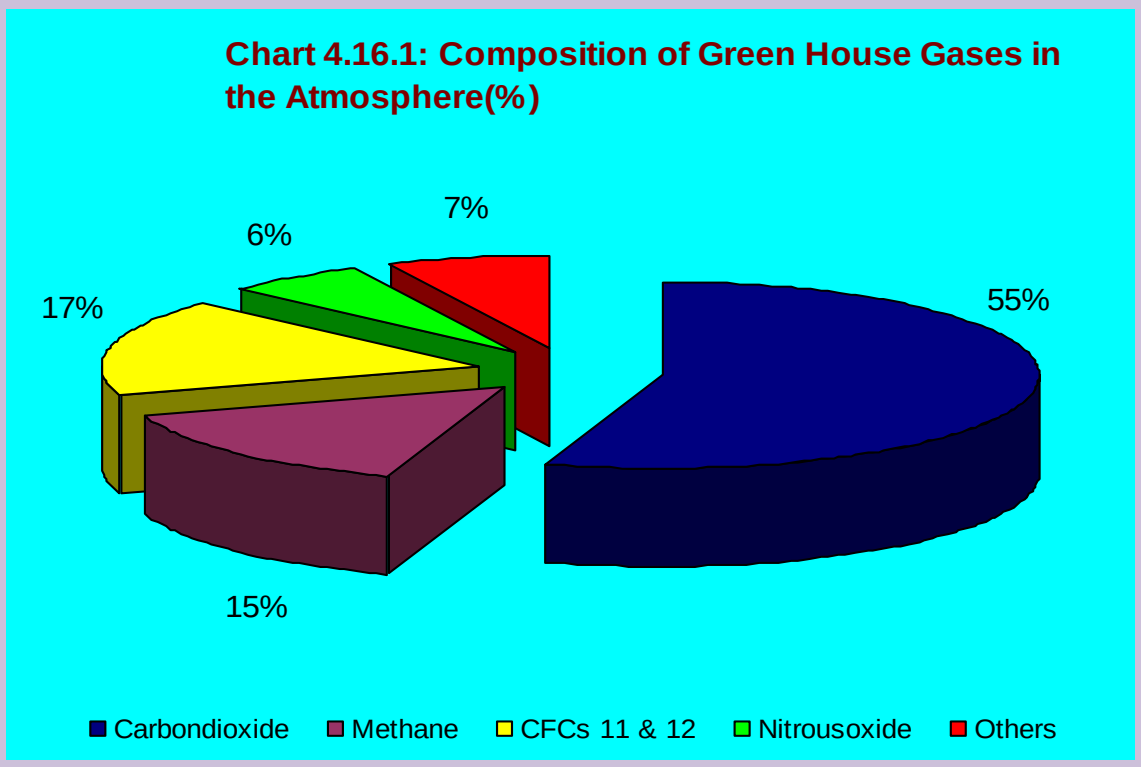
Source: West Bengal Pollution Control Board

4.16 Green House Gases and Their Effects

4.16.1 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 Greenhouse Gases (GHGs) 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.

4.16.2 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 chloro-flouro 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.

Chart 4.16.1: Composition of Green House Gases in the Atmosphere(%)



Source : Central Pollution Control Board

4.16.3 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.

4.17 Ozone Depletion

4.17.1 Ozone depletion describes two distinct, but related observations: a slow, steady decline of about 4% per decade in the total volume of ozone in Earth's stratosphere (the ozone layer) since the late 1970s, and a much larger, but seasonal, decrease in stratospheric ozone over Earth's polar regions during the same period. The latter phenomenon is commonly referred to as the ozone hole. CFCs and other contributory substances are commonly referred to as ozone-depleting substances (ODS). Since the ozone layer prevents most harmful UVB wavelengths (280–315 nm) of ultraviolet light (UV light) from passing through the Earth's atmosphere, observed and projected decreases in ozone have generated worldwide concern leading to adoption of the Montreal Protocol that bans the production of CFCs and halons as well as related ozone depleting chemicals such as carbon tetrachloride and trichloroethane. It is suspected that a variety of biological consequences such as increases in skin cancer, cataracts, damage to plants, and reduction of plankton populations in the ocean's photic zone may result from the increased UV exposure due to ozone depletion.

4.17.2 **Table 4.17.1 at depicts the production of Ozone depleting substances in India and 4.17.2 annexure 4 presents the total consumption of Ozone depleting substances over the years.**

4.18 Action Plan to combat Air Pollution

A brief of the action plans implemented in major cities of India is discussed in the following session.

4.18.1 Major City Specific Action Plan in Delhi

A) Vehicular Pollution Control

a. Public transport (buses, auto, taxis) in Delhi has been converted to CNG mode.

b. Sulphur content in diesel has been reduced in a phased manner.

c. The lead content in petrol has been progressively reduced to make it unleaded.

d. Bharat Stage-III norms have been implemented in Delhi.

e. Pre-mix 2T oil dispensers have been installed at all petrol filling stations.

f. Grossly polluting old commercial vehicles have been phased out .

g. Restriction has been made on plying of goods commercial vehicles during day time.

h. Metro rail has been introduced to have a more efficient public transport system.

(B) Industrial Pollution Control

(i) Directions under Section 5 of E(P)A, 1986 have been issued on April 1996 and July 1996 to all the three power plants located in Delhi for completing the following in a time bound manner.

- Comply with emission and liquid effluent standard.
- Submission of action plan for switching over the beneficiated coal with an ash content of not more than 34%.
- Submission of action plan to achieve 20% utilization of fly-ash by Dec. 1997.
- Installation of opacity meter in all units to ensure compliance with the standards.
- Coverage of abandoned ash ponds with top soil.

(ii) All stone crushers have been closed down in Delhi and shifted to Pali in Rajasthan.

(iii) All the hot mix plants have been closed down and shifted to other states.

(iv) As per the directions of Hon'ble Supreme Court, 168 hazardous industries have been closed down in Delhi.

4.18.2 Major City Specific Action Plan in Mumbai

- Bhatart Stage-III norms have been implemented in Mumbai.
- Unleaded gasoline and low sulphur diesel are being supplied in Mumbai.
- Visits are made to petrol pump as per guidelines prescribed to check/inspect adulteration/malpractices in diesel and petrol under Central Govt. vide order The Motor Spirit and High Diesel (Regulation of Supply and Distribution and Prevention of Malpractices), 1998. Defaulter petrol pumps are legally prosecuted under Essential Commodities Act, 1955.
- Licence and 'End Use Certificate' is made compulsory to persons who store Naptha and Solvents which are also used as adulterants in petrol and diesel.
- Pollution under Control certificate has been made mandatory for every vehicle owner.
- Implementation of rigorous inspection and maintenance measures periodically for all types of vehicles, involving vehicle manufacturers.
- From 15.10.99 'No Pollution Under Certificate- No Petrol' scheme is launched in Mumbai Metropolitan Region (MMR)
- Buses, taxis, autos are on CNG mode.
- Mass awareness Programme are being organized for creating awareness in public.
- The Transport Commissioner's Office has increased vigilance in checking polluting vehicles in Mumbai by increasing number of exhaust monitors for petrol and diesel driven vehicles.
- Auto exhaust checking are also done at entry points to Maharashtra State to check compliance to norms fixed under Central Motor Vehicles Act, 1989.

4.18.3 Major City Specific Action Plan in Ahmedabad

A) Vehicular Pollution Control

The measures include following

(i) Banning of old buses of more than 15 years old

(ii) Bharat Stage- III norms have been introduced in Ahmedabad.

(iii) Banning of diesel run rickshaw within city limits.

(iv) Diversion of heavy vehicles such as trucks/luxury buses/trailers/tankers/tractors/lorries, etc. aw ay from the city.

(v) Improvement of road condition and making the roads pucca upto the footpath not leaving any uncovered space on either sides of the roads.

Strict enforcement of smoke test/vehicle test protocol

(vii) Surveillance of vehicles with higher black smoke emission

(viii) Third party audits of PUC Centres including calibration audits

(ix) To launch a drive to stop usage of kerosene in vehicles particularly three wheelers and commercial vehicles.

(B) Industrial Pollution Control

The measures include following

(i) Intensifying monitoring by special vigilance squad under the Air Act, 1981.
(ii) Determining efficacy of APC system & taking remedial action(s) including upgradation of existing Air Pollution Control Measures wherever needed.

(iii) Implementation of CREP Action Plan for highly pollution industries as decided by MOEF.

(iv) Ban on burning of off specification materials/wastes by scrap traders.

4.18. Major City Specific Action plan in Bangalore

- To reduce traffic congestion, 108 roads have been converted to one way, 5 flyovers completed, 3 railway under pass on Quter rind road (ORR) limit completed, 2 railway over bridges completed and 206 Km of road has been asphalted.
- Low sulphur diesel (Green Diesel) and Green Petrol (Sulphur 0.05%)is being supplied in Bangalore ORR area from 1.4.2003.
- Bharat Stage – III norms have been introduced in Bangalore.
- Out of 70,131 (as on 31.07.2003) auto rickshaws registered in Bangalore city, 35000 auto rickshaws are running on LPG
- 6 Auto LPG dispensing stations (ALDS) are operating

- Transport department has approved Bajaj 4 stroke (rear engine) LPG auto rickshaw in Bi- fuel mode
- 5% ethanol blended petrol is being supplied in all districts from 01.10.2003.
- Regular check on adulteration of fuel is being conducted by Food and Civil Supplies Department.
- Goods vehicles carrying construction materials are allowed within ORR only during 10 PM to 6AM for unloading.
- Modernization of Emission testing Centers for issue of "Pollution Under Control" Certificate bearing photograph of the tested vehicle using Web camera by the Transport Department.
- Karnataka State Pollution Control Board to take action to promote use of cleaner fuels used by major industries in Generator sets and boilers.

4.18. Major City Specific Action Plan in Chennai

- Bharat Stage – III norms have been introduced in Chennai.
- Unleaded gasoline and low sulphur diesel are being supplied in Chennai.
- Pollution Under Control Certificate has been made mandatory.
- Pre mixed 2T oil dispensers have been installed in most of the retail outlets in Chennai City.
- The Motor Spirit and High Speed Diesel (Regulation & Supply and Distribution and Prevention of malpractices) order 1998 has been republished by the Government of Tamilnadu with the intention to curb malpractices such as adulteration etc.,
- LPG supply is being implemented by oil companies, Oil companies have promised to setup 28 Auto ALP dispensing station (ALDS). Presently five ALDS are functioning.
- Mass Rapid Transit System (MRTS) and electric trains are operated by Southern Railways.
- Power plants have been insisted to provide scrubber for the control of emissions
- For all the process emission sources and boiler of higher capacity air pollution control measures such as dust collectors and wet scrubbers are insisted by Tamil Nadu Pollution Control Board.
- The industrial units are also insisted to switch over to cleaner fuels such as LSHS, LDO etc., to control the SO_2 emission.

4.18.5 Major City Specific Action Plan in Kolkata

A) Vehicular Pollution Control

i.Bharat State –III norms have been introduced in Kolkata

ii.Supply, Distribution and Selling of Loose 2T oil in Kolkata Metropolitan Area (KMA) has been

iii. Unleaded Petrol and Low Sulphur Petrol and Diesel made available within Kolkata and Howrah and adjoining agglomeration.

iv. Availability of Cleaner Automotive Fuel like LPG ensured in Kolkata.

v. Introduced Upgraded Auto Emission Testing Centre (PUC Centre)

B) Industrial Pollution Control

i. Stricter Locational Policy for New Industrial Units

ii.Ensuring Regulatory Compliance by Grossly Polluting Industries

iii.Introduction of Stricter Emission Standard for Boilers, Ceramic, Kilns, Foundries and Rolling Mills operating within Kolkata Metropolitan Areas.

iv.Mandatory Use of Cleaner Fuel in Small Boilers, Ceramic Kilns and Rolling Mills operating within Kolkata Metropolitan Area.

v.Discontinuance of Coal Supply to the industries which have been ordered to discontinue the use of coal.

vi.Environmental compliance by Cluster of Small Scale Industries is also ensured

4.18.6 Major City Specific Action Plan in Hyderabad

The measures include following

- Upgradation of existing Pollution under Control (PUC) centers with computer testing facility
- Unleaded gasoline and low sulphur diesel are being supplied in Hyderabad
- Introduction of mobile task forces to monitor the visibly polluting vehicles.
- Bharat Stage-III norms have been introduced in Hyderabad
- Ban on sale of loose 2T oil. Shall be dispensed through premixed dispensing stations
- Establishment of LPG dispensing stations
- Constitution of task forces to check the adulteration of oil and fuel
- Introduction of multi model transport system
- Urban Greening by Hyderabad Urban Development Authority (HUDA) is being carried out
- Open space plantation by Municipal Corporation of Hyderabad (MCH) is being carried out

Table 4.17.1: Production of ozone depleting substances in India

(Metric Tonnes

Sl. No.	ODS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	2	3	4	5	6	7	8	9	10	11	12	13
1	CFC-11	5634.0	4514.0	3689.0	2609.0	2429.0	1543.4	785.1	424.8	117.6	-	83.5*
2	CFC-12	14777.0	14164.0	13167.0	12373.0	10611.0	9702.2	6104.7	1869.9	549.6	-	234.82*
3	CFC-113	5.0	14.0	35.0	32.0	30.0	18.0	373.5	72.6	79.1	-	Nil
4	H-1211	-	-	-	-	-	-	-	-	-	-	-
5	H-1301	-	-	-	-	-	-	-	-	-	-	-
6	CTC	17509.0	16459.0	18957.0	18239.0	16631.0	17433.3	13877.8	9538.0	12035.7	11248.5	15222.818#
7	MCF	-		-	-	-	-	-	-	-	-	-
8	HCFC-22	14061	14868	14606	19216	25592.0	24789.2	30386.4	41213.6	45558.2	47657.1	47613.297
9	Mythyl Bromide	107	85	37914.0	-	-	-	-	-	-	-	-
							-	-	-	-	-	-
Total		51986.0	50019.0	50454.0	52469.0	55293.0	53486.1	51527.6	53118.9	58340.2	58905.6	61354.435

Source : Ozone cell, Ministry of Environment and Forests
ODS: Ozone Depleting Substances
* : For EUN # : Recovered and recycled

CFC :Chloro-Floro-Carbon CTC : Carbon Terachloride HCFC : Hydro Chloro Fluoro Carbon

Table 4.17.2: Total consumption of ozone depleting substances

(Metric Tonnes

Sl. No.	ODS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	2	3	4	5	6	7	8	9	10	11	12	13
1	CFC-11	3002.0	2196	1680.0	829	426	337.3	514.9	274.9	101.6	43.5	78.616
2	CFC-12	2612.0	2315	2210.0	1777	1808	1609	3017.9	723.6	109.7	158.7	212.117
3	CFC-113	-	5	29.0	4	10	14.3	-	-	6.6	-	Nil
4	CTC	11043.0	8471	9510.0	9798	6781	1494.5	3636.8	634	1563.7	34.7	Nil
5	HCF-22	3583.0	2973	3207.0	3648	7228	8854.3	6137	14576.6	10831.7	9386.4	12503.013
6	HCF-123	20.0	25	25.0	0	60	15.3	-	27.2	101	238	115.085
7	HCF-141b	483.0	359	1401.0	952	1357	2155.9	-	4711.9	12588.9	7900	7836.8
8	Mythyl Bromide	-	27	9510.0	-	-	-	-	-	-	-	-
Total		20743	16371	27572.0	17008	17670	14480.6	13306.5	20948.2	25303.2	17761.3	20745.631

Source : Ozone cell, Ministry of Environment and Forests
ODS: Ozone Depleting Substances

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CHAPTER FIVE

LAND AND SOIL

5.1 Introduction

5.1.1 In India, on the basis of nine-fold land-use classification, the land use statistics is available for roughly 306 million hectares (mha) of land out of the 329 million hectares of the total geographic area which accounts for 93% of the total land. **The land use classification of India over the years is presented in table 5.1.1.**

5.1.2 The data shows that land use in the country, over the last five decades, has undergone drastic change. Land under agriculture has almost doubled, forest cover has dwindled to less than half, large tracts of fertile agriculture and forest land have been diverted for urbanization and settlements. Deforestation contributes to loss of precious top soil which amounts to about 35 percent of the global sediment load going to oceans even though water flowing through our rivers is only about five percent of the flow of rivers in the world.

5.1.3 The area under barren and uncultivable land is generally unsuitable for agriculture either because of topography or its inaccessibility. Instances are the desert areas in Rajasthan, the saline land in part of the Rann of Kutch in Gujarat, and the weed infected and ravine land in Madhya Pradesh. Recently, the area under non-agricultural land has increased due to increase in developmental activities; e.g. housing, transport system, irrigation, etc. About 24 mha are occupied by the housing, the industry and for other non-agricultural uses, 19.2 mha are snowbound and remote, leaving only 263 million hectare for agriculture, forestry, pasture and other biomass production. The net sown area increased from 119 mha in 1950-51 to 140 mha in 1970-71, mostly through reclamation of old fallow and cultivable wastelands and diversion of groves. Since 1970-71, the net area sown has remained almost the same at around 141 mha levels. However, there is an increase of 48.48% in the gross sown area, which indicates areas sown more than once have increased considerably. The net irrigated area showed a three fold increase.

Table 5.1.2 depicts the selected categories of land use classification.

5.1.4 The **table 5.1.3 gives the details of waste lands** in India in 2005-06 and 2008-09. Percentage of wasteland to total geographic area has reduced from 14.91% in 2005-06 to 14.75% in 2008-09.

5.2 Soil Survey

5.2.1 Soil survey constitutes a valuable resource inventory linked with the survival of life on the earth. The technological advancements in the field of remote sensing and Geographical Information System have been a boon for such surveys. **The State wise coverage of detailed soil survey in India is in table 5.2.1, the State wise coverage of soil resource mapping is in table 5.2.2, the reporting under Rapid Reconnaissance Survey in table 5.2.3.**

5.2.2 Alkali, or alkaline, soils are clay soils with high pH (> 9), a poor soil structure and a low infiltration capacity. Often they have a hard calcareous layer at 0.5 to 1 meter depth. Alkali soils owe their unfavorable physico-chemical properties mainly to the dominating presence of sodium carbonate which causes the soil to *swell.* Alkaline soils are difficult to take into agricultural production. Alkaline soils are difficult to take into agricultural production. State wise extent of alkali once in India and physical progress in its reclamation are depicted in table 5.2.4

Table 5.1.1 : Land use classification in India…. (Cont…/)

(Million Hectare)

Classification	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2001-02
1	2	3	4	5	6	7	8
I. Geographical Area	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**
II. Reporting Area for Land Utilisation Statistics (1 to 5)	**284.32**	**298.46**	**303.76**	**304.16**	**304.86**	**305.18**	**305.12**
1. Forests	40.48	54.05	63.92	67.47	67.81	69.53	69.57
2. Not Available for Cultivation (a+b)	**47.52**	**50.75**	**44.64**	**39.62**	**40.48**	**41.62**	**41.78**
(a) Non Agricultural Uses	9.36	14.84	16.48	19.66	21.09	23.86	24.06
(b) Barren and Unculturable Land	38.16	35.91	28.16	19.96	19.39	17.76	17.72
3. Other Uncultivated Land excluding fallow land (a+b+c)	**49.45**	**37.64**	**35.06**	**32.32**	**30.22**	**27.70**	**27.36**
(a)Permanent Pastures and Other Grazing Land	6.68	13.97	13.26	11.97	11.40	10.66	10.58
(b) Land Under Miscellaneous Tree Crops and Groves not Included in Net Area Sown	19.83	4.46	4.30	3.61	3.82	3.43	3.38
(c) Culturable Wasteland	22.94	19.21	17.50	16.74	15.00	13.61	13.40
4. Fallow Land (a+b)	**28.13**	**22.82**	**19.88**	**24.75**	**23.36**	**25.08**	**24.96**
(a) Fallow Lands Other Than Current Fallows	17.45	11.18	8.76	9.92	9.66	10.31	10.32
(b) Current Fallows	10.68	11.64	11.12	14.83	13.70	14.77	14.64
5. Net Area Sown (6-7)	118.75	133.20	140.27	140.00	143.00	141.40	141.45
6. Gross Cropped Area	131.89	152.77	165.79	172.63	185.74	185.37	189.71
7. Area Sown More Than Once	13.15	19.57	25.52	32.63	42.74	43.97	48.26
8. Cropping Intensity*	111.10	114.70	118.20	123.30	129.90	131.10	134.10
III. Net Irrigated Area	**20.85**	**24.66**	**31.10**	**38.72**	**48.02**	**55.08**	**56.67**
IV. Gross Irrigated Area	**22.56**	**27.98**	**38.20**	**49.78**	**63.20**	**75.97**	**78.73**

Table 5.1.1 : Land use classification in India…. (Concluded)

Classification	2002-03	2003-04	2004-05	2005-06 (P)	2006-07 (P)	2007-08 (P)	2008-09 (P)	2009-10 (P)&	2010-11(P)
1	9	10	11	12	13	14	15	16	17
I. Geographical Area	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**
II. Reporting Area for Land Utilisation Statistics (1 to 5)	**305.34**	**305.56**	**305.58**	**305.43**	**305.64**	**305.67**	**305.69**	**305.61**	**305.90**
1. Forests	69.70	69.73	69.72	69.79	69.81	69.63	69.63	70.00	70.00
2. Not Available for Cultivation (a+b)	**42.08**	**42.24**	**42.34**	**42.51**	**42.63**	**43.19**	**43.32**	42.95	43.56
(a) Non Agricultural Uses	24.27	24.66	24.76	25.03	25.19	26.01	26.31	26.17	26.51
(b) Barren and Unculturable Land	17.81	17.58	17.58	17.48	17.44	17.18	17.02	16.78	17.05
3. Other Uncultivated Land excluding fallow land (a+b+c)	**27.40**	**26.97**	**26.96**	**26.92**	**27.05**	**26.85**	**26.51**	**26.34**	**26.28**
(a)Permanent Pastures and Other Grazing Land	10.50	10.44	10.42	10.42	10.36	10.36	10.34	10.14	10.30
(b) Land Under Miscellaneous Tree Crops and Groves not Included in Net Area Sown	3.37	3.40	3.38	3.38	3.45	3.12	3.40	3.35	3.32
(c) Culturable Wasteland	13.53	13.13	13.16	13.12	13.24	13.07	12.76	12.85	12.66
4. Fallow Land (a+b)	**33.47**	**25.49**	**25.14**	**24.17**	**25.72**	**25.11**	**24.86**	**26.23**	**24.59**
(a) Fallow Land Other Than Current Fallows	11.78	11.21	10.71	10.50	10.48	10.35	10.32	10.48	10.32
(b) Current Fallows	21.69	14.28	14.43	13.67	15.24	14.76	14.54	15.75	14.27
5. Net Area Sown (6-7)	132.69	140.97	141.14	141.89	140.30	140.90	141.36	139.18	141.58
6. Gross Cropped Area	175.62	190.20	190.42	192.80	193.72	195.16	195.10	188.99	198.97
7. Area Sown More Than Once	42.93	49.23	49.28	50.90	53.72	54.25	53.74	49.81	57.39
8. Cropping Intensity*	132.40	134.90	134.90	135.90	138.10	138.50	138.00	135.79	140.54
III. Net Irrigated Area	**53.78**	**56.62**	**58.87**	**60.20**	**60.86**	**63.10**	**63.20**	**61.93**	**63.60**
IV. Gross Irrigated Area	**72.55**	**78.00**	**80.00**	**82.63**	**85.78**	**87.92**	**88.42**	**85.09**	**89.36**

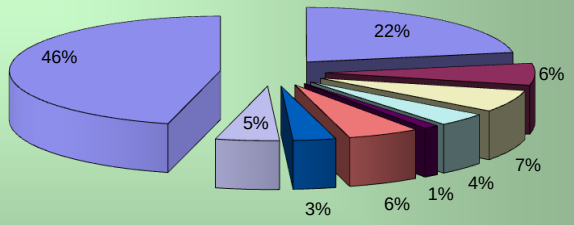
Source : State of Indian Agriculture 2011-12 Dept of Agr.& Cooperation, Ministry of Agriculture.

P : Provisional (except geographical area)

* : Cropping Intensity is obtained by dividing the gross cropped area by the net area sown expressed in percentage.

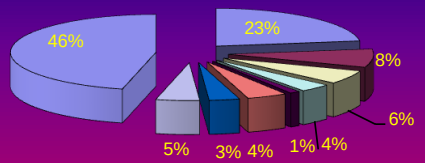
& In 2009-10 there is significant decline in total cropped area and net area sown due to decline in net area sown in the states of Andhra pradesh, Bihar, Jharkhand, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal. This was mainly due to deficient rainfall

Chart 5.1 : Land use in India -1980-81



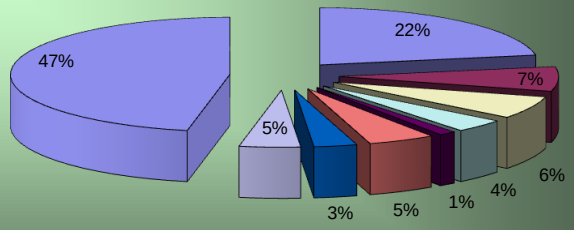
Forests | Non Agricultural Uses | Barren and unculturable land
Permanent Pastures and other grazing land | Miscellaneous tree crops and groves | Culturable Wasteland
Fallow Land | Net area sown

Land Use in India-2000-01



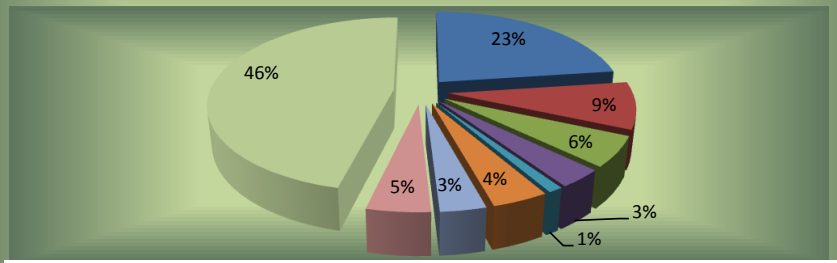
Forests | Non Agricultural Uses | Barren and unculturable land
Permanent Pastures and other grazing land | Miscellaneous tree crops and groves | Culturable Wasteland
Fallow Land | Net area sown

Land use in India-1990-91



Forests | Non Agricultural Uses | Barren and unculturable land
Permanent Pastures and other grazing land | Miscellaneous tree crops and groves | Culturable Wasteland
Fallow Land | Net area sown

Land Use in India 2010-11



Forests | Non Agricultural Uses | Barren and Unculturable Land
Permanent Pastures and Other Grazing Land | Land Under Miscellaneous Tree Crops and | Culturable Wasteland
Fallow Lands Other Than Current Fallows | Current Fallows | Net Area Sown

Table 5.1.2: Selected categories of land use in India (Million Hectares)						
Year	Net area sown	Total cropped area	Area sown more than once (3-2)	Net Irrigated Area	Gross Irrigated Area	Area Irrigated more than once (6-5)
1	2	3	4	5	6	7
1950-51	118.75	131.89	13.15	20.85	22.56	1.71
1951-52	119.40	133.23	13.83	21.05	23.18	2.13
1952-53	123.44	137.68	14.23	21.12	23.31	2.18
1953-54	126.81	142.48	15.67	21.87	24.36	2.49
1954-55	127.85	144.09	16.24	22.09	24.95	2.86
1955-56	129.16	147.31	18.16	22.76	25.64	2.88
1956-57	130.85	149.49	18.64	22.53	25.71	3.17
1957-58	129.08	145.83	16.75	23.16	26.63	3.47
1958-59	131.83	151.63	19.80	23.40	26.95	3.55
1959-60	132.94	152.82	19.89	24.04	27.45	3.42
1960-61	133.20	152.77	19.57	24.66	27.98	3.32
1961-62	135.40	156.21	20.81	24.88	28.46	3.58
1962-63	136.34	156.76	20.42	25.67	29.45	3.79
1963-64	136.48	156.96	20.48	25.89	29.71	3.82
1964-65	138.12	159.23	21.11	26.60	30.71	4.11
1965-66	136.20	155.28	19.08	26.34	30.90	4.56
1966-67	137.23	157.36	20.12	26.91	32.68	5.78
1967-68	139.88	163.74	23.86	27.19	33.21	6.01
1968-69	137.31	159.53	22.22	29.01	35.48	6.47
1969-70	138.70	162.27	23.57	30.20	36.97	6.78
1970-71	140.86	165.79	24.93	31.10	38.20	7.09
1971-72	139.72	165.19	25.47	31.55	38.43	6.88
1972-73	137.14	162.15	25.01	31.83	39.06	7.22
1973-74	142.42	169.87	27.46	32.55	40.28	7.74
1974-75	137.79	164.19	26.40	33.71	41.74	8.03
1975-76	141.65	171.30	29.64	34.59	43.36	8.77
1976-77	139.48	167.33	27.86	35.15	43.55	8.40
1977-78	141.95	172.23	30.28	36.55	46.08	9.53
1978-79	142.98	174.80	31.82	38.06	48.31	10.25
1979-80	138.90	169.59	30.69	38.52	49.21	10.69
1980-81	140.29	172.63	32.34	38.72	49.78	11.06
1981-82	142.12	176.75	34.63	40.50	51.41	10.91
1982-83	140.81	172.75	31.94	40.69	51.83	11.14
1983-84	143.21	179.56	36.35	41.95	53.82	11.88
1984-85	140.90	176.33	35.43	42.15	54.53	12.38
1985-86	140.90	178.46	37.56	41.87	54.28	12.42
1986-87	139.58	176.41	36.83	42.57	55.76	13.19
1987-88	134.09	170.74	36.65	42.89	56.04	13.14
1988-89	141.89	182.28	40.39	46.15	61.13	14.98
1989-90	142.34	182.27	39.93	46.70	61.85	15.15
1990-91	143.00	185.74	42.74	48.02	63.20	15.18

Cont..

Table 5.1.2: Selected categories of land use in India (Concluded)

(Million Hectares)

Year	Net area sown	Total cropped area	Area sown more than once (3-2)	Net Irrigated Area	Gross Irrigated Area	Area Irrigated more than once (6-5)
1	2	3	4	5	6	7
1991-92	141.63	182.24	40.61	49.87	65.68	15.81
1992-93	142.72	185.70	42.98	50.29	66.76	16.47
1993-94	142.34	186.58	44.25	51.34	68.26	16.92
1994-95	142.96	188.05	45.09	53.00	70.65	17.65
1995-96	142.20	187.47	45.27	53.40	71.35	17.95
1996-97	142.93	189.50	46.57	55.11	76.03	20.91
1997-98	141.95	189.99	48.04	55.21	75.67	20.46
1998-99	142.75	191.65	48.90	57.44	78.67	21.23
1999-00	141.06	188.40	47.33	57.53	79.22	21.69
2000-01	141.36	185.34	44.00	55.13	76.19	21.05
2001-02	140.73	188.01	47.28	56.92	78.42	21.50
2002-03#	132.47	173.89	41.94	53.87	73.41	19.54
2003-04	140.76	189.66	48.95	56.96	78.15	21.19
2004-05(p)	141.17	191.10	50.46	59.21	81.18	21.98
2005-06(p)	141.46	192.73	51.76	60.79	84.26	23.47
2006-07(p)	140.00	192.38	52.56	62.70	86.77	24.06
2007-08(p)	140.90	195.23	54.20	63.10	87.92	24.82
2008-09(p)	141.36	195.31	53.41	63.20	88.42	25.22
2009-10(p)@	139.17	188.99	49.84	61.93	85.09	23.15
2010-11(p)	141.58	198.97	57.39	63.60	89.36	25.76

Source: Directorate of Economics & Statistics, Department of Agriculture & Cooperation.

(p): Provisional

: In 2002-03 there is significant decline in Total Cropped Area and Net Area Sown due to decline in net area sown in the States of Andhra Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu, West Bengal and Haryana. This was mainly due to deficient rainfall.

@ : : In 2009-10 there is signnificant decline in Total Cropped Area and Net Area Sown due to decline in net area sown in the States of Andhra Pradesh, Bihar, Jharkhand , Rajasthan,Tamil Nadu, Uttar Pradesh and West Bengal. This was mainly due to deficient rainfall.

Table 5.1.3: State Category wise total area under wastelands (sq.km) during 2008-09 vis-a-vis 2005-06

State	No of Disticts	Total Geographic Area (TGA)	Total Waste Land(WL)		Change	Total Reduction	Total Increase	% of WL to TGA		% Change over 2005-06
			2005-06	2008-09				2005-06	2008-09	
Andhra Pradesh	23	275068	38788.22	37296.62	-1491.60	1682.10	190.46	14.10	13.56	-0.54
Arunachal Pradesh	16	83743	5743.83	14895.24	9151.41	108.48	9259.89	6.86	17.79	10.93
Assam	23	78438	8778.02	8453.86	-324.16	862.56	538.04	11.19	10.78	-0.41
Bihar	37	94171	6841.09	9601.01	2759.92	1895.09	4654.41	7.26	10.20	2.93
Chattisgarh	16	135194	11817.82	11482.18	-335.64	379.06	43.15	8.74	8.49	-0.25
Delhi	1	1483	83.34	90.21	6.87	3.62	10.27	5.62	6.08	0.46
Goa	2	3702	496.27	489.08	-7.19	11.48	3.99	13.41	13.21	-0.19
Gujarat	25	196024	21350.38	20108.06	-1242.32	2858.99	1616.67	10.89	10.26	-0.63
Haryana	21	44212	2347.05	2145.98	-201.07	232.20	31.92	5.31	4.85	-0.45
Himachal Pradesh	12	55673	22470.05	22347.88	-122.17	197.25	75.57	40.36	40.14	-0.22
Jammu & Kashmir	14	101387	73754.38	75435.77	1681.39	1191.48	2872.78	72.75	74.40	1.66
Jharkhand	24	79706	11670.14	11017.38	-652.76	1183.50	531.16	14.64	13.82	-0.82
Karnataka	27	191791	14438.12	13030.62	-1407.50	1477.98	70.82	7.53	6.79	-0.73
Kerala	14	38863	2458.69	2445.62	-13.07	247.55	234.44	6.33	6.29	-0.03
Madhya Pradesh	48	308252	40042.98	40113.27	70.29	258.95	329.25	12.99	13.01	0.02
Maharashtra	35	307690	38262.81	37830.82	-431.99	469.93	38.22	12.44	12.30	-0.14
Manipur	9	22327	7027.47	5648.53	-1378.94	2391.10	1012.14	31.48	25.30	-6.18
Meghalaya	7	22429	3865.76	4127.43	261.67	93.86	355.13	17.24	18.40	1.17
Mizoram	8	21081	6021.14	4958.64	-1062.50	2669.27	1606.71	28.56	23.52	-5.04
Nagaland	7	16579	4815.18	5266.72	451.54	721.75	1172.60	29.04	31.77	2.72
Orissa	30	155707	16648.27	16425.76	-222.51	271.75	48.69	10.69	10.55	-0.14
Punjab	20	50362	1019.50	936.83	-82.67	112.70	30.56	2.02	1.86	-0.16
Rajasthan	32	342239	93689.47	84929.10	-8760.37	10264.60	1503.37	27.38	24.82	-2.56
Sikkim	4	7096	3280.88	3273.15	-7.73	11.83	4.29	46.24	46.13	-0.11
Tamilnadu	30	130058	9125.56	8721.79	-403.77	426.78	22.74	7.02	6.71	-0.31
Tripura	4	10486	1315.17	964.64	-350.53	486.15	135.07	12.54	9.20	-3.34
Uttarakhand	13	53483	12790.06	12859.53	69.47	440.35	509.86	23.91	24.04	0.13
UttarPradesh	70	240928	10988.59	9881.24	-1107.35	1269.71	163.08	4.56	4.10	-0.46
West Bengal	19	88752	1994.41	1929.20	-65.21	92.98	28.46	2.25	2.17	-0.07
Union Territory	8	9490	337.30	315.00	-22.30	27.33	4.68	3.55	3.32	-0.23
Total	599	3166414	472261.95	467021.16	-5240.79	32340.38	27098.42	14.91	14.75	-0.17

Source: Wastelands Atlas of India 2011, Ministry of Rural Development Department of Land resource.

Table 5.2.1(a) :State wise coverge under rapid reconnaissance survey

(upto March 2013) (Area in ha)

Sl. No.	State	RVP	FPR	Non-RVP/FPR	Consultancy	Total
1	Andaman & Nicobar Islands					
2	Andhra Pradesh	7766404		7229156		14995560
3	Arunachal Pradesh		855350	1952958		2808308
4	Assam	58888	740890	1264090		2063868
5	Bihar		3635126	4223168		7858294
6	Chandigarh		10437			10437
7	Chhattisgarh	9296983	1692471	86285	5000	11080739
8	Dadra & Nagar Haveli	12810				12810
9	Daman & Diu			3806		3806
10	Delhi		106025			106025
11	Goa			356108		356108
12	Gujarat	576773	108870	9574453		10260096
13	Haryana		1812850			1812850
14	Himachal Pradesh	3216445	644667			3861112
15	Jammu & Kashmir	1095602				1095602
16	Jharkhand	3400122	1308249	2724591	540715	7973677
17	Karnataka	11106666		4980702	8000	16095368
18	Kerala	399552		2631720		3031272
19	Lakshadweep					0
20	Madhya Pradesh	14681209	5230356	6833576	2289713	29034854
21	Maharashtra	21861441	77071	7924682	1721440	31584634
22	Manipur			755909		755909
23	Meghalaya		341260			341260
24	Mizoram		4735	1220508		1225243
25	Nagaland			619495		619495
26	Odisha	2739206		4528771		7267977
27	Pondicherry	7868		38621		46489
28	Punjab	8275	1024279			1032554
29	Rajasthan	2198442	4625839	3209825		10034106
30	Sikkim	1119806				1119806
31	Tamil Nadu	1795980		11100248		12896228
32	Tripura	58056		990453		1048509
33	Uttar Pradesh	1049373	6650251	5704660	288260	13692544
34	Uttarakhand	312821	3394513		53513	3760847
35	West Bengal	862938	1191921	6629635		8684494
	G.Total	**83625660**	**33455160**	**84583420**	**4906641**	**206570881**

Source: Soil and Land Use Survey of India, Department of Agriculture & Coopn., Ministry of Agriculture

RVP : River Valley Project

FPR : Flood Prone Rivers

Table 5.2.1 (b) :State wise coverage under detailed soil survey (area in ha)

Sl. No.	State/UT	RVP	FPR	Non-RVP/FPR	Consultancy	Refuge Rehabilitation	Coal Mine Rehabilitation	Total
1	2	3	4	5	6	7	8	9
1	Andaman & Nicobar Islands				4400			4400
2	Andhra Pradesh	733995		354564	10115			1098674
3	Arunachal Pradesh			24990	10591			35581
4	Assam	24241			7834			32075
5	Bihar		111422	41	7623			119086
6	Bihar & Jharkhand			318				318
7	Chandigarh				18750	8502		27252
8	Chhattisgarh	1103886	21574	10471				1135931
9	Dadra & Nagar Haveli	9933		21613				31546
10	Delhi			164302			5	164307
11	Goa			7495				7495
12	Gujarat	242495						242495
13	Haryana		22352	490				22842
14	Himachal Pradesh	420480	64550		456			485486
15	Jammu & Kashmir	16007		92395	595	2922		111919
16	Jharkhand	787050	327804	82843	2031		289	1200017
17	Karnataka	1730059		15277				1745336
18	Kerala	88078		68687	9979	13179		179923
19	Madhya Pradesh	1832003	149807	33351		13535		2028696
20	Maharashtra	1640487		166				1640653
21	Mizoram			112109	21006			133115
22	Odisha	1129263		2490				1131753
23	Punjab	1350		23860				25210
24	Rajasthan	380138	316502					696640
25	Sikkim	110046		23232				133278
26	Tamil Nadu	118856						118856
27	Tripura	3970						3970
28	Uttar Pradesh	45481	333843	27299	6199			412822
29	Uttarakhand	30210	30957	4391			15006	80564
30	West Bengal	433537	279430	4905	9842	1430		729144
Total		**10881565**	**1658241**	**1075289**	**109421**	**39568**	**15300**	**1239578**

Source: Soil and Land Use Survey of India, Ministry of Agriculture (data up to March 2013)

RVP : Rivers valley Project , FPR Flood Prome Rivers

Table 5.2.1(c) :State wise coverage under RRS,DSS,LDM AND SRM

(as on March 2013)

(Area in ha)

Sl. No.	State	RRS	DSS	LDM	SRM
1	Andhra Pradesh	14995560	1098674	4561637	20025524
2	Andaman & Nicobar Islands		4400		
3	Arunachal Pradesh	2808308	35581		
4	Assam	2063868	32075		4873134
5	Bihar	7858294	119086	1864743	2295700
6	Bihar & Jharkhand				11400
7	Chandigarh	10437	318		
8	Chhattisgarh	11080739	1152716		
9	Dadra & Nagar Haveli	12810	20404		
10	Daman & Diu	3806			146600
11	Delhi	106025	21613		370200
12	Goa	356108	164307	370200	14215818
13	Gujarat	10260096	249990	2668091	1242685
14	Haryana	1812850	22352		2829136
15	Himachal Pradesh	3861112	485520	1238104	
16	Jammu & Kashmir	1095602	16463		504380
17	Jharkhand	7973677	1210766	1940807	1783191
18	Karnataka	16095368	1815222	5099718	1264683
19	Kerala	3031272	103355	448000	28575708
20	Madhya Pradesh	29034854	2073655	6194392	
21	Maharashtra	31584634	1687373	3093380	196206
22	Manipur	755909		109700	1615700
23	Meghalaya	341260		1198600	593081
24	Mizoram	1225243	166	2108700	
25	Nagaland	619495		1657900	
26	Odisha	7267977	1262378		
27	Puducherry	46489			
28	Punjab	1032554	3840		
29	Rajasthan	10034106	720500	3653666	
30	Sikkim	1119806	110046	709600	710600
31	Tamil Nadu	12896228	142088	3675734	
32	Tripura	1048509	3970	1048600	
33	Uttar Pradesh	13692544	412822	2305640	7876026
34	Uttarakhand	3760847	80564		5208480
35	West Bengal	8684494	729144	1969361	7436800
	G.Total	**206570881**	**13779388**	**45916573**	**101775052**

Source: Soil and Land Use Survey of India, Department of Agriculture & Coopn., Ministry of Agriculture

RRS: Rapid Reconnaissance Survey

DSS: Detailed Soil Survey

LDM : Land Degradation Mapping

SRM : Soil Resource Mapping

Table 5.2.2 :State wise coverage under soil resource mapping		
State/UT	**District**	**Total Area (ha)**
Andhra Pradesh	Adilabad	1610500
	Anantpur	1913000
	Chittor	1515200
	Cuddapah	1535900
	East Godavari	1080700
	Krishna	872700
	Mahboob Nagar	1843200
	Nalgonda	1422324
	Nellore	1307600
	Prakasham	1762600
	Ranga Reddy	749300
	Srikakulam	583700
	Visakhapatnam	1116100
	Vizianagaram	653900
	Warangal	1284600
	West Godavari	774200
Total		**20025524**
Assam	Barpeta	324500
	Cachar	378600
	Darrang	348100
	Dhemaji	323700
	Dhurbi	283800
	Dibrugarh	338100
	Hailkakandi	132610
	Karimgunj	180900
	Kokrajhar	316922
	Lakhimpur	297700
	Marigaon	145002
	Nagaon	399300
	Nalbari	225700
	Sibsagar	266800
	Sonitpur	532400
	Tinsukia	379000
		4873134
Bihar	Banka	301900
	Bhagalpur	257000
	Bhojpur	347400
	Buxar	162400
	Muzzaffapur	317200
	Patna	320200
	Saran	264100
	Siwan	221900
	Vaishali (Hajipur)	203600
		2395700

Table 5.2.2 :State wise coverage under soil resource mapping (upto March 2013)		
State/UT	**District**	**Total Area (ha)**
Chandigarh	Chandigarh	**11400**
Delhi	Central Delhi	2300
	East Delhi	4900
	New Delhi	3500
	North Delhi	5900
	North East Delhi	5600
	North West Delhi	44300
	South Delhi	24900
	South West Delhi	42100
	West Delhi	13100
		146600
Goa	North Goa	173600
	South Goa	196600
		370200
Gujarat	Ahmedabad	808681
	Amreli	738117
	Anand	307588
	Banaskantha	1030015
	Bhavnagar	998100
	Bhrauch	625824
	Dahod	373300
	Dangs	176400
	Gandhinagar	216300
	Jamnagar	1366325
	Junagarh	884600
	Kheda	382931
	Mehsana	438400
	Narmada	270583
	Navsari	221100
	Panchmahal	508300
	Patan	553724
	Rajkot	1080186
	Sabarkantha	739000
	Surat	740994
	Suredernagar	999848
	Vadodara	755500
		14215816
Haryana	Fatehabad	246165
	Hissar	394742
	Jhhajjar	186768
	Sirasa	415010
		1242685

Table 5.2.2 :State wise coverage under soil resource mapping (upto March 2013)		
State/UT	**District**	**Total Area (ha)**
Himachal Pradesh	Bilaspur	114143
	Hamirpur	109503
	Kangra	564164
	Kullu	538346
	Mandi	386529
	Shimla	501571
	Sirmour	275893
	Solan	188048
	Una	150939
		2829136
Jharkhand	Palamau	**504380**
Karnataka	Chickmangalur	723391
	Tumkur	1059800
		1783191
Kerala	Ernakulam	307331
	Palakkad	447652
	Kannur	296600
	Wayanad	213100
		1264683
Madhya Pradesh	Balaghat	890059
	Barwani	522698
	Betul	967598
	Bhind	429702
	Bhopal	265975
	Chhatarpur	838891
	Chhindwara	1136866
	Damoh	702397
	Datia	243156
	Dewas	674032
	Dhar	784346
	Dindori	581146
	Guna	613666
	Gwaliar	438782
	Harda	320886
	Hoshangabad	643234
	Indore	376276
	Jabalpur	384328
	Jhabua	651670
	Kanti	592821
	Mandla	693930

Table 5.2.2 :State wise coverage under soil resource mapping (upto March 2013)		
State/UT	**District**	**Total Area (ha)**
	Mandsaur	533825
	Morena	474026
	Narshimhapur	493807
	Neemuch	412351
	Nimar East	718366
	Panna	713500
	Raisen	814618
	Rajgarh	592763
	Ratlam	466829
	Rewa	616469
	Sagar	985511
	Satna	713888
	Sehore	632025
	Seoni	842843
	Shahdol	538744
	Shajapur	596229
	Sheopur	643566
	Shivpuri	1005608
	Sidhi	1012105
	Tikamgarh	485006
	Ujjain	609100
	Umaria	446642
	Vidisha	702875
		27803155
Manipur	East Imphal	109700
	West Imphal	86506
		196206
Meghalaya	East Garo Hills	149000
	Jayantia Hills	381900
	South Garo Hills	188700
	West Khasi Hills	524700
	West Garo Hills	371400
		1615700
Mizoram	Kolasib	138251
	Lunglei	454830
		593081
Sikkim	East Sikkim	96400
	North Sikkim	422600
	South Sikkim	75000
	West Sikkim	116600
		710600

Table 5.2.2 :State wise coverage under soil resource mapping		
State/UT	**District**	**Total Area (ha)**
Uttar Pradesh	Agra	388421
	Ambedkar Nagar	225611
	Azamgarh	415029
	Baghpat	128997
	Barabanki	424762
	Bareilly	398678
	Basti	267754
	Bijnor	438931
	Fatehpur	399090
	Gautam Budha Nagar	134483
	Gazipur	325078
	Ghaziabad	197345
	Gonda	385552
	JP Nagar	388351
	Jaunpur	212214
	Kanpur Dehat	306514
	Kanpur Nagar	288439
	Kausambi	193513
	Kushinagar	277859
	Lakhimpur Kheri	274529
	Maharajganj	283713
	Meerut	249500
	Rai Bareilly	443832
	Saharanpur	360831
		7876026
Uttarakhand	Dehradun	296486
	Almora	301487
	Bageshwar	221138
	Chamoli	763296
	Champawat	172646
	Pauri Garhwal	513309
	Hardwar	230037
	Nainital	399683
	Pithoragarh	704442
	Rudraprayag	194321
	Tehri Garhwal	379742
	Udham Singh Nagar	246305
	Uttarkashi	785590
		5208480
West Bengal	Bankura	688200
	Barddhaman	702400
	Birbhum	454500
	Dakshin Dinajpur	221900
	Darjeeling	314900
	Hooghly	314900
	Jalpaiguri	622700
	Malda	373300
	East Midnapur	473600
	Murshidabad	532400
	Nadia	392700
	Purulia	625900
	North 24 Parganas	409400
	South 24 Parganas	996000
	Uttar Dinajpur	314000
		7436800

(Concluded)

Source: Soil and Land use survey of India, Department of Agriculture & Coop.

Table 5.2.3 : State wise information on rapid reconnaissance survey (up to March 2013)

(Area in lakh hectares)

Sr. No	State/UT	Surveyed Area	Priority Area	No. of SWS/MWS
1	Andaman & Nicobar Islands			
2	Andhra Pradesh	149.96	21.12	1144
3	Arunachal Pradesh	28.08	9.47	482
4	Assam	20.64	3.27	321
5	Bihar	78.58	7.79	404
6	Chandigarh	0.10	0.04	6
7	Chhattisgarh	110.81	18.58	779
8	Dadara & Nagar Haveli	0.13	0.06	2
9	Daman -Diu	0.04	0.00	-
10	Delhi	1.06	0.17	12
11	Goa	3.56	0.91	61
11	Gujarat	102.60	11.69	2507
12	Haryana	18.13	8.14	1126
13	Himachal Pradesh	38.61	4.52	240
14	Jammu & Kashmir	10.96	6.21	821
15	Jharkhand	79.74	32.44	1199
16	Karnataka	160.95	35.44	1773
17	Kerala	30.31	10.84	681
18	Madhya Pradesh	290.35	86.93	7134
19	Maharashtra	315.85	81.83	3648
20	Manipur	7.56	4.75	145
21	Meghalaya	3.41	2.74	571
22	Mizoram	12.25	9.16	1642
23	Nagaland	6.19	3.51	77
24	Odisha	72.68	20.11	902
25	Puducherry	0.46	0.03	1
26	Punjab	10.33	0.58	29
27	Rajasthan	100.34	22.52	1012
28	Sikkim	11.20	4.57	224
29	Tamil Nadu	128.96	19.23	1830
30	Tripura	10.49	2.45	286
31	Uttar Pradesh	136.93	23.01	1538
32	Uttarakhand	37.61	17.47	1376
33	West Bengal	86.84	8.41	378
	Total	2065.71	50.69	**34384**

Source Soil & Land Use Survey of India, Ministry of Agriculture

SWS- Sub-Watershed MWS- Micro -Watershed.

Table 5.2.4 : State wise extent of alkali area, physical progress of reclamation

(Phy. In thousand ha.)

S.No	Name of State	Alkali Area	Reclamation up to IX Plan	Progress during 3 years of X Plan (2002-05)	Reclamation upto (2004-05)
1	2	3	4	5	6
1	Andhra Pradesh	64.00	0.00	0.00	0.00
2	Bihar	4.00	0.00	0.00	0.00
3	Gujarat	610.00	4.72	25.00	29.80
4	Haryana	450.00	166.95	32.00	198.90
5	Karnataka	76.00	0.00	2.34	2.30
6	Madhya Pradesh	164.00	0.09	0.00	0.10
7	Maharashtra	59.00	0.00	0.00	0.00
8	Punjab	718.00	275.20	1.33	276.50
9	Rajasthan	332.00	5.87	13.40	19.30
10	Tamilnadu	4.00	0.00	2.10	2.10
11	Uttar Pradesh	1100.00	128.23	1.54	**129.70**
	Total	**3581.00**	**581.06**	**77.71**	**658.70**

Source: Ministry of Agriculture

5.3 Land Degradation

5.3.1 Land is degraded when it suffers a loss of intrinsic qualities, decline in its capabilities or loss in its productive capacity. Land degradation may be due to natural causes or human causes or it may be due to combination of both. **The State wise information of degraded land of the Districts is in table 5.3.1. The table 5.3.2 at exhibits the trends in usage of agricultural inputs in India.**

5.3.2 Land degradation is a global problem, largely related to agricultural use. The major causes include:

- Land clearance, such as deforestation
- Agricultural depletion of soil nutrients through poor farming practices
- Livestock including overgrazing
- Inappropriate Irrigation
- Urban sprawl and commercial development
- Land pollution including industrial waste
- Vehicle off-roading
- Quarrying of stone, sand, ore and minerals

5.4 Soil Erosion

5.4.1 Soil is the non-renewable natural resource which supports life on earth. It is estimated that one-sixth of the world's soils have already been degraded by water and wind erosion. This has two important consequences: the reduced ability of society to produce sufficient food due to loss of quality and depth of soils; and resulted in off-site pollution associated with erosion. These include siltation of dams, pollution of water-courses by agricultural chemicals and damage to property by soil-laden runoff. On-site issues of declining soil quality tend to be spatially dispersed occurring on many different soil types whereas off-site pollution issues tend to be locally concentrated.

5.4.2 Soil erosion problems are not confined to the Developing World. In the last two decades, there has been a growing appreciation of the threat to European soils as a result of intensification of agriculture, overgrazing and climate change. The threat is most apparent in the Mediterranean Region where the term "desertification" has been used to describe a series of inter-related changes which include soil erosion. The EU-funded Mediterranean Desertification and Land Use (MEDALUS) project is currently addressing these latter issues for much of Southern Europe.

5.4.3 In India, about 130 million hectares of land (45% of total geographical area) is affected by serious soil erosion through ravine and gully, shifting cultivation, cultivated wastelands, sandy areas, deserts and water logging (Govt. of India, 1989).

5.4.4 Soil erosion by rain and river that takes place in hilly areas causes landslides and floods, while cutting trees for firewood, agricultural implements and timber, grazing by a large number of livestock, over and above, the carrying capacity of grass lands, traditional agricultural practices, construction of roads, indiscriminate (limestone) quarrying and other activities, have all led to the opening of hill-faces to heavy soil erosion. Wind erosion causes expansion of deserts, dust, storms, whirlwinds and destruction of crops, while moving sand covers the land and makes it sterile. Excessive soil erosion with consequent high rate of sedimentation in the reservoirs and decreased fertility has become serious environmental problems with disastrous economic consequences. Of the 16 rivers of world, which experience severe erosion and carry heavy sediment load, 3 rivers, namely; Ganges, Brahmaputra and Kosi occupy the 2^{nd}, 3^{rd} and 12^{th} position, respectively.

5.4.5 Soil erosion results in huge loss of nutrients in suspension or solution, which are removed away from one place to another, thus causing depletion or enrichment of nutrients. Besides the loss of nutrients from the topsoil, there is also degradation through the creation of gullies and ravines, which makes the land unsuitable for agricultural production. Subsidence of the land in some areas and landslides in the hilly tracts are problems affecting highways, habitations and irrigation dams.

Table 5.3.1 : State wise information on degraded land in the districts

Upto March 2013 (hectare)

Sl. No.	State/UT	District		Total Area	Total Degraded Land area	% Degraded Land Area
1	2	3		4	5	6
1	Andhra Pradesh	1	Chittor	1492644	127725	8.56
		2	Kurnool	1761393	309412	17.57
		3	Nellore	1307600	169808	12.99
2	Bihar	1	Banka	278768	29294	10.51
		2	Bhagalpur	255822	32589	12.74
		3	Gaya	473659	7727	1.63
		4	Munger	634594	144617	22.79
		5	Siwan	221900	22611	10.19
3	Goa	1	North Goa	175592	24634	14.03
		2	South Goa	194608	19639	10.09
4	Gujarat	1	Bharuch	776430	192841	24.84
		2	Bhavnagar	1115500	271337	24.32
		3	Surat	776161	85469	11.01
5	Himachal Pradesh	1	Chamba	671500	74238	11.06
		2	Kullu	566604	259127	45.73
6	Jharkhand	1	East Singhbhum	337155	27783	8.24
		2	Palamau	802291	50363	6.28
		3	Sarailela- Kharsawan	272340	37050	13.60
		4	West Singhbhoom	529021	58539	11.07
7	Karnataka	1	Bagalkot	658877	135145	20.51
		2	Bijapur	1053471	256010	24.30
		3	Chickmagalur	722072	16038	2.22
		4	Gulbarga	1610208	313347	19.46
		5	Tumkur	1055090	58808	5.57
8	Kerala	1	Palghat	448000	16204	3.62
9	Madhya Pradesh	1	Balaghat	924500	112941	12.22
		2	Chattarpur	863120	191511	22.19
		3	Gwalior	456449	144079	31.57
		4	Jhabua	646912	322601	49.87
		5	Morena	1168336	373553	31.97
		6	Ratlam	486007	160244	32.97
		7	Sidhi	1039194	228736	22.01
		8	Ujjain	609874	129700	21.27
10	Maharashtra	1	Bhandara	934716	49933	5.34
		2	Nasik	1527764	647462	42.38
		3	Wardha	630900	69308	10.99
11	Manipur	1	East Impal	57800	10238	17.71
		2	West Impal	51900	15098	29.09
12	Meghalaya	1	East Garohills	260300	34201	13.14
		2	Jaintia Hills	381900	178666	46.78
		3	South Garohills	185700	8003	4.31
		4	West Garohills	370700	42516	11.47
13	Mizoram	1	Aizawl	357631	109184	30.53
		2	Champhai	318583	184795	58.01
		3	Kolasib	138251	16865	12.20
		4	Lawngtlai	199119	95965	48.19
		5	Lunglei	453800	59913	13.20
		6	Mamit	302575	50986	16.85
		7	Saiha	196581	29416	14.96
		8	Serchhip	142160	70702	49.73

Table 5.3.1 : State wise information on degraded land of the districts

Sl. No.	State/UT	District		Total Area	Total Degraded	% Degraded Area
1	2	3		4	5	6
14	Nagaland	1	Kohima, Phek, Wokha, Zunheboto, Tuensang,Mokokchung, Mon	1657900	441339	26.62
15	Rajasthan	1	Ajmer	842388	398913	47.36
		2	Jhunjhunu	591681	81478	13.77
		3	Nagaur	1764504	361120	20.47
			Rajsamand	455093	136908	30.08
16	Sikkim		East	95400	5922	6.21
			West	116600	17274	14.81
			North	422600	94963	22.47
			South	75000	5323	7.10
17	Tamilnadu	1	Coimbatore	746128	19566	2.62
		2	Dharmapuri	962247	194532	20.22
		3	Erode	825997	5579	0.68
		4	Thirunelveli	682308	36240	5.31
		5	Tuticorin	459054	78213	17.04
18	Tripura	1	West	303300	21385	7.05
		2	South	314000	33396	10.64
		3	North	210070	60732	28.91
		4	Dhalai	221230	47323	21.39
19	Uttar Pradesh	1	Agra	400369	92650	23.14
		2	Bijnor	454057	37732	8.31
		3	Lalitpur	504149	95450	18.93
		4	Mathura	376432	22975	6.10
		5	Sitapur	570633	88717	15.55
20	West Bengal	1	North 24 Pargana	378090	64062	16.94
		2	Puruliya	625100	198619	31.77
		3	South 24 Paragna	966171	263635	27.29
GRAND TOTAL				**45916573**	**8980987**	**19.56**

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

Table 5.3.2 : Use of agricultural inputs

..Cntd

Sl. No.	Programme	Unit	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-2001
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	**Seeds**											
	I. Production of Breeder Seeds	Thousand Quintals	34.90	36.00	37.00	40.11	43.36	46.03	46.13	38.99	51.13	42.69
	II. Production of Foundation Seeds	Lakh Quintals	3.75	3.93	4.06	4.73	4.76	5.76	6.84	6.75	4.66	5.91
	III. Distribution of Certified/Quality Seeds	Lakh Quintals	57.50	60.33	62.20	65.86	69.90	73.27	78.79	84.97	87.98	86.27
2.	**Consumption of Chemical Fertilizers (I+II+III)**											
	I. Nitrogenous(N)	Lakh Tonnes	80.46	84.26	87.88	95.07	98.23	103.02	109.02	113.54	115.92	109.20
	II. Phosphatic(P)	Lakh Tonnes	33.21	28.43	26.69	29.32	28.98	29.77	39.14	41.12	47.99	42.15
	III. Potassic(K)	Lakh Tonnes	13.61	8.84	9.09	11.25	11.56	10.29	13.72	13.32	16.78	15.67
	Total (N+P+K)	Lakh Tonnes	127.28	121.53	123.66	135.64	138.77	143.08	161.88	167.98	180.69	167.02
	Per Hectare**	Kg	69.84	65.48	66.27	72.13	74.02	75.47	84.94	87.02	94.94	89.63
3.	**Consumption of Pesticides(Technical Grade)**	Thousand Tonnes	72.13	70.79	63.65	61.36	61.26	56.11	52.24	49.16	46.20	43.58
4	**Area covered under Soil Conservation**	Lakh ha	-	-	-	-	-	-	-	-	-	4.36

Source : Agricultural Statistics at a Glance 2012
2. Department of Agriculture & Cooperation, New Delhi
3. States/UTs Zonal Conference, Kharif & Rabi
**Based on 2009-10 Provisional Gross Cropped Area.

Table 5.3.2 : Use of agricultural inputs

Concluded

Sl. No.	Programme	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1	2	14	15	16	17	18	19	20	21	22	23	24
1.	**Seeds**											
	I. Production of Breeder Seeds	45.54	48.42	61.82	66.46	66.88	73.83	91.96	94.41	105	119.2	119.2
	II. Production of Foundation Seeds	5.44	6.14	6.50	6.90	7.40	7.96	8.22	9.69	10.5	17.53	21.86
	III. Distribution of Certified/Quality Seeds	91.80	98.03	108.59	120.26	126.75	155.01	179.05	215.81	257.1	277.3	283.9
2.	**Consumption of Chemical Fertilizers (I+II+III)**											
	I. Nitrogenous(N)	113.10	104.74	110.77	117.13	127.23	137.73	144.19	150.91	155.8	165.6	173
	II. Phosphatic(P)	43.82	40.19	41.24	46.24	52.04	55.43	55.15	65.06	72.74	80.5	79.14
	III. Potassic(K)	16.67	16.01	15.98	20.60	24.13	23.35	26.36	33.13	36.32	35.14	25.26
	Total (N+P+K)	173.59	160.94	167.99	183.97	203.40	216.51	225.70	249.10	264.86	281.22	277.40
	Per Hectare**	91.13	91.45	88.05	94.52	105.50	111.76	115.27	127.67	137.8	146.3	144.3
3.	**Consumption of Tonnes Pesticides(Technical Grade)**	47.02	48.30	41.00	40.67	39.77	41.51	44.77	43.86	41.82	55.54	50.58
4	**Area covered under Soil Conservation**	4.70	4.30	5.55	7.37	8.67	11.41	7.34	6.90	5.32	7.49	4.72

Source : Agricultural Statistics at a Glance 2012
2. Department of Agriculture & Cooperation, New Delhi
3. States/UTs Zonal Conference, Kharif & Rabi
**Based on 2009-10 Provisional Gross Cropped Area.

Table 5.3.3 : Performance of crop production

Sl. No.	Crops	Year						
		2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
1	2	3	4	5	6	7	8	9
1	Rice	83.13	91.79	93.35	96.69	99.18	89.09	95.98
2	Wheat	68.64	69.35	75.81	78.57	80.68	80.80	86.87
3	Coarse Cereals	33.47	34.07	33.92	40.76	40.03	33.55	43.40
4	**Total Cereals**	**185.24**	**195.21**	**203.08**	**216.02**	**219.89**	**203.44**	**226.25**
5	Total Pulses	13.13	13.39	14.23	14.76	14.57	14.66	18.24
6	**Total Foodgrains**	**198.37**	**208.60**	**217.31**	**230.78**	**234.46**	**218.10**	**244.49**
7	Sugarcane	237.08	281.17	355.52	348.19	285.03	292.30	342.38
8	Total Oilseeds	24.35	27.98	24.29	29.76	27.72	24.88	32.48
9	Cotton $	16.43	18.50	22.63	25.88	22.28	24.02	33.00
10	Jute & Mesta #	10.27	10.84	11.27	11.21	10.37	11.82	10.62

Source : Directorate of Economics & Statistics

: Production in million bales of 180 kg. each

$: Production in million bales of 170 kg. each

5.3.4 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. **Tables 5.3.3 & 5.3.4 at depicts the changing pattern of crop production in India.**

Table 5.3.4 :Area under crops - All India

(Thousand Hectares)

Year	FOODGRAINS													
	Rice	Jowar	Bajra	Maize	Ragi/ Marua	Wheat	Barley	Other Cereals & Millets	Total Cereals & Millets (col.2 to 9)	Gram	Tur or Arhar	Other pulses (Excl. Gram & Tur or Arhar)	Total Pulses (col.11 to 13)	Total Foodgrains (col.10+ 14)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1950-51	31056	15554	9744	3250	2254	10010	3198	5576	80642	7803	2228	10523	20554	101196
1951-52	30434	15960	10083	3435	2229	9624	3384	5396	80545	6963	2521	10824	20308	100853
1952-53	29991	18023	11489	3721	2315	9938	3346	5597	84420	7392	2499	10901	20792	105212
1953-54	31186	17876	12727	3877	2423	10745	3547	6057	88438	8097	2476	11426	21999	110437
1954-55	30660	17273	11436	3928	2407	11344	3401	5899	86348	9295	2474	11238	23007	109355
1955-56	31633	17447	10972	3811	2333	12704	3405	5412	87717	9844	2336	11428	23608	111325
1956-57	32365	16663	11301	3834	2292	13625	3518	5200	88798	9694	2333	11837	23864	112662
1957-58	32292	17298	11185	4146	2355	11758	3072	5033	87139	9087	2357	11185	22629	109768
1958-59	33195	17935	11405	4259	2454	12616	3314	5225	90403	10038	2466	11938	24442	114845
1959-60	33888	17715	10852	4348	2472	13384	3379	5200	91238	10348	2433	12338	25119	116357
1960-61	34056	18426	11470	4401	2478	12931	3140	4997	91899	9274	2429	11962	23665	115564
1961-62	34656	18220	11275	4501	2459	13565	3309	4908	92893	9562	2439	12387	24388	117281
1962-63	35734	18402	10961	4646	2426	13589	3021	5000	93779	9192	2447	12739	24378	118157
1963-64	35745	18370	11103	4586	2420	13519	2774	4855	93372	9353	2513	12458	24324	117696
1964-65	36359	18023	11916	4617	2410	13453	2675	4803	94256	8875	2560	12728	24163	118419
1965-66	35338	17623	11959	4794	2408	12539	2638	4807	92106	8004	2533	12244	22781	114887
1966-67	35060	18117	12787	5119	2419	12775	2859	4804	93940	7975	2621	11462	22058	115998
1967-68	36108	17900	12798	5612	2417	14926	3377	5099	98237	8012	2653	12352	23017	121254
1968-69	35864	17633	12447	5590	2411	15612	2828	5059	97444	6718	2610	12537	21865	119309
1969-70	37141	16985	12570	5717	2545	16782	2780	5185	99705	7631	2639	12739	23009	122714
1970-71	37381	16871	13391	5856	2474	18293	2556	4962	101784	7820	2639	12667	23126	124910
1971-72	37843	16489	11961	5588	2452	19095	2456	4428	100312	7944	2347	12243	22534	122846
1972-73	36894	16705	12287	5807	2385	18684	2453	4486	99701	6985	2455	12202	21642	121343
1973-74	38215	17059	14132	6011	2344	18641	2656	4658	103716	7726	2643	13298	23667	127383
1974-75	37804	16238	11468	5815	2428	17940	2889	4723	99305	7036	2566	12889	22491	121796
1975-76	39372	16062	11598	5912	2632	20339	2810	4994	103719	8303	2728	13788	24819	128538
1976-77	38477	15740	10806	5978	2502	20876	2244	4800	101423	7975	2578	13101	23654	125077
1977-78	40280	16100	11006	5712	2682	21277	2003	4747	103807	7928	2634	13356	23918	127725
1978-79	40511	16052	11400	5784	2682	22540	1837	4504	105310	7671	2679	13606	23956	129266
1979-80	39542	16618	10798	5754	2603	22098	1771	4067	103251	6952	2825	12570	22347	125598
1980-81	40237	16412	11658	6032	2504	22225	1799	4033	104900	6547	2877	13284	22708	127608
1981-82	40778	16817	11826	5916	2555	21992	1728	3905	105517	7839	2989	13352	24180	129697
1982-83	38424	16343	11155	5720	2345	23523	1493	3585	102588	7339	2909	12726	22974	125562
1983-84	41485	16608	11796	5837	2561	25545	1383	3681	108896	7041	3135	13351	23527	132423
1984-85	41167	16179	10659	5821	2379	23488	1247	3306	104246	6769	3156	12877	22802	127048
1985-86	41220	16338	10854	5797	2372	23179	1361	3198	104319	7746	3247	13444	24437	128756
1986-87	41154	16184	11497	5955	2394	23196	1224	3003	104607	7003	3186	13196	23385	127992
1987-88	38866	16116	9171	5645	2242	23213	1139	2929	99321	5794	3346	12415	21555	120876
1988-89	41756	14499	12156	5894	2275	24065	1087	2722	104454	6798	3514	12807	23119	127573
1989-90	42178	14602	11056	5946	2299	23461	1001	2574	103117	6446	3600	13363	23409	126526
1990-91	42744	14158	10735	5893	2145	24046	972	2372	103065	7471	3609	13803	24883	127948
1991-92	42661	12481	10268	5878	2109	23378	964	2102	99841	5591	3639	13449	22679	122520
1992-93	41860	13222	10854	6087	2039	24644	925	2015	101646	6434	3596	13539	23569	125215
1993-94	42687	12942	9738	6102	2017	25202	809	1917	101414	6326	3454	13631	23411	124825
1994-95	42894	11843	10333	6104	1897	25887	897	1811	101666	7500	3283	13500	24283	125949
1995-96	43016	11477	9558	6117	1929	25105	838	1786	99826	7121	3470	13046	23637	123463
1996-97	43529	11435	10297	6270	1864	25991	765	1634	101785	7040	3517	12760	23317	125102
1997-98	43581	10798	9940	6376	1757	26741	871	1653	101717	7456	3341	13201	23998	125715
1998-99	44898	9905	9527	6338	1862	27466	806	1563	102365	8535	3404	12576	24515	126880
1999-00	45456	9882	9103	6574	1736	27671	746	1432	102600	6295	3454	12369	22118	124718
2000-01	44761	9915	10022	6805	1816	25797	789	1449	101354	5318	3665	12343	21326	122680
2001-02	44677	9807	9744	6683	1732	26318	682	1321	100964	6424	3340	13494	23258	124222
2002-03	41209	9278	7936	6742	1512	25271	689	1221	93858	5898	3339	12160	21397	115255
2003-04	42293	9403	10961	7275	1779	26964	675	1164	100514	7084	3451	13923	24458	124972
2004-05	42637	9048	9432	7434	1669	26885	620	1097	98822	6688	3432	13768	23888	122710
2005-06	43920	8682	9745	7628	1648	26687	630	1000	99940	6790	3537	13345	23672	123612
2006-07(p)	43535	8459	9577	7775	1329	28325	654	963	100617	7375	3342	13527	24244	124861
2007-08(p)	43684	7827	9700	8101	1521	28575	660	924	100992	7743	3598	13527	24868	125860
2008-09(p)	45211	7543	8858	8128	1505	28022	717	889	100873	7920	3274	12570	23764	124637
2009-10(p)	42569	7809	9065	8164	1233	28547	622	900	98909	7997	3273	11303	22573	121482
2010-11(p)	43870	7363	9680	8392	1258	29835	707	847	101952	8865	4291	12593	25749	127701

Source : Department of Agriculture and Cooperation, Directorate of Economic & Statistics, Ministry of Agriculture.

5.3.5 The pesticides and insecticides used in agriculture have a negative impact on the productivity conditions of the soil. **Tables 5.3.5 and Table 5.3.6 at shows the capacity and production of chemical industry for insecticides, fungicides, herbicides, weedicides, roddenticides and fumigents.**

Table 5.3.5 : Capacity and production in the chemical industry in India (Insecticides)

(thousand metric tonnes)

Sl. No.	Products	2004-05		2005-06		2006-07		2007-08		2008-09		2009-10		2010-11		2011-12	
		Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap. 2010-11	Pro.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Insecticides																
1	D.D.T.	6.3	4.0	6.3	4.4	6.3	4.5	6.34	3.44	6.30	3.31	6.30	3.61	6.30	3.09	6.30	3.62
2	Malathion	11.9	4.7	11.8	2.7	8.8	4.0	8.80	3.97	8.80	2.00	8.80	0.62	8.80	0.64	8.80	0.70
3	Parathion (Methyl)	4.0	1.0	4.0	0.5	4.0	0.0	4.00	0.00	4.00	0.00	4.00	0.00	4.00	0.00	4.00	0
4	Dimethoate	3.2	0.9	3.2	0.8	3.2	1.0	3.22	0.87	3.20	0.56	3.20	0.96	3.20	1.12	3.20	0.69
5	D.D.V.P.	4.3	5.0	4.3	3.8	4.3	3.9	4.32	3.29	5.40	2.73	5.40	3.12	5.40	3.13	5.40	4.18
6	Quinalphos	4.0	0.9	4.0	0.9	4.0	0.8	4.00	0.52	4.00	0.89	4.00	0.99	4.00	1.01	4.00	0.99
7	Monocrotophos	13.9	9.5	14.0	4.9	14.0	4.9	13.97	5.12	14.00	4.57	14.00	5.74	14.00	8.60	14.00	8.60
8	Phosphamidon	3.9	0.4	3.9	0.5	3.9	0.4	3.90	0.71	3.90	0.85	3.90	1.00	3.90	0.03	3.90	0.06
9	Phorate	8.2	3.6	8.2	6.2	8.2	5.7	8.20	3.23	8.20	2.03	8.20	2.00	8.20	2.63	8.20	2.33
10	Ethion	5.6	1.8	5.6	1.5	5.6	1.8	5.63	0.77	5.60	0.16	5.60	0.43	5.60	0.65	5.60	0.00
11	Endosulphan	10.1	3.1	10.1	2.9	9.9	3.9	9.90	3.96	9.90	4.26	9.90	2.80	9.90	1.73	9.90	0.02
12	Fenvalerate	2.6	0.6	2.7	0.6	2.7	0.5	2.65	0.72	2.60	0.49	2.60	0.53	2.60	0.08	2.60	0.05
13	Cypermethrin	5.9	6.5	6.9	6.5	6.9	5.1	6.90	4.66	6.90	4.03	6.90	6.32	6.90	4.95	6.90	8.80
14	Anilophos	1.1	0.4	1.1	0.2	1.1	0.0	1.10	0.00	1.10	0.00	1.10	0.00	1.10	0.00	1.10	0.00
15	Acephate	6.1	6.1	9.2	8.5	9.2	8.3	9.22	10.06	9.20	9.65	9.20	10.83	9.20	12.84	9.20	14.60
16	Chlorpyriphos	8.6	9.0	9.1	4.9	9.1	4.7	9.09	4.54	9.10	3.89	9.10	2.90	9.10	3.35	9.10	1.90
17	Phosalone	1.0	0.5	1.0	0.3	1.0	0.2	1.00	0.50	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
18	Metasystox	*	0.6	*	0.3	*	0.6	*	0.00	*	0.00	*	0.00	*	0.00	*	0.00
19	Abate	*	0.0	*	0.0	*	0.0	-	-	*	-	*	0.00	*	0.00	*	0.00
20	Fenthion	*	0.2	*	0.3	*	0.1	*	0.00	*	0.00	*	1.00	*	1.58	*	0.70
21	Triazophos	*	2.9	*	2.9	*	1.8	*	1.84	*	2.06	*	0.00	*	0.00	*	0.00
22	Lindane	1.4	0.4	0.7	0.2	0.7	0.3	0.73	0.08	0.70	0.00	0.70	0.00	0.70	0.00	0.70	0.00
23	Temephos	0.2	0.3	0.2	0.0	0.2	0.1	0.24	0.08	0.20	0.13	0.20	0.02	0.20	0.00	0.20	0.00
24	Deltamethrin	0.5	0.4	0.5	0.3	0.5	0.3	0.55	0.26	0.50	0.03	0.50	0.02	0.50	0.00	0.50	0.32
25	Alphamethrin	1.3	0.3	1.5	0.2	1.5	0.2	1.53	0.21	1.53	0.02	1.50	0.00	1.50	0.51	1.50	0.32
	Total	**104.1**	**63.1**	**108.4**	**54.5**	**105.3**	**53.2**	**105.29**	**48.82**	**106.13**	**41.64**	**106.10**	**42.89**	**106.10**	**45.94**	**106.10**	**47.88**

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

* : Not available

Note : Cap. = Capacity & Pro. = Production

5.3.6 The use of pesticides above permissible limits enters the food chain, causing health hazards. A major concern particularly about chlorinated hydrocarbons like DDT is their persistence in soil.

Table 5.3.6 : Capacity and production in the chemical industry in India (Fungicides, Herbicides, Weedicdes,Rodenticides, Fumigents)

Sl. No.	Products	2004-05		2005-06		2006-07		2007-08		2008-09		2009-10		2010-11		2011-12	
		Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap.	Pro.	Cap. 2010-11	Pro.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
I	**Fungicides**	**26.2**	**22.7**	**26.1**	**19.4**	**26.1**	**23.5**	**26.12**	**27.37**	**26.20**	**0.04**	**26.20**		**26.20**		**26.20**	**14.00**
1	Captan & Captafol	1.8	0.8	1.8	0.0	1.8	0.2	1.80	0	1.80	0	1.80	0.00	1.80	0.00	1.80	0.90
2	Ziram (Thio Barbamate)	0.5	0.3	0.5	0.1	0.5	0.2	0.45	185	0.50	0.07	0.50	0.00	0.50	0.00	0.50	0.54
3	Carbendazim (Bavistin)	1.5	0.7	1.5	0.4	1.5	0.1	1.47	68	1.50	0.19	1.50	0.19	1.50	0.26	1.50	0.16
4	Calixin	0.2	0.1	0.2	0.0	0.2	0.0	0.20	0	0.20	0	0.20	0.00	0.20	0.00	0.20	0.00
5	Mancozab	20.7	20.8	20.7	18.9	20.7	22.9	20.70	27115	20.70	35	20.70	31.05	20.70	26.05	20.70	12.40
6	Copper-Oxychloride	1.5	0.0	1.5	0.0	1.5	0.0	1.50	0	1.50	0	1.50	0.00	1.50	0.00	1.50	0.00
II	**Herbicides**	**1.7**	**0.4**	**1.7**	**0.6**	**1.7**	**0.2**	**1.70**	**0.30**	**1.70**	**0.00**	**1.70**		**1.70**	**0.09**	**1.70**	**0.03**
1	2, 4-D	1.2	0.1	1.2	0.3	1.2	0.0	1.20	270.0	1.20	0	1.20	0.21	1.20	0.00	1.20	0.00
2	Butachlor	0.5	0.3	0.5	0.3	0.5	0.2	0.50	28	0.50	0	0.50	0.12	0.50	0.09	0.50	0.03
III	**Weedicides**	**10.1**	**5.9**	**8.8**	**5.9**	**8.8**	**5.4**	**8.03**	**4.48**	**8.00**	**0.01**	**8.00**		**8.00**	**6.18**	**8.00**	**3.46**
1	Isoproturon	5.4	4.7	5.4	4.3	5.4	3.2	5.39	2962	5.40	3	5.40	2.98	5.40	3.90	5.40	2.50
2	Glyphoshate	3.9	1.0	2.6	1.5	2.6	2.1	2.64	1517	2.60	2	2.60	2.33	2.60	2.28	2.60	0.96
3	Paraquat	*	0.0	*	0.0	*	0.0	*	*	*	*	*	0.01	*	0.20	*	0.18
4	Diuron	0.1	0.0	0.1	0.0	0.1	0.0	0.10	75	0.10	0.01	0.10	0.26	0.10	0.24	0.10	0.67
5	Atrazine	0.5	0.0	0.5	0.0	0.5	0.1	0.50	218	0.50	0.26	0.50	0.00	0.50	0.00	0.50	0.00
6	Fluchloralin	0.2	0.2	0.2	0.1	0.2	0.1	0.20	0	0.30	0	0.30	0.00	0.30		0.30	0.00
IV	**Rodenticides**	**3.2**	**1.7**	**3.2**	**1.8**	**3.2**	**2.3**	**3.2**	**2.1**	**3.2**	**1.7**	**3.2**		**3.2**	**2.2**	**3.2**	**2.2**
1	Zinc Phosphide	0.9	0.3	0.9	0.3	0.9	0.8	0.86	462	0.9	0	0.9	0.33	0.9	0.42	0.9	0.39
2	Aluminium Phosphide	2.3	1.4	2.3	1.5	2.3	1.5	2.3	1615	2.3	1722	2.3	2.16	2.3	1.80	2.3	1.80
V	**Fumigants**	**0.4**	**0.1**	**0.4**	**0.0**	**0.4**	**0.1**										
1	Methyl Bromide	0.2	0.0	0.2	0.0	0.2	0.0	*	*	*	*	*		*		*	0
2	Dicofol	0.2	0.1	0.2	0.0	0.2	0.1	0.15	88	0.02	88	0.02	2.00	0.02	0.04	0.02	0.08
	Total	**145.7**	**93.9**	**148.7**	**82.2**	**145.5**	**84.7**		**83.42**		**85.338**	**59.78**					**19.76**

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

* : Not Available

0" Prodicton is either zero or negligible

Among fertilizers, the conversion of fertilizer-N to gaseous forms-ammonia (NH3) and various oxides of Nitrogen lead to atmospheric pollution. Escape of fertilizer-N as ammonia gas is called ammonia volatilization. The presence of ammonia and sulphur dioxide may lead to acid rains which ultimately degrade the soil. Atmospheric ammonia contaminates water bodies, impairs visibility and causes corrosion. Nitrous oxide also contributes to global warming.

5.5.1 The activity of mining and quarrying covers underground and surface mines, quarries and wells and includes extraction of minerals and also all the supplemental activities such as dressing and benefaction of ores, crushing, screening, washing, cleaning, grading, milling floatation, melting floatation and other preparations carried out at the mine site which are needed to render the material marketable.

Table 5.5.1 : State wise distribution mining leases

Sl. No.	State	No. of Leases	Percentage	Leases Area (in ha)	Percentage
1	2	3	4	5	6
1	Andhra Pradesh	1999	18.17	68047.13	12.42
2	Assam	8	0.07	929.50	0.17
3	Bihar	11	0.10	2074.72	0.38
4	Chhattisgarh	316	2.87	23551.77	4.30
5	Goa	336	3.05	24393.26	4.45
6	Gujarat	1152	10.47	30035.65	5.48
7	Haryana	118	1.07	12255.12	2.24
8	Himachal Pradesh	54	0.49	3440.41	0.63
9	Jammu & Kashmir	57	0.52	2671.84	0.49
10	Jharkhand	332	3.02	37071.32	6.77
11	Karnataka	754	6.85	59204.59	10.81
12	Kerala	82	0.75	2878.62	0.53
13	Madhya Pradesh	1100	10.00	30930.93	5.65
14	Maharashtra	251	2.28	16093.72	2.94
15	Manipur	2	0.02	610.17	0.11
16	Meghalaya	21	0.19	1297.63	0.24
17	Odisha	532	4.84	77743.91	14.19
18	Rajasthan	2696	24.50	107102.01	19.55
19	Sikkim	3	0.03	96.32	0.02
20	TamilNadu	945	8.59	37780.11	6.90
21	Uttar Pradesh	95	0.86	7608.54	1.39
22	Uttarakhand	89	0.81	1276.76	0.23
12	West Bengal	50	0.45	720.28	0.13
	All States	**11003**	**100.00**	**547814.31**	**100.00**

Source : Annual Report-2011-12, Indian Bureau of Mines (IBM), Nagpur

* : Excuding fuel, atomic and minor minerals.

5.5.2 The mining activities in the country are governed by the Mineral Conservation Development Rules (MCDR), 1988. Every license holder of mining lease shall take all possible precautions for protection of environment and control of pollution while conducting prospecting, mining beneficiation or metallurgical operations in the area. Specific provisions for proper removal and utilization of top soil, storage of over burden and waste rocks, reclamation and rehabilitation of lands, precautions against air pollution, noise and ground vibrations, restoration of flora, discharge of toxic liquid, control of surface subsidence have been provided under the MCDR. The Indian Bureau of Mines collects the statistics on all these aspects under the above rules.

The State wise mines reported (2005- 2011) in India is presented below in table 5.5.2.

Table 5.5.2 : Number of reporting Mines* in India [Excluding atomic and minerals, Petroleum (crude) Natural Gas & Minor Minerals]

Sl. No.	State	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
1	2	3	4	5	6	7	8
1	Andhra Pradesh	409	415	418	469	456	427
2	Arunachal Pradesh				1	1	1
3	Assam	9	9	12	12	11	11
4	Bihar	9	8	6	5	6	9
5	Chhattisgarh	148	144	148	162	152	153
6	Goa	76	72	78	77	75	75
7	Gujarat	431	457	457	440	446	412
8	Himachal Pradesh	27	26	26	26	26	24
9	Jammu & Kashmir	1	0	0	11	11	10
10	Jharkhand	7	11	11	300	299	291
11	Karnataka	297	293	294	241	233	238
12	Kerala	236	231	226	32	30	28
13	Meghalaya	37	33	30	8	9	9
14	Madhya Pradesh	5	8	10	329	287	292
15	Maharashtra	333	336	331	158	158	157
16	Odisha	150	154	163	239	220	175
17	Rajasthan	235	233	226	291	289	270
18	Tamil Nadu	235	217	243	178	175	179
19	Uttar Pradesh	173	177	171	26	25	23
20	Uttarakhand	23	26	26	32	34	36
21	West Bengal	36	37	32	113	112	108
Total		**2877**	**2887**	**2908**	**3150**	**3055**	**2928**

Source : Indian Bureau of Mines

P: Provisional

* Reporting mine: A mine reporting production or reporting 'Nil' production during a year but engaged in developmental work such as overburden removal;, underground driving, winzing, sinking work; exploration by pitting, trenching or drilling as evident from the MCDR returns.

The detail of underground mines in India is exhibited in table 5.5.3 below:

Table 5.5.3: Number of underground mines

Mineral	2008-09 (P)			2009-10 (P)#			2010-11#		
	Total	A' Category	B' Category (Other than 'B')	Total	A' Category	B' Category (Other than 'B')	Total	A' Category	B' Category (Other than 'B')
1	5	6	7	8	9	10	11	12	13
Apatite	1	0	1	1	-	1	1	-	1
Asbestos	3	1	2	3	1	2	3	1	2
Ball Clay	1	0	1	1	-	1	1	-	1
Barytes	1	0	1	1	-	1	-	-	-
Chalk	1	0	1	1	-	1	1	-	1
Chromite	5	5	0	5	5	-	6	6	-
Copper Ore	3	3	0	3	3	-	3	3	-
Gold	4	3	1	4	3	1	4	3	1
Lead & Zinc Ore	6	6	0	6	6	-	5	5	-
Manganese Ore	12	8	4	13	8	5	-	8	5
Mica	28	3	25	27	3	24	25	3	22
Salt (Rock)	1	0	1	1	-	1	1	-	1
Steatite	22	1	21	21	2	19	21	2	19
Total	**105**	**34**	**71**	**87**	**31**	**56**	84	31	53

Source : Indian Bureau of Mines (IBM), Nagpur
Category 'A' : Mechanised Mines, > 150 labour in all and > 75 labour in workings below ground.
Category 'B' : Other than Category 'A'
P : Provisional
: Excluding fuel, atomic & minerals.

The number of Mines in various States and production of minerals are presented in tables 5.5.4 & 5.5.5 .

5.5.3 **The details of machinery and explosives used in Mining Industry is exhibited in tables 5.5.6 & 5.5.7 .**

5.5.4 The details of production of coal and lignite, consumption of minerals in various industry are elaborated in tables 5.5.8 to 5.5.12 .

5.5.5 The condition of reserves and resources for various minerals in the Country is presented in table 5.5.13 .

5.5.6 Environmental issues associated with mining can include erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater and surface water by chemicals from mining processes. In some cases, additional forest logging is done in the vicinity of mines to increase the available room for the storage of the created debris and soil. Contamination resulting from leakage of chemicals can also affect the health of the local population if not properly controlled. Mining companies in most countries are required to follow stringent environmental and rehabilitation codes in order to minimize environmental impact and avoid impacts on human health. These codes and regulations all require the common steps of Environmental impact assessment, development of Environmental management plans, Mine closure planning (which must be done before the start of mining operations), and Environmental monitoring during operation and after closure. However, in some areas, particularly in the developing world, regulation may not be well enforced by governments.

Table 5.5.4 :Number of reporting mines (2000-01 to 2010-11)

Year	Total*	Coal & Lignite	Metalic Minerals	Non-Metallic Minerals
1	2	3	4	5
2000-01	3191	596	565	2030
2001-02	3193	570	574	2049
2002-03	3145	562	591	1993
2003-04	3131	562	612	1957
2004-05	3209	571	625	2013
2005-06	2999	556	636	1807
2006-07	3005	570	639	1796
2007-08	3025	570	693	1762
2008-09	3150	574	719	1857
2009-10	3055	573	701	1781
2010-11	2928	573	687	1668

Source : Indian Bureau of Mines (IBM), Nagpur

* : Includes iron & steel P : Provisional

Reporting mine: A mine reporting production or reporting 'Nil' production during a year but engaged in developmental work such as overburden removal;, underground driving, winzing, sinking work;exploration by pitting, trenching or drilling as evident from the MCDR returns.

Table 5.5.5: Production of minerals (Excluding Atomic and Minor Minerals)

Sl. No.	Minerals	Unit	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12(p)
1	2	3	4	5	6	7	8	9	10
	Fuel Minerals								
1	Coal	Thousnd Tonnes	407039	430832	457082	492757	532042	532694	539950
2	Lignite	Thousnd Tonnes	30066	31285	33980	32421	34071	37733	42332
3	Natural Gas (Ut.)	M.C.M.	32202	31747	32417	32845	47496	52222	47559
4	Petroleum (Crude)	Thousnd Tonnes	32190	33988	34118	33508	33690	37712	38090
	Metallic Minerals								
5	Bauxite	Tonne	12595803	15732535	22624960	15460202	14124093	12640785	12877394
6	Chromite	Tonne	3714284	5295551	4872847	4073479	3425580	4262207	3764120
7	Copper Ore	Tonne	2642706	3273906	3242371	3452406	3271169	3615038	3478189
8	Copper Conc.	Tonne	125392	149584	216966	137514	124577	136856	130458
9	Gold Ore	Tonne	479353	512609	681243	587215	517520	727020	492192
10	Gold (Primary)	Kg.	2880	2361	2936	2438	2084	2239	2192
11	Gold (by product)	Kg.	167	127	0	0	0	0	
12	Iron Ore (Total)	Thousnd Tonnes	165230	187696	213246	212960	218553	207998	167289
13	Lead & Zinc Ore	Tonne	4801184	5139915	5783099	6680698	7101872	7489693	8041881
14	Lead Conc.	Tonne	95738	107334	125755	133768	133921	145043	161157
15	Zinc Conc.	Tonne	889007	947387	1035828	1224077	1279880	1420105	1412291
16	Manganese Ore	Tonne	1906353	2115507	2696980	2789025	2491950	2881080	2349300
17	Silver	Kg.	27961	53271	80697	105284	138780	148288	207142
18	Tin Conc.	Kg.	98734	100835	63218	59778	599016	61355	48971
	Non-Metallic Minerals								
19	Agate	Tonne	9	38	25	-	11	19	476
20	Apatite	Tonne	9053	9464	6691	6415	5992	3846	3053
21	Phosphorite	Tonne	-	-	-	1803954	1605489	2097490	2326876
21	Asbestos	Tonne	2323	390	269	315	243	268	280
22	Ball Clay	Tonne	406675	626801	796134	997676	932993	958454	1594634
23	Barytes	Tonne	1156227	1680695	1076290	1686148	2152552	2333805	1722804
24	Calcite	Tonne	73558	105724	86364	67284	49309	39370	51499
25	Chalk	Tonne	148352	210838	194934	203085	185218	174914	176010
26	Clay (Others)	Tonne	805765	1224235	818993	1220783	1056273	590702	744561
27	Corundum	Kg.	58000	156000	89920	21000	6600	-	
28	Diamond	Carat	44170	2180	586	536	16891	19774	18489
29	Diaspore	Tonne	24494	15944	21236	24642	25569	26905	24124
30	Dolomite	Tonne	4750512	5171649	5852256	5509237	5911759	5064875	5416817
31	Dunite	Tonne	36621	29708	57989	50935	71642	18591	39223
33	Felspar	Tonne	426498	479715	488458	534032	496997	472041	660371
32	Felsite	Tonne	981	642	550	1238	1337	1670	1018
34	Fireclay	Tonne	535735	497315	544973	495781	548748	571421	759746
35	Fluorite (Graded)	Tonne	5577	2053	3970	3176	4995	59954	50147
36	Fluorite (Conc.)	Tonne	3764	0	3794	6814	8786	4394	-
37	Garnet (Abrasive)	Tonne	674541	858843	1275919	1151241	1580617	2126337	1824648
38	Garnet (Gem)	Kg.	0	0	0	-	-	-	-

39	Graphite (R.O.M.)	Tonne	125651	162293	170813	117767	124625	115697	148974
40	Gypsum	Tonne	3291478	3005572	3400050	3876671	3370322	4918170	3189229
41	Jasper	Tonne	536	0	0	99	-	-	-
42	Kaolin	Tonne	1335744	1460363	1466442	2083731	2798340	2727946	2734349
43	Kyanite	Tonne	8869	8059	5102	4620	5495	5954	4064
44	Laterite	Tonne	1040816	1373325	1478590	1237393	1300772	1220304	1665820
45	Lime Kankar	Tonne	291926	395817	336385	434332	335067	383817	311218
46	Limeshell	Tonne	110296	103548	128250	97856	62215	30410	33226
47	Limestone	Thousnd Tonnes	170029	196695	193089	221573	232950	246336	256669
48	Magnesite	Tonne	340674	238981	252849	252880	301070	235762	217662
49	Marl		-	-	4155925	4167452	5908226	4399379	4143975
50	Mica (Crude)	Tonne	2115797	1410576	4577835	1462	1061	1333	1807
51	Mica (Waste & Scrap)(2)	Tonne	4754362	3169838	3504.865	5685	8098	7311	13690
52	Ochre	Tonne	1007088	1047831	1233221	766382	1258207	1218261	1352812
53	Perlite	Tonne	122	68	0	-	-	-	
54	Pyrites	Tonne	-	-	-	-	-	-	
55	Phosphorite	Tonne	2049277	1586843	1849188	-	-	-	
56	Pyrophyllite	Tonne	182526	147807	203707	255699	240747	240082	239811
57	Pyroxenite	Tonne	340953	301733	289321	281785	279332	253205	87310
58	Quartz	Tonne	302259	293660	315281	430734	512320	497546	520146
59	Quartzite	Tonne	109210	102711	95850	97458	112652	118177	181065
60	Salt (Rock)	Tonne	1871	1714	1216	2011	1836	1200	-
61	Sand (Others)	Tonne	2277632	1770235	1804306	1808185	2159405	2057119	2625329
62	Selenite	Tonne	0	0	3864	15224	14598	6736	12852
63	Shale	Tonne	2683853	2849877	2894922	3047063	3033948	3081622	3338919
64	Silica Sand	Tonne	2369977	2663289	4303513	2836804	2545988	3380968	4334925
65	Sillimanite	Tonne	33119	26366	40537		33687	48784	58043
66	Slate	Tonne	2527	4	7827	8931	-	-	-
67	Steatite	Tonne	681534	739849	922505	15224	14598	6728	-
68	Sulphur(3)	Tonne	152090	204186	227311	269572	263124	236998	381146
69	Talc/steatite/soapstone	Tonne	-	-	-	-	876548	902686	958746
70	Vermiculite	Tonne	6674	11827	8910	12647	11662	19234	9746
71	Wollastonite	Tonne	128582	131572	118666	111581	132385	183381	184445

Source : Indian Bureau of Mines,(Ministry of Petroleum & natural Gas, New Delhi, O/o Coal Controller, Kolkata and MCDR Retums.

(2) : Includes the mine waste and waste obtained while dressing of crude mica at the mine site

P: Provisional - not availble Obtained

Table 5.5.6 :Mining machinery in metalliferrous open mechanised cast mines during 2010-11

Sl. No.	Machinery	2006-07		2007-08		2008-09		2009-10		2010-11	
		In Use	In Reserve	In Use	In Reserve	In Use	In Reserve	In Use	In Reserve	In Use	In Reserve
1	2	3	4	5	6	7	8	9	10	11	12
1	Hauler/Dumper	4961	340	5473	321	5789	323	6578	362	6482	360
2	Drills/Blast Holes	474	42	780	91	839	100	723	83	791	84
3	Air Compressor	738	36	657	85	642	84	617	68	686	62
4	Front end loader	403	22	726	52	773	50	645	26	889	31
5	Dipper Shovels (Hydrl)	626	23	537	59	580	85	469	58	563	52
6	Bulldozer	352	27	467	20	513	17	381	24	512	22
7	Back Hoe	13	0	819	44	1001	58	816	54	1066	77
8	Crusher	624	70	348	16	398	13	347	7	198	3
9	Crane	140	4	175	3	176	3	154	3	414	14
10	Dipper Shovels (Mechl)	49	5	65	7	39	15	37	3	598	59
11	Motor Grader	0	0	88	6	88	2	82	1	109	2
12	Locomotives	20	0	12	0	17	0	19	-	23	-
13	Drag Lines	75	6	0	0	0	0	9	-	-	-
14	Surface Miners	816	99	9	0	15	0	0	0	11	-

Source : Indian Bureau of Mines

Table 5.5.7: Consumption of explosives for mining, 2010-11

Sl. No.	Mineral	Gun Powder (in Tonnes)	High Explosives (in Tonnes)	Detonators (in thousand)		Fuses (Meters) (in thousands)	
				Ordinary*	Electric	Safety	Cordtex
1	2	3	4	5	6	7	8
1	Bauxite	0	747	10	67	15	1319
2	Chromite	46	176	1	203	3	357
3	Copper Ore	0	2347	2	0	2	516
4	Graphite	0	83	0	0	0	52
5	Iron Ore	0	22792	48	145	44	2144
6	Lead & Zinc Ore	0	30985	1	207	0	853
7	Manganese Ore	0	459	2	109	2	190
8	Dolomite	0	561	35	36	26	189
9	Limestone	0	21287	155	1013	376	3573
10	Pyrophyllite	0	16	1	82	2	0
11	Steatite	0	503	145	17	366	318
12	Others	0	4046	62	221	72	300
	Total	**46**	**84002**	**462**	**2100**	**908**	**9811**

Source : Indian Bureau of Mines
P : Provisonal
* Includes ordinary and other detonators

Table 5.5.8 : Production of coal 2000-01 to 2010-11

Year	Quantity (Lakh tonnes)	Value (Rs. Crores)	No of Mines	Labour * Employed (Av. Daily)**
1	2	3	4	5
2000-01	3137	20352	591	449021
2001-02	3278	21648	564	428855
2002-03	3413	24187	556	413467
2003-04	3612	25440	554	405719
2004-05	3826	30434	563	393513
2005-06	4070	33675	547	384644
2006-07	4308	34837	561	371490
2007-08	4571	38465	559	357467
2008-09	4928	45537	561	356848
2009-10	5320	41318	560	356848
2010-11(P)	5327	62021	559	356848

Source : Indian Bureau of Mines (IBM), Nagpur

* : Excluding Meghalaya

** : Including Lignite.

P : Provisional

Table 5.5.9 : Production of lignite 2000-01 to 2010-11

Year	Quantity (Lakh tonnes)	Value (Rs. Crores)	No. of Mines
1	2		
2000-01	242	1418	5
2001-02	248	1695	6
2002-03	260	1743	6
2003-04	280	2038	8
2004-05	305	2201	8
2005-06	301	2153	9
2006-07	313	2626	9
2007-08	340	2961	11
2008-09	324	3688	13
2009-10	341	3776	13
2010-11	377	4331	14

Source : Indian Bureau of Mines (IBM), Nagpur

P : Provisional

TABLE 5.5.10 : Consumption of minerals in Iron & steel industry (2000-01 to 2010-11)

Year	Iron Ore*	Coal*	Limestone*	Dolomite **	Manganese Ore **	Ferro-Allyos**	Bauxite**
1	2	3	4	5	6	7	8
2000-01	313	222	48	2850	351	212	14
2001-02	322	240	52	2760	255	223	20
2002-03	338	224	50	3142	212	228	16
2003-04	374	252	54	2988	101	265	1
2004-05	378	252	53	3644	169	259	1
2005-06	402	352 #	59	3740	123	395	1
2006-07	484	218#	70	4330	139	418	1
2007-08 (R)	513	180#	73	4580	108	449	1
2008-09(R)	517	178#	62	4790	148	538	1
2009-10(P)	564	186#	73	4360	135	574	1
2010-11	599	186#	76	4450	139	585	1

Source : Indian Bureau of Mines (IBM), Nagpur

* Lakh Tonnes ** : Thousand Tonnes

P : Provisional R : Revised

All the figures in these tables are based on non-statutory returns and estimates.

Dispatches of Coal, since consumption data is not available.

TABLE 5.5.11 Consumption of minerals in cement industry (2000-01 to 2010-11)

('000 tonnes)

Year	Limestone*	Coal*	Gypsum*	Quartz **	Bauxite **	Iron Ore **	Kaolin/1* *	Fireclay **
1	2	3	4	5	6	7	8	9
2000-01	985	110	36	180	336	726	NA	NA
2001-02	1073	131	37	274	339	701	163	178
2002-03	1137	144	38	271	345	828	177	207
2003-04	1185	146	41	304	423	832	203	270
2004-05	1264	162	43	290	504	985	207	273
2005-06	1320	147#	49	289	516	950	238	262
2006-07	1570	147#	57	293	693	1066	243	262
2007-08	1680	153#	60	293	615	1022	270	247
2008-09	1725	131#	66	298	1144	1074	339	245
2009-10	2031	131#	70	279	1043	1294	642	245
2010-11	2006	131#	71	277	888	1130	663	245

Source : Indian Bureau of Mines (IBM), Nagpur

* Lakh tonnes P: Provisiona **1** Pertains to raw/unprocessed china clay.

** Thousand Tonnes NA : Not Applicable R : Revised

All the figures in these tables are based on non-statutory returns and estimates.

Dispatches of Coal, since consumption data is not available.

TABLE 5.5.12 Consumption of minerals in refractory industry (2000-01 to 2010-11)

('000 tonnes)

Year	Dolomite	Fireclay	Magnesite*	Quartz & Quartzite	Bauxite & Diaspore	Chromite *	Kyanite & Sillimanit	Kaolin
1	2	3	4	5	6	7	8	9
2000-01	379	227	182	61	197	25	18	18
2001-02	392	274	183	59	176	22	17	20
2002-03	391	160	144	48	194	22	17	17
2003-04	372	162	154	48	193	13	17	18
2004-05	372	178	220	48	220	21	20	27
2005-06	373	188	215	61	295	21	24	24
2006-07	373	179	239	59	295	23	28	23
2007-08	63	182	239	53	304	23	20	28
2008-09	63	182	312	54	318	24	17	28
2009-10	63	163	229	55	128	24	18	33
2010-11 (P)	63	162	229	45	128	24	19	25

Source : Indian Bureau of Mines (IBM), Nagpur

* Includes iron & steel

P : Provisional R : Revised

All the figures in these tables are based on non-statutory returns and estimates.

Table 5.5.13: Mineral reserves and resources

Sl.No.	Mineral/ Grades	Unit		As on 1.4.2010		
				Reserves (A)	Remaining Resources (B)	Total (A+B)
1	Andalusite	Th. Tonnes		0	18450	18450
2	Antimony	Tonnes	Ore	0	10588	10588
		Tonnes	Metal	0	174	174
3	Apatite	Tonnes		2090216	22138530	24228746
4	Asbestos	Tonnes		2510841	19655762	22166
5	Ball Clay*	Tonnes		16777842	66615662	83393504
6	Barytes	Tonnes		31584128	41149746	72733874
7	Bauxite	Th. Tonnes		592938	2886682	3479620
	Bentinite	Th. Tonnes		25060508	543306838	568367346
9	Borex	Tonnes		0	74204	74204
10	Calcite	Tonnes		2664338	18281110	20945448
	Chalk	Tonnes		4332	585	4917
	China clay	Tonnes		177158	2528049	2705207
12	Chromite	Th. Tonnes		53970	149376	203346
13	Cobalt	Mill.Tonnes		0	44.91	44.91
14	Copper	Th. Tonnes	Ore	394372	1164086	1558458
		Th. Tonnes	Metal	4768.33	7518.34	12286.67
15	Corundum	Tonnes		597	740194	740792
18	Diamond	Carats		1045318	30876432	31921750
					`	
16	Diaspore	Tonnes		2859674	3125144	5984818
17	Diatomite	Th.Tonnes		0	2885	2885
19	Dolomite	Th.Tonnes		738185	6992372	7730557
20	Dunite	Th.Tonnes		17137	168232	185369
	Emerald			**NE**		
22	Feldsper	Tonnes		44503240	87832212	132335452
23	Fire Clay	Th.Tonnes		30104	683415	713519
24	Fluorite	Tonnes		4712316	13501588	18213904
	Fuller's Earth	Tonnes		58200	256593879	256652079
26	Garnet	Tonnes		19324793	37638032	56962825
27	Gold*	Tonnes	Ore (Primary)	24124537	469570375	493694912
		Tonnes	Metal (Primary)	110.54	549.3	659.84
		Tonnes	Ore (Placer)		26121000	26121000
		Tonnes	Metal (Placer)		5.86	5.86
	Granite (Dimen Stone)	th. cum		263692	45966608	46230300
29	Graphite	Tonnes		8031864	166817781	174849645
30	Gypsum	Th.Tonnes		39096	1247402	1286498
31	Iron Ore & Conc (Heamatite)	Th.Tonnes		8093546	9788551	17882097
32	Iron Ore (Magnetite)	Th.Tonnes		21755	10622305	10644060
	Kyanite	Tonnes		1574853	101670767	103245620
	Laterite	Tonnes		24714	446119	470833
35	Lead & Zinc Ore					
		Th.Tonnes	Ore	108980	576615	685595
		Th.Tonnes	Lead Metal	2245.01	9304.38	11549.39
		Th.Tonnes	Zinc Metal	12453.26	24211.64	36664.9
		Th.Tonnes	Lead & Zinc Metal	0	118.45	118.45
34	Limestone	Th.Tonnes		14926392	170008720	184935112

(Contd…)

Table 5.5.13: Mineral reserves and resources (Contd...)

Sl.No.	Mineral/ Grades	Unit		As on 1.4.2010		
				Reserves (A)	Remaining Resources (B)	Total (A+B)
36	Magnesite	Th.Tonnes		41950	293222	335172
37	Manganese Ore	Th.Tonnes		141977	288003	429980
38	Marble	Th.Tonnes		276495	1654968	1931463
	Marl			139976150	11704870	151681020
39	Mica	Tonnes		190741448	341495531	532236979
40	Molybdenum	Tonnes	Ore	0	19286732	19286732
		Tonnes	Contained MOS_2	0	12640	12640
41	Nickel Ore	Mill. Tonnes		0	189	189
42	Ochre	Tonnes		54942176	89319089	144261265
43	Perlite	Th.Tonnes		428	1978	2406
45	Pt. Grp of Metal	Tonnes	Metal	0	15.7	15.7
44	Potash	Mill. Tonnes		0	21816	21816
46	Pyri tes	Th.Tonnes		0	1674401	1674401
	Phosphorite/Rock Phosphate	Th.Tonnes		34778650	261505701	296284351
47	Pyrophyllite	Tonnes		23275451	32807451	56082902
48	Quartzite	Th.Tonnes		429223	3069808	3499031
49	Quartz & Silica and Sand	Th.Tonnes		86599	1164649	1251248
52	Ruby	Kilogram		236	5112	5348
51	Rock Salt	Th.Tonnes		16026	0	16026
53	Sapphire	Kilogram		0	450	450
54	Shale	Th.Tonnes		15331	580	15911
	Sillimanite	Th.Tonnes		4085052	62902385	66987437
55	Silver	Tonnes	Ore	187558668	279426291	466984959
		Tonnes	Metal	8039.57	19588.68	27628.25
	Slate	Th.Tonnes		0	2369	2369
56	Sulpher	Th.Tonnes		0	210	210
57	Talc-Steatite - Soapstone	Th.Tonnes		90026	178996	269022
58	Tin	Th.Tonnes	Ore	7131	83719066	83726197
		Th.Tonnes	Metal	1132.43	101142.41	102274.84
59	Titanium Minerals	Th.Tonnes		22030223	371965694	393995917
60	Tungsten	Tonnes	Ore	0	87387464	87387464
		Tonnes	Contained WO3	0	142094.35	142094.35
61	Vanadium					
		Tonnes	Ore	410955	24307933	24718888
		Tonnes	Metal	1602.72	63284.45	64887.17
62	Vermiculite	Tonnes		1704007	803003	2507010
63	Wollastonite	Tonnes		2487122	14082751	16569873
64	Zircon	Tonnes		1347470	1786482	3133952

Source : Annual Report-2011-12, Indian Bureau of Mines (IBM), Nagpur

The data on rehabilitation of mining land and reclamation of abandoned mines in India shown in table 5.5.14 indicates the progress made in these areas.

Table 5.5.14 : Information on rehabilitation of mining land/reclaimation of abandoned mines

Sl. No.	Item	2008-09	
		For the Year	Cumulative
1	2	3	4
1	No. of abandoned mines	0	102
2	No. of abandoned mines reclaimed	0	53
3	Total area reclaimed in abandoned mines (in hect.)	0	660
4	No. of mines (working) where reclamation / rehabilitation is carried out	37	1202
5	Area of such reclaimed / rehabilitation in working mines(in hect.)	524	11771

Source : Indian Bureau of Mines

5.5.7 Status of afforestation and trees survived in mining areas in India is presented in table 5.5.15 .

Table 5.5.15 : Status of afforestation(related to Mining) and trees survived (up to 2009-10)

Sl. No.	Minerals	Mines Covered	Area Covered (in Hects.)	Trees Planted (in Nos.)	Trees Survived (in Nos.)	Survival (%)
1	2	3	4	5	6	7
1	Limestone	412	14289	22939	15530	68
2	Iron Ore	138	11267	45368	29631	65
3	Bauxite	83	2488	7358	5579	76
4	Manganese	58	2416	6387	4128	65
5	Lead & Zinc	9	1503	822	707	86
6	Chromite	14	1069	3159	2182	69
7	Magnesite	18	548	504	339	67
8	Gold	5	434	922	645	70
9	Copper	7	377	1525	966	63
10	Dolomite	75	336	532	342	64
11	Iron &	31	226	685	511	75
12	Pyrite	1	7	21	15	71
13	Others	404	3579	3965	2541	64
Total		**1255**	**38539**	**94187**	**63116**	**67**

Source : Indian Bureau of Mines

5.6 Natural disasters in India

5.6.1 Many of the natural disasters occuring in India are related to the climate of the country. They cause massive losses of Indian life and property. Droughts, flash floods, cyclones, avalanches, landslides brought on by torrential rains, and snowstorms pose the greatest threats. Other dangers include frequent summer dust storms, which usually track from north to south; they cause extensive property damage in North India and deposit large amounts of dust from arid regions. Hail is also common in parts of India, causing severe damage to standing crops such as rice and wheat.

Table 5.6.1 : Frequently occurring natural disasters in India

Sl. No.	Type	Location/ Area
1	2	3
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
2	Floods	8 major river valleys spread over 40 million hectares of area in the entire country
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
4	Earthquake	56% of the total area of the country susceptible to seismic disturbances
5	Landslide	Entire sub Himalayan region and Western Ghats
6	Avalanche	Many parts of the Himalaya
7	Fires	States of Bihar, West Bengal, Orissa and north eastern States

Source : India: State of the Environment, 2001, Ministrry of Environment & Forests

The details of the natural disasters occurred in India as depicted in table 5.6.2.indicates the frequency and impact of major natural disasters.

5.6.2 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 1934. 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 6.3 in the Richter scale showed that this region, too, is unstable and earthquake prone. Table 5.6.3 presents the major earthquakes in India.

5.6.3 Landslides are common in the Lower Himalayas. The young age of the region's hills result in labile rock formations, which are susceptible to slippages. Rising population and development pressures, particularly from logging and tourism, cause deforestation. The result is denuded hillsides which exacerbate the severity of landslides; since tree cover impedes the downhill flow of water. Parts of the Western Ghats also suffer from low-intensity landslides. Avalanches occurrences are common in Kashmir, Himachal Pradesh, and Sikkim.

5.6.4 Floods are the most common natural disaster in India. The heavy southwest monsoon rains cause the Brahmaputra and other rivers to distend their banks, often flooding surrounding areas. Though they provide rice paddy farmers with a largely dependable source of natural irrigation and fertilisation, the floods can kill thousands and displace millions. Excess, erratic, or untimely monsoon rainfall may also wash away or otherwise ruin crops. Almost all of India is flood-prone, and extreme precipitation events, such as flash floods and torrential rains, have become increasingly common in central India over the past several decades, coinciding with rising temperatures. Mean annual precipitation totals have remained steady due to the declining frequency of weather systems that generate moderate amounts of rain. Table 5.6.4 presents a record of damages due to floods in India.

5.6.5 **The State wise details of damage to human lives and property due to heavy rains/ floods during 2011 in India is in table 5.6.5 and the details of extent of damage in various States due to disasters like cyclonic storms/heavy rains/landslide etc for various years can be found in table 5.6.6 .**

5.6.7 Drought is a perennial and recurring feature in many parts of India. Drought leads to large-scale migration in search of alternative livelihoods, loss of human life due to stress, suicide, starvation or unhygienic conditions, and increased social conflict.

Table 5.6.7 gives the names of districts covered under Drought Prone Area Programme which was launched in 1973-74 to tackle drought prone areas. At present DPAP is under implementation in 972 blocks of 195 districts of 16 States. The details can be seen in Table 5.6.7

Table 5.6.2: India's major natural disasters since 1980

Sl. No.	Year		Type	Affected Population Location/Area	Life	Loss to Crops and Property
1	1980		Floods	Uttar Pradesh	1525	Rs. 2.0 Billion
2	1981		Floods	Uttar Pradesh	362	1.5 Million hectares of cropped area affected
3	1982		Floods	Orissa	1000	3 Million hectares of agricultural land affected. Loss estimated to run into thousands 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	928	Rs. 22.470 Billion
13	1991	*	Earthquake	Uttarkashi, Uttar Pradesh	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	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 damaged. 0.1 Million Hectares of crop damaged. Loss to property worth Rs. 61.26 Billion.
20	1997	*	Earthquake	Jabalpur	39	--
21	1998	*	Earthquake	Chamoli	100	--
22	1999	**	Cyclone	Orissa	9887	1.8 Million Hectares of crop area and 1.6 Houses damaged
23	2001		Earthquake	Gujarat		Over 20,000 people killed, 1,50,000 injured and 1,59,00,000 affected, 12.54 lakhs house damaged
24	2004		Tsunami/Tide waves	A & N Island, Andhra Pradesh, Tamil Nadu, Pondicherry		over 10,749 persons were killed. 5640 person were eperted missing. About 6.5 Lakhs person moved to refer place
25	2005		Earthquake	Pakistan & Kashmir		over 87,000 people in Pakistan & Kashmir dead.

Source : India: State of Environment Report 2001 & Website of Ministry of Home Affairs
* : State of the Environment: India 1995, Ministry of Environment and Forests, Government of India
** : Ministry of Agriculture

Table 5.6.3 : Major earthquakes in India

Sl. No.	Date	Lattitude (Degree N)	Longitude (Degree E)	Magnitude	Region	Remarks
1	2	3	4	5	6	7
1	16.06.1819	24.00	70.00	8.0	Kutch	About 2000 people killed
2	12.06.1897	25.00	92.00	8.7	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	Kangra	20000 lives lost
4	15.01.1934	26.60	86.80	8.3	India-Nepal Border	Most severe in Indian history, More than 10000 killed
6	26.06.1941	12.40	92.50	8.1	Andaman Islands	Flooding in port Blair
7	15.08.1950	28.46	96.66	8.5	Assam	532 people killed
8	06.08.1988	25.14	95.12	5.8	Burma-India Border	3 killed 11 injured
9	20.08.1988	26.78	86.61	6.5	Nepal-India Border	1000 people killed, 1000 injured Extensive damage in Northern Bihar
10	19.10.1991	30.75	78.86	6.6	West UP Hills(Uttarkashi)	768 people killed
11	30.09.1993	18.07	76.00	6.3	Latur, Osmanabad	7601 people killed
12	22.05.1997	23.08	80.06	6.0	Jabalpur	38 People killed
13	29.03.1999	30.41	79.42	6.8	Uttar Pradesh	there 1000 dead
14	26.01.2001	23.40	70.28	7.9	Gujarat	Over 20000 people killed, 150000 injured
15	8.10.2005	34.60	37.00	7.6	Pakistan & Kashmir	Over 87,000 in Pakistan & Kashmir dead

Source : Ministry of Environment & Forests

Table 5.6.4 : Flood damage/heavy rains in India

Year	Area Affected	Population Affected	Damage to Crops		Damage to House		Cattle Lost Nos.	Human Lives Lost	Damage to Public Utilities	Total Damages Crops Houses & Public Utilities
			Area	Value	Nos.	Value				
	(M.Ha)	(Million)	(M.Ha)	(Rs. Crore)	('000)	(Rs. Crore)	('000)	(No.)	(Rs. Crore)	(Rs. Crore)
1953	2.29	24.28	0.93	42.08	265	7.42	47	37	2.9	52.4
1960	7.53	8.35	21.27	42.55	610	14.31	14	510	6.31	63.17
1965	1.46	3.61	0.27	5.87	113	0.20	7	79	1.07	7.14
1970	8.46	31.83	4.91	162.78	1434	48.61	19	1076	76.44	287.83
1975	6.17	31.36	3.85	271.49	804	34.10	17	686	166.05	471.64
1980	11.46	54.12	5.55	366.37	2533	170.85	59	1913	303.28	840.5
1985	8.38	59.59	4.65	1425.37	2450	583.86	43	1804	2050.04	4059.27
1990	9.30	40.26	3.18	695.61	1020	213.73	134	1855	455.27	1708.92
1991	6.36	33.89	2.70	579.02	1134	180.42	41	1187	728.89	1488.33
1992	2.64	19.26	1.75	1027.58	687	308.28	79	1533	2010.67	3344.53
1993	11.44	30.41	3.21	1308.63	1926	528.32	211	2864	1445.53	3282.49
1994	4.81	27.55	3.96	888.62	915	165.21	52	2078	740.76	1794.59
1995	5.24	35.93	3.24	1714.79	2002	1307.89	62	1814	679.63	3702.31
1996	8.05	44.73	3.83	1124.49	727	176.59	73	1803	861.39	3005.74
1997	4.57	29.66	2.26	692.74	505	152.5	28	1402	1985.93	2831.18
1998	10.85	47.44	7.50	2594.17	1933	1108.78	107	2889	5157.77	8860.72
1999	7.77	27.99	1.75	1850.87	1613	1299.06	91	745	462.83	3612.76
2000	5.38	45.01	3.58	4246.62	2629	680.94	123	2606	3936.98	8864.54
2001	6.18	26.46	3.96	688.48	716	816.47	33	1444	5604.46	7109.42
2002	7.09	26.32	2.19	913.09	762	599.37	22	1001	1062.08	2574.54
2003	6.12	43.2	4.27	7307.23	775	756.48	15	2166	3262.15	11325.87
2004	5.31	43.73	2.89	778.69	1664	879.6	134	1813	1656.09	3529.71
2005	12.56	22.93	12.30	2370.92	716	380.53	120	1455	4688.22	7660.49
2006	1.10	25.22	1.82	2850.67	1497	3636.85	267	1431	13303.93	21546.29
2007	7.14	41.4	8.79	3121.53	3280	2113.11	89	3389	8049.04	13425.34
2008	3.43	29.91	3.19	3401.56	1567	1141.89	102	2876	5046.48	9595.34
2009	3.84	29.54	3.59	4232.61	1236	10809.8	63	1513	17509.35	32554.77
2010	2.62	18.3	4.99	5887.38	294	875.95	40	1582	12757.25	19520.59
2011	1.90	15.97	2.72	1393.85	1153	410.48	36	1761	6053.57	7857.89
Total	**426.25**	**1913.39**	**223.57**	**66009.63**	**74042**	**33373.32**	**5699**	**97551**	**110203.29**	**213114.9**
Average	7.22	32.43	3.79	1118.81	1255	565.65	97	1653	1867.85	3612.12
Maximum (Year)	17.5 (1978)	70.45 (1978)	12.30 (2005)	7307.23 (2003)	3508 (1978)	10809.80 (2009)	618 (1979)	11316 (1977)	17509.35 (2009)	32554.77 (2009)

Source: Centre Water Commission (FMP Directorate) (as per the report received from State Revenue Authorities.)

Nil:0
data up to 14/08/2013.

Table 5.6.5 : State wise details of damage due to flood/heavy rains during 2011 in India

Name of the State/Uts.	Area Affected	Population Affected	Damage to Crops		Damage to House		Cattle Lost	Human Lives Lost	Damage to Public Utilities	Total Damages to Crops, Houses & Public Utilities
			Area	Value	Nos.	Value	(Nos)			
	(M.Ha)	(Million)	(M.Ha)	(Rs. Crore)	('000)	(Rs. Crore)	('000)	(No.)	(Rs. Crore)	(Rs. Crore)
Andhra Pradesh	0	0	0	0	0	0	0	0	0	0
Arunachal Pradesh	0	0.12	0	0.50	0	0	3	20	1203.3	1203.8
Assam	0	0	0	0	0	0	0	0	0	0
Bihar	0	0.58	0.16	59.87	34906	17.79	39	143	25.79	103.45
Chhattisgarh	0.02	0.17	0.01	3.79	39126	4.49	318	21	53.78	62.06
Goa	0	0	neg	1	185	1	13	1	0	1.15
Gujarat	0	0.018	0	3.06	5007	3.35	212	110	5.83	12.24
Haryana	0	0	0	0	0	0	0	0	0	0
Himachal Pradesh	0.03	0.61	0.16	417.39	8467	0.48	2372	51	618.6	1036.47
J & K	0	0	0	0	0	0	0	0	0	0
Jharkhand	0	0	0	0	0	0	0	0	0	0
Karnataka	0	0	0	0	0	0	0	0	0	0
Kerala	0	0.37	0.01	60.21	8436	9.32	466	119	71.53	141.07
Madhya Pradesh	0	0	0.008	0.004	15431	6.51	203	82	2.45	8.97
Maharashtra	0	0	0	0	0	0	0	106	0	0
Manipur	0.083	0.066	0.025	7.75	Nil	Nil	Nil	Nil	5.9	13.65
Meghalaya	0	0	0	0	0	0	0	0	0	0
Mizoram	0	0	0	0	0	0	0	0	0	0
Nagaland	0	0	0	0	0	0	0	0	0	0
Odisha	0	5.98	0.52	0	178481	0	1487	87	2874.41	2874.41
Punjab	0	0	0.2	59.56	2538	6.47	28901	38	31.19	97.22
Rajasthan	0	0	0	0	0	0	0	0	0	0
Sikkim	0	0	0	0	0	0	0	0	0	0
Tamil Nadu	0	0	0	0	0	0	0	0	0	0
Tripura	0.002	0.08	0	5.86	653	0.6	29	14	1.05	7.5
Uttar Pradesh	0.53	2.31	0.4	199.94	313436	79.37	239	729	1159.13	1438.44
Uttarakhand	0	0	0	0	3325	0	1407	54	0	0
West Bengal	1.23	5.68	1.23	575.3	542519	281.56	293	186	0.6	857.46
Andaman & Nicobar	0	0	0	0	0	0	0	0	0	0
Chandigarh	0	0	0	0	0	0	0	0	0	0
Dadra & Nagar Haveli	0	0	0	0	0	0	0	0	0	0
Daman & Diu	0	0	0	0	0	0	0	0	0	0
Delhi	0	0	0	0	0	0	0	0	0	0
Lakshadweep	0	0	0	0	0	0	0	0	0	0
Puducherry	0	0	neg	0	0	0.025	0	0	0	0
Total	**1.90**	**15.97**	**2.72**	**1393.85**	**1152518**	**410.48**	**35982**	**1761**	**6053.57**	**7857.89**

Sources: Central Water Commission (FMP Directorate) (as per the report received from Stare Revenue Authorities and MHA)
Note: Neg: Negliable NR : Not Repoted Nill: 0.000

Table 5.6.6: Year-wise damage caused due to floods, cyclonic storms, landslides etc. in India

Year	Live Lost human (in No)	Cattle Lost (in No)	Houses damaged (in No)	Cropped areas affected (in Lakh hectares)
2001-02	834	21269	346878	18.72
2002-03	898	3729	462700	21.00
2003-04	1992	25393	682209	31.98
2004-05	1995	12389	1603300	32.53
2005-06	2698	110997	2120012	35.52
2006-07	2402	455619	1934680	70.87
2007-08	3764	119218	3527041	85.13
2008-09	3405	53833	1646905	35.56
2009-10	1677	128452	1359726	47.13
2010-11	2310	48778	1338619	46.25

Source: Ministry of Home Affairs (MHA)

Table 5.6.7: List of districts covered under drought prone area programme (DPAP)

Sl.No.	State/District		No. of Blocks	Area of Blocks (in hectare)
1	**Andhra Pradesh**			
	1	Adilabad	9	11793
	2	Chittoor	8	7761
	3	Cuddapah	7	8225
	4	Khammam	2	1228
	5	Kurnool	13	17366
	6	Mahabubnagar	16	18178
	7	Modak	5	4323
	8	Nalgonda	9	8178
	9	Prakasam	14	15165
	10	Ranareddy	7	5535
	11	Srikakulam	4	1466
		Total	94	99218
2	**Bihar**			
	1	Kaimur (Bhabhua)	5	2237
	2	Jamul	7	3062
	3	Madhubani	4	772
	4	Nawadah	9	2276
	5	Rohtas	2	639
	6	Sitamarhi	3	547
		Total	30	9533
3	**Chattisga**			
	1	Bastar	6	3857
	2	Bilaspur	3	1709
	3	Bijapur	3	6010
	4	Dantewada	3	
	5	Durg	2	1146
	6	Janjgir	1	440
	7	Kavardha	2	1386
	8	Korba	5	4309
	9	Rajnandgaon	4	2944
		Total	29	21801
4	**Gujarat**			
	1	Ahmedabad	6	4429
	2	Amreli	11	7393
	3	Bharuch	4	3129
	4	Bhavnagar	6	4896
	5	Dahod	7	3811
	6	Junagarh	6	3162
	7	Narmada	4	2800
	8	Navsari (Valsad)	1	593
	9	Panchmahals	10	4639
	10	Porbandar	2	1729
	11	Sabarkantha	1	368
	12	The Dangs	1	1723
	13	Vadodara	5	3244
	14	Valsad	3	2022
		Total	67	43938

Contd…

Sl.No.	State/District		No. of Blocks	Area of Blocks (in hectare)
5	**Himachal Pradesh**			
	1	Bilaspur	3	1120
	2	Solan	2	685
	3	Una	5	1514
		Total	10	3319
6	**Jammu & Kashmir**			
	1	Doda	6	11656
	2	Ramban	4	
	3	Kishtwar	5	
	4	Udhampur	3	3049
	5	Reasi	4	
		Total	22	14705
7	**Jharkhand**			
	1	Bokaro	2	755
	2	Chatra	4	2493
	3	Deoghar	7	2436
	4	Dhanbad	8	2000
	5	Dumka	16	3693
	6	Garhwa	14	3630
	7	Godda	7	2019
	8	Hazaribagh	6	430
	9	Ramgarh	4	
	10	Jamtara	4	0
	11	Kodarma	4	0
	12	Latehar	7	0
	13	Pakur	6	0
	14	Palamau	11	0
	14	Sahebganj	6	0
		Total	100	34843
8	**Karnataka**			
	1	Bangalore	4	5843
	2	Ramnagara	4	
	3	Belgaum	7	9450
	4	Bidar	4	4491
	5	Chamarajanagar	1	1406
	6	Chickmangalur	6	6416
	7	Chitradurga	5	6681
	8	Davangere	1	953
	9	Dharwad	4	3016
	10	Gadag	4	4210
	11	Gulbarga	9	14603
	12	Hassan	4	4002
	13	Haveri	6	4063
	14	Kolar	5	6370
	15	Chikkaballapura	4	2630
	16	Mysore	3	
	17	Tumkur	10	10198
		Total	81	84332

Contd…

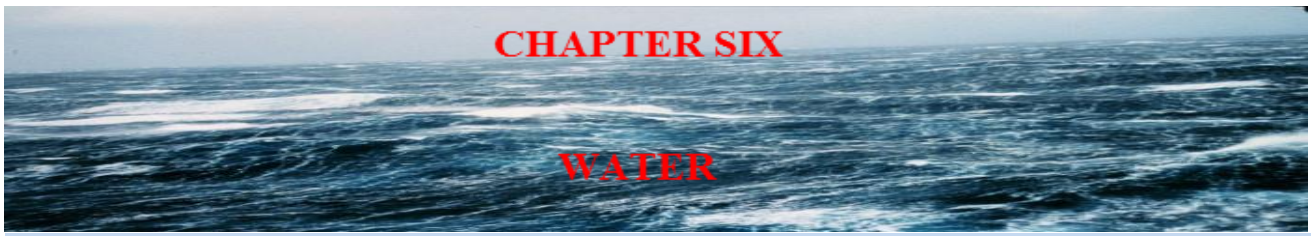
Sl.No.	State/District		No. of Blocks	Area of Blocks (in hectare)
9	**Madhya Pradesh**			
	1	Badwani	6	3184
	2	Betul	10	7080
	3	Bhind	1	406
	4	Chindwada	8	7474
	5	Damoh	3	2204
	6	Dewas	3	3009
	7	Dhar	8	4981
	8	Guna	6	7196
	9	Ashok Nagar		
	10	Jabalpur	1	863
	11	Jhabua	12	6791
	12	Alirajpur	5	3886
	13	Khandwa		
	14	Khargone	5	3246
	15	Panna	3	2727
	16	Raisen	3	2325
	17	Rajgarh	2	1873
	18	Ratlam	1	681
	19	Rewa	4	2124
	20	Seoni	5	5424
	21	Shahdol	4	5225
	22	Annuppur		
	23	Shahjapur	2	1639
	24	Shivpuri	3	2780
	25	Sidhi	4	10350
	26	Singroli	4	
	27	Umaria	2	3633
		Total	105	89101
10	**Maharashtra**			
	1	Ahmednagar	10	14109
	2	Akola	7	5363
	3	Washim	6	5177
	4	Amravati	9	6407
	5	Aurangabad	6	8108
	6	Beed	6	9008
	7	Buldhana	9	6877
	8	Chandrapur	3	4206
	9	Dhule	3	5735
	10	Nandurbar	4	4886
	11	Gadchiroli	3	7686
	12	Jalgaon	7	6504
	13	Jalna	2	2826
	14	Latur	4	5676
	15	Nagpur	1	829
	16	Nanded	4	4703
	17	Nasik	13	15658
	18	Osmanabad	3	3197
	19	Parbhani	2	3288
	20	Hingoli	2	3308
	21	Pune	12	33355
	22	Sangli	7	7164
	23	Satara	4	5035
	24	Sholapur	10	13730
	25	Yeotmal	12	11638
		Total	149	194473

Contd…

Sl.No.	State/District		No. of Blocks	Area of Blocks (in hectare)
11	**Orissa**			
	1	Bargarh	6	2648
	2	Bolangir	8	3446
	3	Boudh	2	2516
	4	Dhenkanal	2	1167
	5	Kalahandi	10	5741
	6	Naupada	5	2685
	7	Phulbani (Kandhamal)	12	7376
	8	Sonepur	2	599
		Total	47	26178
12	**Rajasthan**			
	1	Ajmer	3	2660
	2	Banswara	8	5037
	3	Baran	2	3587
	4	Bharatpur	1	501
	5	Dungarpur	5	3793
	6	Jhalawar	3	3536
	7	Karouli	1	1393
	8	Kota	2	1964
	9	Swai Madhopur	1	1375
	10	Tonk	3	3176
	11	Udaipur	3	4947
		Total	32	31969
13	**Tamil Nadu**			
	1	Coimbatore	5	1530
	2	Dharmapuri	14	5751
	3	Krishnagiri		
	4	Dindigul	3	1846
	5	Karur	2	976
	6	Perambalur	2	2122
	7	Ariyalur	4	
	8	Pudukottai	4	1334
	9	Ramanathapuram	7	2988
	10	Salem	5	1087
	11	Namakkal	3	592
	12	Sivaganga	7	2616
	13	Thiruvannamalai	1	255
	14	Thothukudi	8	3662
	15	Tiruchirapalli	1	475
	16	Tirunelveli	1	326
	17	Vellore	6	1349
	18	Virudhunagar	7	2507
		Total	80	29416
14	**Uttar Pradesh**			
	1	Allahabad	1	587
	2	Bharaich	14	5405
	3	Sravasthi		
	4	Balrampur (Gonda)	4	2090

Sl.No.	State/District		No. of Blocks	Area of Blocks (in hectare)
	5	Banda	6	3546
	6	Chitrakoot	5	3647
	7	Hamirpur	3	2216
	8	Jalaun	3	*2140*
	9	Jhansi	5	3281
	10	Lakhimpur Kheri	2	392
	11	Lalitpur	2	1793
	12	Mahoba	2	*1835*
	13	Mirzapur	2	1385
	14	Sitapur	3	1108
	15	Sonebhadra	8	6273
		Total	60	35698
15	**Uttarakhand**			
	1	Almora &		
	2	Bageswar	8	3114
	3	Chamoli	4	5850
	4	Garhwal (Pauri)	10	4070
	5	Pithoragarh &		
	6	Champavath	5	1709
	7	Tehri Garhwal	3	1053
		Total	30	15796
16	**West Bengal**			
	1	Bankura	7	2185
	2	Birbhum	2	397
	3	Midnapur	7	2707
	4	Purulia	20	6305
		Total	36	11594
		DPAP Total: 195 Districts	972	745914

Source : Central Water Commission,
(Information System Organisation, Water Resources Information Systems Directorate)
Department of Land Resources, Ministry of Rural Development



6.1 Introduction

6.1.1 Beyond meeting basic human needs, water supply and sanitation services, water as a resource, are critical to sustainable development. It is a major source of energy in some parts of the world, while in others its potential as an energy source remains largely untapped. Water is also necessary for agriculture and for many industrial processes. And in more than a few countries, it makes up an integral part of transport systems. With improved scientific understanding, the international community has also come to appreciate more fully the valuable services provided by water-related ecosystems, from flood control to storm protection and water purification.Fresh water is a renewable resource, yet the world's supply of clean, fresh water is steadily decreasing. Water demand already exceeds supply in many parts of the world and as the world population continues to rise, so too does the water demand.

6.1.2 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. In India also, 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.

6.1.3 The following **table 6.1.1 indicates the estimated water demand in India for different sectors.**

Table 6.1.1 Projected Water Demand in India (By Different Use)

Sector	Water Demand in BCM(Billion Cubic Meter)								
	Standing Sub-Committee of MOWR			NCIWRD					
	2010	2025	2050	2010		2025		2050	
				Low	High	Low	High	Low	High
Irrigation	688	910	1072	543	557	561	611	628	807
Drinking Water	56	73	102	42	43	55	62	90	111
Industry	12	23	63	37	37	67	67	81	81
Energy	5	15	130	18	19	31	33	63	70
Other	**52**	72	80	54	54	70	70	111	111
Total	**813**	**1093**	**1447**	**694**	**710**	**784**	**843**	**973**	**1180**

Source: Basin Planning Directorate, CWC, XI Plan Document.
Report of the Standing Sub-Committee on "Assessment of Availability & requirement of Water for Diverse uses-2000"
Note: NCIWRD: National Commission on Integrated Water Resources Development
BCM: Billion Cubic Meters

MOWR: Ministry of Water Resourses.

6.1.4 **The details of water availability in India is presented in table 6.1.2 which shows a reduction of 228 Cu.M in per capita availability of water in 2010 compared to 2001.**

Table 6.1.2 : Water availability in India

Sl.No	Items	Quanitity
1	Annual Precipitation (including snowfall)	4000 BCM
2	Average Annual Availability	1869 BCM
3	(i) Per Capita Water Availability (2001) in cubic metres	1816Cu.M
	(ii) Per Capita Water Availability (2010) in cubic metres	1588Cu.M
4	Estimated Utilizable Water Resources	1123 BCM
	(i)Surface Water Resources	690 BCM
	(ii) Ground Water Resources	433 BCM

Source: Central Water Commission-2010
BCM : Billion Cubic Meter. Cu.M - Cubic Meter.

6.2 Rain Water

6.2.1 India is home to an extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north, where elevated regions receive sustained winter snowfall. The nation's climate is strongly influenced by the Himalayas and the Thar Desert. The Himalayas, along with the Hindu Kush mountains in Pakistan, prevent cold Central Asian katabatic winds from blowing in, keeping the bulk of the Indian subcontinent warmer than most locations at similar latitudes. Simultaneously, the Thar Desert plays a role in attracting moisture-laden southwest summer monsoon winds that, between June and October, provide the majority of India's rainfall.

The **table 6.2.1 gives the detailed information about the monsoon performance in the Country**.

Table 6.2.1 Monsoon performance 1998-2012

(June-September)

Sl. No.	Year	Number of Meteorological Sub-Divisions			Percentage of Districts With Normal/Excess Rainfall	Percentage of Long Period Average Rainfall for the Country as a Whole
		Normal	Excess	Deficient/Scanty		
1	2	3	4	5	6	7
1	1998	22	11	2	83	105
2	1999	25	3	7	67	96
3	2000	23	5	7	65	92
4	2001	28	1	6	68	91
5	2002	14	1	21	37	81
6	2003	23	8	5	76	105
7	2004	23	0	13	57	87
8	2005	24	8	4	73	99
9	2006	21	6	9	60	100
10	2007	18	13	5	73	106
11	2008	31	2	3	77	98
12	2009	11	3	22	42	78
13	2010	17	14	5	70	102
14	2011	26	7	3	76	102
15	2012	22	1	13	58	93

Source : India Meteorological Department, Ministry of Earth Sciences.

Category: % Age from LPA(Long Period Average)

E-Excess ,+20% or more D- Deficient ,-20 to -59%

N-Normal ,+19% to -19% S-Scanty ,-60% to -99%

Rainfall during -2012

During SW monsoon of 2012, the rainfiall recorded for the country as a whole was 7% less than its Long period average(1950-2000). Southern peninsula, Central India, NW India and East& North East India experienced rainfall of 90%,96%,92% and 91% of LPA respectvely. At district level 9% districts of the country received excess rainfall, 49% normal rainfall, 38% deficient rainfall and 4% scanty rainfall.

Out of 36 sub-divisions 13 recorded deficient rainfall, 22 recorded normal rainfall and remaining 1 sub-divisions recorded excess rainfall. Out of 620 districts for which data was available 365 (58%) dustricts received 'excess'/'normal' rainfall and remaining 255(42%) districts received deficient/scanty rainfall during SW monsoon 2012. The annual rainfall for the country as a whole was 1054.3(mm) against its normal value of 1186.2(mm).

As it is evident from the diagram chart 6.2.1, the rainfall in India fluctuated considerably in the past.

Chart 6.2.1 : Monsoon performence (June-September)

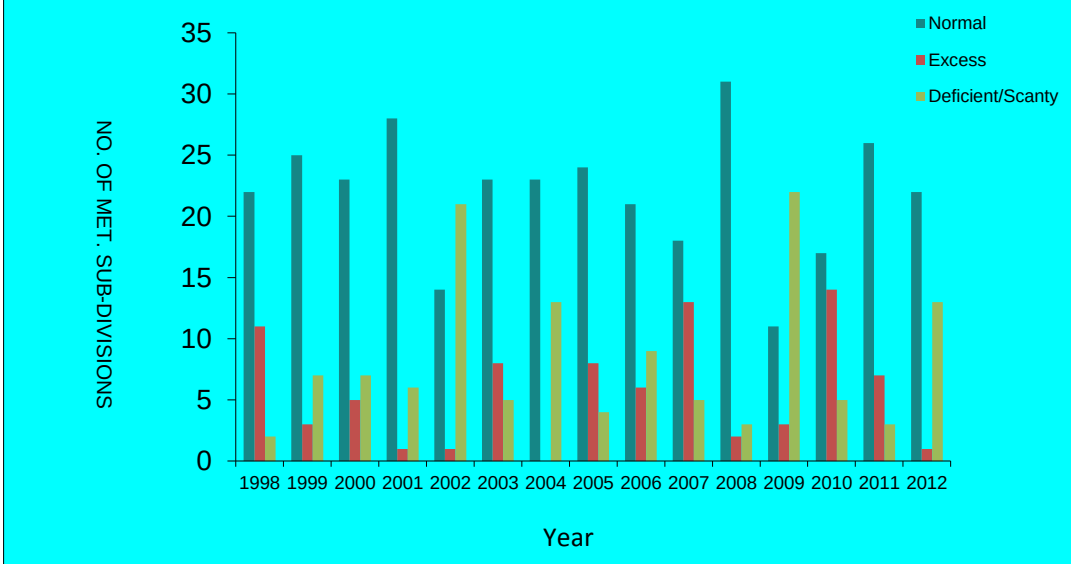


Table 6.2.2 : Sub divisional actual and normal rainfall

(Millimetre)

Sl. No.	Meteorological Sub-divisions	2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
		Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Andaman & Nicobar Islands	2310.7	2945.5	2446.9	2945.7	2508.1	3060.7	2762.5	3001.8	2447.9	3001.8	2656.7	3001.8	3335.2	3001.8	2614.3	3001.8	3147.8	2980.1	3833.6	2926.3	3515.9	2926.3
2	Arunachal Pradesh	2559.6	3329.8	2761.2	3003.2	2922.6	2927.5	2542.5	2935.9	2107.9	2935.9	2439.2	2935.9	2470.5	2935.9	2163.2	2935.9	2397.6	2785.9	1923.4	2933.7	2760.9	2933.7
3	Assam and Meghalaya	2530.7	3163.1	2835.1	2817.2	3055.7	2792.9	2314.9	2802.0	1777.5	2817.1	2415.2	2801.6	2271.1	2802.2	1863.0	2802.0	2499.7	2897.7	1758.5	2624.9	2321.3	2624.9
4	Nagaland, Mizoram, Manipur & T	1960.8	2154.1	2029.0	2100.2	2075.1	1969.5	1612.3	1920.6	1561.5	1920.6	2185.2	1920.6	1481.7	1920.6	1446.5	1920.0	2023.3	2142.9	1655.1	2278.0	1669.2	2278.0
5	Sub-Himalayan West Bengal & S	2820.1	2683.6	3288.5	2808.8	2768.3	2644.9	2670.8	2617.0	2304.5	2617.0	2641.3	2617.0	2618.9	2617.0	2275.4	2617.0	2844.0	2603.8	2359.9	2708.9	2630.2	2708.9
6	Gangetic West Bengal	1597.6	1518.7	1457.8	1461.3	1488.0	1494.1	1585.4	1494.6	1587.2	1494.6	1953.2	1494.6	1580.6	1494.6	1322.5	1494.6	1081.4	1493.4	1671.7	1527.2	1258.3	1527.2
7	Odisha	1166.5	1415.8	1750.6	1450.3	1337.7	1459.1	1549.7	1464.2	1810.0	1472.5	1664.9	1472.5	1600.4	1472.5	1397.7	1472.5	1332.3	1478.6	1300.4	1460.5	1430.2	1460.5
8	Jharkhand	1315.5	1293.3	1299.0	1296.3	1157.8	1328.8	859.4	1334.7	1356.0	1321.9	1441.4	1317.3	1200.6	1317.3	1061.1	1320.1	806.1	1307.4	1274.7	1296.3	1102.0	1296.3
9	Bihar	1193.3	1186.7	1454.8	1192.5	1077.0	1230.6	913.7	1282.0	1000.4	1233.2	1466.2	1230.8	1306.7	1230.8	993.6	1230.8	943.4	1213.7	1217.3	1205.6	924.2	1205.6
10	East Uttar Pardesh	795.8	1013.3	1177.1	1020.9	849.3	1038.3	828.3	1041.9	771.4	1041.9	863.3	1041.9	1121.9	1041.9	711.1	1041.9	758.5	1035.9	874.7	1018.6	853.6	1018.6
11	West Uttar Pradesh	729.0	880.5	1129.5	873.3	647.2	887.1	752.6	888.8	510.6	888.8	586.1	888.8	840.5	888.8	552.5	888.8	818.9	885.0	775.9	886.2	582.8	886.2
12	Uttarakhand	2188.5	1556.0	1903.7	1586.2	1605.7	1553.8	1492.6	1582.6	1264.8	1582.6	1894.2	1582.6	1298.6	1582.6	1076.0	1582.6	1863.9	1562.8	1708.3	1580.9	1309.7	1580.9
13	Haryana, Chandigarh & Delhi	488.7	618.7	720.7	619.5	524.0	570.9	587.1	567.5	377.0	567.5	479.9	567.5	632.9	567.5	350.5	567.5	597.7	562.6	433.2	562.8	313.6	562.8
14	Punjab	446.1	643.2	645.0	652.2	445.1	649.1	603.6	648.8	544.7	648.8	494.1	648.8	708.9	648.8	403.9	648.8	502.1	640.4	533.5	635.9	338.9	635.9
15	Himachal Pardesh	1075.5	1370.7	1268.9	1396.1	766.4	1252.3	996.4	1323.8	895.8	1323.8	862.6	1323.8	1049.0	1323.8	805.6	1323.8	1220.2	1323.8	1051.7	1373.9	1035.1	1373.9
16	Jammu & Kashmir	750.5	900.5	1106.1	1030.0	919.5	1124.5	1309.8	1246.0	1477.3	1246.0	1037.9	1232.7	1087.2	1246.0	872.7	1246.0	1240.7	1227.6	1122.2	1205.3	1116.5	1205.3
17	West Rajasthan	118.9	330.7	386.7	325.7	190.4	298.9	260.4	297.0	362.4	297.0	282.2	297.0	309.6	297.0	166.6	297.0	473.2	295.7	426.6	299.2	318.3	299.3
18	East Rajasthan	307.1	703.2	629.6	685.4	627.5	677.7	617.4	678.2	711.7	678.2	553.6	678.2	627.1	678.2	460.6	678.2	741.5	684.7	849.1	671.3	695.8	671.3
19	West Madhya Pradesh	807.8	991.2	1011.0	991.0	839.6	987.8	784.5	987.9	1140.5	987.9	887.7	987.9	747.8	987.9	797.2	987.9	818.2	987.8	1062.2	956.3	1012.3	956.3
20	East Madhya Pradesh	1075.7	1254.0	1532.5	1252.3	946.8	1227.1	1408.6	1229.3	1007.7	1229.3	864.1	1229.3	989.7	1229.3	910.5	1229.3	966.6	1219.3	1220.7	1169.4	1097.0	1169.4
21	Gujarat Region	705.4	1002.6	1259.5	1084.0	1004.2	977.8	1385.4	979.0	1458.1	979.1	1159.0	979.0	932.4	979.0	649.6	979.1	1059.7	954.1	903.9	943.4	652.0	943.4
22	Saurashtra, Kutch	402.7	570.7	733.1	587.8	498.5	517.4	638.6	518.3	702.9	518.3	892.1	518.3	572.3	518.3	616.9	518.3	1073.9	519.2	725.1	507.0	315.2	507.0
23	Konkan & Goa	2324.2	2964.4	2828.5	2985.5	2911.6	2981.7	3557.6	298.5	3379.0	2978.5	3401.0	2978.5	3051.5	2778.5	2738.2	2978.5	3749.0	2975.4	3842.6	3100.2	2993.9	3100.5
24	Madhya Maharashtra	711.6	926.3	740.3	902.6	883.3	852.7	1101.7	850.4	1180.5	850.4	921.4	850.4	858.9	850.4	918.1	850.4	1006.1	849.7	842.9	876.8	664.2	876.8
25	Marathwada	704.7	803.5	645.2	833.9	676.4	838.8	864.3	840.4	819.2	840.4	625.6	840.4	651.0	840.4	687.5	840.4	1039.3	845.9	685.7	821.6	538.4	821.6
26	Vidarbha	1045.4	1074.4	1032.9	1096.8	796.3	1104.7	1257.8	1104.6	1276.5	1104.6	1135.8	1104.6	855.7	1104.6	804.1	1104.6	1355.2	1103.7	958.5	1084.5	1090.3	1084.5
27	Chhattisgarh	--	--	1702.7	1318.3	1174.3	1362.5	1305.2	1368.4	1231.4	1368.4	1244.1	1368.4	1144.0	1368.4	859.7	1368.4	1145.7	1363.8	1313.0	1290.7	1366.8	1290.7
28	Coastal Andhra Pradesh	757.3	1000.7	1118.6	1015.9	933.6	1012.7	1238.9	1011.2	1067.2	1011.2	1094.0	1011.2	1057.2	1011.2	745.2	1011.2	1614.0	1011.6	835.5	1024.2	1183.4	1024.2
29	Telangana	767.7	945.7	1006.7	946.0	761.7	942.3	1230.9	942.7	1044.5	942.7	902.6	942.7	998.1	942.7	665.8	942.7	1247.6	941.7	739.6	942.6	972.8	942.6
30	Rayalaseema	504.4	695.9	654.0	684.0	655.9	679.5	999.3	677.9	608.9	677.9	934.1	677.9	795.0	677.9	672.8	677.9	915.8	677.8	642.9	706.1	665.3	706.1
31	Tamilnadu & Puducherry	723.4	918.6	925.0	960.7	1104.5	911.4	1314.0	910.7	911.8	911.6	968.6	911.3	1195.7	910.3	934.3	911.3	1118.8	908.7	1013.2	914.4	709.6	914.4
32	Coastal Karnataka	2920.9	3583.4	3086.5	3638.5	3061.6	3620.2	3274.9	3613.2	3865.9	3613.2	3904.8	3613.2	3050.9	3613.3	3798.2	3613.2	4007.6	3612.8	4146.4	3526.3	3395.0	3526.3
33	North Interior Karnataka	556.3	706.6	473.6	711.5	644.6	725.6	856.2	720.1	627.9	720.1	788.4	720.1	700.5	720.1	977.1	720.1	857.3	719.9	620.1	740.3	529.4	740.3
34	South Interior Karnataka	869.1	1305.8	817.9	1064.8	1028.3	1018.4	1356.9	1014.8	951.0	1014.8	1229.5	1014.8	1105.7	1014.8	1177.3	1014.8	1308.7	1029.5	1040.6	1019.2	832.1	1019.2
35	Kerala	2457.3	2863.7	2275.8	3065.5	2977.3	3158.6	3153.1	3095.8	3297.8	3097.5	3619.6	3097.5	2534.1	3097.5	2816.0	3097.5	3141.9	3094.6	3041.2	2924.3	2187.5	2923.4
36	Lakshadweep	1034.4	1579.5	1532.8	1582.3	2096.8	1583.4	1579.0	1584.7	1695.4	1584.7	2037.9	1584.7	1726.4	1584.7	1572.5	1584.7	1725.4	1584.7	1531.4	1600.0	1433.2	1600.0

Source : Indian Meteorological Department, Ministry of Earth Sciences

Table 6.2.3 : State-wise distribution of number of districts with excess, normal, deficient, scanty and no rainfall

(01-06-2012 To 30-09-2012)

Sl. NO.	STATE/UT	Excess	Normal	Deficient	Scanty	No Rainfal	No data	Total
1	2	3	4	5	6	7	8	9
1	Andaman & Nicobar Islands	1	2	0	0	0	0	3
2	Arunachal Pradesh	5	4	5	0	0	2	16
3	Assam	4	20	3	0	0	0	27
4	Meghalaya	1	4	1	0	0	1	7
5	Nagaland	1	2	3	0	0	5	11
6	Manipur	0	2	2	0	0	5	9
7	Mizoram	0	4	3	0	0	2	9
8	Tripura	0	3	1	0	0	0	4
9	Sikkim	1	3	0	0	0	0	4
10	West Bengal	0	9	10	0	0	0	19
11	Odisha	4	20	6	0	0	0	30
12	Jharkhand	0	15	8	0	0	1	24
13	Bihar	0	18	18	1	0	1	38
14	Uttar Pradesh	3	31	35	2	0	0	71
15	Uttarakhand	2	7	4	0	0	0	13
16	Haryana	0	3	16	2	0	0	21
17	Chandigarh	0	1	0	0	0	0	1
18	Delhi	0	2	5	2	0	0	9
19	Punjab	0	3	9	8	0	0	20
20	Himachal Pradesh	1	7	3	1	0	0	12
21	Jammu & Kashmir	4	11	2	3	0	2	22
22	Rajasthan	10	20	3	0	0	0	33
23	Madhya Pradesh	13	34	3	0	0	0	50
24	Gujarat	0	4	21	1	0	0	26
25	D. & N. Haveli & Daman	0	0	2	0	0	0	2
26	Diu	0	0	1	0	0	0	1
27	Goa	0	2	0	0	0	0	2
28	Maharashtra	1	20	14	0	0	0	35
29	Chhattisgarh	3	15	0	0	0	0	18
30	Andhra Pradesh	5	16	2	0	0	0	23
31	Tamil Nadu	0	11	19	2	0	0	32
32	Puducherry	0	2	0	0	0	2	4
33	Karnataka	0	7	23	0	0	0	30
34	Kerala	0	3	11	0	0	0	14
35	Lakshadweep	0	1	0	0	0	0	1
Total		**59**	**306**	**233**	**22**	**0**	**21**	**641**
Categorywise distribution of districts out of the 620 districts whose data was received		9.5%	49%	38%	4%	0%		

Source : India Meteorological Department, Ministry of Earth Sciences

Table 6.2.4 : List of districts with deficient or scanty rainfall

June - Sept.2012 *June - Sept.2012*

MET. Sub Division 1	Districts 2	MET. Sub Division 1	Districts 2
Arunachal Pradesh		**Punjab**	
	East Kameng		Amritsar
	Lower Subansiri		Barnala
	Tawang		Bhatinda
	Tirap		Faridkot
	West Kameng		Ratehgarh Sahib
Assam & Meghalya			Ferozpur
	Darrang		Hosiarpur
	Hailakandi		Jalandhar
	Nagaon		Ludhiana
	Jaintia Hills		Mansa
Nagaland, Mizoram, Manipur and Tripura			Moga
	Dimapur		Muktsar
	Kephire		Nawanshahar
	Kohima		Patiala
	Thoubal		Sangrur
	Senapati		Sas Nagar Mohali
	Lungle		Tarn Taran
	Mamit	**Himachal Pradesh**	
	Serchhip		Chamba
	Dhalai		Kinnaur
Sub-Himalayan West Bengal & Sikkim			Lahaul & Spiti
	Malda		Sirmaur
	North Dinajpur		
Gangetic West Bengal		**Jammu and Kashmir**	Doda
	Birbhum		Kargil
	Hoogly		Ladah(Leh)
	Howrah		Shopian
	Murshidabad		Udhampur
	Nadia		
	North 24 Paraganas	**West Rajasthan**	Jalore
	South 24 Parangans		
	West Minapure	**East Rajasthan**	Jhalawar
Odisha			Kota
	Balasore		
	Bhadrak	**West Madhya Pradesh**	Barwani
	Jagatsinghpur		Guna
	Jajpur		
	Kendrapara	**East Madhya Pradesh**	Umaria
	Nawapara		
Jharkhand			
	Chatra	**Gujarat Region**	Ahmedabad
	Deoghar		Anand
	Godda		Banaskantha
	Hazaribag		Baroda
	Khunti		Broach
	Koderma		Dangs
			Kheda
East Uttar Pradesh	Azamgarh		Mehsana
	Ballia		Narmada
	Chandauli		Navsari
	Deoria		Patan
	Farrukhabad		
	Ghazipur	**Bihar**	Araria
	Jaunpur		Banka
	Kanpur City		Begusarai
	Kaushambi		Bhojpur
	Kushi Nagar		Buxar
	Maharajganj		Jamui
	Mau		Katihar
	Rae Bareilly		Khagaria
	Varanasi		Lakhisarai
			Madhepura
West Uttar Pradesh	Aligarh		Madhubani
	Auraiya		Nawada
	Badaun		Purnea
	Baghpat		Samastipur
	Bareilly		Saran
	Bijnor		Sheohar
	Bulandshahar		Supaul
	Etah		Vaishali
	Etawah		
	Firozabad	**Saurashtra & Kutch**	Amreli
	Gautam Budh Nagar		Bhavnagar
	Ghaziabad		Jamnagar
	Hamirpur		Junagarh
	Jhansi		Kutch
			Porbandar
			Rajkot
			Surendranagar

East Uttar Pradesh	Azamgarh			
	Ballia			
	Chandauli			
	Deoria			
	Farrukhabad		**Konkan and Goa**	Diu
	Ghazipur			
	Kanpur City		**Madhya Maharashtra**	Mumbai City
	Kaushambi			Ahmednagar
	Kushi Nagar			Dhule
	Maharajganj			Jalgaon
	Mau			Pune
	Rae Bareilly			Sangli
	Varanasi			Sholapur
Telangana	Nizamabad		**Marathwada**	Aurangabad
				Beed
Rayalaseema	Cuddapah			Hingoli
				Jalna
Tamil Nadu and Puducherry	Ariyalur			Nanded
	Chennai			Osmanabad
				Parbhani
	Cuddalore			
	Dharmapuri		**North Interior Karnataka**	Bagalkote
	Dindigul			Belgam
	Kanchipuram			Bijapur
	Kanyakumari			Dharwad
				Gadag
Uttarakhand	Garhwal Tehri			Gulbarga
	Pithoragarh			Haveri
	Rudraprayag			Koppal
	Udhamsingh Nagar			Raichur
				Yadgir
Haryana, Chandigarh and Delhi	Ambala			
	Faridabad			
	Fatehabad			
	Hissar		**South Interior Karnataka**	Bangalore Rural
	Jhajjar			Bangalore Urban
	Jind			Bellary
	Kaithal			Chamarajanagar
	Karnal			Chickballapur
	Kurukshetra			Chikmagalur
	Mewat			Davangere
	Palwal			Hassan
	Panchkula			Kodagu
	Panipat			Mandya
	Rewari			Mysore
	Rohtak			Ramanagara
	Sirsa			Tumkur
	Sonepat			
	Yamuna Nagar			
	Central Delhi		**Kerala**	Alapuzha
	East Delhi			Ernakulam
	North Delhi			Idukki
	North East Delhi			Kollam
	North West Delhi			Kottayam
	South West Delhi			Malappuram
	West Delhi			Palakkad
				Pathanamthitta
				Thiruvananthapuram
				Thrissur
				Wynad

Note: The districts Nandurbar and Pune in Madhya Maharastra have not been included in the list of Defficent/Scanty districts for June-Sept. 2010.
Source: Indian Meteorological Department

6.2.2 The record of rainfall received over the years - State/ UT wise is in table 6.2.2 . State wise distribution of districts as per the rainfall received is given in table 6.2.3 . The list of districts with deficient/ scanty rainfall is in table 6.2.4 . The tables 6.2.5 (a) & (b) give the trend of rain fall in India as per meteorological sub divisions during June –September.

Table 6.2.5(a) : Number of meteorological sub-divisions with excess/ normal and deficient/scanty rainfall (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
12	2002	15	21
13	2003	31	5
14	2004	23	13
15	2005	32	4
16	2006	27	9
17	2007	31	5
18	2008	33	3
19	2009	14	22
20	2010	31	5
21	2011	33	3
22	2012	23	13

Source : India Meteorological Department - Ministry of Earth Sciences

6.2.3 Rainwater harvesting can enable households, factories, schools and offices to overcome their problems of irregular and inadequate water supply or water supply of poor quality. The process involves storing rainwater that falls within one's premises and re-using it after basic treatment. By using equipment that is easily available, rainwater is diverted towards existing underground tanks or terrace fitted tanks and then supplied to the taps. The purification methods can be used by households, factories and offices to treat rainwater. Treated rainwater is safe not just for cleaning and washing but also for cooking and personal consumption. The amount of rainfall notwithstanding, people living and working in various types of geographical terrains can harvest rainwater. In the long run, rainwater harvesting will replenish the India's rapidly depleting ground water levels, and lead to water security and sustainability.

Table 6.2.5(b) : Percentage of districts with excess/normal and deficient/scanty rainfall (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	66	34
11	2001	68	32
12	2002	44	56
13	2003	75	25
14	2004	55	45
15	2005	73	27
16	2006	60	40
17	2007	73	27
18	2008	77	23
19	2009	42	58
20	2010	70	30
21	2011	76	24
22	2012	58	42

Source : India Meteorological Department, Ministry of Earth Sciences.

6.3 Surface water -River and other Inland water sources

6.3.1 Rivers are the lifeline of majority of population in cities, towns and villages. Every river stretch has a distinct water use like bathing, drinking, municipal supply, navigation, irrigation and fishing, sports, etc. **The annual Water availability in major rivers in India is depicted in Table 6.3.1.**

Table 6.3.1: Water availability-basinwise

Sl.No	Name of the River Basin	Average Annual Availability (cubic km/year)
1	Indus (up to Border)	73.31
2	a) Ganga	525.02
	b) Brahmaputra, Barak & Others	585.60
3	Godavari	110.54
4	Krishna	78.12
5	Cauvery	21.36
6	Pennar	6.32
7	East Flowing Rivers Between Mahanandi & Pennar	22.52
8	East Flowing Rivers Between Pennar and Kanyakumari	16.46
9	Mahanadi	66.88
10	Brahmani & Baitarni	28.48
11	Subernarekha	12.37
12	Sabarmati	3.81
13	Mahi	11.02
14	West Flowing Rivers of Kutch, Sabarmati including Luni	15.10
15	Narmada	45.64
16	Tapi	14.88
17	West Flowing Rivers from Tapi to Tadri	87.41
18	West Flowing Rivers from Tadri to Kanyakumari	113.53
19	Area of Inland drainage in Rajasthan desert	Negligible
20	Minor River Basins Draining into Bangladesh & Burma	31.00
	Total	1869.35

Source: Ministry of Water Resources, 2006

Table 6.3.2 : State-wise details of inland water resources of various types

(Lakh Hectares)

Sl. No.	Name of the State/UT.	Rivers & Canals (Length in kms.)	Water Bodies				
			Reservoirs	Tanks, Lakes & Ponds	Floodplain Lakes & Derelict Water (Lakh Ha)	Brackish Water	Total
1	2	3	4	5	6	7	8
	States						
1	Andhra Pradesh	11514	2.34	5.17	-	0.60	8.11
2	Arunachal Pradesh	2000	-	2.76	0.42	-	3.18
3	Assam	4820	0.02	0.23	1.10	-	1.35
4	Bihar	3200	0.60	0.95	0.05	-	1.60
5	Chhattisgarh	3573	0.84	0.63	-	-	1.47
6	Goa	250	0.03	0.03	-	NEG	0.06
7	Gujarat	3865	2.43	0.71	0.12	1.00	4.26
8	Haryana	5000	NEG	0.10	0.10	-	0.20
9	Himachal Pradesh	3000	0.42	0.01	-	-	0.43
10	Jammu & Kashmir	27781	0.07	0.17	0.06	-	0.30
11	Jharkhand	4200	0.94	0.29	-	-	1.23
12	Karnataka	9000	4.40	2.90	-	0.10	7.40
13	Kerala	3092	0.30	0.30	2.43	2.40	5.43
14	Madhya Pradesh	17088	2.27	0.60	-	-	2.87
15	Maharashtra	16000	2.79	0.59	-	0.10	3.48
16	Manipur	3360	0.01	0.05	0.04	-	0.10
17	Meghalaya	5600	0.08	0.02	NEG	-	0.10
18	Mizoram	1395	-	0.02	-	-	0.02
19	Nagaland	1600	0.17	0.50	NEG	-	0.67
20	Odisha	4500	2.56	1.14	1.80	4.30	9.80
21	Punjab	15270	NEG	0.07	-	-	0.07
22	Rajasthan	5290	1.20	1.80	-	-	3.00
23	Sikkim	900	-	-	0.03	-	0.03
24	Tamil Nadu	7420	5.70	0.56	0.07	0.60	6.93
25	Tripura	1200	0.05	0.13	-	-	0.18
26	Uttar Pradesh	28500	1.38	1.61	1.33	-	4.32
27	Uttarakhand	2686	0.20	0.01	0.00	-	0.21
28	West Bengal	2526	0.17	2.76	0.42	2.10	5.45
	Union Territories						
29	Andaman & Nicobar Islands	115	0.01	0.03	-	1.20	1.24
30	Chandigarh	2	-	NEG	NEG	-	0.00
31	Dadra & Nagar Haveli	54	0.05	-	-	-	0.05
32	Daman & Diu	12	-	NEG	-	NEG	0.00
33	Delhi	150	0.04	-	-	-	0.04
34	Lakshadweep	-		-	-	-	0.00
35	Puducherry	247	-	NEG	0.01	NEG	0.01
TOTAL		**195210**	**29.07**	**24.14**	**7.98**	**12.40**	**73.59**

Source : Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture (Annual Report 2011-12)

NEG: Negligible

6.3.2 In India, the total length of all the major rivers is 195210 km and the combined area of all other water bodies is 73.59 lakh hectares.

The State wise details of Inland Water resources of various types is presented in Table 6.3.2. The table 6.3.3 shows the catchment area of major river basins.

Table 6.3.3 : 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	Mansarovar (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.	Manipur Hills (Manipur)		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 , Water yearBook-2008.
Note : Figures within bracket indicate the total river basin in india and neighbouring countries.

6.3.3 The details including catchment area, average water resources potential, utilizable surface water resources in major river basins of India are exhibited in Table 6.3.4.

Table 6.3.4: Water resources potential in river basins of India

(Unit :BCM)

Sl.No.	River Basin	Catchment Area (Sq. Km.)	Average Water Resources Potential	Utilisable Surface Water Resources
1	Indus (Up to Border)	321289	73.31	46.0
2	a) Ganga	861452	525.02	250.0
	b) Brahmaputra	194413	537.24	24.0
	c) Barak & Others	41723	48.36	
3	Godavari	312812	110.54	76.3
4	Krishna	258948	78.12	58.0
5	Cauvery	81155	21.36	19.0
6	Subernarekha*	29196	12.37	6.8
7	Brahamani & Baitarni	51822	28.48	18.3
8	Mahanadi	141589	66.88	50.0
9	Pennar	55213	6.32	6.9
10	Mahi	34842	11.02	3.1
11	Sabarmati	21674	3.81	1.9
12	Narmada	98796	45.64	34.5
13	Tapi	65145	14.88	14.5
14	West Flowing Rivers From Tapi to Tadri	55940	87.41	11.9
15	West Flowing Rivers From Tadri to Kanyakumari	56177	113.53	24.3
16	East Flowing Rivers between Mahanadi & Pennar	86643	22.52	13.1
17	East Flowing Rivers between Pennar & Kanyakumari	100139	16.46	16.5
18	West Flowing Rivers of Kutch and Saurashtra including Luni	321851	15.10	15.0
19	Area of Inland drainage in Rajasthan	-	Negl	NA
20	Minor River Draining into Myanmar (Burma) & Bangladesh	36202	31.00	NA
			1869.35	690.1

Source: B.P. Directorate, Central Water Commission: BCM- Billion Cubic Meter

1 Reassessment of Water Resources Potential of India March 1993, CWC.

2 Report of the Standing Sub-Committee for assessment of availability and requirement of water for diverse uses in the country, August,2000.

Note *: Combining Subernarekha and other small rivers between Subernarekha and Baitarni.

The water flow in some of the important streams of the Country is given in table 6.3.5

6.3.4 In hydrology, discharge is the volume rate of water flow, including any suspended solids dissolved chemical species and/or biologic material which is transported through a given cross-sectional area. **The water discharge, sediment load, water discharge in monsoon & non –monsoon period in major river basins of India is presented in table 6.3.6, table 6.3.7 and table 6.3.8**

6.3.5 **Water ways are also an important mode of transport in India. The details of navigable water ways in India can be viewed in table 6.3.9.**

6.4 Ground water

6.4.1 **Groundwater** is water that is found underground in the cracks and spaces in soil, sand and rock. Groundwater is stored in and moves slowly through layers of soil, sand and rocks called aquifers. Groundwater comes from rain, snow, sleet, and hail that soaks into the ground. Water moves down into the ground because of gravity, passing between particles of soil, sand, gravel, or rock until it reaches a depth where the ground is filled, or saturated, with water. The area that is filled with water is called the saturated zone and the top of this zone is called the water table. Water table may be very near the ground's surface or it may be hundreds of feet below.

6.4.2 The ground water availability estimates in various States/ UTs of India and Ground water resources and Ground water resource potential as per river basin are exhibited in Tables 6.4.1 & 6.4.2

6.4.3 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.

Table 6.3.5 : Water flow in stream for the period 2002-03 to 2009-2010

(Cusecs)

Sl. No.	Name of Basin/River	Name of Guage Station		No. of CWC Sites	Year for Which Data Given	Maximum 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	2003-2004	4000.0	1677.0	0.00	1.80
				6	2009-2010	657.9	465.4	0.00	5.20
2	Tapi	Dedtalai	Ghala	12	2003-2004	1839.0	1286.0	0.00	16.63
3	Narmada	Dindori	Garudeshwar	25	2002-2003	666.3	2070.0	0.85	0.00
				19	2009-2010	772.4	10684.0	5.01	11.50
4	Godavari	Ghargaon	Polavaram	56	2005-2006	635.8	43703.0	0.00	13.23
5	Cauvery	Kudige	Musiri	31	2004-2005	1388.0	632.3	1.06	0.00
				34	2009-2010	677.1	5.9	490.80	3.18
6	Krishna	Karad	Vijaywada	57	2002-2003	1121.0	158.7	0.00	2.87
				36	2009-2010	1258.0	27660.0	0.00	27.61
7	Mahanadi	Baronda	Tikarpara	21	2002-2003	406.7	12306.0	0.00	154.10
				19	2009-2010	685.4	0.0	1841.00	146.70
8	Subarnarekha	Muri	Ghatsila	3	2002-2003	7457.0	2037.0	0.42	11.33
				8	2009-2010	118.0	0.2	315.90	0.40
9	Godavari	Dhalegaon	Polavaram	47	2009-2010	320.4	11249.0	0.00	74.69
10	Sabarmati	Vautha	Jotsan	6	2009-2010	972.9	10.2	133.70	0.00

Sources : Water year Books of different River Basins.(C.W.C.)

Table 6.3.6 : Water discharge in major river basins

(Cumecs)

Sl. No	Name of Basin/River	No of C.W.C Sites	Reference Period	Maximum Discharge		Minimum Discharge		Basin Range	
				Highest	Lowest	Heighst	Lowest		
				Site Name/Value	Site Name/Value	Site Name/Value	Site Name/Value	Maximum	Minimum
1	2	3	4	5	6	7	8	9	10
1	Mahanadi	23	1971- 2010	Seoninarayan (22800.00)	Salebhata (4.17)	Tikarapara (121.00)	Baronda (0.00)	4.17 to 22800.00	0.00 to 121.0
2	Brahmani	10	1972-2008	Jaraikela (12539.00)	Bolani (16.00)	Jaraikela (25.20)	Tilga (0.00)	16.00 to 12539.00	0.00 to 25.20
3	Godavari	29	1964-2010	Polavaram (87250)	Sangam (1101)	Polavaram (65.07)	Ambabai (0.00)	1101 to 87250	0.00 to 65.07
4	Krishna	46	1965- 2010	Bawapuram (36303.25)	Navalgund (391.1234)	Daddi (679.603)	Vijaywade (18.947)	689.082 to 36303.25	18.947 to 679.603
5	Cauvery	36	1971-2009	Musiri (7690.26)	Gopurajapuram (0.38)	Chunchunkatte (48.68)	Akkihebbail (0.0)	0.38 to 7690.26	0.00 to 48.68
6	West Flowing River	29		Bentawal (9832.00)	Ashramam (120.38)	Neelaeshwaram (65.13)	Addoor (0.00)	120.38 to 9832.00	0.00 to 65.13
6	Tapi	7	1971-2009	Nanipalsan (9500)	Pingalwada (1085)	Motinaroli (0.278)	Mahuwa (0.00)	1085 to 9500	0.00 to 0.278
7	Narmada	27	1971- 2010	Garudeswar (60642)	Dhulsar (616)	Garudeswar (55.00)	Chandwade (0.00)	616 to 60642	0.00 to 55.00
8	Mahi, Sabarmati & others	22	1971- 2010	Khanpur (31061.914)	Chitrasani (127.200)	Khanpur (7.900)	Mataji (0.00)	127.200 to 31061.914	0.00 to 7.900

Source : Integrated Hydrological Data Book, March 2012, (ISO), CWC.

Table 6.3.7 (a) : Sediment load in major river basins - 2009-2010

Sl. No	Name of Basin/River	Monsoon Flow (Million Metric Tonnes)		Non-Monsoon Flow (Million Metric Tonnes)		Annual Flow (Million Metric Tonnes)		Basin Range (Million Metric Tonnes)		
		Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Monsoon	Non-monsoon	Annual
		Highest flow	Lowest flow	Highest flow	Lowest flow	Highest flow	Lowest flow			
1	2	4	5	6	7	8	9	10	11	12
1	Mahanadi	Keesinga (14.770)	Kantamal (0.000)	Tikarapara (0.051)	Manendragarh (0.000)	Keesinga (14.770)	Kantamal (0.000)	0.000 to 14.770	0.000 to 0.051	0.000 to 14.770
2	Brahmani	Panposh (4.573)	Tilga (1.469)	Pamposh (0.010)	Tilga (0.000)	Panposh (4.583)	Tilga (1.469)	1.469 to 4.573	0.000 to 0.010	1.469 to4.583
3	Godavari	Poavaram (12.067)	Saigaon (0.001)	Polavaram (0.027)	Pathsguden (0.000)	Poavaram (12.094)	Saigaon (0.001)	0.001 to 12.067	0.000 to 0.027	0.001 to 12.094
4	Krishna	Yadgir (13.191)	Karad (0.105)	wadenpalli (0.620)	Takali (0.000)	Yadgir (13.195)	Karad (0.109)	0.105 to 13.191	0.000 to 0.620	0.109 to 13.195
5	Cauvery	Biligundulu (0.238)	Thengudi (0.003)	Kudimodi (0.038)	Thengidi (0.002)	Biligundulu (0.279)	Thengudi (0.005)	0.003 to 0.268	0.002 to 0.038	0.005 to 0.279
	West Flowing River	Kumbidi (0.385)	Ambarampalayam (0.009)	Ramamanglam (0.008)	Kalampur (0.000)	Kumbidi (0.389)	Ambarampalayam (0.011)	0.009 to 0.385	0.000 to 0.008	0.011 to 0.389
6	Tapi	Sarankheda (5.015)	Gopalkheda (0.508)	Burhanpur (0.011)	Gopalkheda (0.000)	Sarankheda (5.015)	Gopalkheda (0.508)	0.508 to 5.015	0.000 to 0.011	0.508 to 5.015
7	Narmada	Sandia (47.17)	Chandwads (0.047)	Handia (0.239)	Chandwada (0.000)	Sandia (47.212)	Chandwads (0.137)	0.047 to 47.17	0.000 to 0.383	0.137 to 47.212
8	Mahi, Sabarmati & Others	Mataji (2.311)	Derol Bridge (0.000)	Khanpur (0.000)	Derol Bridge (0.000)	Mataji (2.311)	Derol Bridge (0.000)	0.000 to 2.311	0.000 to 0.000	0.000 to 2.311

Note: The sediment delivered - and transported by a stream is its sediment load. This can be classified in - three types, depending on sediment size and the competence of the river. The coarsest sediment, consisting of boulders and cobbles as well as sand, moves on or near the bed of the stream and is the bed load of the river. The finer particles, silts and clays, are carried in suspension by the turbulent action of flowing water; and these fine particles, which are moved long distances at the velocity of the flowing water, constitute the suspended load of the river. The remaining component of the - tal sediment load is the dissolved load, which is composed of chemical compounds taken in - solution by the water moving on or in the soils of the drainage basin. These three types of sediment constitute the - tal sediment load of the stream.

Source :CWC, Integrated Hydrological Data Book (Non- Classified River Basin), September,2012

Table 6.3.7(b) : State wise river water quality

Sl.No.	State	Water body	Dissolved Oxygen (mg/l)			pH			Conductivity (µmhos/cm)		
			MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
1	Andhra Pradesh	RIVER	0	11.7	6.6	2	9.6	7.8	76	14920	641
2	Assam	RIVER	0	18	7.2	5.8	8.1	7.2	43	868	193
3	Bihar	RIVER	2.6	9.4	8.4	7.1	8.6	8	162	476	329
4	Chhattisgarh	RIVER	0.8	8.5	7.3	7	8.8	7.7	85.5	755	258
5	Daman Diu	RIVER	-	-	-	7.2	8.1	7.6	202	348	277
6	Delhi	RIVER	0	10.5	2.6	7.1	8.3	7.7	230	1590	767
7	Goa	RIVER	3.6	8.1	6.5	6.6	8	7.2	8.2	1370	118
8	Gujarat	RIVER	0	12.8	6.1	6.8	8.9	8	138	55300	2627
9	Haryana	RIVER	0.42	10.6	7.3	4.5	8.7	7.6	150	3640	665
10	Himachal Pradesh	RIVER	2.2	13.3	8.8	7	8.7	7.8	53	1495	324
11	Jammu & Kashmir	RIVER	1.8	9.8	7.5	6.7	8.8	7.6	163	548	247
12	Jharkhand	RIVER	5.1	8.9	7.6	6	7.8	7	-	-	-
13	Karnataka	RIVER	0.7	14	7.1	6	8.9	7.9	20	2400	482
14	Kerala	RIVER	0	8	6.2	5.4	8.2	6.6	24	44000	923
15	Madhya Pradesh	RIVER	0	16	7.1	6.8	10	7.8	104	9340	734
16	Maharashtra	RIVER	0	9.9	5.8	5.8	8.9	7.6	44	55830	651
17	Manipur	RIVER	3.8	9.6	7.2	6.5	8	7.4	141	735	404
18	Meghalaya	RIVER	1.4	10	6.8	2.9	7.4	6.2	123	950	294
19	Mizoram	RIVER	4.3	8.7	6.8	7.5	8.3	7.9	70	220	148
20	Nagaland	RIVER	2.4	9.2	6.2	4.7	8.7	7.8	62	400	160
21	Odisha	RIVER	3.4	9.7	7.7	6.7	8.5	7.8	17.4	48400	1384
22	Puducherry	RIVER	6.6	7.6	7	6.7	8. 4	7.6	398	715	593
23	Punjab	RIVER	1.2	8.9	6.2	6.5	7. 9	7.4	162	1600	575
24	Rajasthan	RIVER	3.2	7.8	5.7	7.2	8.7	8.1	250	880	453
25	Sikkim	RIVER	8	12.5	10.8	6	7.2	6.6	210	290	255
26	Tamilnadu	RIVER	0.6	9.3	6.9	5.7	8.8	7.4	42	28700	556
27	Tripura	RIVER	4.2	6.9	5.8	7.1	8.1	7.6	110	180	141
28	Uttar Pradesh	RIVER	0	20.6	6.7	7	9.5	7.9	122	8010	610
29	Uttarakhand	RIVER	5.6	10.2	8.5	6.5	8.4	7.3	40	398	154
30	West Bengal	RIVER	2.5	15.2	6.7	6.8	8.7	7.9	60	68700	1244

cont..

Table 6.3.7(b) : State wise river water quality

(concluded)

Sl.No.	State	Water body	BOD (mg/l)			Total Coliform (MPN/100ml)			Fecal Coliform (MPN/100ml)		
			MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
1	Andhra Pradesh	RIVER	0.1	50	2.7	3	28000	1888	0	800	44
2	Assam	RIVER	0.3	32	1.9	1	240000	3816	0	24000	653
3	Bihar	RIVER	1.7	2.9	2.3	700	90000	11707	300	50000	4823
4	Chhattisgarh	RIVER	0.2	3.4	1.6	4	1100	110	0	0	0
5	Daman Diu	RIVER	-	-	-	-	-	-	-	-	-
6	Delhi	RIVER	1	70	19.9	19000	103000000	12024579	500	10900000	1256411
7	Goa	RIVER	0.7	4.7	2	4	5400	511	2	1300	168
8	Gujarat	RIVER	0.1	50	4.4	0	2100000	31885	0	460000	12567
9	Haryana	RIVER	1	590	18.8	112000	6600000	804484	180	760000	76726
10	Himachal Pradesh	RIVER	0.1	7.6	0.7	2	4400000	127730	0	430000	6349
11	Jammu & Kashmir	RIVER	0.1	40	2.4	-	-	-	-	-	-
12	Jharkhand	RIVER	0.4	10.5	2.9	750	2400	1516	110	930	287
13	Karnataka	RIVER	0.1	7	1.7	1	160000	4791	0	90000	2031
14	Kerala	RIVER	0.1	11	1.1	0	56000	2318	0	44000	1236
15	Madhya Pradesh	RIVER	0.2	50	4.4	0	2400	349	0	280	7
16	Maharashtra	RIVER	1.2	50	7.6	0	1800	439	0	1600	100
17	Manipur	RIVER	-	-	-	5	415	101	-	-	-
18	Meghalaya	RIVER	1	7.7	3.3	31	2200	552	23	1700	402
19	Mizoram	RIVER	0.3	1.7	0.9	3	15	5	-	-	-
20	Nagaland	RIVER	0.4	2.8	1.1	-	-	-	-	-	-
21	Odisha	RIVER	0.4	6.4	1.9	630	1600000	18088	230	160000	6293
22	Puducherry	RIVER	0	1	0.3	-	-		-	-	-
23	Punjab	RIVER	0	50	9.9	35	2500000	81441	0	500000	13787
24	Rajasthan	RIVER	0.1	6.2	1.7	4	210	32	3	14	4
25	Sikkim	RIVER	2	3.8	2.8	80	350	238	40	220	118
26	Tamilnadu	RIVER	0.1	23	1.7	21	5400	574	13	3500	375
27	Tripura	RIVER	0.5	4	2.3	180	620	483	17	560	356
28	Uttar Pradesh	RIVER	1	364	9.2	160	140000000	1808500	20	1790000	90302
29	Uttarakhand	RIVER	0.9	7.6	1.8	0	10100000	559977	1	380000	27016
30	West Bengal	RIVER	0	6.8	2.3	540	1400000	139135	280	850000	62013

Source: Central Pollution Control Board.(2009)

Note : BOD : Bio chemical Oxygen demand

(µmhos/cm) : Micromhos per centimeter; MPN: Most Probable Number

Table 6.3.8 : Water discharge at monsoon & non- monsoon in major river basins-2008-2009

Sl. No	Name of Basin/River	Monsoon Load (Million Metric Tonnes)		Non- Monsoon Load (Million Metric Tonnes)		Annual Load (Million Metric Tonnes)		Basin Range (Million Metric Tonnes)		
		Site Name/Value Highest Flow	Site Name/Value Lowest Flow	Site Name/Value Highest Flow	Site Name/Value Lowest Flow	Site Name/Value Highest Flow	Site Name/Value Lowest Flow	Monsoon	Non-monsoon	Annual
1	2	4	5	6	7	8	9	10	11	12
1	Mahanadi	Tikarapara (49608)	Sukma (-)	Tikarapara (9655)	Sukma (-)	Tikarapara (59269)	Sukma (-)	.- to 49608	- to 9655	- to 59263
2	Brahmani	Jenapur (17049)	Anandpur (-)	Jenapur (2826)	Anandpur (-)	Jenapur (19875)	Anandpur (-)	.- to 17049	- to 2826	- to 19875
3	Godavari	Polavaram (26655)	Betmogrra (0)	Polavaram (2368)	Betmogrra (0)	Polavaram (29023)	Betmogrra (0)	0 to 26655	0 to 2368	0 to 29023
4	Krishna	Wadenpally (21622)	Halia (351)	Wadenpally (3224))	Kurunwad (0)	Wadenpally (24846)	Cholachaguda (352)	351 to 21622	0 to 3224	352 to 24846
5	Cauvery	Kodumudi (5575)	Thevur (0)	Kodumudi (3397)	K.M. Wadi (0)	Kodumudu (8972)	Thopper (0)	0 to 5575	0 to 3397	0 to 8972
	West Flowing River	Neeleshwaram (4193)	Addoor (-)	Neeleshwaram (1409)	Addoor (-)	Neeleshwaram (5602)	Addoor (-)	.- to 4193	- to 1409	- to 5602
6	Tapi	Durvesh (1950)	Pingalwada (86)	Durvesh (126)	Gadat (0)	Durvesh (2076)	Pingalwada (116)	86 to 1950	0 to 128	116 to 2076
7	Narmada	Handia (15616)	Chandwada (323)	Maneleshwar (15227)	Chandwada (0)	Maneleshwar (28066)	Bamni (270)	323 to 128.38.90	0 to 15226.87	270 to 28065.77
8	Mahi, Sabarmati & others	Mataji (1055)	Baltura (0)	Vautha (345)	Baltura (0)	Mataji (1067)	Bellora (0)	0 to 1055	0 to 345	0 to 1067

Source :CWC, Integrated Hydrological Data Book (Non- Classified River Basin), March 2012

Table 6.3.9 : Navigable waterways in India 2011-12

(Km.)

Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4
1	**ANDHRA PRADESH**		
	Godavari	1530	171
	Krishna	386	35
	Others **	585	585
	Total	**2501**	**791**
2	**ASSAM**		
	Brahmaputra		891
	Borak	2800	152
	Subansiri	900	111
	Dhansiri	..	26
	Lohit		132
	Gangadhar		112
	Sonkosh		48
	manas		48
	Aai		64
	Beki		56
	Nakhonda		41
	Pahumara		40
	Pagladia		40
	Borolia		24
	Puthimari		64
	Dikrang		41
	Rangandi		45
	Kapi		102
	Dehing		160
	Katakhal		160
	Soani		48
	Amguri		16
	Mahura		32
	Badri		25
	Chiri		42
	Jiri		64
	Total	**3700**	**2584**
3	**BIHAR**		
	Damodar	…	---
	Ganga	510	510
	Gandak	323	300
	Koshi	236	160
	Ghaghra	100	100
	Sone	226	31
	Mahananda	140	--
	Burhi Gandak	400	--
	Punpun	200	--
	Phalgu Harihar	300	--
	Kiul	100	--
	Kari Koshi	150	--
	Chandan	100	--
	Karmnasha	144	--
	Others	860	290
	Total	**3789**	**1391**
4	**GOA**		
	Mandovi	76	65
	Zuari	56	45
	Mapusa	26	20
	Chapora	34	25
	Tiracol	29	15
	Sal	20	15
	Cumbarjua Canal	17	17
	Others	--	-
	Total	**258**	**202**
5	**GUJARAT**		
	Narmada	161	130
	Tapti	140	15
	Ambica	136	20
	Auranga	75	4
	Puma	141	13
	Rukmavati	60	2.3
	Total	**713**	**184.3**
6	**KARNATAKA**		
	Sharavathi	80	27
	Tungabhadra	375	375
	Malaprabha	230	230
	Ghataprabha	160	160
	Krishna	325	325
	Cauvery	270	34
	Kabini	117	22
	Gurupur	80	20
	Gangolli	48	20
	Bheema	860	125
	Udyavara	37	14
	Netravathi	96	26
	Kali	184	29
	Total	**2862**	**1407**
7	**KERALA**		
	Manjeswar	16	3.2
	Uppala	50	-
	Shiriya	67	4.8
	Mogral	34	-
	Chandragiri	105	12.8
	Chittari	25	-
	Nileswar	46	11.2
	Kariangoda	64	24
	Kavvai	31	9.6
	Peruvamba	51	16
	Ramapuram	19	6.4
	Kuppan	82	24
	Valapattanam	110	44.8
	Anjara Kandy	48	27.2
	Teiciherry	28	21.6
	Mahe	54	24
	Kuthiadi	74	9.6
	Korapuzha	40	24.8

Table 6.3.9 : Navigable waterways in India 2011-12 .....Contd.

(Km.)

Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4
	Kerala		
	Kallai	22	9.6
	Chaliyar	169	68.4
	Kadalundy	130	43.2
	Tirur	48	9.6
	Bharathappujha	209	40
	Keecheri	51	-
	Puzhakkal	29	-
	Karivannur	48	24
	Chalakkudy	130	16
	Periyar	244	72
	Muvattei Puzha	121	25.6
	Meenachil	78	41.6
	Manimala	90	54.4
	Pamba	176	73.6
	Achan coil	128	32
	Pallickal	42	2
	Kallada	121	40
	Ithikkara	56	16
	Ayroor	17	1
	Vamanapuram	88	11.2
	Mamom	27	1
	Karamana	68	-
	Neyyar	56	-
	Total	**3092**	**845.2**
8	**MAHARASHTRA**		
1	Dande River	2	1
2	Pangere River	2	1
3	Girye River	3	1
4	Kajali River	35	5
5	Kalbadevi River	10	2
6	Are River	6	1
7	Jog River	10	5
8	Kelshi River	10	3
9	Savitri River (Bankot to	45	40
10	Kal River	6	4
11	Vaitarna River	24	9
12	Ulhas River	32.5	28
13	Mahim River (Bay)	1.5	1
14	Amba River	23	20
15	Patalganga	11	6.5
16	Kundalika River	16	16
17	Mandad River (Rajpuri	14	10
18	Mhasla River (Turmad	9	5
19	Vashisti River (Dabhol	45	38
20	Jagbudi River	20	20
21	Shastri River/Jaigad	45	40
22	Rajapur River	30	30
23	Vagothan	38	22
24	Gad River (Kalaval	13	7
25	Terekhol River/Creek	28	28
26	Karli River (Malva)	23	13
26	Others	129	105
	Total	**631**	**462**

Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4
9	**ORISSA**		
	Mahanadi	493	199
	Brahmani	541	277
	Baitarani	344	32
	Subarnarekha	--	50
	Budha Balanga	--	35
	Dhamara	--	20
	Salandi	--	17
	Panchputra	--	21
	Pernei	--	45
	Hatel	--	30
	Bansagadal	--	32
	Hansua	--	37
	Tirkota	--	18
	Jamboo	--	6
	Gobari	--	16
	Ramchandi	--	16
	Kharansi	--	14
	Batigharia	--	14
	Birupa	--	110
	Genguti	--	45
	Luna	--	37
	Devi	--	20
	Pradhi	--	15
	Kadha	--	30
	Kusavadra	--	25
	Daya	--	9
	Rajua	--	7
	Makara	--	11
	Ohers **	--	462
	Total $	**1378**	**1650**
10	**TAMIL NADU**		
	North Buckingam Canal	58	-
	Central Buckingam Cana	7	-
	South Buckingam Canal	105	-
	Total	170	-
11	**UTTAR PRADESH**		
	Gomti	960	
	Rapti	778	
	Ghaghra	1116	
	Ganga	2345	425#
	Sai	760	
	Tons	485	
	Total	**6444**	

Table 6.3.9 : Navigable waterways in India 2011-12 ….Contd.

Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4
12	**WEST BENGAL**		
	Hooghly	580	580
	Mahananda	206	58
	Ajoy	174	174
	Jalangi	232	232
	Dwarka	129	129
	Bakreswar	102	102
	Damodar	437	437
	Dwarekeswar	103	103
	Silabati	135	135
	Kumari	308	308
	Ichamati	232	232
	Others @	2103	2103
	Total	**4741**	**4593**
13	**NAGALAND*** **		
	Doyans	185	105
	Tizu/Zungki	287	90
	Dhansiri/Chathe	170	75
	Dikhu	120	52
	Tapi-Yangnyn	95	18
	Tsurang/Disai	60	15
	Others	20	20
	Total	**937**	**375**
14	**MIZORAM**		
	R.TlawNg (Dhaleswari)	238	81
	R.Kolodyne (Chhimtuipo	196	22
	Khawtthlang Tuipui	134	17
	R. Tuichawrg	167	19
	Total	**735**	**139**

Source : Transport Research Wing, Ministry of Surface Transport

** Including Canals *** Related to 2007-08

@ Includes 268 Kms. Each of Total Length and Navigable Length pertaining to cannals.

- Not available

Navigable length pertains to NW I for Allahabad-Buxar stretch in Uttar Pradesh is available.

$ Total length is less than navigable length as length of canals is not provided whereas navigable length of canals is provided.

Table 6.4.1(a) : Ground water resources

Unit:BCM/Yr

States	Annual Replenishable Ground Water Resources				Total	Natural Dischage during non-monsoon season	Net Annual Ground Water Availability	Annual Ground Water Draft			Projected Demand for Domestic and Industrial uses upto 2025	Ground Water availability for future irrigation	Stage of Ground Water Development (%)
	Monsoon Season		Non-monsoon Season					Irrigation	Domestic and Industrial uses	Total			
	Recharge from rainfall	Recharge from other sources	Recharge from rainfall	Recharge from other source									
1	2	3	4	5	6	7	8	9	10	11	12	13	14
States	**246.05**	**67.32**	**45.63**	**71.46**	**430.45**	**34.99**	**395.52**	**221.29**	**21.83**	**243.14**	**30.65**	**153.26**	**61**
Andhra Pradesh	15.12	6.52	5.49	6.70	33.83	3.07	30.76	12.61	1.54	14.15	2.69	15.89	46
Arunachal Pradesh	3.41	0.00	1.04	0.00	4.45	0.45	4.01	0.00	0.00	0.00	0.01	4.00	0.07
Assam	18.95	2.20	8.62	0.59	30.36	2.54	27.81	5.33	0.69	6.02	0.98	21.50	22
Bihar	18.92	3.92	3.40	2.38	28.62	2.42	26.21	9.79	1.56	11.35	2.56	13.85	43
Chhattisgarh	9.85	0.56	0.91	0.90	12.22	0.64	11.58	3.08	0.52	3.60	0.64	7.85	31
Delhi	0.11	0.10	0.02	0.08	0.31	0.02	0.29	0.14	0.26	0.40	0.26	0.01	138
Gujarat	0.14	0.01	0.01	0.07	0.22	0.09	0.13	0.01	0.03	0.04	0.04	0.08	33
Goa	12.21	2.76	0.00	3.46	18.43	1.08	17.35	11.93	1.05	12.98	1.47	5.32	75
Haryana	3.53	2.69	1.01	3.25	10.48	0.68	9.80	11.71	0.72	12.43	0.79	-2.70	127
Himachal Pradesh	0.40	0.02	0.12	0.04	0.58	0.06	0.53	0.23	0.08	0.31	0.08	0.22	58
Jammu & Kashmir	1.45	1.69	0.36	0.19	3.69	0.37	3.33	0.15	0.58	0.73	0.82	2.35	22
Jharkhand	4.46	0.14	1.11	0.26	5.97	0.55	5.41	1.17	0.44	1.61	0.62	3.62	30
Karnataka	6.30	4.28	2.73	3.51	16.82	2.00	14.81	9.01	1.00	10.01	1.26	6.18	68
Kerala	4.77	0.06	0.64	1.15	6.62	0.59	6.03	1.30	1.50	2.80	1.71	3.02	47
Madhya Pradesh	27.49	1.10	0.80	4.56	33.95	1.70	32.25	16.66	1.33	17.99	1.83	13.76	56
Maharashtra	22.04	2.67	1.90	9.12	35.73	1.93	33.81	15.91	1.04	16.95	2.00	16.32	50
Manipur	0.24	0.01	0.19	0.01	0.45	0.04	0.40	0.00	0.00	0.00	0.05	0.35	1
Meghalaya	1.02	0.00	0.22	0.00	1.23	0.12	1.11	0.00	0.00	0.00	0.10	1.01	0.15
Mizoram	0.03	negligible	0.02	neg	0.05	0.00	0.04	0.00	0.00	0.00	0.00	0.04	1
Nagaland	0.28	-	0.14	-	0.42	0.04	0.38	-	0.01	0.01	0.01	0.36	2.14
Odisha	11.29	2.53	1.33	2.63	17.78	1.09	16.69	3.47	0.89	4.36	1.27	11.94	26
Punjab	5.86	10.57	1.34	4.78	22.55	2.21	20.35	33.97	0.69	34.66	0.95	-14.57	170
Rajasthan	8.76	0.67	0.32	2.11	11.86	1.07	10.79	12.86	1.65	14.51	1.84	0.75	135
Sikkim	-	-	-	-	0.00	-	0.05	0.00	0.01	0.01	0.01	0.03	21
Tamil Nadu	7.54	11.05	2.16	2.18	22.93	2.29	20.65	14.71	1.85	16.56	1.97	4.70	80
Tripura	1.66	0.00	0.73	0.57	2.96	0.23	2.74	0.09	0.07	0.16	0.23	2.42	6
Uttar Pradesh	40.78	11.37	5.41	17.70	75.26	6.68	68.57	46.00	3.49	49.49	5.36	17.22	72
Uttarakhand	1.26	0.24	0.20	0.46	2.16	0.10	2.07	1.01	0.03	1.04	0.08	0.98	51
West Bengal	18.17	2.16	5.43	4.74	30.50	2.92	27.58	10.11	0.79	10.90	1.02	16.75	40
Union Territories	**0.40**	**0.06**	**0.09**	**0.03**	**0.59**	**0.04**	**0.54**	**0.13**	**0.05**	**0.18**	**0.06**	**0.40**	**34**
Andaman & Nicobar	0.25	-	0.07	-	0.31	0.01	0.30	0.00	0.01	0.01	0.02	0.28	4
Chandigarh	0.02	0.00	0.01	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.02	0.00
Dadar & Nagar Haveli	0.04	0.00	0.01	0.01	0.06	3.00	0.06	0.00	0.01	0.01	0.01	0.05	15
Daman & Diu	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	99
Lakshadweep	-	-	-	-	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	74
Puducherry	0.09	0.06	0.01	0.02	0.17	0.02	0.15	0.12	0.03	0.15	0.03	0.05	98
Grand Total	**246.45**	**67.38**	**45.71**	**71.48**	**431.03**	**35.03**	**396.06**	**221.42**	**21.89**	**243.32**	**30.71**	**153.66**	**61**

BCM: Billion Cubic Meter.
Source: Central Ground Water Board, Hydrology Project, Ministry of Water Resource, (as on 31st March, 2009)
Note: * Included ET loss frommtree for 8 non-monsoon months, water loss due to autflow to see, buffer zone for reserve during or lesser monsoon period
Total may not tally due to rounding off.
: The stage of Ground water development is to be computed as : E/N (Where E: Existing Gross draft for all uses and N: Net annual availability.)

Table 6.4.1(b) Projected Water Demand in India

(By Different Use)

Sector	Projected Water Demand in Km3 (or BCM)								
	Standing Sub-Committee of MOWR			NCIWRD					
	2010	2025	2050	2010		2025		2050	
				Low	High	Low	High	Low	High
Irrigation	688	910	1072	543	557	561	611	628	807
Drinking Water	56	73	102	42	43	55	62	90	111
Industry	12	23	63	37	37	67	67	81	81
Energy	5	15	130	18	19	31	33	63	70
Other	**52**	72	80	54	54	70	70	111	111
Total	**813**	**1093**	**1447**	**694**	**710**	**784**	**843**	**973**	**1180**

Source: Basin Planning Directorate, CWC, XI Plan Document.

Report of the Standing Sub-Committee on "Assessment of Availability & requirement of Water for Diverse uses-2000"

Note: NCIWRD: National Commission on Integrated Water Resources Development

BCM: Billion Cubic Meters

Table 6.4.2: Ground water resource potential as per basin (Prorata Basis)

Sl. No.	Basin	Total Replenishable Ground Water Resource (M.C.M/Yr)	Provision of Domestic Industrial & Other Uses (M.C.M/Yr)	Available for Irrigation (M.C.M/Yr)	Net Draft (M.C.M/Yr)	Balance for future Use (M.C.M/Yr)	% Level of G.W. Development
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
MCM/yr : Million Cubic Metre/Year

6.5 Water quality

6.5.1 Simultaneously, rivers are 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.

6.5.2 The Primary water quality criteria are as per the details given below.

Table 6.5.1 : 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 $20^{o}C$ 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 $20^{o}C$ 3mg/l or less.
3	Drinking Water Source after conventional treatment and disinfection	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 $20^{o}C$ 3mg/l or less.
4	Propagation of Wild Life and Fisheries	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 disposal	E	1 pH between 6.0 to 8.5 2 Electrical conductivity at $25^{o}C$ Micro mhos/cm Max 2250. 3 Sodium Absorption Ratio, Max 26 4 Boron, Max 2mg/l

Source : Status of Water Quality in India - 2009, 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 if at a location, 80% of the time Dissolved Oxygen, 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.

6.5.2 **The Biological water quality criteria is shown in table 6.5.2.**

Table 6.5.2: 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

6.5.3 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.

Table 6.5.3 : Physico-chemical and biological water quality of polluted stretch 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
* refer table 6.5.1

6.5.4 **National Water Quality Monitoring Programme:** The Central Pollution Control Board in collaboration with State Pollution Control Board is operating the Water Quality Monitoring Network comprising of 1429 stations in 27 States and 6 Union Territories spread over the country for monitoring of aquatic resources. The monitoring is undertaken on monthly/quarterly basis in surface water and half yearly basis in cases of groundwater. The monitoring network covers 293 rivers, 94 lakes, 9 tanks, 41ponds, 15 creeks/sea water, 23 canals, 18 drains and 411 groundwater wells. This is done through three major schemes 1) Global Environmental Monitoring System (GEMS)- 2) Monitoring of Indian National Aquatic Resources (MINARS) - and 3) Yamuna Action Plan (YAP)

6.5.5**The tables 6.5.4 a, 6. 5.4 b and 6.5.5 present the water quality in major Indian rivers and selected major river basins. Table 6.5.6 at presents the river basin wise distribution of water quality monitoring centres.**

Table6.5.4: Water Quality in Indian Rivers – 2002 to 2011										
Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(°C) (Min-Max)	pH	Conductivity(µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Ganga	2525	34	2002	3-34	6.4-9.0	19-2720	2.7-11.5	0.5 – 16.8	300-25x10	20-11x10^5
		34	2003	4-34	6.8-8.9	49-1323	4-11	0.8-27	47-45x10^5	26-12x10^5
		34	2004	5-35	7-8.8	72-4080	0.3-13.2	0.7-14.4	11-45x10^5	11-7x10^5
		39	2005	4-39	6.1.-9	23-1696	3.2-12.8	0.1-15.2	13-45x10^5	13-11x10^5
		39	2006	9-33	7.0-8.88	97-5620	2.2-11.9	0.1-16.4	1-25x10^5	17-11x10^5
		39	2007	4-33	6.1-8.8	23-5040	1.4-11	0-14	0-28x10^5	0-7 x10^5
		39	2008	2.5-35.5	6.1-8.9	39-6320	1.2 - 11.6	0.5-21.0	0- 101 x10	0 - 85 x10^5
		57	2009	4-37	6.5-8.9	68-4460	4.3-11.2	0.2-16	2-65 x10^4	0-4 x10^4
		57	2010	4-35	6.7-9.0	21-5250	3.6-12	0.2-15	3-14 x10^5	2-4 x10^5
		61	2011	3-37	6.7-9.1	49-10240	4-14.3	0.2-11	5-25 x10^5	5-11 x10^5
Yamuna	1376	23	2002	3-34	6.7-9.8	56-1959	0.1-22.7	1.0 – 36	27-26.3x1	11-17.2x10^5
		23	2003	2-38	6.6-10	45-3500	0.3-22.8	1-58	110-171x1	40-203x10^6
		23	2004	7-35	6.8-9	76-2150	0.3-19.5	1-40	21-1103x1	18-62x10^6
		23	2005	11-37	6.8-9.1	90-2290	0.5-17.3	0.8-59	14-307x10	11-52x10^5
		23	2006	4-34	7.14-9.5	220-1876	1.3-18.8	1.0-144	7-231x10^7	2-13x10^6
		23	2007	6.5-34	5-8.4	57-1940	0-17.7	0-93	0-32 x10^7	0-23 x10^6
		23	2008	7.5-32	6.8 - 9.5	40-3340	0.0 - 20.6	0.4-70.0	0 - 103x10	11 -109x10^5
		27	2009	5-35	7.0 - 8.8	80 - 3040	0.0 - 17.9	0.2 - 103	4 - 23 x10	9 - 21 x10^8
		27	2010	5-35	6.1-9.4	100-2220	0.0-21.1	08-84	13 - 39x10	9 - 29x10^6
		32	2011	4-38	6.9-8.8	60-1905	0-17	0.2-41	10-16 x10^7	4-11 x10^8
Mahi	583	7	2002	19-34	7.1-9.2	175-5720	0.2-8.5	0.1 – 3.0	3-2400	3-75
		7	2003	18-34	7-8.8	97-750	2.9-10.1	0.5-3.9	4-2400	2-28
		7	2004	20-34	7.4-9.2	166-650	2.7-8.7	0.3-4.9	4-1600	2-28
		9	2005	20-32	7.5-9	182-7080	4.1-11.1	0.2-5.9	3-14x10^3	2-1x10^3
		9	2006	16-28	7.2-8.9	263-580	7.3-12.1	1.1-8.5	3-180	2-9
		9	2007	20-31	7.6-8.89	234-3720	0.4-10.7	0.3-5.7	4-160	0-11
		9	2008	20- 32	7.2-8.9	225-1660	4.6-13	0.2-6.8	0-210	0- 18
		9	2009	22-32	7.1-10	160-766	3.5-8.6	0.1-4.0	3-170	0-9
		9	2010	20 - 34	7.4 – 8.7	230-7234	3.5 – 9.9	0.22- 4.0	4 - 110	0 -7
		11	2011	18-36.5	7.1-9.1	256 -1310	3.2-8.9	0.6 -8.0	7-28	2-9

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(^{o}C)	pH	Conductivity(µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Tapi	724	10	2002	20-40	7.4-9.0	76-700	4.8-8.8	0.6 – 10.0	40-2100	2-210
		10	2003	18-36	3.1-9.2	119-1130	3.1-10.4	1-10	30-930	2-230
		10	2004	13-39	3.1-9.5	190-790	1.2-8.7	0.7-36	3-5X10^{5}	2-9X10^{4}
		13	2005	26-30	7.2-9.4	186-1084	4-8.4	1-25.1	2-46X10^{4}	2-15X10^{4}
		13	2006	14-31	7.7-9.28	161-923	4.6-9.7	0.3-24	5-11X10^{4}	2-11X10^{4}
		14	2007	23-39	7.3-8.5	210-581	3.7-8.7	1.1-25	17-46 x10^{3}	7-15 x10^{3}
		14	2008	19-41	6.6-8.9	132-26000	2.1- 8.8	0.1-21	0-46 X10^{4}	0-24 X10^{4}
		14	2009	18-42	6.2-8.9	173-45400	3.7-8.2	0.6-12	14-39000	0-14000
		14	2010	15 - 42	7.0-8.7	125- 3940	1 -8.1	0.4 - 16	9- 9300	0 - 4300
		14	2011	24-41.5	7.0-8.7	172-41836	3.2-7.6	1.2-10	22-24000	9 -9000
Narmada	1312	14	2002	-	6.9-9.3	102-1341	5.8-9.8	0.1 – 3.8	9-2400	2-64
		14	2003	12-31	7.1-8.5	95-441	4.5-9.5	0.4-3.3	4-1600	1-110
		14	2004	15-34	7-8.6	181-815	5.5-9.6	0.2-3.8	3-2400	2-15
		15	2005	21-30	7.3.9	190-1746	4.8-10.9	0.6-4.5	3-2400	2-210
		15	2006	9-32	7.1-8.6	188-682	6.2-11	0.4-3.7	3-2400	0-39
		15	2007	19-31	7.5-8.8	244-1629	6.2-10.4	1.2-3.5	7-1600	0-15
		21	2008	14-32	6.8-10	180-853	4.9- 13	0.2 -11.4	0-2400	0-140
		21	2009	17-33	6.5-8.9	178-1930	4.2-11.5	0.2-30	2-1600	0-90
		21	2010	19 - 39	7.2 – 8.5	194 -727	4.8 - 11	0.21- 5.4	4 - 11000	0 - 4600
		26	2011	14.7-38	7.1- 8.6	217-651	6.2- 9.9	0.8- 5.0	4-1600	0-17
Godavari	1465	11	2002	22-35	7.0-9.0	118-1400	3.1-10.9	0.5 – 78.0	8-5260	2-3640
		11	2003	22-37	7.1-8.7	115-1350	3.2-9.3	1.7-53	70-68200	3-1400
		11	2004	21-35	6.5-9	86-1290	2.4-9.2	0.2-15	4-22 x 10^{4}	2-5 x 10^{4}
		18	2005	23-32	6.7-9.1	121-1300	0.8-8.7	0.5-20	2-33 x 10^{3}	1-10 x 10^{3}
		18	2006	19-34	6.65-9.11	75-691	1.1-9.6	1.2-32	2-31 x 10^{3}	2-6 x 10^{3}
		18	2007	20-37	5.9-8.9	126-918	3.2-7.5	0.2-36	0-2200	5-36 x10
		35	2008	13-35	5.2-9.6	114-3994	1.2-11.3	0.2-20	3-28 x10^{3}	0-800
		35	2009	15-41	6-9.2	115-3169	3.2-12.3	0.0-26	5-16000	0-340
		35	2010	12-40	5.4-8.9	91-1670	1.8-14.2	0.3-60	2-2400	1-1600
		35	2011	18-40	6.4-9.1	132-1959	1.2-12.2	0.0-37	7-2400	1-500

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(°C)	pH	Conductivity(µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Krishna	1401	17	2002	18-33	6.8-9.5	28-11050	2.9-10.9	0.2 – 10.0	17-33300	3-1 x 10^3
		17	2003	18-35	6.7-8.9	36-40000	0.7-12.6	0.5-17	6-7 x 10^4	2-2 x 10^4
		17	2004	18-38	6.7- 9	71-44000	0.4-9.2	0.3-9	15-124 x 1	3-28 x 10^3
		21	2005	24-37	6.5-9.9	69-43300	1.4-8.8	0.4-40	17-84 x 10	1-34 x 10^3
		19	2006	15-40	6.32-9.30	76-2580	3.0-8.5	0.4-14.8	4-86 x 10^3	1-6 x 10^3
		19	2007	13-38	6.2-9.1	69-23400	3.0-10	0.1-9.8	0-71x10^3	0-1600 ^{3}
		22	2008	17.3-39	5.8-8.9	44-14290	1.1-9.8	0.2-17.6	8-16 x 10^3	0-3 x 10^3
		22	2009	18.4-41	6.7-9.0	75-19960	0-12.6	0.3-9.6	8-170000	0-1400
		24	2010	17-39	6.5-9.1	42-16720	1.5-11.8	0-10	2-4000	0-1600
		26	2011	19.2-38	6.9-8.7	99-8570	1.7-15.8	0.4-16	4-16000	2-9000
Cauvery	800	20	2002	21-37	2.0-9.2	31-53100	0.1-12.6	0.1 – 26.6	39-16 x 10	2-28 x 10^3
		20	2003	8-34	7-9.2	42-57200	2.1-13.5	0.2-10	4-22 x 10^3	2-4 x 10^3
		20	2004	19- 35	6.6-9	35-39720	3.3-9.9	1-9	2-5 x 10^4	2-17 x 10^3
		20	2005	20-37	6.2-9.5	28-48700	0.3-9.8	1-12	2-9500	1-3 x 10^3
		20	2006	20-34	7.0-9.3	26-1694	2.7-8.9	1-6	90-3500	3-1400
		20	2007	19-32	6.5-8.8	28-56500	0-12.4	0.1-38	40-28 x10^3	4-17 x10^3
		20	2008	20-35	6.5-8.8	27-28700	0.6-14	0.1-23	27-5400	0-3500
		20	2009	20-34	6.5-8.9	65-81800	1.5-10.3	0.1-17	7-9200	2-5400
		29	2010	21-30	6.5-8.9	18-8430	0.4-12.2	0.1-27	70-15000	20-12000
		31	2011	20-34	4.3-8.9	7-3640	1.7-10.9	0.1-7.2	90-6200	20-2200
Mahanadi	851	16	2002	18-38	7.3-8.9	114-15940	1.3-10.4	1.0 – 7.6	15-30000	50-17000
		16	2003	17-37	6.5-8.6	77-83600	4.7-10.1	0.3-5.6	4-35X10^3	50-28X10^3
		16	2004	17- 34	6.3-8.8	105-20700	4.4- 9.4	0.2-4	3-92X10^3	27-24X10^3
		21	2005	22-34	6.1-8.7	75-36279	4.5-10	0.2-16	3-92X10^3	78-54X10^3
		21	2006	20-32	6.97-8.9	113-34587	4.7-8.5	0.2-3.8	14-92X10^3	68-54X10^3
		21	2007	26-33	7.3-8.54	102-813	6.2-8.9	1.2-3.6	27-35 x10^3	700-17 x10^3
		22	2008	18-36	6.7-8.8	109-29400	0.8-8.9	0.2-4.6	15-16 x10^4	310- 54 x10^3
		22	2009	17-39	6.7-8.8	103-48830	0.2-11	0.2-7.1	5-1600000	110-160000
		22	2010	17-39	7.0 – 9.3	92 - 42350	4.4-11	0.2 – 14.3	10 - 16000	45 - 92000
		23	2011	18-36	7.1–8.5	90 - 13190	4.9 -10.5	0.6 -3.6	10- 16000	78-160000

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(°C)	pH	Conductivity(µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Brahaman	799	11	2002	20-38	7.0-8.4	81-376	5.2-9.8	1.5 – 6.0	80-90000	40-60000
		11	2003	17-35	6.6-8.4	69-501	6.1-10.2	0.2-6	90-24x10^3	60-14x10^3
		11	2004	16-28	6.3-8.4	47-402	6-9.6	0.2-7	90-28x10^3	22-13x10^3
		11	2005	16-34	6.3-8.7	65-850	5.1-13.8	0.3-5.2	90-16x10^4	330-16x1
		11	2006	18-32	6.9-8.4	102-380	4.6-8.9	0.3-5.4	940-5400	630-2400
		15	2007	20-40	6.7-8.5	91-582	1.9-8.9	0.3-4.9	10-54 x10^3	110-22 x10^3
		16	2008	18-38	6.4-8.4	93- 664	5.3- 9.7	0.4-6.2	50-21 x10^3	110- 14 x10^3
		16	2009	12-40	6.6-8.5	70-431	4.5-18.3	0.2-5.8	40-22000	460-13000
		16	2010	17-37	6.6-8.5	97-623	5.6-12	0.4-5.6	30-92000	130-35000
		16	2011	15-38	6.7–8.5	93 - 458	5.0 -9.9	0.6 - 6.6	30-92000	170-35000
Baitarni -		5	2002	24-36	7.3-8.3	54-78400	6.8-9.3	2.0 – 6.8	00-22000	700-11000
		5	2003	18-36	6.7-7.8	75-54802	5.4-11.3	0.3-3.5	30-16x10^3	230-9x10^3
		5	2004	18-32	6.6-8.1	64-29118	5.9-9.8	0.4-2.6	640-92000	310-35x10^2
		5	2005	24-34	7-8.6	68-42257	5.2-8.8	0.4-4.3	90-24x10^3	3330-11x10^3
		5	2006	15-25	7.6-8.4	90-2287	7.4-8.0	0.3-1.8	400-4300	790-1700
		5	2007	22-35	7.3-8.2	136-19450	5.6-8.8	0.4-2.2	330-5400	170-2200
		5	2008	22-36	7.5-8.2	75-48400	6.3-9.2	0.8-2	940-5400	700-3500
		5	2009	25-38	6.7-8.4	69-28400	6.1-9.0	0.6-3.4	630-5400	230-2800
		5	2010	18 - 36	6.6-8.3	98 - 33320	5.6 – 8.8	0.4 – 2.6	70 - 16000	210 - 5400
		5	2011	15-36	7.1-8.4	83- 32540	5.2-11.9	0.3- 3.2	50 - 54000	140 - 24000
Subarnare	395	6	2002	18-36	6.5-8.0	113-355	5.2-8.5	0.2 – 12.0	150-1800	70-540
		6	2003	22-35	7.3-8.3	133-346	6.4-8.4	1-2	300-7900	130-3300
		6	2004	24-28	7.8-8.3	152-623	7.1-7.5	0.4-2.5	470-2200	270-700
		6	2005	20-36	6.8-8.3	130-405	5.5-8.6	1.0-4.7	110-1400	78-700
		6	2006	19-34	6.9-7.9	192-15013	5.8-8.2	0.3-4.6	2200	1300
		6	2007	19-37	6-8.1	134-740	4.6-8.7	0.9-8.0	540-2400	200-920
		12	2008	19-35.5	6.5-8.0	119-332	5.1-8.9	0.0-10.5	540-3500	200-1700
		12	2009	19.5-40	6.4-8.4	164-717	4.0-8.5	0.4-6.3	280-2400	70-1300
		12	2010	19-38	6.8-8.0	152-244	5.9-8.2	0.4-2.8	-	-
		12	2011	15-38	6.5-8.4	126-408	3.0-8.6	0.2-7.0	50-43000	110-15000

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(^{o}C)	pH	Conductivity(µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Brahmapu	916	6	2002	15-32	6.5-9.0	104-684	1.1-10.5	0.1 – 3.9	0-240000	300-24000
		6	2003	14-32	6.4-8.4	77-570	1.2-11.5	0.4-3.5	60-24x10^{4}	300-24x10^{4}
		6	2004	15-34	5.2-9	91-445	1.1-9.4	0.4-4.3	60-24x104	300-24x10^{4}
		10	2005	-	5.9-7.6	20-408	2-10.5	0.3-6.2	00-24x10^{4}	150-24x10^{4}
		10	2006	18-30	6.9-8.0	55-485	4.2-10.2	0.3-5.7	1-24x10^{4}	300-24x10^{4}
		10	2007	18-32	5.9-7.9	76-645	5.1-10	0.1-3.4	0-24 x10^{4}	0-24 x10
		10	2008	12-32	6.1-8.1	75-460	3.3-9.6	0.4-5.4	1-24 x10^{4}	0-24 x10^{3}
		10	2009	17-31	6.1-8.1	69-303	4.4-10.5	0.3-5.4	1-24000	0-1100
		10	2010	18-32	6.5-8.1	49-371	3.6-9.4	0.6-6.3	0-3000	0-360
		10	2011	17-32	6.1-8.5	68-238	4.4-30	0.3-9.2	0-15000	0-1500
Satluj	1078	20	2002	9-32	6.8-8.8	131-819	3.8-11.4	0.1 – 45.0	8-35000	2-3500
		20	2003	5-30	6.9-8.9	164-1226	3.4-11.5	0.1-24	3-3x10^{4}	1-1300
		20	2004	9-29	7.1-8.3	144-694	1.6-10.3	0.1-64	7-2x10^{5}	2-9x10^{4}
		21	2005	10-28	7.1-8.3	150-818	2.8-14.2	0.1-40	1-35x10^{4}	1-11x10^{4}
		21	2006	7-28	7.1-8.26	160-958	2.8-10.6	0.1-32	1-17x10^{4}	1-5x10^{4}
		21	2007	2-26	7-8.6	145-865	3.2-11.9	0-28	3-17 x10^{4}	0-9 x10^{4}
		21	2008	4.5-23	7.0-8.5	162-843	1.2 - 12.4	0.0-48	.2- 11 x10^{4}	0 - 10 x10^{3}
		22	2009	7.5-26	6.3-8.5	124-932	0.6-11.4	0.1-55	4-250000	0-110000
		23	2010	4-27	4.2-8.6	155-982	4.1-11.1	0.1-40	6 -1 x10^{5}	2-5 x10^{4}
		23	2011	1.8-25	6.8-8.69	87-1022	3.8-12	0.1-32	4-90000	2 - 50000
Beas	460	19	2002	3-32	7.1-8.7	53-517	5.2-11.5	0.3 – 5.0	2-2400	2-1600
		19	2003	4-29	7.3-8.9	76-559	7-12	0.1-6	2-2400	2-1600
		19	2004	2-29	6.9-8.5	60-396	6.8-11.8	0.2-4.8	2-5x10^{4}	2-3500
		19	2005	4-27	7-8.8	54-395	4.8-13	0.2-10	2-11x10^{3}	2-1100
		19	2006	4-27	7.0-8.2	94-395	5.8-11.0	0.2-3.2	2-11x10^{3}	2-1100
		19	2007	2-22	6.2-8.9	86-470	5.9-12.8	0.1-2.9	0-2400	0-2400
		19	2008	1.5-22	7.0-8.4	53-432	3.8-12.5	0.1-7.6	2-1600	2-1600
		23	2009	5- 26	7.1-8.5	46-338	6.4-11.8	0.1-4.3	7-2400	2-1600
		23	2010	5-26	6.2-8.8	63-548	5.8-11.2	0.1-2.8	7-39000	2-7000
		23	2011	2.5-24	6.5-8.87	49-638	5-12.5	0.1-1.5	8-2400	0 - 920

BOD : Biological Oxygen Demand ; DO- Dissolved Oxygen.
(µmhos/cm) : Micromhos per centimeter; MPN: Most Probable Number
Source: Central Pollution Control Board.

Table6.5.5: Water quality in major river basins

Sl. No	Name of Basin/River	Reference Period	pH				Specific Conductance			
			6.5 - 8.5				Max= 2250.00 (Micromho/cm)			
			Minimum		Maximum		Minimum		Maximum	
			Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value (2006-07)	Site Name/ Value (2006-07)	Site Name/ Value (2006-07)	Site Name/ Value (2006-07)
			Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
1	2	3	4	5	6	7	8	9	10	11
1	Mahanadi	2009-2010	Kesinga (7.9)	Basantpur (7.0)	Simga (8.6)	Basantpur (7.9)	N.A	N.A	N.A	N.A
2	Brahmani	2009-2010	Nandira (7.6)	Tilga (6.4)	Jenapur (8.4)	Tilga (7.8)	N.A	N.A	N.A	N.A
3	Godavari	2009-2010	Tekra (8.2)	Perur (7.0)	Pathagudem (8.8)	Konta (8.3)	N.A	N.A	N.A	N.A
4	Krishna	2009-2010	Vijaywada (8.1)	Cholachagudda (7.0)	Bawapuram (9.2)	Kurunwad (7.5)	N.A	N.A	N.A	N.A
5	Cauvery	2009-2010	Nallamaranpatty (8.3)	Savandapur (7.1)	Nallamaranpatty (8.6)	Nellathuri (7.7)	N.A	N.A	N.A	N.A
6	West Flowing Rivers	2009-2010	Mangaon (7.4)	Kalloopara (5.9)	Beline Bridge (8.5)	Kalampur (6.8)	N.A	N.A	N.A	N.A
7	Tapi	2009-2010	Mahuwa (7.7)	Burthanpur (6.3)	Gopalkheda (9.2)	Sarangkheda (7.7)	Gopalkheda (338)	Dedtali (178)	Ghala (1217)	Gidhade (397)
8	Narmada	2009-2010	Manot (8.3)	Bamni (7.2)	Gaudeshwar (9.3)	Dindori (8.1)	Rajghat (247)	Mohgaon (130)	Rajghat (886)	Mandleshwar (229)
9	Mahi,Sabarmati & other Basins	2009-2010	Derol Bridge (8.5)	Pingalwada (6.8)	Mataji (8.5)	Abu Road (8.1)	Motinaroli (451)	Durvesh (139)	Vautha (3692)	Durvesh (292)

TABLE 6.5.5 : Water quality in major river basins ….contd

Sl. No	Name of Basin/River	Reference Period	Calcium (Ca**) Max= 80.00 (mg/l)				Magnesium (Mg**) Max =24.00 (mg/l)			
			Minimum		Maximum		Minimum		Maximum	
			Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value
			Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
1	2	3	12	13	14	15	16	17	18	19
1	Mahanadi	2009-2010	Simga (20)	Andhiyarkore (2)	Andhiyarkore (49)	Baronda (9)	Simga (10.7)	Baronda (1.9)	Jondhra (30.6)	Baronda (4.9)
2	Brahmani	2009-2010	RSP Nala (14)	Tilga (5)	RSP Nala (40)	Tiulga (13)	RSP Nala (5.8)	Tilga (1.9)	Nadhira (24.3)	Tigla (5.8)
3	Godavari	2009-2010	Nandgaon (28)	Perur (5)	Bamni (156)	Hivera (26)	Mancherial (13.2)	Pauni (3.2)	Bamni (107.8)	Pathagudem (9.8)
4	Krishna	2009-2010	Paleru Bridge (40)	Simoga (3)	Chulacgudda (83)	Simoga (8)	Paleru Bridge (19.4)	Karad (2.4)	T.Ramapuram (36.0)	Simoga (2.9)
5	Cauvery	2009-2010	Elunuthimangalam (56)	Thengudi (8)	Elunuthimangalam (152)	Nellithural (12)	Elunuthimangalam (32.1)	Thengumarahada (1.0)	Elunuthimangalam (194.4)	Nallthur (14.6)
6	West Flowing Rivers	2009-2010	Pudur (28.8)	Yennehole (2)	Pudur (33.6)	Yennehole (3)	Pudur (5.9)	Ayilam (0.5)	Ambarampalayam (23.3)	Ayilam (1.0)
7	Tapi	2009-2010	Mahuwa (32)	Mahuwa (32)	Hgopalkheda (36)	Sarangkheda (32)	Burhanpur (6.8)	Mahuwa (6.8)	Gopalkheda (12.6)	Mahuwa (8.7)
8	Narmada	2009-2010	Chanwada (32)	Bamni (8)	Palan (60)	Bamni (32)	Pati (11.4)	Hoshangabad (1.0)	Kogaon (44.7)	Chandwada (7.8)
9	Mahi,Sabarmati & other Basins	2009-2010	Luwara (138)	Mataji (29)	Vautha (972.9)	Chitrasani (30)	Luwara (65.1)	Mataji (5.8)	Luwara (92.3)	Kamalpur (5.8)

TABLE 6.5.5 : Water quality in major river basins ….contd

Sl. No	Name of Basin/River	Reference Period	Iron (Fe ***) Max = 50.00 (mg/l)				Free Amonia (NH_4**) Max= 1.20			
			Minimum		Maximum		Minimum		Maximum	
			Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value
			Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
1	2	3	20	21	22	23	24	25	26	27
1	Mahanadi	2009-2010	Tikarpara (0.0)	Baribda (0.0)	Tikarapara (0.2)	Baronda (0.0)	N.A	N.A	N.A	N.A
2	Brahmani	2009-2010	Jaraikela (0.1)	Tulga (0.0)	Tilga (18.7)	Telcher (0.1)	N.A	N.A	N.A	N.A
3	Godavari	2009-2010	Polavaram (0.1)	Konta (0.0)	Mancherial (0.9)	Nandgaon (0.0)	P.G. Bridge (0.11)	Polavaram (0.0)	Konta (1.23)	Jagadalpur (0.24)
4	Krishna	2009-2010	Phulgaon (0.3)	Vijayawada (0.0)	Cholachagudda (1.4)	Vijaywada (0.0)	Vijaywada (0.0)	Vijaywada (0.0)	Vijaywada (0.0)	Vijaywada (0.0)
5	Cauvery	2009-2010	Kudlur (0.060)	Musiri (0.000)	Thengumarahada (2.034)	Billigundulu (0.1)	T. Bekuppe (3.64)	Musiri (0.0)	T.Bekuppe (12.71)	Akkihebbal (0.00)
6	West Flowing Rivers	2009-2010	Santeguli (0.1)	Badlapur (0.0)	Badlapur (0.9)	Santeguli (0.1)	Karathodu (0.21)	Erinjipuzha (0.005)	Kumbidi (0.49)	Ambarampalayam
7	Tapi	2009-2010	-	-	-	-	Sarangkheda (0.08)	Burthanpur (0.05)	Gopalkheda (0.26)	Mahuwa (0.08)
8	Narmada	2009-2010	-	-	-	-	Chandwada (0.1)	Chandwada (0.1)	Chandwada (0.1)	Chandwada (0.1)
9	Mahi,Sabarmati & other Basins	2009-2010	Vautha (0.6)	Khanpur (0.1)	Vautha (1.4)	Derol Bridge (0.2)	Vautha (9.90)	Gadat (0.05)	Vautha (29.80)	Gadat (0.10)

Table6.5.5: Water quality in major river basins ….contd

Sl. No	Name of Basin/River	Reference Period	Chloride (Cl) Max=600.00(mg/l)				Fluoride (F) Max= 1.50(mg/l)			
			Minimum		Maximum		Minimum		Maximum	
			Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value
			Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
1	2	3	4	5	6	7	8	9	10	11
1	Mahanadi	2009-2010	SimgA (13.2)	Rajim (1.9)	Simga (53.9)	Baronda (6.0)	Ghatora (0.14)	Baronda (0.05)	Kurubhanta (1.20)	Baronda (0.05)
2	Brahmani	2009-2010	RSP Nala (15.5)	Tilga (7.4)	RSP Nala (38.9)	Tilga (13.6)	RSP Nala (0.20)	Tilga (0.05)	Nandira (0.93)	Tilga (0.05)
3	Godavari	2009-2010	Mancherial (24.1)	Pathagedum (2.9)	Bamnidi (458.7)	Konta (10.2)	Mancherial (0.51)	Konta (0.01)	Pauni (1.16)	Konta (0.31)
4	Krishna	2009-2010	T. Ramapuram (83.5)	Karad (5.1)	T. Ramapuram (362.6)	Simoga (7.8)	Huvenahahole (0.76)	Marol (0.2)	Paleru Bridge (3.35)	Simoga (0.06)
5	Cauvery	2009-2010	Elunuthimsngalam (310.4)	Nellithurai (5.7)	Elunuthimangalam (3054.0)	Nellithurai (17.0)	Thevur (1.01)	Thengumarahada (0.00)	Kudlur (1.59)	Annavasai (0.40)
6	West Flowing Rivers	2009-2010	Puddur (22)	Haladi (3.8)	Ambarampalayam (59.6)	Haladi (3.9)	Ambarampalayam (0.11)	Mangaon (0.0)	Kuttyadi (0.94)	Aversha (0.02)
7	Tapi	2009-2010	Gopalkheda (84.7)	Burahnpur (26.7)	Gopalkheda (277.3)	Sarangkheda (63.1)	Sarangkheda (0.12)	Mahuwa (0.08)	Burahnpur (0.36)	Sarangkheda (0.15)
8	Narmada	2009-2010	Chandwada (88.8)	Belkheri (4.6)	Garudeswar (155.3)	Bamni (9.9)	Bamni (0.27)	Sandia (0.05)	Dindori (0.77)	Chandwada (0.20)
9	Mahi,Sabarmati & other Basins	2009-2010	Luwara (950)	Kamalpur (18.0)	Luwara (2119)	Kamalpur (30.0)	Luwara (0.99)	Durvesh (0.05)	Luwara (1.16)	Gadat (0.24)

Table6.5.5: Water quality in major river basins…..contd

Sl. No	Name of Basin/River	Reference Period	Sulphate (SO_4) Max= 1000.00 (mg/l)				Nitrate (NO_3) Max= 50.00 (mg/l)			
			Minimum		Maximum		Minimum		Maximum	
			Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value
			Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
1	2	3	12	13	14	15	16	17	18	19
1	Mahanadi	2009-2010	Simga (16.0)	Baronda (5.0)	Ghalora (80.0)	Pathardih (20.0)	Tikarpara (-)	Rajim (-)	Sundergarh (-)	Selebhata (-)
2	Brahmani	2009-2010	RSP Nala (17.4)	Panposh (1.6)	RSP Nala (91.2)	Tilga (15.8)	RSP Nala (4.46)	Tilga (0.04)	RSP Nala ((14.71)	Tilga (0.21)
3	Godavari	2009-2010	Satrapur (19.7)	Konta (0.0)	Bamni (65.3)	Konta (1.7)	Bamni (0.14)	Konta (0.00)	Jagdalpur (1.19)	P.G. Bridge (0.14)
4	Krishna	2009-2010	T.Ramapuram (131.2)	Simoga (0.8)	T.Ramapuram (585.0)	Shimoga (3.2)	Hoovinahahole (1.88)	Kessara (0.00)	T. Ramapuram (2.59)	Simoga (0.48)
5	Cauvery	2009-2010	Elunuthimangalam (113.0)	Nellethori (0.3)	Elunuthimangalam (707.4)	Thengumarahada (6.0)	T.Bekuppe (3.64)	Nallamarapatty (0.06)	Elunuthimangalam (15.10)	T.K. Halli (0.77)
6	West Flowing Rivers	2009-2010	Badlapur (15)	Kumbidi (1)	Balne Bridge (40)	Perumannu (1)	Aversha (0.25)	Perumannu (0.03)	Badlapur (1.75)	Perumannu (0.03)
7	Tapi	2009-2010	Gopalkheda (13.5)	Mahuwa (12.1)	Gopalkheda (28.8)	Sarankheda (13.4)	Gopalkheda (0.15)	Mahuwa (0.08)	Burahnpur (0.40)	Sarankheda (0.10)
8	Narmada	2009-2010	Chandwada (12.1)	Patan (3.3)	Garudeswar (16.7)	Dindori (5.9)	Dhulsar (0.40)	Sandia (0.01)	Pati (4.00)	Chandwada (0.04)
9	Mahi,Sabarmati & other Basins	2009-2010	Vautha (85.9	Durvesh (8.4)	Vautha (126.6)	Mataji (12.1)	Luwara (2.27)	Durvesh (0.08)	Luwara (6.86)	Chitrasani (0.07)

Table6.5.5: Water quality in major river basins ….contd

Sl. No	Name of Basin/River	Reference Period	Dissolved Oxygen (DO)				Biochemical Oxygen Demand (BOD)			
			Min=6.00 (mg/l)				Max=3.00 (mg/l)			
			Minimum		Maximum		Minimum		Maximum	
			Site Name/Value	Site Name/Value	Site Name/Value	Site Name/Value	Site Name/Value	Site Name/Value	Site Name/Value	Site Name/Value
			Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
1	2	3	20	21	22	23	24	25	26	27
1	Mahanadi	2009-2010	Pathardin (28.4)	Simoga (1.4)	Kesinga (9.1)	Pathardih (6.0)	Pathardih (9.6)	Rajim (0.2)	Rajim (6.0)	Pathardih (1.0)
2	Brahmani	2009-2010	Telcher (7.2)	RSP Nala (3.4)	Jenapur (9.3)	Tilga (7.8)	Nandira (1.6)	Tilga (0.8)	Gomlai (193.0)	Tilga (1.2)
3	Godavari	2009-2010	Tekra (6.2)	Bamni (0.0)	Satrapur (9.0)	Saigaon (5.8)	Bamni (1.6)	Polavaram (0.1)	Bamni (85.0)	Saigaon (0.7)
4	Krishna	2009-2010	Cholachagudda (7.0)	Paleru Bridge (1.3)	Kurunwad (8.5)	Karad (6.3)	Vijayawada (1.3)	Malkhed (0.1)	Bawapuram (5.9)	T. Ramapuram (1.1)
5	Cauvery	2009-2010	Nellithurai (7.1)	T. Bekuppe (0.1)	Urachikellai (8.6)	T.K. Halli (6.6)	Gopurajapuram (1.7)	Annavasai (0.1)	T.Bekuppe (8.2)	Muthenkera (0.6)
6	West Flowing Rivers	2009-2010	Kumbidi (9.2)	Badlapur (3.9)	Kumbidi (9.2)	Bentawal (7.7)	Bantwal (0.6)	Balne Bridge (0.1)	Badlapur (2.2)	Thumpaman (0.2)
7	Tapi	2009-2010	Gopalkheda (5.6)	Burahnpur (2.3)	Mahuwa (10.3)	Gopalkheda (7.7)	Sarangkheda (0.3)	Mahuwa (0.2)	Gopalkheda (19.0)	Mahuwa (1.9)
8	Narmada	2009-2010	Gurudeshwar (7.3)	Manot (4.7)	Gurudeshwar (7.3)	Manot (6.9)	Mandleshwar (0.7)	Gurudeswar (0.2)	Mandleshwar (2.6)	Gurudeshwar (1.3)
9	Mahi,Sabarmati & other Basins	2009-2010	Derol Bridge (8.5)	Abu Road (4.5)	Motinaroli (11.4)	Abu Road (4.5)	Vautha (7.0)	Kamlapur (0.1)	Pingalwada (43.0)	Kamlapur (0.7)

Table6.5.5: Water quality in major river basins….contd

Sl. No	Name of Basin/River	Reference Period	Total Hardness ($CaCo_3$) Max=300 (mg/l)				Sodium Percentage Max=60.00(mg/l)			
			Minimum		Maximum		Minimum		Maximum	
			Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value
			Highest	Lowest	Highest	Lowest	Highest	Lowest	Highest	Lowest
1	2	3	4	5	6	7	8	9	10	11
1	Mahanadi	2009-2010	Simga (95)	Baronda (18)	Andhiyakore (246)	Baronda (42)	Pathardih (16)	Mahendergarh (8.0)	Sundergarh (55)	Rampur (19)
2	Brahmani	2009-2010	RSP Nala (68)	Tilga (20)	Nandira (209)	Tilga (56)	Tilga (20)	Jarikela (12)	Tilga (42)	Panposh (22)
3	Godavari	2009-2010	Bhatpalli (117)	Perur (28)	Bamni (782)	Pathagudem (96)	Mancherial (24)	Pathagudem (6)	Bamni (51)	Konta (17)
4	Krishna	2009-2010	Dharamcherela (153)	Simoga (20)	Cholachagudda (309)	Simoga (32)	Hoovinahahole (67)	Karad (13)	T. Ramapuram (69)	Phulgaon (19)
5	Cauvery	2009-2010	Elunuthimangalam (318)	Nellethori (20)	Elunuthimangalam (1041)	Nellethori (61)	Elunuthimangalam (57)	Thengumarhada (12)	Elunuthimangalam (83)	Thengumarhada (19)
6	West Flowing Rivers	2009-2010	Pudur (103)	Haladi (8)	Balne Bridge (207)	Aliyam (12)	Aliyam (43)	Balne Bride (7)	Aliyam (52)	Pudur (25)
7	Tapi	2009-2010	Burahnpur (108)	Gopalkheda (108)	Gopalkheda (142)	Mahuwa (120)	Gopalkheda (46)	Burahnpur (22)	Goplkheda (75)	Sarankheda (45)
8	Narmada	2009-2010	Chhidgaon (114)	Bamni (35)	Kogaon (305)	Chandwada (113)	Chandwada (50)	Beikheeri (5)	Gurudeswar (66)	Gadarwara (18)
9	Mahi,Sabarmati & other Basins	2009-2010	Luwara (616)	Kamalpur (96)	Luwara (774)	Kamalpur (108)	Luwara (69)	Kamalpur (21)	Durvesh (95)	Kamalpur (30)

Table6.5.5: Water quality in major river basins….contd

Sl. No	Name of Basin/River	Reference Period	Sodium Absorption Ratio (SAR) Max=26.00			
			Minimum		Maximum	
			Site Name/ Value	Site Name/ Value	Site Name/ Value	Site Name/ Value
			Highest	Lowest	Highest	Lowest
1	2	3	12	13	14	15
1	Mahanadi	2009-2010	Pathardih (0.4)	Baronda (0.1)	Simga (2.1)	Rampur (0.4)
2	Brahmani	2009-2010	RSP Nala (0.4)	Gomlai (0.2)	RSP Nala (0.8)	Gomlai (0.5)
3	Godavari	2009-2010	Bamni (0.4)	Pathagudem (0.1)	Bamni (3.4)	Jagdalpur (0.3)
4	Krishna	2009-2010	Hoovinahahole (5.1)	Karad (0.3)	Hoovinahahole (9.9)	Phulgaon (0.4)
5	Cauvery	2009-2010	Elunuthimangalam (5.7)	Thengumarhada (0.2)	Elunuthimangalam (29.9)	Thengumarhada (0.4)
6	West Flowing Rivers	2009-2010	Haladi (0.3)	Balne Bridge (0)	Ambarampalayam (1.8)	Ramamangalam (0)
7	Tapi	2009-2010	Gopaikheda (2.1)	Burhanpur (0.6)	Gopalkheda (6.7)	Sarangkheda (1.8)
8	Narmada	2009-2010	Chandwada (2.2)	Mandelshwar (0.2)	Gurudeswar (4.3)	Bamni (0.5)
9	Mahi,Sabarmati & other Basins	2009-2010	Luwara (11.3)	Mataji (0.6)	Durvesh (108.8)	Mataji (0.9)

Sources:CWC, Integrated Hydrological Data Book (Non-Classified River Basin), March 2012.
Note: N.A - Not available

Table 6.5.6 : River-basin wise distribution of water quality monitoring stations

Sl. No.	River (main stream) Lake etc.	Tributaries	Total Stations
1	2	3	4
1	**Baitarni (5)** **Tributaries -Kusei (1)**	--------	6
2	**Tributaries**	Karo (1) Kharasrota (2), Koel (5), Sankh (1).	25
3	**Brahmputra (10) Tributaries**	Burhidihing (3), Dhansiri (7), Disang (2), Jhanji (1), Subansiri (1), Bhogdoi (1), Bharalu (1) Borak (2), Deepar Bill (1), Digboi (1), Mora Bharali (1),Teesta (5), Dickhu (1), Maney(2), Ranchu (2), Rangit (5), Jai Bharali (1), Kathakal (1), Kharsang(1), Kolong (2), Manas (1), Pagldia (1), Chathe (1), Dzu (1), Kapili (1), Beki (1), Kundil (1) Kushiara (1), Panchnai (1), Sankosh (1), Sonai (1), Kohara (1), Ranga (1), Bogindai (1), Dikhow (1), Kaljani (1), Karola (1)	68
4	**Cauvery (20) Tributaries**	Arkavati (1), Amravati (1), Bhawani (5), Kabini (4), Laxmantirtha (1), Shimsa (2), Hemavati (1) Vagachi (1)	36
5	**Ganga (52) Tributaries**	Alakananda-upper Ganga (4),Madakini -upper Ganga (1), Ajay (1) Ashwani (1), Barakar (2), Batta (2),Betwa (10), Bhalla (2), Bichia (1),Bihar (1), Bokaro (1), Burhi Gandak (1), Chambal(8),Churni (3), Daha (3), Damodar (12), Dhela (2), Dhous (1), Dwarakeshwari (1), Dwarka (2), Farmer (1), Gandak (3), Giri (3), Sot (1), Kamala (2), Kanshi (1), Khan (3), Kichha (1), Kolar (1), Konar (3), Koshi (2), Kosi (Uttarakhand) (1), Kshipra (3), Mahananda (3), Mandakini (Madhya Pradesh) (1), Manusmar (1), Matha Bhanga (1), Maurakshi (1), Nalkari (1), Nandaur (2), Pabbar (3), Parvati (4), Pilkhar (1), Ramganga (1), Ram Rekha (1), Rapti (2), Rihand (2), Ruppanarayan (2), Sai (2), Sankh (1), Silabati (1), Sindh (1), Sirsa (1), Saryu - Ghaghra (4), Sone (5), Suswa (1), Tons (Himachal Pradesh) (1), Tons (Madhya Pradeh) (2), VAruna (2), Vindyadhri (2), Yamuna (27)	233
6	**Godavari (35) Tributaries**	Manjira(6), Maner(2), Nira(l),), Wainganga{8), Wardha(6), Kolar (1), Kannhan (3), Purna (3), Indravati (2), Sankhani (1), Nakkavagu (1), Vamsadhara (1), Darna (5), Bindusar (1), Penganga (3), Wena (2), Kinnersani (1), Sabari (1)	83
7	**Indus**	Beas (23), Chenab (1), Jhelum (3), Larji (1), Parvati (3), Ravi (6), Sutlej (22), Tawi (1), Gawkadal (1), Chuntkol(1), Sirsa(3), Swan (1), Basoa (1), Binwa (1), Negual (1), Siul (1), Spiti (1), Suketi Khand (1)	72
8	**Krishna (22)**	Bhadra (3), Bhima (12), Ghataprabha (2), Malprabha (3), Muneru (1), Musi (3), Nira (5), Paleru (1), Tunga (1), Tungabhadra (6), Panchganga (4), Chandrabhaga (2),Kagin (1), Koya (1) , Mula (2), Mutha (4), Mula-Mutha (2), Venna (3), Pawana (6), Indrayani (3), Hundri (1), Kundu (1), God (1), Sina (1), Urmodi (1), Vel (1)	93
9	**Mahi (9)**	Anas (1), Panam(1), Jammer (1), Malei (1), Shivna (1), Chillar (1)	15
10	**Mahanadi (22)**	Ib (4), Hasdeo (2), Kathajodi (1), Kharoon (4), Kuakhai (3), Sheonath (3), Birupa (1), Apra (1), Kelo (2), Bheden (1), Tel (1), Serua (1), Daya (1), Sankha (1)	48
11	**Narmada (21)**	Chhota Tawa (1), Gour (1), Katni (1), Kunda (1)	25
12	**Pennar (5)**	----	5
13	**Sabarmati (9)**	Meswa (1), Shedhi (1), Khari (1).	12
14	**Subarnerekha (12)**	Jumar (1)	13
15	**Tapi (14)**	Girna (2).	30

Table 6.5.6 : River-basin wise distribution of water quality monitoring stations--Concld.

Sl. No.	River (main stream) Lake etc.	Tributaries	Total Stations
1	2	3	4
16	**Medium rivers**	Ambika (1), Ulhas (3), Ulhas-Bhasta (3), Ulhas -Kalu (1) Imphal (4), Mandovi (2), Palar (1), Pamba (3), Pariyar (7), Rushikulya (2), Tambiraparani (7), Achankoil (2), Chalakudy (1), Damanganga (14), Ghaggar (19), Kallada (1), Kali Karnataka (1), Manimala (2), Mindhola (1), Nagavalli (4), Amlakhadi (2), Chaliyar (2), Iril (2), Kharkhala (1), Karmana (1), Kolak (2), Kundalika (4), Meenachil (1), Muvattupuza (1), Patalganga (7), Umtrew (1), Vamanpuram (1), Zuari (2), Gumti (2), Kalna (1), Valvant (1), Madai (1), Khandepar (2), Asanora (1), Bhadar (1), Neyyar (1), Ithikkara (1), Kadalundy (1), Kuttiyady (1), Mahe (2), Kuppum (1), Neelsvaram (2), Karingoda (1), Chandergiri (1), Chitrapuzha (1), Nambul (2), Ganol (1), Simsang (1), Myntdu (1), Arasalar (1), Kodra (1), Haora (1),Khuga (1), Khujairok (1), Sekmai (1), Markanda (3), Sukna (1), Baleshwar Khadi (1), Netravati (1), Kumardhara (1),Purna (1), Kaveri(1), Dhadar (1), Tiawng (2),Tuirial (2), Talpona (1), Bhogavo (1), Tiveni Sangam (1), Mapusa (1), Bicholim (1), Chapora (1),Kushawati (1), Sal (2), Meethi (1),Savitri (5), Vashisti (3), Neyyar (1), Mamom (1), Ayroor (1), Pallickal (1),Karuvannurr (1),Puzhackal (1), Keecheri (1), Thirur (1), Kadalundi (1), Kallai (1), Korapuzha (1), Thallassery (1), Ancharakandy (2), Kuppam (1), Ramapuram (1), Peruvamba (1), Kavvai (1), Pullur (1), Mogral (1), Shriya (1), Uppala (1), Manjeswar (1) Korayar (1), Bharathapuzha (2), Kadambayar (2), Gautami- Godavari (2), Coringa (1), Budhabalanga (2), Vanshadhara(2), Kerandi (1), Amba (1), Kan (1), Muchkundi (1), Pehlar (1), Surya (3), Tansa (1), Vaitarna (1)	216
17	**Lakes (117)**	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), Periar (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 (2), Pichola (1), Udaisagar (1), Ramgarhjaipur (1), Pushkar (1), Fatehsagar (1), Kalyana (1), Nakki (1), Udhagamadalam (1), Kodaikanal (1), Yercaud (1), Lakshminarayan Baridigh (1), Rudrasagar (1), Ramgarh-Uttar Pradesh (1), Naini (1), Rabindrasarovar (1) Nalsarovar (1), Bindusaraovar(1), Sahastriling Sarovar (1), LakhotaTalav (1), Narshimehta Talav(1),Nadiad city Lake (1), (RAnjitnagar TAlav(1),Ankleshwar reservoir (1), Dharoi dam(1), Kuwadava (1), Moticher lake (1), Mayem lake (1), Janunia talav (1),Yashwant sagar (1),Sirpur talav (1), Kali sindhi reserviur (1), Periat tank (1), Sgagpura (1), Madhav lake(1), Nagchun (1), Karwa dam (1), Khandari reservoir (1), Daloni Beel (1), Mer Beel (1), Govindgarh tank (1),Bilawali talav (1) Bhoothathankettu reservoir (1), Dimna lake (1), Edamalayar reservoir (1), Hazaribag Meethajhee (1), Kondacharala -aava lake (1), Laxnubarayan Chevuru (1), Malampuzha reserviur (1), Mirakam lake (1), Noor Md. Kunta (1), Oazgassu reserviur (1), Ranchi lake (1), Topchachi lake (1), Vembabadu lake (1), Chilka lake (1), Anshupa lake (1), Kawar lake (1), Moti Jheel (1), Samarpur lake (1), Shukra Tal (1), Khaziar lake (1), Raiwalsar lake (1), Belboni lake (1), Koch Bihar lake (1), Mirikh lake (1) Saheb bandh (1), Sinchal lake (1), Tarekeshwar lake (3), Delo reservoir (1)	170
	Tanks (9)	Dharamsagar (1), Bibinagar (1), Kistrapetrareddy (1), Goysagar (1),Gandigudem (1),Kajipally tank (1), Mallapur Tank (1), Premajipet tank (1)	
	Ponds (44)	Elangabeel System (1), Lakshadweep (1), Olpad village pond (1), Bishnu Pudhkst pukhuti (1), Bor Beel (1), Bor pukhuri (1), Botodriva pond (1), Chand dubi beel (1), Deepar Beel (1), Dighali pukhuri (1),Dhudia talav (1), Baskandi pond (1), Galabeel (1), Ganga pukhuri (1), Gaurisagar (1), Gopur tank (1), Padum pukhuri (1), Hordai pukhuri (1), Jaipal pukhuri (1), Mahamaya pukhuri (1), Rajdhania pukhuri (1), Raja pukhuri (1), Rajmaw pukhuri (1), Saranbeel (1), Sivasagar tank (1),Subhagya kund (1), Sai Chevuru (1), Asani kunta (1), Durgam Chevuru (1), Pedda Chevuru (1), Nalla Chevuru (1), Bhadrakali Chevuru (1), Shiv Ganga Pond (1), Padmanabha Swamy Temple Pond (1), Bindusagar (1), Narendra polhari (1), Markanda pokhari (1), Indradyumna (1), Swetaganga (1), Parvatisagar (1), Tighi Talab (1), Suraj Kund (1), Laxmi Pond (1), Maahil Pond(1)	
18	**Creeks, Canals and Drains**	Creeks (8),Sea Water (7), Agra Canal (1), Gurgaon Canal (1), Western Yamuna Canal (11), Agartala Canal (1),Cuncolim canal (2), Panoli canal (1), Narmada canal (1), Cumbvarja canal (1), Samarla Kota canal (1), Tulje Bagh Canal (1), Kharda canal (1), NOAI canal (1), Upper Ganga Canal (1), Taladanda canal (3), Drains (18)	60
19	**Groundwater**	----	490
		Total	**1700**

Source: Monitoring of Indian Aquatic Resources Series: MINARS/ /2009-10 ,Status of water quality in India- 2009 ,Central Pollution Control Board.

G - GEMS (Global Environmental Monitoring System),
M - MINARS (Monitoring of Indian National Aquatic Resources)
YAP- Yamuna Action Plan

6.6 Water Pollution –causes

6.6.1 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.

6.6.2 Water pollution 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. 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. 13 major water polluting industries have been identified and are closely monitored by the Central Pollution Control Board. **A status report of the waste water generation, collection and treatment in metro cities is available in table 6.6.1**

6.6.3 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.

6.6.4 Water pollution from domestic and human wastewater is severely harmful for humans too. The most common contamination in the water is from the disease bearing human wastes, which is usually detected by measuring fecal coliform levels. In some parts of the country, ground water is also found to be polluted. **As elaborated in table 6.6.2 , the occurrence of Arsenic in ground water has been reported from a number of Districts in various States.**

6.6.5 The diseases commonly caused due to contaminated water are diarrhea, trachoma, intestinal worms, hepatitis, etc. It is clearly evident that more stringent preventive and protective measures are required to tackle the impact of water pollution.

Table 6.6.1 : 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		Capacity	Treatment		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	Bangaluru	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	Mumbai	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
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
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
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	Chennai	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
Note : Data Collected During 1995-96

Y = Yes N = No
mld - Million Liter per day

Table 6.6.2: Occurrence of high arsenic in groundwater of some states of India

State	District	Blocks where high Arsenic is observed wells of CGWB
Assam	Dhemaji	Dhemaji, Bodordloni,Sisiborgaon
Bihar	Bhojpur	Barhara, Shahpur, Koilwar, Arrah, Bihiya, Udawant Nagar
	Bhagalpur	Jagdishpur,Sultanganj, Nathnagar
	Begusarai	Matihani, Begusarai, Barauni, Balia, Sabehpur Kamal, Bachwara
	Buxar	Brahmpur,Semary, Chakki, Buxar
	Darbhanga	Biraul
	Khagaria	Khagaria, Mansi, Godri, Parbatta
	Kishangarh	Kishanganj, Bahadurganj
	Katihar	Manasahi, Kursela, Sameli, Barari, Manihari, Amdabad
	Lakhiserai	Piparia, Lakhiserai
	Munger	Jamalpur, Dharhara, Bariarpur, Munger
	Patna	Maner, Danapur, Bakhtiarpur, Barh
	Purnea	Purnea East, Kasba
	Saran	Dighwara, Chapra, Revelganj, Sonpur
	Samastipur	Mohinuddin Nagar, Mohanpur, Patori, Vidhyapati Nagar
	Vaishali	Raghopur, Hajipur, Bidupur, Desri, Sahdei Bujurg
Chattisgarh	Rajnandgaon	Chouki
West Bengal	Bardhman	Purbasthali I & II , Katwa, I & II and Kala II
	Haora	Uluberia II and Shampur II
	Hugli	Balagarh
	Malda	English Bazar, Manikchak, Kaliachak I, II & III, Ratua I and II
	Murshidabad	Raninagar I & II, Domkal, Nowda, Jalangi,Hariharpara, Suti I & II, Bhagwangola I & II, Beldanga I & II, Berhampur, Raghunathganj I & II, Farakka, Lalgola, Murjigang, Samsherganj
	Nadia	Karimpur I & II, Tehatta I & II, Kaliganj, Nawadwip, Haringhata, Chakda, Santipur, Naksipra, Hanskhali, Krishnagarh,Chapra, Ranaghat I & II, Krishnanagar I & II.
	North 24 Parganas	Habra I & II, Barasat I & II, Rajarhat, Deganga, Beduria, Gaighata, Amdanga, Bagda, Boangoan, Haroa, Hasnabad, Basirhat I & II, Swarupnagar, Barackpur I & II Sandeshkhali II
	South 24 Parganas	Baruipur, Sonarpur,Bhangar I & II, Joynagar I, Bishnupur I & II, Mograhat II, Budge Budge II
Uttar Pradesh	Agra	Agra, Etmadpur, Fatehabad, Khairagarh
	Aligarh	Jawan Sikandarpur
	Ballia	Belhari, Baria, Muralichapra, Reoati, Siar
	Balrampur	Gaindas Bujurg, Gainsari, Harraiyyabazar, Pachparwa, Sridatganj, Tulsipur
	Gonda	Bhelsar, Colonelganj, Haldarmau, Katrabazar, Nawabganj, Pandari, Kripal, Tarabgani, Wazirganj
	Gorakhpur	Gorakhpur
	Lakhimpur Kheri	Daurahara,Ishanagar, Nighasan, Pallia, Ramia Vihar
	Mathura	Mathura
	Moradabad	Moradabad

Sources : Ministry of Water Resources, 2008

CHAPTER SEVEN

Human Settlements

7.1 Introduction

7.1.1 The rapid population growth and economic development in country are degrading the environment through the uncontrolled growth of urbanization and industrialization, expansion and intensification of agriculture, and the destruction of natural habitats. One of the major causes of environmental degradation in India could be attributed to rapid growth of population, which is adversely affecting the natural resources and environment. The growing population and the environmental deterioration face the challenge of sustained development without environmental damage. The existence or the absence of favorable natural resources can facilitate or retard the process of economic development. The three fundamental demographic factors of births, deaths and migration produce changes in population size; composition, distribution and these changes raise a number of important questions of cause and effect. India has approximately 18 per cent of the world population but only 2 per cent of the geographical area. **The Country's population growth can be assessed from the table 7.1.1 .**

7.1.2 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.

7.1.3 Life expectancy at birth in India since 1901 is given in table 7.1.2 . In India, the expectation of life at birth of female which was lower than that of male till 1980 and has shown a reverse trend thereafter (table 7.1.2)

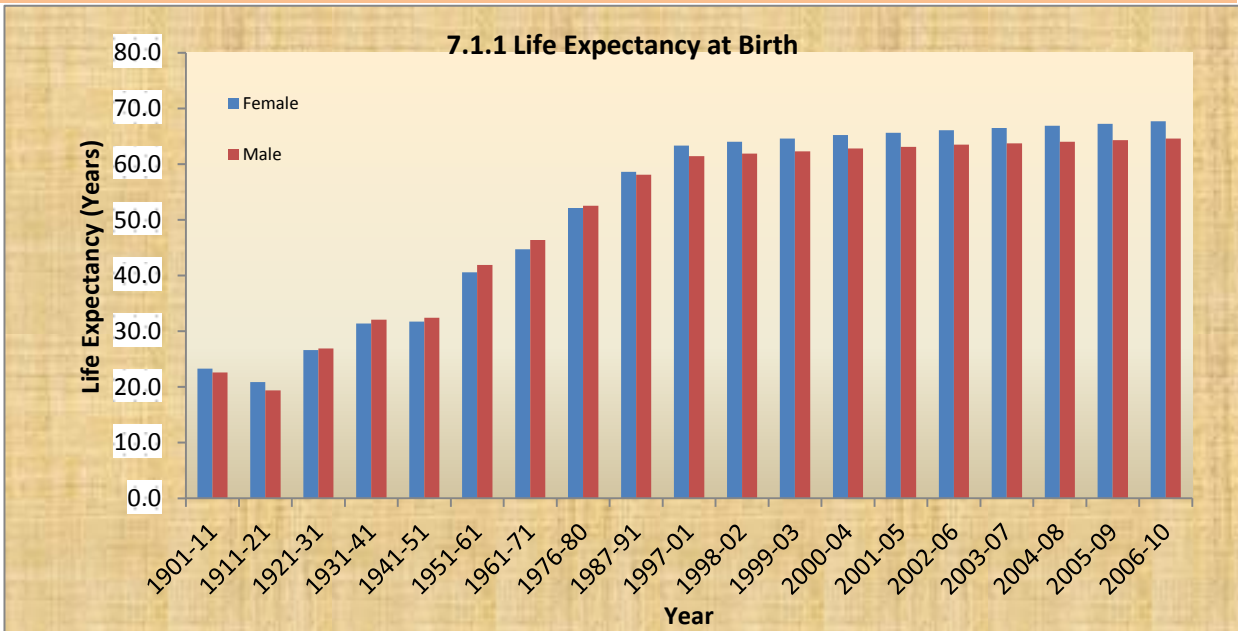


Table 7.1.1: Population Totals - India and States

(Numbers)

Sl. No.	States/U.Ts.	1981		1991		2001		2011	
		Male	Female	Male	Female	Male	Female	Male	Female
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	27,109,616	26,441,410	33,724,581	32,783,427	38,527,413	37,682,594	42442146	42138631
2	Arunachal Pradesh	339,322	292,517	465,004	399,554	579,941	518,027	713912	669815
3	Assam	9,444,037	8,597,211	11,657,989	10,756,333	13,777,037	12,878,491	15939443	15266133
4	Bihar	35,930,560	33,984,174	33,838,238	30,692,316	43,243,795	39,754,714	54278157	49821295
5	Chhattisgarh++		..	8,872,620	8,742,308	10,474,218	10,359,585	12832895	12712303
6	Goa	510,152	497,597	594,790	575,003	687,248	660,420	739140	719405
7	Gujarat	17,552,640	16,533,159	21,355,209	19,954,373	26,385,577	24,285,440	31491260	28948432
8	Haryana	6,909,679	6,012,440	8,827,474	7,636,174	11,363,953	9,780,611	13494734	11856728
9	Himachal Pradesh	2,169,931	2,110,887	2,617,467	2,553,410	3,087,940	2,989,960	3481873	3382729
10	Jammu & Kashmir+	3,164,660	2,822,729	4,142,082	3,694,969	5,360,926	4,782,774	6640662	5900640
11	Jharkhand++	..	..	11,363,853	10,480,058	13,885,037	13,060,792	16930315	16057819
12	Karnataka	18,922,627	18,213,087	22,951,917	22,025,284	26,898,918	25,951,644	30966657	30128640
13	Kerala	12,527,767	12,925,913	14,288,995	14,809,523	15,468,614	16,372,760	16027412	17378649
14	Madhya Pradesh	26,886,305	25,292,539	25,394,673	23,171,569	31,443,652	28,904,371	37612306	35014503
15	Maharashtra	32,414,432	30,368,386	40,825,618	38,111,569	50,400,596	46,478,031	58243056	54131277
16	Manipur[1]	721,006	699,947	938,359	898,790	1,161,952	1,131,944	1290171	1280219
17	Meghalaya	683,710	652,109	907,687	867,091	1,176,087	1,142,735	1491832	1475057
18	Mizoram	257,239	236,518	358,978	330,778	459,109	429,464	555339	541867
19	Nagaland	415,910	359,020	641,282	568,264	1,047,141	942,895	1024649	953853
20	Odisha	13,309,786	13,060,485	16,064,146	15,595,590	18,660,570	18,144,090	21212136	20762082
21	Punjab	8,937,210	7,851,705	10,778,034	9,503,935	12,985,045	11,373,954	14639465	13103873
22	Rajasthan	17,854,154	16,407,708	23,042,780	20,963,210	29,420,011	27,087,177	35550997	32997440
23	Sikkim	172,440	143,945	216,427	190,030	288,484	252,367	323070	287507
24	Tamil Nadu	24,487,624	23,920,453	28,298,975	27,559,971	31,400,909	31,004,770	36137975	36009055
25	Tripura	1,054,846	998,212	1,417,930	1,339,275	1,642,225	1,556,978	1874376	1799541
26	Uttarakhand++	..	..	3,674,540	3,438,943	4,325,924	4,163,425	5137773	4948519
27	Uttar Pradesh	58,819,535	52,042,977	70,362,417	61,636,387	87,565,369	78,632,552	104480510	95331831
28	West Bengal	28,560,901	26,019,746	35,510,633	32,567,332	41,465,985	38,710,212	46809027	44467088
	Union Territories								
1	A&N Islands	107,261	81,480	154,369	126,292	192,972	163,180	202871	177710
2	Chandigarh	255,278	196,332	358,614	283,401	506,938	393,697	580663	474787
3	D&N Haveli	52,515	51,161	70,953	67,524	121,666	98,824	193760	149949
4	Daman & Diu	38,298	40,683	51,595	49,991	92,512	65,692	150301	92946
5	Delhi	3,440,081	2,780,325	5,155,512	4,265,132	7,607,234	6,243,273	8987326	7800615
6	Lakshadweep	20,377	19,872	26,618	25,089	31,131	29,519	33123	31350
7	Puducherry	304,561	299,910	408,081	399,704	486,961	487,384	612511	635442
	All India[+ & 1]	**353,374,460**	**329,954,637**	**439,358,440**	**407,062,599**	**532,223,090**	**496,514,346**	**623121843**	**587447730**

Source : Office of the Registrar General, India

\+ : The 1991 Census was not held in Jammu & Kashmir. 1991 Census figures include interpolated Population of Jammu & Kashmir.

++ : The States of Uttarakhand, Jharkhand and Chhattisgarh are carved out from Uttar Pradesh,Bihar, and Madhya Pradesh respectivly, in 2001 Census. In 1991 the recasted figures for these States are given as per jurisdiction of 2001 Census.

1 - : India and Manipur figures include estimated figures for those of the three sub-divisions viz. Mao Maram, Paomata and Purul of Senapati district of Manipur as population Census 2001 in these three sub-divisions were cancelled due to technical and administrative reasons.

. * : The figures for India and Manipur, exclude the population of Mao Maram, Paomata and Purul sub-divisions of Senapati district of Manipur for Census 2011 due to administrative reasons.

Table 7.1.2 : Life Expectancy at birth (all State/Uts)

(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	55.4
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
19	1994-98	62.2	60.6	61.4
20	1995-99	62.3	60.8	61.5
21	1996-00	62.7	61.2	61.9
22	1997-01	63.3	61.4	62.3
23	1998-02	64.0	61.9	62.9
24	1999-03	64.6	62.3	63.4
25	2000-04	65.2	62.8	63.9
26	2001-05	65.6	63.1	64.3
27	2002-06	66.1	63.5	64.7
28	2003-07	66.5	63.7	65.0
29	2004-08	66.9	64.0	65.4
30	2005-09	67.2	64.3	65.7
31	2006-10	67.7	64.6	66.1

Source : Office of the Registrar General, Government of India

7.1.4 Infant mortality rate is high in rural India compared to the Urban Sector.(Table 7.1.3)

Table 7.1.3 : 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	1990	81	78	86	50	80
3	1995*	76	73	80	48	74
4	1996*	73	71	77	46	72
5	1997*	72	70	77	45	71
6	1998*	74	70	77	45	72
7	1999	70	71	75	44	70
8	2000	69	67	74	44	68
9	2001	68	64	72	42	66
10	2002**	62	62	69	40	63
11	2003*	64	57	66	38	60
12	2004	58	58	64	40	58
13	2005	61	56	64	40	58
14	2006	59	56	62	39	57
15	2007	56	55	61	37	55
16	2008	55	52	58	36	53
17	2009	52	49	55	34	50
18	2010	49	46	51	31	47
19	2011	46	43	48	29	44
20	2012	44	41	46	28	42

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

7.1.6 Poverty indicates a condition in which a person fails to maintain a living standard adequate for a comfortable lifestyle. In rural India, nearly 25.7%, and in urban India 13.7% population (2011-12 estimates) are below the poverty line. The details are depicted in **Tables 7.1.4 a, 7.1.4 b & 7.1.4 c**.

Table 7.1.4 (a): State-wise percentage of population below the poverty line -Rural (1973-74 to 2011-12)

(in % of person)

Sl. No.	States/ Union Territories	1973-74	1977-78	1983	1987-88	1993-94	1999-2000	2004-05 (URP)*	2004-05 (MRP)*	2009-10	2011-12
1	2	3	4	5	6	7	8	9	10	11	12
	States										
1	Andhra Pradesh	48.41	38.11	26.53	20.92	48.10	11.05	32.30	7.50	22.80	11.00
2	Arunachal Pradesh	52.67	59.82	42.60	39.35	60.00	40.04	33.60	17.00	26.20	38.90
3	Assam	52.67	59.82	42.60	39.35	54.90	40.04	36.40	17.00	39.90	33.90
4	Bihar	62.99	63.25	64.37	52.63	62.30	44.30	55.70	32.90	55.30	34.10
5	Chattisgarh	-	-	-	-	55.90	-	55.10	31.20	56.10	44.60
6	Goa	46.85	37.64	14.81	17.64	25.50	1.35	28.10	1.90	11.50	6.80
7	Gujarat	46.35	41.76	29.80	28.67	43.10	13.17	39.10	13.90	26.70	21.50
8	Haryana	34.23	27.73	20.56	16.22	40.00	8.27	24.80	9.20	18.60	11.60
9	Himachal Pradesh	27.42	33.49	17.00	16.28	36.70	7.94	25.00	7.20	9.10	8.50
10	Jammu & Kashmir	45.51	42.86	26.04	25.70	32.50	3.97	14.10	2.70	8.10	11.50
11	Jharkhand	-	-	-	-	65.90	-	51.60	40.20	41.60	40.80
12	Karnataka	55.14	48.18	36.33	32.82	56.60	17.38	37.50	12.00	26.10	24.50
13	Kerala	59.19	51.48	39.03	29.10	33.90	9.38	20.20	9.60	12.00	9.10
14	Madhya Pradesh	62.66	62.52	48.90	41.92	49.00	37.06	53.60	29.80	42.00	35.70
15	Maharashtra	57.71	63.97	45.23	40.78	59.30	23.72	47.90	22.20	29.50	24.20
16	Manipur	52.67	59.82	42.60	39.35	64.40	40.04	39.30	17.00	47.40	38.80
17	Meghalaya	52.67	59.82	42.60	39.35	38.00	40.04	14.00	17.00	15.30	12.50
18	Mizoram	52.67	59.82	42.60	39.35	16.60	40.04	23.00	17.00	31.10	35.40
19	Nagaland	52.67	59.82	42.60	39.35	20.10	40.04	10.00	17.00	19.30	19.90
20	Odisha	67.28	72.38	67.53	57.64	63.00	48.01	60.80	39.80	39.20	35.70
21	Punjab	28.21	16.37	13.20	12.60	20.30	6.35	22.10	5.90	14.60	7.70
22	Rajasthan	44.76	35.89	33.50	33.21	40.80	13.74	35.80	14.30	26.40	16.10
23	Sikkim	52.67	59.82	42.60	39.35	33.00	40.04	31.80	17.00	15.50	9.90
24	Tamil Nadu	57.43	57.68	53.99	45.80	51.00	20.55	37.50	16.90	21.20	15.80
25	Tripura	52.67	59.82	42.60	39.35	34.20	40.04	44.50	17.00	19.80	16.50
26	Uttar Pradesh	56.53	47.60	46.45	41.10	50.90	31.22	42.70	25.30	39.40	30.40
27	Uttarkhand	-	-	-	-	36.70	-	35.10	31.70	14.90	11.60
28	West Bengal	73.16	68.34	63.05	48.30	42.50	31.85	38.20	24.20	28.80	22.50
	Union Territories										
1	Andman& Nicobar Islands	57.43	57.68	53.99	45.80	-	20.55	-	16.90	0.40	
2	Chandigarh	27.96	27.32	23.79	14.67	-	5.75	-	3.80	10.30	
3	Dadra & Nagar Haveli	46.85	37.64	14.81	67.11	-	17.57	-	36.00	55.90	
4	Daman & Diu	NA	NA	NA	NA	-	1.35	-	1.90	34.20	
5	Delhi	24.44	30.19	7.66	1.29	16.20	0.40	15.60	0.10	7.70	12.90
6	Lakshadweep	59.19	51.48	39.03	29.10	-	9.38	-	9.60	22.20	
7	Puducherry	57.43	57.68	53.99	45.80	28.10	20.55	22.90	16.90	0.02	17.10
	All India	**56.44**	**53.07**	**45.65**	**39.09**	**50.10**	**27.09**	**42.00**	**21.80**	**33.80**	**25.70**

* URP- Unifrom Reference Period : MRP- Mixed Reference Period

Source : Planning Commission & NSSO (Tendulkar Methodology)

Notes : 1.The estimates for Chhatisgarh, Madhya Pradesh, Bihar, Jharkhand, UttarPradesh and Uttaranchal are for states as they exist after bifurcation in 2001. The estimates for 1993-94 have been calculated from the unit data using district and state boundaries of the divided states in 1993-94.

2 Population as on 1st March 2010 has been used for estimating number of persons below poverty line. (interpolated between 2001 and 2011 population census)

3 Poverty line of Tamil Nadu is used for Andaman and Nicobar Island.

4 Urban Poverty Line of Punjab used for both rural and urban Poverty of Chandigarh.

5 Poverty line of Maharashtra is used for Dadra & Nagar Haveli.

6 Poverty Ratio of Goa is used for Daman & Diu.

7 Poverty ratio of Kerala is used for Lakshadweep.

Table 7.1.4 (b): State-wise percentage of population below the poverty line -Urban (1973-74 to 2011-12)

(in % of person)

Sl. No.	States/ Union Territories	1973-74	1977-78	1983	1987-88	1993-94	1999-2000	2004-05 (URP)*	2004-05 (MRP)*	2009-10	2011-12
1	2	3	4	5	6	7	8	9	10	11	12
	States										
1	Andhra Pradesh	50.61	43.55	36.30	40.11	35.20	26.63	23.40	20.70	17.70	5.80
2	Arunachal Pradesh	36.92	32.71	21.73	9.94	22.60	7.47	23.50	2.40	24.90	20.30
3	Assam	36.92	32.71	21.73	9.94	27.70	7.47	21.80	2.40	26.10	20.50
4	Bihar	52.96	48.76	47.33	48.73	44.70	32.91	43.70	28.90	39.40	31.20
	Chattisgarh	-	-	-	-	28.10	-	28.40	34.70	23.80	24.80
5	Goa	37.69	36.31	27.00	35.48	14.60	7.52	22.20	20.90	6.90	4.10
6	Gujarat	52.57	40.02	39.14	37.26	28.00	15.59	20.10	10.10	17.90	10.10
7	Haryana	40.18	36.57	24.15	17.99	24.20	9.99	22.40	11.30	213.00	10.30
8	Himachal Pradesh	13.17	19.44	9.43	6.29	13.60	4.63	4.60	2.60	12.60	4.30
9	Jammu & Kashmir	21.32	23.71	17.76	17.47	6.90	1.98	10.40	8.50	12.80	7.20
	Jharkhand	-	-	-	-	41.80	-	23.80	16.30	31.10	24.80
10	Karnataka	52.53	50.36	42.82	48.42	34.20	25.25	25.90	27.20	19.60	15.30
11	Kerala	62.74	55.62	45.68	40.33	23.90	20.27	18.40	16.40	12.10	5.00
12	Madhya Pradesh	57.65	58.66	53.06	47.09	31.80	38.44	35.10	39.30	22.90	21.00
13	Maharashtra	43.87	40.09	40.26	39.78	30.30	26.81	25.60	29.00	18.30	9.10
14	Manipur	36.92	32.71	21.73	9.94	67.20	7.47	34.50	2.40	46.40	32.60
15	Meghalaya	36.92	32.71	21.73	9.94	23.00	7.47	24.70	2.40	24.10	9.30
16	Mizoram	36.92	32.71	21.73	9.94	6.30	7.47	7.90	2.40	11.50	6.40
17	Nagaland	36.92	32.71	21.73	9.94	21.80	7.47	4.30	2.40	25.00	16.50
18	Odisha	55.62	50.92	49.15	41.63	34.50	42.83	37.60	40.30	25.90	17.30
19	Punjab	27.96	27.32	23.79	14.67	27.20	5.75	18.70	3.80	18.10	9.20
20	Rajasthan	52.13	43.53	37.94	41.92	29.90	19.85	29.70	28.10	19.90	10.70
21	Sikkim	36.92	32.71	21.73	9.94	20.40	7.47	25.90	2.40	5.00	3.70
22	Tamil Nadu	49.40	48.69	46.96	38.64	33.70	22.11	19.70	18.80	12.80	6.50
23	Tripura	36.92	32.71	21.73	9.94	25.40	7.47	22.50	2.40	10.00	7.40
24	Uttar Pradesh	60.09	56.23	49.82	42.96	38.30	30.89	34.10	26.30	31.70	26.10
	Uttarkhand	-	-	-	-	18.70	-	26.50	32.00	25.20	10.50
25	West Bengal	34.67	38.20	32.32	35.08	31.20	14.86	24.40	11.20	22.00	14.70
	Union Territories										
1	Andman& Nicobar Islands	49.40	48.69	46.96	38.64	-	22.11	-	18.80	0.30	
2	Chandigarh	27.96	27.32	23.79	14.67	-	5.75	-	3.80	9.20	
3	Dadra & Nagar Haveli	37.69	36.31	27.00	-	-	13.52	-	19.20	17.70	
4	Daman & Diu	NA	NA	NA	NA	-	7.52	-	20.80	33.00	
5	Delhi	52.23	33.51	27.89	13.56	15.70	9.42	12.90	10.80	14.40	9.80
6	Lakshadweep	62.74	55.62	45.68	40.33	-	20.27	-	16.40	1.70	
7	Puducherry	49.40	48.69	46.96	38.64	32.40	22.11	9.90	18.80	1.60	6.30
	All India	**49.01**	**45.24**	**40.79**	**38.20**	**31.8**	**23.62**	**25.70**	**21.70**	**20.90**	**13.70**

* URP- Unifrom Reference Period : MRP- Mixed Reference Period

Source : Planning Commission & NSSO (Tendulkar Methodology)

Notes : 1.The estimates for Chhatisgarh, Madhya Pradesh, Bihar, Jharkhand, UttarPradesh and Uttaranchal are for states as they exist after bifurcation in 2001. The estimates for 1993-94 have been calculated from the unit data using district and state boundaries of the divided states in 1993-94.

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3 Poverty line of Tamil Nadu is used for Andaman and Nicobar Island.

4 Urban Poverty Line of Punjab used for both rural and urban Poverty of Chandigarh.

5 Poverty line of Maharashtra is used for Dadra & Nagar Haveli.

6 Poverty Ratio of Goa is used for Daman & Diu.

7 Poverty ratio of Kerala is used for Lakshadweep.

Table 7.1.4 (c): State-wise percentage of population below the poverty line - Rural + Urban (1973-74 to 2011-12)

(in % of person)

Sl. No.	States/ Union Territories	1973-74	1977-78	1983	1987-88	1993-94	1999-2000	2004-05 (URP)*	2004-05 (MRP)*	2009-10	2011-12
1	2	3	4	5	6	7	8	9	10	11	12
	States										
1	Andhra Pradesh	48.86	39.31	28.91	25.86	44.60	15.77	29.90	11.10	21.10	9.20
2	Arunachal Pradesh	51.93	58.32	40.88	36.22	54.50	33.47	31.10	13.40	25.90	34.70
3	Assam	51.21	57.15	40.47	36.21	51.80	36.09	34.40	15.00	37.90	32.00
4	Bihar	61.91	61.55	62.22	52.13	60.50	42.60	54.40	32.50	53.50	33.70
5	Chattisgarh	-	-	-	-	50.90	-	49.40	32.00	48.70	39.90
6	Goa	44.26	37.23	18.90	24.52	20.80	4.40	25.00	10.20	8.70	5.10
7	Gujarat	48.15	41.23	32.79	31.54	37.80	14.07	31.80	12.00	23.00	16.60
8	Haryana	35.36	29.55	21.37	16.64	35.90	8.74	24.10	12.50	20.10	11.20
9	Himachal Pradesh	26.39	32.45	16.40	15.45	34.60	7.63	22.90	9.90	9.50	8.10
10	Jammu & Kashmir	40.83	38.97	24.24	23.82	26.30	3.48	13.20	6.70	9.40	10.40
11	Jharkhand	-	-	-	-	60.70	-	45.30	4.20	39.10	37.00
12	Karnataka	54.47	48.78	38.24	37.53	49.50	20.04	33.40	34.80	23.60	20.90
13	Kerala	59.79	52.22	40.42	31.79	31.30	12.72	19.70	17.40	12.00	7.10
14	Madhya Pradesh	61.78	61.78	49.78	43.07	44.60	37.43	48.60	11.40	36.70	31.70
15	Maharashtra	53.24	55.88	43.44	40.41	47.80	25.02	38.10	32.40	24.50	17.40
16	Manipur	49.96	53.72	37.02	31.35	65.10	28.54	38.00	25.20	47.10	36.90
17	Meghalaya	50.20	55.19	38.81	33.92	35.20	33.87	16.10	13.20	17.10	11.90
18	Mizoram	50.32	54.38	36.00	27.52	11.80	19.47	15.30	14.10	21.10	20.40
19	Nagaland	50.81	56.04	39.25	34.43	20.40	32.67	9.00	9.50	20.90	18.90
20	Odisha	66.18	70.07	65.29	55.58	59.10	47.15	57.20	14.50	37.00	32.60
21	Punjab	28.15	19.27	16.18	13.20	22.40	6.16	20.90	39.90	15.90	8.30
22	Rajasthan	46.14	37.42	34.46	35.15	38.30	15.28	34.40	5.20	24.80	14.70
23	Sikkim	50.86	55.89	39.71	36.06	31.80	36.55	31.10	17.50	13.10	8.20
24	Tamil Nadu	54.94	54.79	51.66	43.39	44.60	21.12	28.90	15.20	17.10	11.30
25	Tripura	51.00	56.88	40.03	35.23	32.90	34.44	40.60	17.80	17.40	14.10
26	Uttar Pradesh	57.07	49.05	47.07	41.46	48.40	31.15	40.90	14.40	37.70	29.40
27	Uttarkhand	-	-	-	-	32.00	-	32.73	25.50	18.00	11.30
28	West Bengal	63.43	60.52	54.85	44.72	39.40	27.02	34.30	31.80	26.70	20.00
	Union Territories										
1	Andman& Nicobar Islands	55.56	55.42	52.13	43.89	-	20.99	-	20.60	0.40	
2	Chandigarh	27.96	27.32	23.79	14.67	-	5.75	-	17.60	9.20	
3	Dadra & Nagar Haveli	46.55	37.20	15.67	67.11	-	17.14	-	3.80	39.10	
4	Daman & Diu	NA	NA	NA	NA	-	4.44	-	30.60	33.30	
5	Delhi	49.61	33.23	26.22	12.41	15.70	8.23	13.10	8.00	14.20	9.90
6	Lakshadweep	59.68	52.79	42.36	34.95	-	15.60	-	12.30	6.80	
7	Puducherry	53.82	53.25	50.06	41.46	30.90	21.67	14.10	18.20	1.20	9.70
	All India	**54.88**	**51.32**	**44.48**	**38.86**	**45.30**	**26.10**	**37.20**	**21.80**	**29.80**	**21.90**

* URP- Unifrom Reference Period : MRP- Mixed Reference Period

Source : Planning Commission & NSSO (Tendulkar Methodology)

Notes : 1.The estimates for Chhatisgarh, Madhya Pradesh, Bihar, Jharkhand, UttarPradesh and Uttaranchal are for states as they exist after bifurcation in 2001. The estimates for 1993-94 have been calculated from the unit data using district and state boundaries of the divided states in 1993-94.

2 Population as on 1st March 2010 has been used for estimating number of persons below poverty line. (interpolated between 2001 and 2011 population census)

3 Poverty line of Tamil Nadu is used for Andaman and Nicobar Island.

4 Urban Poverty Line of Punjab used for both rural and urban Poverty of Chandigarh.

5 Poverty line of Maharashtra is used for Dadra & Nagar Haveli.

6 Poverty Ratio of Goa is used for Daman & Diu.

7 Poverty ratio of Kerala is used for Lakshadweep.

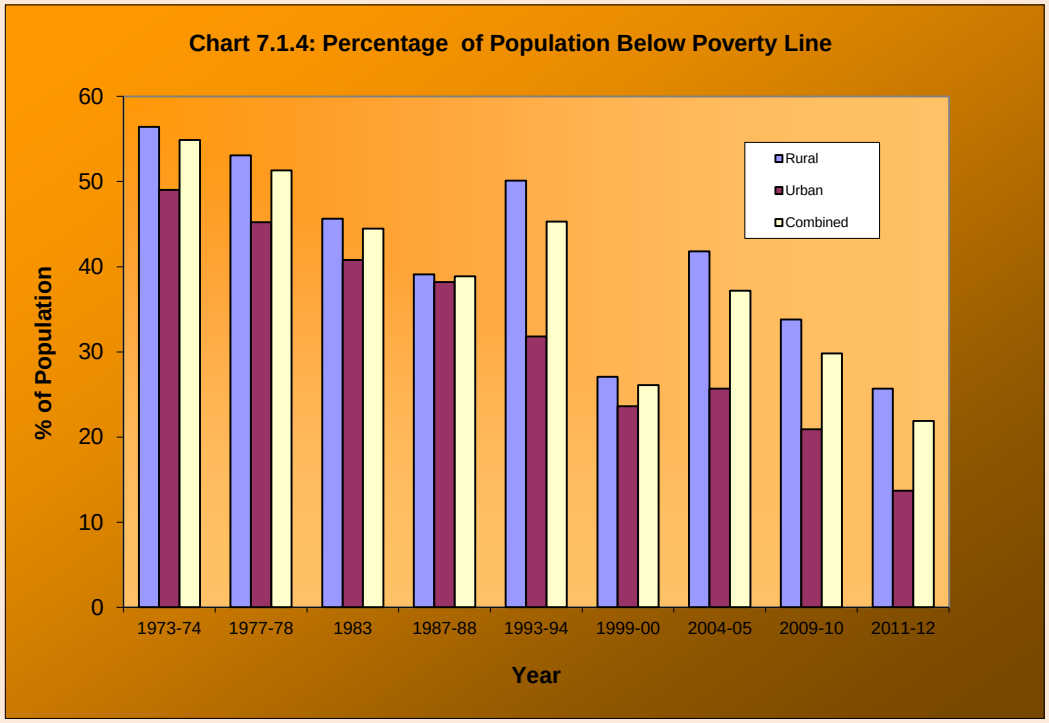
Chart 7.1.4: Percentage of Population Below Poverty Line
60
50
40
30
20
10
0
% of Population
Rural
Urban
Combined
1973-74
1977-78
1983
1987-88
1993-94
1999-00
2004-05
2009-10
2011-12
Year

7.2 HOUSING AND BASIC FACILITIES

7.2.1 The Housing facility available to Indian population can be assessed from the following table 7.2.1.

Table 7.2.1 : Urban-rural breakup of total population, number of households, houses and average size of housefolds, average no of households and persons per house

Sl. No.	Year	Total Population	No. of Households	No. of Houses	Av. Size of Households	Av. No of Household Per House	Av. No. of Persons Per House
1	2	3	4	5	6	7	8
1	1981*						
	Total	665,287,849	119,772,545	121,782,109**	5.6	1.0	5.5
	Urban	157,680,171	28,905,949	29,897,491	5.5	1.0	5.3
	Rural	507,607,678	90,866,596	91,884,618	5.6	1.0	5.5
2	1991+						
	Total	838,583,988	152,009,467	159,425,666**	5.5	1.0	5.3
	Urban	215,771,612	40,418,141	43,518,317	5.3	0.9	5.0
	Rural	622,812,376	111,591,326	115,907,349	5.6	1.0	5.4
3	2001++						
	Total	1,028,610,328	193,579,954	202,973,364#	5.3	1.0	5.1
	Urban	286,119,689	55,832,570	58,514,738	5.1	1.0	4.9
	Rural	742,490,639	137,747,384	144,458,626	5.4	1.0	5.1
4	2011^						
	Total	1,210,193,422	246,692,667	330,835,767	4.9	0.7	3.7
	Urban	377,105,760	78,865,937	110,139,853	4.8	0.8	3.4
	Rural	833,087,662	167,826,730	220,695,914	3.8	0.8	3.8

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.
++ India figures are final and exclude those of the three sub-divisions viz. Mao Maram, Paomata and Purul of Senapati district of Manipur as population Census 2001 in these three sub-divisions were cancelled due to technical and administrative reasons although a population census was carried out in these sub-divisions as per
# The occupied residential houses and vacant houses are based on Census 2001 Houselisting data.
^ Provisional Population totals, paper 2, volume 1 of 2011, Rural-Urban distribution, INDIA series 1.
Tables on houses, household Amenities and Assets, India series-1, Census of India-2011.

7.2.2 The Urban –Rural wise break up of number of households, occupied residential and vacant houses along with population as per Census is presented in table 7.2.2 and the dwelling room facilities in Indian households is depicted in table 7.2.3. The details of homeless households and population in India is in table 7.2.4.

Table 7.2.2 : Number of households, population and occupied residential and vacant houses with rural/urban break up

Sl. No.	Total/ Urban/ Rural		Number of Households	Population			No. of Houses at the time of Houselisting		
				Total	Male	Female	Total #	Occupied residential	Vacant
1	2	3	4	5	6	7	8	9	10
1		1981*							
	Total	Total	119,772,545	665,287,849	343,930,423	321,357,426	121,782,109	113,735,542	8,046,567
		Institutional	247,457	3,790,700	3,116,289	674,411			
	Urban	Total	28,905,949	157,680,171	83,876,403	73,803,768	29,897,491	27,604,947	2,292,544
		Institutional	143,015	2,377,559	1,956,711	420,848			
	Rural	Total	90,866,596	507,607,678	260,054,020	247,553,658	91,884,618	86,130,595	5,754,023
		Institutional	104,442	1,413,141	1,159,578	253,563			
2		1991+							
	Total	Total	152,009,467	838,583,988	435,216,358	403,367,630	159,425,666	147,013,766	12,411,900
		Institutional	244,881	4,252,976	3,351,584	901,392			
	Urban	Total	40,418,141	215,771,612	113,936,953	101,834,659	43,518,317	39,073,337	4,444,980
		Institutional	140,702	2,406,841	1,893,949	512,892			
	Rural	Total	111,591,326	622,812,376	321,279,405	301,532,971	115,907,349	107,940,429	7,966,920
		Institutional	104,179	1,846,135	1,457,635	388,500			
3		2001++							
	Total	Total	193,579,954	1,028,610,328	532,156,772	496,453,556	202,973,364	187,162,172	15,811,192
		Institutional	460,717	7,802,866	5,460,238	2,342,628			
	Urban	Total	55,832,570	286,119,689	150,554,098	135,565,591	58,514,738	52,062,718	6,452,020
		Institutional	208,470	3,758,714	2,717,220	1,041,494			
	Rural	Total	137,747,384	742,490,639	381,602,674	360,887,965	144,458,626	135,099,454	9,359,172
		Institutional	252,247	4,044,152	2,743,018	1,301,134			
4		2011^							
	Total	Total	246,692,667	1,210,193,422	623,724,248	586,469,174	269,314,550	244,641,582	24,672,968
		Institutional							
	Urban	Total	78,865,937	377,105,760	195,807,196	181,298,564	89,578,609	78,484,979	11,093,630
		Institutional							
	Rural	Total	167,826,730	833,087,662	427,917,052	405,170,160	179,735,941	166,156,603	13,579,338
		Institutional							

Source : Office of Registrar General of India

Note :

\# : No. of census houses (occupied residential + vacant)

* : Excluding Assam

\+ : Excluding Jammu & Kashmir

++ India figures are final and exclude those of the three sub-divisions viz. Mao Maram, Paomata and Purul of Senapati district of Manipur as population Census 2001 in these three sub-divisions were cancelled due to technical and administrative reasons although a population census was carried out in these sub-divisions as per schedule.

^ Provisional Population totals, paper 2, volume 1 of 2011, Rural-Urban distribution, INDIA series 1.
Tables on houses, household Amenities and Assets, India series-1, Census of India-2011.

Table 7.2.3 : Household by number of dwelling rooms

	No. of Households	Distribution of Households according to number of dwelling rooms						
		One Room	Two Rooms	Three Rooms	Four Rooms	Five or More Rooms	No exclusive room	Un-specified rooms
1	2	3	4	5	6	7	8	9
1981*								
Total	118,614,803	53,046,175	33,948,809	14,496,724	7,482,461	6,852,624	769,506	2,018,504
Percentage	100.00	44.70	28.60	12.20	6.30	5.80	0.65	1.70
Urban	28,541,877	13,072,617	7,947,026	3,484,741	1,804,721	1,626,979	149,001	456,792
Percentage	100.00	45.80	27.80	12.30	6.30	5.70	0.52	1.60
Rural	90,072,926	39,973,558	26,001,783	11,011,983	5,677,740	5,225,645	620,505	1,561,712
Percentage	100.00	44.40	28.90	12.20	6.30	5.80	0.69	1.73
1991+								
Total	151,032,898	61,154,743	46,180,064	20,910,465	10,791,101	10,608,294	43,538	1,344,693
Percentage	100.00	40.50	30.60	13.80	7.20	7.00	0.03	0.89
Urban	39,493,450	15,620,078	11,992,915	5,852,191	3,070,829	2,751,947	16,578	188,912
Percentage	100.00	39.50	30.40	14.80	7.80	7.00	0.04	0.48
Rural	111,539,448	45,534,665	34,187,149	15,058,274	7,720,272	7,856,347	26,960	1,155,781
Percentage	100.00	40.80	30.70	13.50	6.90	7.00	0.02	1.04
2001								
Total	191,963,935	73,856,117	57,571,314	27,541,899	14,361,957	12,660,232	5,972,416	-
Percentage	100.00	38.47	29.99	14.35	7.48	6.60	3.11	
Urban	53,692,376	18,852,794	15,857,448	9,176,931	4,656,850	3,900,405	1,247,948	-
Percentage	100.00	35.11	29.53	17.09	8.67	7.26	2.32	
Rural	138,271,559	55,003,323	41,713,866	18,364,968	9,705,107	8,759,827	4,724,468	-
Percentage	100.00	39.78	30.17	13.28	7.02	6.34	3.42	
2011^								
Total	246692667	91491894	78124581	35803824	18377481	6395066	9638369	6861452
Percentage	100	37.09	31.67	14.51	7.45	2.59	3.91	2.78
Rural	167826730	66155450	53987801	21308634	11071009	3842346	7211590	4249900
Percentage	100	39.42	32.17	12.70	6.60	2.29	4.30	2.53
Urban	78865937	25336444	24136780	14495190	7306472	2552720	2426779	2611552
Percentage	100	32.13	30.60	18.38	9.26	3.24	3.08	3.31

Source: Office of the Registrar General of India

* : Excuding Assam Excluding houseless and Institutional Households

\+ : Excluding J& K ,Excluding houseless and Institutional Households

^ Tables on houses, household Amenities and Assets, India series-1, Census of India-2011.

Table 7.2.4 : Number of houseless households and population

Sl. No.	Year	Numbers of houseless households	Houseless Population		
			Total	Male	Female
1	2	3	4	5	6
1	**1981***				
	Total	629,929	2,342,954	1,376,512	966,442
	Urban	209,520	618,843	406,154	212,689
	Rural	420,409	1,724,111	970,358	753,753
2	**1991+**				
	Total	522,445	2,007,489	1,180,368	827,121
	Urban	216,917	725,592	471,077	254,515
	Rural	305,528	1,281,897	709,291	572,606
3	**2001**				
	Total	447,585	1,943,766	1,136,496	807,270
	Urban	187,810	778,599	502,344	276,255
	Rural	259,775	1,165,167	634,152	531,015
4	**2011**				
	Total	449,761	1,772,889		
	Urban	192,865	834,541		
	Rural	256,896	938,348		

Source: Primary census Abstract for total polulation and houseless population, 2011,Office of the Registrar General of India

* : Excluding Assam

\+ : Excludes Jammu & Kashmir

7.2.3Though, there is a reduction in the number of homeless people in 2011 over 1991, the homeless people still constitutes 0.14% of the Country's population.

7.3 Safe water and improved sanitation facilities

7.3.1 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.

7.3.2 Access to safe drinking water remains an urgent need as only 70.6% 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 worse with only 30.8% households reported water supply through Tap Water. 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. As per Census 2011, 69.3% rural households 18.6% urban households are still without toilet of any type.

7.3.3 The **details Rural –Urban classification of Households by water supply and toilet installation is in Table 7.3.1**

TABLE 7.3.1 : HOUSEHOLDS CLASSIFIED BY SUPPLY OF WATER AND TOILET INSTALLATION BY RURAL AND URBAN

Year	Total number of Households	Households with Water Supply though Tap Water			Toilet Installation	
		Total	Inside	Outside	With Toilet of Any Type	Without Toilet of Any Type
1	2	3	4	5	6	7
2011						
Total	246692667	107,417,176	78,873,488	28,533,688	115,737,458	130,955,209
Percentage	100	43.5	32.0	11.6	46.9	53.1
Rural	167826730	51,705,165	29,969,145	21,736,020	51,575,339	116,251,391
Percentage	100	30.8	17.9	13.0	30.7	69.3
Urban	78865937	55,702,011	48,904,343	6,797,668	64,162,119	14,703,818
Percentage	100.0	70.6	62.0	8.6	81.4	18.6

Source : Office of the Registrar General of India (Census 2011)

7.3.4 Water is a finite resource. 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. **The state wise estimated requirement of water for domestic purposes including for cattle is presented in Table 7.3.2 .**

7.3.5 The source of drinking water is an indicator of development towards availability of safe drinking water. **The distribution of households by major source of drinking water in rural and urban areas is exhibited in tables 7.3.3a, 7.3.3b & 7.3.3 c.**

7.3.6 Food, potable drinking water, adequate system for disposal of excreta, good sanitation and personal hygiene etc are pre – requisite to reduce prevalence of morbidity. Sewage treatment is an important initiative in this direction, however, in Indian Metropolitan cities, on an average; sewage treatment capacity is only 51% of the sewage generation. The data on this is depicted in **tables 7.3.4 a, 7.3.4 b&7.3.4 c .**

The facilities for garbage disposal in Indian households are a representative indicator of the cleanliness of its environment. The distribution of household by arrangement of garbage disposal is in **table 7.3.5.**

TABLE 7.3.2 : STATE-WISE ESTIMATED ANNUAL REQUIREMENT OF WATER FOR DOMESTIC PURPOSES INCLUDING FOR CATTLE IN DIFFERENT STATES

Sl. No.	State/UT	Population in Thousand					Water Requirement in BCM				
		1991	2001	2004	2006	2025	1991	2001	2004	2006	2025
1	2	3	4	5	6	7	8	9	10	11	12
1	Andhra Pradesh	66,508	75,728	78,527	80,430	94,276	2.50	3.20	3.45	3.63	4.91
2	Arunachal Pradesh	865	1,091	1,139	1,170	1,429	0.03	0.05	0.05	0.05	0.07
3	Assam	22,414	26,638	28,050	29,009	36,766	0.84	1.13	1.23	1.31	1.91
4	Bihar	86,374	82,879	87,810	90,830	114,845	3.25	3.50	3.86	4.09	5.98
5	Chandigarh	642	901	969	1,013	1,642	0.02	0.04	0.04	0.05	0.09
6	Chhattisgarh	@	20,796	22,011	22,859	29,513	@	0.88	0.97	1.03	1.54
7	Goa	1,170	1,344	1,451	1,537	2,703	0.04	0.06	0.06	0.07	0.14
8	Gujarat	41,310	50,597	53,195	54,814	67,402	1.55	2.14	2.34	2.47	3.51
9	Haryana	16,464	21,083	22,296	23,040	28,941	0.62	0.89	0.98	1.04	1.51
10	Himachal Pradesh	5,171	6,077	6,294	6,425	7,345	0.19	0.26	0.28	0.29	0.38
11	Jammu & Kashmir	7,719	10,070	10,935	11,603	21,767	0.29	0.43	0.48	0.52	1.13
12	Jharkhand	@	26,909	28,303	29,173	35,730	@	1.14	1.24	1.32	1.86
13	Karnataka	44,977	52,734	54,824	56,137	65,879	1.69	2.23	2.41	2.53	3.43
14	Kerala	29,099	31,839	32,862	33,569	38,360	1.09	1.34	1.45	1.51	2.00
15	Madhya Pradesh	66,181	60,385	64,237	66,801	88,062	2.49	2.55	2.82	3.01	4.58
16	Maharashtra	78,937	96,752	101,275	104,104	127,719	2.97	4.09	4.45	4.69	6.65
17	Manipur	1,837	2,389	2,499	2,561	3,128	0.07	0.10	0.11	0.12	0.16
18	Meghalaya	1,775	2,306	2,411	2,472	3,021	0.07	0.10	0.11	0.11	0.16
19	Mizoram	690	891	932	955	1,167	0.03	0.04	0.04	0.04	0.06
20	Nagaland	1,210	1,989	2,090	2,132	2,606	0.05	0.08	0.09	0.10	0.14
21	Odisha	31,660	36,707	38,139	39,053	45,763	1.19	1.55	1.68	1.76	2.38
22	Punjab	20,282	24,289	25,336	25,976	30,609	0.76	1.03	1.11	1.17	1.59
23	Rajasthan	44,006	56,473	60,127	62,431	80,005	1.66	2.39	2.64	2.81	4.16
24	Sikkim	406	540	566	579	708	0.02	0.02	0.02	0.03	0.04
25	Tamil Nadu	55,859	62,111	64,019	65,261	73,569	2.10	2.62	2.82	2.94	3.83
26	Tripura	2,757	3,191	3,326	3,421	4,180	0.10	0.13	0.15	0.15	0.22
27	Uttar Pradesh	139,112	166,053	176,765	183,856	245,772	5.23	7.01	7.77	8.29	12.79
28	Uttarakhand	@	8,480	8,925	9,216	11,506	@	0.36	0.39	0.42	0.60
29	West Bengal	68,078	80,221	83,585	85,780	103,194	2.56	3.39	3.68	3.70	5.37
30	A. & N. Islands	281	356	377	394	606	0.01	0.02	0.02	0.02	0.03
31	D. & N. Haveli	138	220	237	248	429	0.01	0.01	0.01	0.01	0.02
32	Lakshadweep	52	61	64	66	97	0.00	0.00	0.00	0.00	0.01
33	Puducherry	808	974	1,013	1,042	1,427	0.03	0.04	0.04	0.05	0.07
34	Delhi	9,421	13,783	15,128	16,065	28,394	0.35	0.58	0.67	0.72	1.48
35	Daman & Diu	102	158	170	178	301	0.00	0.01	0.01	0.01	0.02
TOTAL		**846,303**	**1,027,015**	**1,079,887**	**1,114,200**	**1,398,861**	**31.84**	**43.38**	**47.49**	**50.23**	**72.81**

Source: Central Water Commission

BCM : Billion Cubic Metres

Note : + : All India figures relate to the estimated requirement as worked out by the standing sub committee for Assessment of availability and requirement of water for diverse uses in the country, 2000. (distributed prorata in the states in proportion to population).

@ : Three States namely Jharkhand, Uttarakhand & Chhatisgarh have been formed after 1991 as such their population as well water requirement in year 1991 have been included in the respective states: Chhattisgarh in M.P, Jharkhand in Bihar and Uttaranchal in Uttar Pradesh.

Table: 7.3.3 Distribution of households by availability of drinking water facility

Sl.No	India/ State/ Union Territory #	Distribution of households by availability of drinking water facility													Availability of Drinking Water		
		Total No. of Households (Excluding institutional households)	Tap water			Well			Handpump	Tubewell	Spring	River, Canal	Tank, Pond, Lake	Any other source	Within the premises	Near the premises	Away
			Total	From treated source	From un-treated source	Total	Covered well	Un-covered well									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	A & N Islands #	93,376	85.0	68.9	16.2	7.3	0.7	6.6	0.0	0.5	1.2	2.6	1.5	1.9	60.6	27.0	12.4
2	Andhra Pradesh	21,024,534	69.9	49.0	20.9	6.4	0.5	5.9	13.7	6.9	0.5	0.3	0.3	2.1	43.2	37.3	19.5
3	Arunachal Pradesh	261,614	65.5	26.4	39.1	5.7	1.4	4.3	10.7	2.4	5.7	6.0	0.9	3.2	41.1	37.4	21.6
4	Assam	6,367,295	10.5	9.2	1.3	18.9	1.7	17.2	50.2	9.2	1.3	3.4	4.6	2.0	54.8	26.7	18.5
5	Bihar	18,940,629	4.4	3.1	1.3	4.3	0.7	3.7	86.6	3.0	0.0	0.2	0.1	1.4	50.1	37.9	12.0
6	Chandigarh #	235,061	96.7	93.7	3.0	0.1	0.1	0.0	1.8	0.9	0.0	0.0	0.1	0.5	86.2	11.7	2.2
7	Chhattisgarh	5,622,850	20.7	12.3	8.4	11.4	0.8	10.6	58.4	7.2	0.7	0.9	0.2	0.5	19.0	54.5	26.5
8	Dadra & Nagar Haveli #	73,063	46.5	26.0	20.5	7.2	1.5	5.7	24.5	20.6	0.6	0.3	0.0	0.4	52.6	36.4	11.0
9	Daman & Diu #	60,381	75.2	54.6	20.6	0.7	0.5	0.2	5.5	18.1	0.0	0.0	0.0	0.5	76.4	22.1	1.5
10	Delhi #	3,340,538	81.3	75.2	6.1	0.1	0.1	0.0	5.3	8.4	0.0	0.0	1.2	3.6	78.4	15.4	6.2
11	Goa	322,813	85.4	82.1	3.4	11.1	4.0	7.1	0.1	0.3	1.2	0.3	0.4	1.3	79.7	15.5	4.8
12	Gujarat	12,181,718	69.0	39.9	29.2	7.1	2.3	4.8	11.6	9.6	0.1	0.3	0.2	2.0	64.0	23.5	12.4
13	Haryana	4,717,954	68.8	55.9	12.9	3.0	0.7	2.3	12.0	12.9	0.0	0.3	0.9	1.9	66.5	21.4	12.1
14	Himachal Pradesh	1,476,581	89.5	83.9	5.6	2.9	1.6	1.3	3.6	0.7	0.7	0.3	0.5	1.9	55.5	35.0	9.5
15	Jammu & Kashmir	2,015,088	63.9	34.7	29.2	6.5	1.9	4.7	11.4	1.5	6.2	6.7	0.7	3.1	48.2	28.7	23.1
16	Jharkhand	6,181,607	12.9	10.0	2.9	36.5	1.9	34.6	43.8	3.5	0.8	1.6	0.2	0.8	23.2	44.9	31.9
17	Karnataka	13,179,911	66.1	41.2	24.8	9.0	1.0	8.0	5.5	16.0	0.3	0.8	1.0	1.4	44.5	37.3	18.2
18	Kerala	7,716,370	29.3	23.4	6.0	62.0	14.6	47.4	0.5	3.7	1.4	0.2	0.7	2.1	77.7	14.1	8.2
19	Lakshadweep #	10,703	20.3	9.1	11.1	71.7	6.9	64.9	2.5	0.1	0.0	0.0	0.4	5.1	83.7	14.3	2.0
20	Madhya Pradesh	14,967,597	23.4	16.5	6.9	20.0	1.1	18.9	47.1	7.6	0.3	0.7	0.4	0.6	23.9	45.6	30.5
21	Maharashtra	23,830,580	67.9	56.3	11.6	14.4	2.2	12.2	9.9	5.7	0.4	0.4	0.4	1.0	59.4	27.6	13.1
22	Manipur	507,152	38.6	25.6	13.0	7.5	2.8	4.7	6.5	0.4	5.6	15.0	23.2	3.4	16.1	46.2	37.8
23	Meghalaya	538,299	39.3	27.8	11.5	25.4	6.9	18.5	2.8	2.6	19.0	2.6	5.7	2.6	24.1	43.2	32.7
24	Mizoram	221,077	58.7	39.4	19.3	4.7	2.0	2.7	0.8	0.9	18.4	7.7	1.8	6.9	31.2	46.7	22.2
25	Nagaland	399,965	47.2	6.1	41.1	25.7	6.6	19.1	2.2	4.5	5.6	2.0	10.3	2.7	29.3	42.4	28.3
26	Odisha	9,661,085	13.8	10.0	3.9	19.5	2.2	17.3	41.5	20.0	1.8	1.7	0.9	0.8	22.4	42.2	35.4
27	Puducherry #	301,276	95.3	90.8	4.5	1.9	0.1	1.8	1.2	1.4	0.0	0.0	0.0	0.3	77.4	21.5	1.1
28	Punjab	5,409,699	51.0	41.1	9.9	0.5	0.2	0.2	24.7	21.9	0.0	0.2	0.1	1.7	85.9	10.0	4.1
29	Rajasthan	12,581,303	40.6	32.0	8.5	10.8	1.2	9.6	25.3	12.2	0.1	0.8	5.9	4.3	35.0	39.0	25.9
30	Sikkim	128,131	85.3	29.2	56.1	0.6	0.5	0.2	0.0	0.0	11.1	0.4	0.6	2.0	52.6	29.7	17.7
31	Tamil Nadu	18,493,003	79.8	55.8	24.0	5.1	1.2	3.8	4.6	8.2	0.2	0.2	0.5	1.5	34.9	58.1	7.0
32	Tripura	842,781	33.2	20.3	12.9	27.4	2.9	24.5	18.1	16.3	1.9	1.8	0.5	0.9	37.1	30.5	32.4
33	Uttar Pradesh	32,924,266	27.3	20.2	7.1	4.0	0.6	3.4	64.9	2.9	0.0	0.1	0.1	0.7	51.9	36.0	12.1
34	Uttarakhand	1,997,068	68.2	53.9	14.3	1.1	0.7	0.4	22.0	2.0	1.1	0.9	0.7	4.0	58.3	26.6	15.2
35	West Bengal	20,067,299	25.4	21.0	4.4	6.0	0.7	5.4	50.1	16.7	0.5	0.3	0.2	0.8	38.6	34.7	26.6
	INDIA	**246,692,667**	**43.5**	**32.0**	**11.6**	**11.0**	**1.6**	**9.4**	**33.5**	**8.5**	**0.5**	**0.6**	**0.8**	**1.5**	**46.6**	**35.8**	**17.6**

Source: Registrar General of India, 2011

Table 7.3.4 (a) : Status of sewage generation and treatment capacity in Metropolitan cities

Sl.No.	Name of the city	Sewage generation (in MLD)	Sewage Treatment Capacity (in MLD)	Percent of treatment capacity
1	Agra	260.36	88	33
2	Ahmadabad	472.00	488	96
3	Allahabad	176.00	60	34
4	Amritsar	192.00	-	-
5	Asansol	147.00	-	-
6	Bangalore	771.75	-	-
7	Bhopal	334.75	22	6
8	Chennai	158.00	264	100
9	Coimbatore	120.00	-	-
10	Delhi	3800.00	2330	61
11	Dhanbad	192.00	-	-
12	Faridabad	164.00	65	39
13	Hyderabad	426.21	593	100
14	Indore	204.00	78	38
15	Jabalpur	143.34	-	-
16	Jaipur	451.71	54	11
17	Jamshedpur	199.43	-	-
18	Kanpur	417.35	171	41
19	Kochi	188.40	-	-
20	Kolkata	705.86	172	24
21	Lucknow	363.81	42	11
22	Ludhiana	235.20	311	100
23	Madurai	97.93	-	-
24	Meerut	177.05	-	-
25	Mumbai	2671.00	2130	80
26	Nagpur	380.00	100	26
27	Nasik	227.84	107.5	47
28	Patna	279.14	105	37
29	Pune	474.00	305	64
30	Rajkot	108.80	44.5	40
31	Surat	432.00	202	46
32	Vadodara	180.00	206	100
33	Varanasi	230.17	102	44
34	Vijayawada	128.39	-	-
35	Vishakhapatnam	134.99	-	-
	Total	15644.48	8040	51

Source: Status of sewage treatment in India (CUPS/61/2005-06) Central Pollution Control Board
MLD: Million litre per day

Note: Information related to Sewage Generation and Treatment Capacities of Metropolitan Cities.

- Status of Municipal Wastewater Generation and treatment capacity of Metro Politian Cities.
- There are 35 metropolitan cities (more than 10 Lac populaiton), 15,644 Millions Liter Per Day (MLD) of sewage is generated from these metropolitian cities. The treatment capacity exists for 8040 MLD i.e. 51% is treatment capacity is created.
- Among the Metropolitan cites, Delhi has the maximum treatment capacity that is 2330 MLD (30% of the total treatment capacity of metropolitan cities)
- Next ot Delhi, Mumbai has the capacity of 2130 MLD, which is 26% of total capacity in metropolitan cities.
- Delhi and Mumbai therefore in combination have 55% of treatment capacity of the metropolitan cities.
- Some cities such as Hydrerabad, Vadodara, Chennai and Ludhiana and Ahmadabad treatment capacity meets the volume of generation.
- Cities like Delhi, Dhanbad have more than 50% capacity, rest of the cities have the capacity less than 50%

Table 7.3.4 (b): State-wise sewage generation of class-I cities

Sl.No.	State/Union Territory	No. of Cities	Population (in Year 2008)	Sewage Generation (in MLD)	Sewage Treatment Capacity (in MLD)
1	Andaman & Nicobar	1	107,200	12.90	-
2	Andhra Pradesh	47	20,143,050	1760.60	654.00
3	Assam	5	1,417,820	380.70	-
4	Bihar	23	5,783,554	1009.70	135.50
5	Chandigarh	1	994,820	429.76	164.79
6	Chhattisgarh	7	2,515,100	350.00	69.00
7	Delhi	1	14,858,800	3800.00	2330.00
8	Goa	1	122,330	9.79	-
9	Gujarat	28	14,678,240	1680.92	782.50
10	Haryana	20	5,494,110	626.69	312.00
11	Himachal Pradesh	1	163,490	28.94	35.63
12	Jammu & Kashmir	2	1,910,060	213.93	-
13	Jharkhand	14	4,964,171	830.47	-
14	Karnataka	33	15,102,373	1790.40	43.44
15	Kerala	8	3,778,516	575.17	-
16	Madhya Pradesh	25	10,795,000	1248.72	186.10
17	Maharashtra	50	40,255,170	9986.29	4225.25
18	Manipur	1	249,870	26.74	-
19	Meghalaya	1	186,030	20.84	-
20	Mizoram	1	282,550	31.65	-
21	Nagaland	1	171,810	19.24	-
22	Odisha	12	3,335,930	660.73	53.00
23	Puducherry	2	504,130	56.46	-
24	Punjab	19	6,329,860	1545.30	411.00
25	Rajasthan	24	9,611,490	1382.37	54.00
26	Tamilnadu	42	16,852,940	1077.21	333.42
27	Tripura	1	214,327	24.00	-
28	Uttar Pradesh	61	25,762,280	3506.02	1240.13
29	Uttarakhand	6	1,249,380	176.97	18.00
30	West Bengal	60	19,818,471	2345.21	505.92
	Total	**498**	**227,652,872**	**35558.12**	**11553.68**

Source: Central Pollution Control Board. MLD: Million litre per
Status of Water Supply, Wastewater Generation and Treatment in Class-I Cities & Class-II Towns of India
(CUPS/70/ 2009-10)

Table 7.3.4 (c) : State-wise sewage generation of class-II towns

Sl.No.	State/Union Territory	Population in Year 2008	No of Class - II Towns	Sewage generation of Class-II Towns (in MLD)	Sewage Treatment capacity (in MLD)
1	Andhra Pradesh	3448610	52	217.59	10.42
2	Assam	573290	8	6.46	-
3	Bihar	1113800	14	107.42	2.00
4	Chhattisgarh	566080	7	40.82	
5	Goa	172850	2	13.89	18.18
6	Gujarat	2180590	31	227.55	-
7	Haryana	544040	7	43.52	-
8	Jammu & Kashmir	244990	4	27.86	-
9	Jharkhand	826300	10	78.21	-
10	Karnataka	1800258	26	233.37	12.18
11	Kerala	1686660	26	231.32	-
12	Madhya Pradesh	1745050	23	130.90	9.00
13	Maharashtra	2503080	34	213.73	29.00
14	Meghalaya	81750	1	11.25	-
15	Nagaland	126520	1	1.36	-
16	Odisha	904510	12	78.42	-
17	Puducherry	79690	1	7.98	-
18	Punjab	1109670	14	157.40	42.80
19	Rajasthan	1599260	21	147.79	-
20	Tamilnadu	3254950	42	184.67	29.30
21	Uttar Pradesh	3382520	46	345.70	12.61
22	Uttarakhand	69490	1	9.07	6.33
23	West Bengal	2004440	27	180.42	61.88
	Total	**30018398**	**410**	**2696.70**	**233.70**

Source: Status of water supply, waste water generation and treatment in class I cities and class II towns of india Central Pollution Control Board.
MLD: Million litre per day

Table7.3.5 : Number of households by arrangement of garbage disposal per 1000 housholds living in a house

State/UT	Arrangement of garbage disposal						No. of households living in a house	
	By panchayat/ municipality/corporation	By residents	Others	No arrangement	Not reported	All	Estimated	Sample
Urban								
A & N Islands	870	54	0	76	0	1000	20,748	192
Andhra Pradesh	683	134	40	143	0	1000	5,881,294	2650
Arunachal Pradesh	18	731	109	141	2	1000	25,452	387
Assam	268	496	75	160	0	1000	435,469	804
Bihar	393	70	35	498	3	1000	1,534,197	1003
Chandigarh	593	132	70	207	0	1000	299,066	240
Chhattisgarh	515	138	61	286	4	1000	779,300	479
D & N Haveli	359	520	54	67	0	1000	5,983	144
Daman & Diu	525	392	22	62	0	1000	13,408	192
Delhi	519	412	11	58	0	1000	2,652,640	1685
Goa	433	0	4	562	0	1000	90,314	95
Gujarat	500	372	41	86	0	1000	3,723,817	1615
Haryana	361	329	29	281	0	1000	1,089,711	767
Himachal Pradesh	703	112	52	133	0	1000	172,585	240
Jammu & Kashmir	577	108	1	314	0	1000	326,486	864
Jharkhand	298	209	48	446	1	1000	972,694	910
Karnataka	670	135	23	171	0	1000	3,252,093	2240
Kerala	231	159	63	547	0	1000	1,732,564	1294
Lakshadweep	117	0	0	883	0	1000	5,827	96
Madhya Pradesh	496	96	23	384	0	1000	3,149,590	2160
Maharashtra	807	71	12	110	0	1000	8,976,198	5014
Manipur	110	531	176	163	20	1000	89,020	707
Meghalaya	504	194	98	204	0	1000	68,708	384
Mizoram	80	498	82	339	2	1000	56,285	910
Nagaland	138	699	96	67	0	1000	44,468	228
Odisha	512	62	157	268	0	1000	1,170,317	802
Pondicherry	564	292	67	77	0	1000	144,890	480
Punjab	464	209	47	280	0	1000	1,673,799	1247
Rajasthan	440	302	39	219	0	1000	2,531,266	1659
Sikkim	954	32	0	14	0	1000	13,046	192
Tamil Nadu	768	114	10	107	0	1000	5,898,627	4245
Tripura	254	51	63	633	0	1000	94,457	480
Uttar Pradesh	544	243	58	151	4	1000	6,559,728	3676
Uttaranchal	693	201	71	36	0	1000	329,812	384
West Bengal	536	102	42	315	0	1000	4,644,618	3376
All India	**590**	**175**	**36**	**199**	**1**	**1000**	**584,584,753**	**41841**

Source : NSS Reoprt No. 489: Housing Condition in India : Household Amenities and Other Characteristics
n.r. : not reported

Table 7.4.1 (a) Per 1000 distribution of households by primary source of energy for cooking (Rural)

States/UT	primary source of energy for cooking										estd. No of house holds (00)	no.of sample house holds surveyed
	coke, coal and charcoal	fire wood and chips	L.P.G.	gobar gas	dung-cake	kerosene	electricity	Charcoal & others	With no cooking arrangement	all		
Andhra Pradesh	1	749	194	1	0	7	1	0	47	1000	148374	3924
Arunachal Pradesh	0	758	238	0	0	1	0	3	0	1000	1706	1041
Assam	0	850	142	0	0	5	0	0	0	1000	48810	2616
Bihar	12	743	35	0	148	2	0	61	0	1000	142999	3294
Chhattisgarh	0	941	20	1	9	8	3	17	1	1000	40353	1495
Delhi	0	0	664	0	0	264	0	0	70	1000	2021	57
Goa	0	332	603	0	0	50	0	13	2	1000	2301	160
Gujarat	0	857	106	4	11	24	0	0	2	1004	65945	1720
Haryana	0	580	214	1	180	15	3	2	5	1000	31782	1440
Himachal Pradesh	1	712	263	0	0	17	1	0	5	1000	12960	1660
Jammu & Kashmir	0	643	246	0	92	12	4	2	0	1000	11938	1446
Jharkhand	134	776	25	1	35	2	9	18	0	1000	42264	1758
Karnataka	0	857	107	1	0	15	0	1	20	1000	76532	2038
Kerala	0	700	265	4	0	3	1	0	28	1000	56673	2606
Madhya Pradesh	1	905	55	3	32	1	0	1	2	1000	98447	2734
Maharashtra	0	782	170	7	1	16	0	5	19	1000	124261	4012
Manipur	0	672	325	0	2	0	0	0	0	1000	3069	1376
Meghalaya	0	909	41	0	1	26	13	2	8	1000	4114	864
Mizoram	0	721	275	0	1	3	0	0	0	1000	937	632
Nagaland	0	516	466	0	0	0	0	0	12	1000	1509	704
Odisha	5	843	37	2	39	2	1	28	43	1000	73798	2974
Punjab	0	326	337	11	289	11	1	21	5	1000	31740	1558
Rajasthan	0	925	56	0	14	4	0	0	2	1000	87698	2575
Sikkim	0	475	454	0	0	23	2	0	34	1000	1195	608
Tamil Nadu	0	701	254	0	0	26	0	0	19	1000	98327	3319
Tripura	4	927	61	0	0	7	0	0	1	1000	6818	1311
Uttar Pradesh	1	700	58	0	196	1	1	39	4	1000	252276	5908
Uttarakhand	0	595	178	0	10	0	0	0	216	1000	17813	1045
West Bengal	39	734	48	0	44	6	0	123	6	1000	137303	3575
A&N Islands	0	493	305	0	0	131	0	0	71	1000	538	272
Chandigarh	0	153	620	0	7	220	0	0	0	1000	423	32
Dadara & N. Haveli	0	461	169	0	0	370	0	0	0	1000	344	96
Daman & Diu	0	102	893	0	0	2	0	3	0	1000	233	64
Lakshadweep	0	713	25	0	0	135	64	0	62	1000	59	55
Puducherry	0	487	467	0	0	18	0	0	28	1000	901	128
All India	**8**	**763**	**115**	**2**	**63**	**8**	**1**	**24**	16	1000	**1626461**	**59097**

Source : NSS Reoprt No. 542: Energy Sources of Indian Households for Cooking and Lighting in India,2009-10 (NSS66th Round)

Table 7.4.1 (b) Per 1000 distribution of households by primary source of energy for cooking (Urban)

States/UT	Primary source of energy for cooking										Estd. No of house holds (00)	No.of sample house hold surveyed
	Coke, coal and charcoal	Fire wood and chips	L.P.G.	Gobar gas	Dung-cake	Kerosene	Electricity	Charcoal & others	With no cooking arrangement	All		
Andhra Pradesh	1	157	686	0	1	50	0	3	101	1000	60162	2951
Arunachal Pradesh	2	170	769	0	14	28	2	7	0	1000	515	600
Assam	0	178	746	0	1	70	0	0	6	1000	6854	832
Bihar	65	295	502	0	68	6	4	18	41	1000	18097	1270
Chhattisgarh	29	251	623	0	13	20	7	19	37	1000	8564	736
Delhi	0	10	809	0	0	12	9	0	159	1000	29020	808
Goa	0	43	893	0	0	64	0	0	0	1000	1015	287
Gujarat	23	151	608	0	9	140	0	58	11	1000	47241	1698
Haryana	1	130	791	0	41	17	1	2	17	1000	15324	1180
Himachal Pradesh	18	68	738	0	0	69	8	0	98	1000	1537	382
Jammu & Kashmir	6	96	775	0	3	94	22	1	1	1000	4040	1269
Jharkhand	422	73	412	0	5	0	9	1	77	1000	11002	990
Karnataka	0	190	589	0	0	110	0	2	108	1000	48084	2037
Kerala	2	368	555	0	0	6	8	2	60	1000	20532	1845
Madhya Pradesh	8	293	602	0	16	23	1	0	58	1000	32234	1973
Maharashtra	2	86	733	0	0	102	3	9	66	1000	97279	3984
Manipur	0	260	705	0	0	5	1	24	4	1000	1161	1182
Meghalaya	4	236	444	0	0	124	46	121	26	1000	896	408
Mizoram	0	88	906	0	0	5	0	0	1	1000	752	896
Nagaland	0	227	732	0	0	27	1	3	10	1000	599	320
Odisha	47	378	414	1	6	32	13	9	100	1000	12759	1055
Punjab	0	108	714	0	34	127	5	1	11	1000	18934	1557
Rajasthan	0	290	631	0	6	17	0	4	53	1000	30579	1551
Sikkim	0	0	732	0	0	30	0	0	238	1000	216	160
Tamil Nadu	0	178	647	1	0	101	0	0	73	1000	82035	3320
Tripura	3	350	608	0	0	29	0	0	2	1000	1587	544
Uttar Pradesh	6	242	619	0	63	12	4	3	52	1000	71435	3086
Uttarakhand	1	141	769	0	2	59	0	0	28	1000	5012	730
West Bengal	145	124	564	0	5	63	0	44	55	1000	49559	2749
A&N Island	0	15	674	0	2	270	0	0	39	1000	344	288
Chandigarh	2	47	725	0	1	67	0	0	157	1000	2123	273
Dadara & N. Haveli	0	0	727	0	0	273	0	0	0	1000	152	96
Daaman & Diu	0	79	882	0	0	40	0	0	0	1000	173	64
Lakshadweep	0	267	422	0	0	70	26	0	216	1000	52	128
Puducherry	0	93	734	0	2	86	2	0	82	1000	1905	448
All India	**23**	**175**	**645**	**0**	**13**	**65**	**3**	**11**	65	1000	**681770**	**41697**

Source : NSS Reoprt No. 542: Energy Sources of Indian Households for Cooking and Lighting in India,2009-10 (NSS 66th Round p-A-55 to72)

7.4 Sources of Fuel and Lighting –Household purposes.

The primary source of energy for cooking and lighting is an indicator of conditions of living as well as w household air pollution. **The Tables 7.4.1 (a) & (b) and 7.4.2(a),(b) & (c) present the sources of ene for cooking and lighting in India.**

Table :7.4.2(a) Distribution of households by source of lighting , India

Sl. No.	India/ State/ Union Territory #	Distribution of households by source of lighting								
		Total No. of Households (Excluding institutional households)		Electricity		Kerosene		Any other		No ligh
		2011	2001	2011	2001	2011	2001	2011	2001	2011
1	2	3	4	5	6	7	8	9	10	11
1	A & N Islands #	93376	73062	86.1	87.8	12.9	21.7	0.6	0.9	0.5
2	Andhra Pradesh	21024534	16849857	92.2	67.2	6.9	32.1	0.6	0.4	0.4
3	Arunachal Pradesh	261614	212615	65.7	54.7	18.5	31.4	5.3	5.6	10.5
4	Assam	6367295	4935358	37.1	24.9	61.8	74.7	1.0	0.3	0.2
5	Bihar	18940629	13982590	16.4	10.3	82.4	89.3	1.2	0.4	0.1
6	Chandigarh #	235061	201878	98.4	96.8	1.2	2.8	0.3	0.2	0.2
7	Chhattisgarh	5622850	4148518	75.3	53.1	23.2	46.0	1.2	0.5	0.3
8	Dadra & Nagar Haveli #	73063	43973	95.2	86.0	4.4	12.9	0.0	0.3	0.3
9	Daman & Diu #	60381	34342	99.1	97.8	0.8	1.8	0.1	0.1	0.1
10	Goa	322813	279216	96.9	93.6	2.4	5.7	0.4	0.3	0.4
11	Gujarat	12181718	9643989	90.4	80.4	8.1	18.1	0.5	0.6	1.0
12	Haryana	4717954	3529642	90.5	82.9	8.1	16.2	1.0	0.5	0.5
13	Himachal Pradesh	1476581	1240633	96.8	94.8	2.8	4.6	0.3	0.4	0.1
14	Jammu & Kashmir	2015088	1551768	85.1	80.6	9.7	14.8	3.2	4.2	2.0
15	Jharkhand	6181607	4862590	45.8	24.3	53.1	75.3	1.0	0.4	0.1
16	Karnataka	13179911	10232133	90.6	78.5	8.6	20.8	0.4	0.3	0.4
17	Kerala	7716370	6595206	94.4	70.2	5.2	29.1	0.4	0.6	0.0
18	Lakshadweep #	10703	9240	99.7	99.7	0.2	0.2	0.1	0.1	0.0
19	Madhya Pradesh	14967597	10919653	67.1	70.0	32.1	29.5	0.6	0.3	0.2
20	Maharashtra	23830580	19063149	83.9	77.5	14.5	21.5	0.7	0.5	0.9
21	Manipur	507152	397656	68.4	60.0	25.1	38.0	5.9	1.0	0.6
22	Meghalaya	538299	420246	60.9	42.7	37.0	55.9	1.3	0.7	0.8
23	Mizoram	221077	160966	84.2	69.6	13.5	27.8	1.9	1.3	0.3
24	Nagaland	399965	332050	81.6	63.6	15.6	31.6	1.6	2.0	1.1
25	NCT of Delhi #	3340538	2554149	99.1	92.9	0.7	6.2	0.2	0.7	0.1
26	Odisha	9661085	7870127	43.0	26.9	55.3	72.1	0.6	0.5	1.1
27	Puducherry #	301276	208655	97.7	87.8	2.1	11.8	0.1	0.2	0.2
28	Punjab	5409699	4265156	96.6	91.9	2.2	6.7	0.6	0.5	0.7
29	Rajasthan	12581303	9342294	67.0	54.7	30.9	44.1	1.2	0.7	0.8
30	Sikkim	128131	104738	92.5	77.8	6.6	21.6	0.4	0.3	0.5
31	Tamil Nadu	18493003	14173626	93.4	78.2	5.9	21.1	0.4	0.4	0.4
32	Tripura	842781	662023	68.4	41.8	29.1	57.5	2.1	0.4	0.3
33	Uttar Pradesh	32924266	25760601	36.8	31.9	61.9	67.4	1.1	0.5	0.2
34	Uttarakhand	1997068	1586321	87.0	60.3	11.1	37.3	1.6	2.1	0.3
35	West Bengal	20067299	15715915	54.5	34.5	43.5	61.9	1.5	0.5	0.5
	INDIA	**246692667**	**191963935**	**67.3**	**86.8**	**31.4**	**43.3**	**0.8**	**0.5**	**0.5**

Source : Office of the Registrar General

Table :7.4.2(b) Distribution of households by source of lighting (Rural)

Sl. No.	India/ State/ Union Territory #	Distribution of households by source of lighting								
		Total No. of Households (Excluding institutional		Electricity		Kerosene		Other		No
		2011	2001	2011	2001	2011	2001	2011	2001	2011
1	2	3	4	5	6	7	8	9	10	11
1	A & N Islands #	59030	49653	79.4	68.1	19.3	29.9	0.8	1.2	0.6
2	Andhra Pradesh	14246309	12676218	89.7	59.7	9.2	39.7	0.6	0.4	0.5
3	Arunachal Pradesh	195723	164501	55.5	44.5	23.6	37.9	7.0	7.1	14.0
4	Assam	5374553	4220173	28.4	16.5	70.4	83.1	1.1	0.3	0.2
5	Bihar	16926958	12660007	10.4	5.1	88.4	94.5	1.2	0.4	0.1
6	Chandigarh #	6785	21302	97.3	97.4	2.4	2.1	0.2	0.3	0.1
7	Chhattisgarh	4384112	3359078	70.0	46.1	28.2	52.9	1.5	0.6	0.3
8	Dadra & Nagar Haveli #	35408	32783	91.7	82.6	7.9	16.0	0.1	0.3	0.6
9	Daman & Diu #	12750	22091	98.3	97.5	1.5	2.0	0.1	0.2	0.2
10	Goa	124674	140755	95.6	92.4	3.4	6.9	0.3	0.3	0.6
11	Gujarat	6765403	5885961	85.0	72.1	12.8	26.2	0.8	0.7	1.4
12	Haryana	2966053	2454463	87.2	78.5	11.3	20.6	1.0	0.5	0.5
13	Himachal Pradesh	1310538	1097520	96.6	94.5	3.0	4.9	0.3	0.4	0.1
14	Jammu & Kashmir	1497920	1161357	80.7	74.8	12.6	19.2	4.1	5.4	2.6
15	Jharkhand	4685965	3802412	32.3	10.0	66.4	89.6	1.2	0.3	0.0
16	Karnataka	7864196	6675173	86.7	72.2	12.3	27.2	0.5	0.3	0.5
17	Kerala	4095674	4942550	92.1	65.5	7.4	33.8	0.4	0.7	0.0
18	Lakshadweep #	2523	5351	99.8	99.7	0.2	0.1	0.0	0.1	0.0
19	Madhya Pradesh	11122365	8124795	58.3	62.3	40.9	37.2	0.6	0.3	0.2
20	Maharashtra	13016652	10993623	73.8	65.2	23.9	33.6	1.0	0.7	1.3
21	Manipur	335752	296354	61.2	52.5	32.2	45.1	5.9	1.2	0.7
22	Meghalaya	422197	329678	51.6	30.3	45.9	68.2	1.6	0.8	0.9
23	Mizoram	104874	79362	68.8	44.1	26.9	52.8	3.9	2.3	0.5
24	Nagaland	284911	265334	75.2	56.9	21.1	37.5	2.2	2.4	1.5
25	NCT of Delhi #	79115	169528	97.8	85.5	1.4	13.0	0.6	0.9	0.2
26	Odisha	8144012	6782879	35.6	19.4	62.8	79.8	0.6	0.5	1.1
27	Puducherry #	95133	72199	95.8	81.0	3.6	18.6	0.2	0.2	0.5
28	Punjab	3315632	2775462	95.5	89.5	2.9	8.9	0.7	0.5	0.9
29	Rajasthan	9490363	7156703	58.3	44.0	39.3	54.7	1.5	0.8	1.0
30	Sikkim	92370	91723	90.2	75.0	8.7	24.3	0.5	0.3	0.6
31	Tamil Nadu	9563899	8274790	90.8	71.2	8.3	28.2	0.3	0.3	0.6
32	Tripura	607779	539680	59.8	31.8	37.7	67.6	2.5	0.4	0.4
33	Uttar Pradesh	25475071	20590074	23.8	19.8	75.0	79.5	1.1	0.6	0.1
34	Uttarakhand	1404845	1196157	83.1	50.3	14.5	46.7	2.1	2.7	0.3
35	West Bengal	13717186	11161870	40.3	20.3	57.8	79.2	1.5	0.5	0.4
	INDIA	**167828744**	**138271559**	**55.3**	**43.5**	**43.2**	**55.6**	**1.0**	**0.6**	**0.5**

Source : Office of the Registrar General

Table :7.4.2(c) Distribution of households by source of lighting (Urban)

Sl. No.	India/ State/ Union Territory #	Distribution of households by source of lighting								
		Total No. of Households (Excluding institutional		Electricity		Kerosene		Other sources		No ligl
		2011	2001	2011	2001	2011	2001	2011	2001	2011
1	2	3	4	5	6	7	8	9	10	11
1	A & N Islands #	34346	23409	97.7	95.2	1.9	4.3	0.1	0.2	0.2
2	Andhra Pradesh	6778225	4173639	97.3	90.0	2.0	9.2	0.5	0.5	0.2
3	Arunachal Pradesh	65891	48114	96.0	89.4	3.2	9.4	0.4	0.5	0.4
4	Assam	992742	715185	84.1	74.3	15.2	25.0	0.5	0.6	0.3
5	Bihar	2013671	1322583	66.7	59.3	32.2	39.9	0.8	0.7	0.2
6	Chandigarh #	228276	180576	98.4	96.7	1.1	2.9	0.2	0.2	0.2
7	Chhattisgarh	1238738	789440	93.7	82.9	5.7	16.5	0.3	0.3	0.2
8	Dadra & Nagar Haveli #	37655	11190	98.5	95.8	1.4	3.8	0.0	0.3	0.1
9	Daman & Diu #	47631	12251	99.3	98.3	0.6	1.3	0.1	0.1	0.1
10	Goa	198139	138461	97.7	94.7	1.8	4.6	0.3	0.3	0.3
11	Gujarat	5416315	3758028	97.2	93.4	2.1	5.5	0.2	0.5	0.5
12	Haryana	1751901	1075179	96.2	92.9	2.7	6.1	0.7	0.5	0.4
13	Himachal Pradesh	166043	143113	98.1	97.4	1.6	2.2	0.2	0.3	0.1
14	Jammu & Kashmir	517168	390411	98.0	97.9	1.2	1.6	0.6	0.4	0.2
15	Jharkhand	1495642	1060178	88.0	75.6	11.4	23.8	0.5	0.5	0.1
16	Karnataka	5315715	3556960	96.4	90.5	3.1	8.8	0.3	0.4	0.2
17	Kerala	3620696	1652656	97.0	84.3	2.8	15.1	0.2	0.5	0.0
18	Lakshadweep #	8180	3889	99.7	99.7	0.2	0.3	0.1	0.0	0.0
19	Madhya Pradesh	3845232	2794858	92.7	92.3	6.6	7.1	0.4	0.3	0.2
20	Maharashtra	10813928	8069526	96.2	94.3	3.1	5.1	0.3	0.3	0.4
21	Manipur	171400	101302	82.4	82.0	11.2	17.3	5.9	0.5	0.5
22	Meghalaya	116102	90568	94.9	88.1	4.4	10.9	0.3	0.5	0.3
23	Mizoram	116203	81604	98.1	94.4	1.5	5.2	0.3	0.2	0.1
24	Nagaland	115054	66716	97.4	90.3	2.1	8.3	0.3	0.5	0.2
25	NCT of Delhi #	3261423	2384621	99.1	93.4	0.6	5.7	0.2	0.7	0.1
26	Odisha	1517073	1087248	83.1	74.1	15.3	24.3	0.4	0.7	1.2
27	Puducherry #	206143	136456	98.5	91.4	1.3	8.2	0.1	0.2	0.1
28	Punjab	2094067	1489694	98.3	96.5	1.0	2.6	0.3	0.4	0.3
29	Rajasthan	3090940	2185591	93.9	89.6	5.2	9.6	0.5	0.4	0.5
30	Sikkim	35761	13015	98.7	97.1	0.9	2.8	0.1	0.1	0.3
31	Tamil Nadu	8929104	5898836	96.1	88.0	3.4	11.1	0.2	0.4	0.3
32	Tripura	235002	122343	91.6	86.4	7.0	13.0	1.2	0.4	0.2
33	Uttar Pradesh	7449195	5170527	81.4	79.9	17.2	19.3	0.9	0.5	0.4
34	Uttarakhand	592223	390164	96.5	90.9	2.9	8.4	0.4	0.4	0.3
35	West Bengal	6350113	4554045	85.1	79.6	12.7	19.5	1.6	0.6	6.0
	INDIA	**78867951**	**53692376**	**92.7**	**87.6**	**6.5**	**11.6**	**0.5**	**0.5**	**0.3**

Source : Office of the Registrar General

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7.5 SLUM POPULATION

7.5.1 In India, as per 2001 Census, 640 cities/ towns are reporting slums accounting for 42.6 million people living in the slums. The total slum population is 23.1% to the total urban population in these cities.

7.5.2 The large urban cities are the centres of economic growth and contributes significantly to the GDP of the country. Cities with population above 100,000 accounts for 60 % of country's population in 2001. About 17.7 million population lives in the citites with population above one million, which is 41.6 % of the total slum population in the country. In absolute numbers, Greater Mumbai has the highest slum population of around 6.5 million followed by Delhi 1.9 million and Kolkata 1.5 million. The slum areas of Surat, Hyderabad, Chennai and Nagpur have more than half a million population each. **The data on Slum Population in India is available in Tables 7.5.1a -7.5.1 d and 7.5.2.**

Table 7.5.1 (a) : Total urban population, population of cities/town reporting slums and slum population in slum area-India, States, Union Territories- 2001

Sl. No.	State/Uts	Number of cities towns reporting slums	Total urban populaiton of State/Ut	Population of cities/towns reporting slums	Total slum populaiton	percentagte of slum populaiton to total	
						Urban populaiton of States/Ut	Population of cities/towns reporting slums
1	2	3	4	5	6	7	8
1	A & N Islands *	1	116198	99984	16244	14.0	16.2
2	Andhra Pradesh	77	20808940	16090585	5187493	24.9	32.2
3	Assam	7	3439240	1371881	82289	2.4	6.0
4	Bihar	23	8681800	4814512	531481	6.1	11.0
5	Chandigarh*	1	808515	808515	107125	13.2	13.2
6	Chhattisgarh	12	4185747	2604933	817908	19.5	31.4
7	Delhi*	16	12905780	11277586	2029755	15.7	18.0
8	Goa	2	670577	175536	14482	2.2	8.3
9	Gujarat	41	18930250	12697360	1866797	9.9	14.7
10	Haryana	22	6115304	4296670	1420407	23.2	33.1
11	Jammu & Kashmir	5	2516638	1446148	268513	10.7	18.6
12	Jharkhand	11	5993741	2422943	301569	5.0	12.4
13	Karnataka	35	17961529	11023376	1402971	7.8	12.7
14	Kerala	13	8266925	3196622	64556	0.8	2.0
15	Madhya Pradesh	43	15967145	9599007	2417091	15.1	25.2
16	Maharashtra	61	41100980	33635219	11202762	27.3	33.3
17	Meghalaya	1	454111	132867	86304	19.0	65.0
18	Odisha	15	5517238	2838014	629999	11.4	22.2
19	Pudicherry*	3	648619	513010	73169	11.3	14.3
20	Punjab	27	8262511	5660268	1159561	14.0	20.5
21	Rajasthan	26	13214375	7668508	1294106	9.8	16.9
22	Tamil Nadu	63	27483998	14337225	2866893	10.4	20.0
23	Tripura	1	545750	189998	29949	5.5	15.8
24	Uttar Pradesh	69	34539582	21256870	4395276	12.7	20.7
25	Uttarakahand	6	2179074	1010188	195470	9.0	19.3
26	West Bengal	59	22427251	15184596	4115980	18.4	27.1
INDIA		**640**	**283741818**	**184352421**	**42578150**	**15.0**	**23.1**

Source :Slum Population -Census of India, 2001

Note : Himachal Pradesh, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Daman & Diu, Dadra & Nagar Haveli and Lakshadweep have not reported any slums in 2001

* Union Territory

Table 7.5.1 (b) : Total population, slum population in municipal corporations with population above one million- 2001

Sl. No.	Name of Million Plus Municipal Corporations	State/Union territory*	Total populaiton	Total slum populaiton	Percentage of slum population to total population
1	2	3	4	5	6
1	Agra	Uttar Pradesh	1275134	121761	9.5
2	Ahmadabad	Gujarat	3520085	473662	13.5
3	Bangalore	Karnataka	4301326	430501	10.0
4	Bhopal	Madhya Pradesh	1437354	125720	8.7
5	Chennai	Tamil Nadu	4343645	819873	18.9
6	Delhi*	Delhi*	9879172	1851231	18.7
7	Faridabad	Haryana	1055938	490981	46.5
8	Greater Mumbai	Maharashtra	11978450	6475440	54.1
9	Haora (Howrah)	West Bengal	1007532	118286	11.7
10	Hyderabad	Andhra Pradesh	3637483	626849	17.2
11	Indore	Madhya Pradesh	1474968	260975	17.7
12	Jaipur	Rajasthan	2322575	368570	15.9
13	Kalyan-Dombivli	Maharashtra	1193512	34860	2.9
14	Kanpur	Uttar Pradesh	2551337	367980	14.4
15	Kolkatta	West Bengal	4572876	1485309	32.5
16	Lucknow	Uttar Pradesh	2185927	179176	8.2
17	Ludhiana	Punjab	1398467	314904	22.5
18	Meerut	Uttar Pradesh	1068772	471581	44.1
19	Nagpur	Maharashtra	2052066	737219	35.9
20	Nashik	Maharashtra	1077236	138797	12.9
21	Patna	Bihar	1366444	3592	0.3
22	Pimpri Chinchwad	Maharashtra	1012472	123957	12.2
23	Pune	Maharashtra	2538473	492179	19.4
24	Surat	Gujarat	2433835	508485	20.9
25	Thane	Maharashtra	1262551	351065	27.8
26	Vadodara	Gujarat	1306227	186020	14.2
27	Varanasi	Uttar Pradesh	1091918	137977	12.6
Total			**73345775**	**17696950**	**24.1**

Source :Slum Population -Census of India, 2001

Table 7.5.1 (c) : Population of scheduled castes and scheduled tribes living in slum areas and their proportion to the total slum population-State/Union territory reporting slum population-2001

Sl. No	State/Uts	Population in slum areas		Percentage of populaiton in slum areas		Percentage of populaiton in urban areas	
		Scheduled Castes population	Scheduled Tribes populaiton	Scheduled Caste	Scheduled Tribes	Scheduled Castes	Scheduled Tribes
1	2	3	4	5	6	7	8
1	A & N Island *	NSC	24	0.0	0.1	0.0	0.9
2	Andhra Pradesh	767272	130997	14.8	2.5	10.2	1.8
3	Assam	12355	211	15.0	0.3	7.9	4.5
4	Bihar	94523	7724	17.8	1.5	10.0	0.5
5	Chandigarh*	41869	NST	39.1	0.0	17.7	0.0
6	Chhattisgarh	143533	64945	17.5	7.9	12.4	8.4
7	Delhi*	552784	NST	27.2	0.0	16.7	0.0
8	Goa	294	7	2.0	0.0	1.9	0.1
9	Gujarat	259986	83741	13.9	4.5	7.5	3.2
10	Haryana	267975	NST	18.9	0.0	14.4	0.0
11	Jammu & Kashmir	17147	1091	6.4	0.4	5.3	2.0
12	Jharkhand	26105	50425	8.7	16.7	10.0	9.8
13	Karnataka	339218	64863	24.2	4.6	12.0	2.9
14	Kerala	4870	120	7.5	0.2	6.9	0.2
15	Madhya Pradesh	510034	91399	21.1	3.8	14.0	4.9
16	Maharashtra	1292808	284010	11.5	2.5	9.2	2.7
17	Meghalaya	720	43843	0.8	50.8	0.9	68.3
18	Odisha	108961	72763	17.3	11.5	12.7	8.1
19	Pudicherry*	18255	NST	24.9	0.0	10.7	0.0
20	Punjab	331320	NST	28.6	0.0	20.7	0.0
21	Rajasthan	349473	52763	27.0	4.1	14.8	2.9
22	Tamil Nadu	744558	14196	26.0	0.5	12.9	0.4
23	Tripura	7136	619	23.8	2.1	18.3	4.7
24	Uttar Pradesh	898790	2495	20.4	0.1	12.5	0.0
25	Uttarakhand	44865	362	23.0	0.2	12.0	0.7
26	West Bengal	567522	50810	13.8	1.2	13.1	1.2
	INDIA	**7402373**	**#VALUE!**	**17.4**	**2.4**	**11.8**	**2.2**

Source :Slum Population -Census of India, 2001
Note : In case of Himachal Pradesh, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Daman & Diu, Dadra & Nagar Haveli and Lakshadweep no slum population has been reported at the Census of India - 2001
NSC : No notified Scheduled Castes, NST : No notified Scheduled Tribes.
* Union Territory

Table 7.5.1 (d) : Population and percentage of scheduled castes and scheduled tribes population living in slums in million plus cities -2001

Sl. No.	Name of Million Plus Municipal Corporations	State/Union territory*	Slum Population		Percentage of populaton in slum		Percentage of populaiton in urban areas	
			Scheduled Castes	Scheduled Tribes	Scheduled Caste	Scheduled Tribes	Scheduled Castes	Scheduled Tribes
1	2	3	3	4	5	6	7	8
1	Agra	Uttar Pradesh	39054	22	32.1	Neg	21.5	Neg
2	Ahmadabad	Gujarat	95633	6692	20.2	1.4	12.1	1.0
3	Bangalore	Karnataka	139920	6957	32.5	1.6	11.1	1.1
4	Bhopal	Madhya Pradesh	36073	5794	28.7	4.6	12.4	3.0
5	Chennai	Tamil Nadu	269301	1830	32.8	0.2	13.8	0.2
6	Delhi*	Delhi*	483640	NST	26.1	0.0	15.8	0.0
7	Faridabad	Haryana	57763	NST	11.8	0.0	9.1	0.0
8	Greater Mumbai	Maharashtra	385626	56567	6.0	0.9	4.9	0.8
9	Haora(Howrah)	West Bengal	9430	368	8.0	0.3	4.8	0.4
10	Hyderabad	Andhra Pradesh	89860	8875	14.3	1.4	7.4	0.9
11	Indore	Madhya Pradesh	61244	4429	23.5	1.7	13.7	2.5
12	Jaipur	Rajasthan	90607	19957	24.6	5.4	12.6	3.7
13	Kalyan-Dombivli	Maharashtra	7111	323	20.4	0.9	5.8	2.1
14	Kanpur	Uttar Pradesh	84255	786	22.9	0.2	11.1	0.1
15	Kolkatta	West Bengal	92812	2507	6.2	0.2	6.0	0.2
16	Lucknow	Uttar Pradesh	24943	107	13.9	0.1	10.1	0.1
17	Ludhiana	Punjab	47917	NST	15.2	0.0	13.1	0.0
18	Meerut	Uttar Pradesh	111345	25	23.6	Neg	16.3	Neg
19	Nagpur	Maharashtra	151111	107936	20.5	14.6	16.7	8.9
20	Nashik	Maharashtra	44198	16749	31.8	12.1	12.5	6.8
21	Patna	Bihar	944	0	26.3	0.0	8.5	0.3
22	Pimpri Chinchwad	Maharashtra	50607	2355	40.8	1.9	13.9	1.9
23	Pune	Maharashtra	125127	5264	25.4	1.1	11.8	1.0
24	Surat	Gujarat	30112	36236	5.9	7.1	3.6	3.5
25	Thane	Maharashtra	23722	10955	6.8	3.1	4.6	2.5
26	Vadodara	Gujarat	20765	12823	11.2	6.9	6.6	3.6
27	Varanasi	Uttar Pradesh	16622	0	12.0	0.0	7.2	0.0
Total			**2589742**	**307557**	**14.6**	**1.7**	**10.3**	**1.2**

Source :Slum Population -Census of India, 2001

NST : No notified Scheduled Tribes Neg : Negligible population

Table 7.5.2 : 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
	Ahmedabad	25.480	5.172	20.3	33.122	6.724 @	20.3	43.629	8.859	20.3
1	Bangalore	29.218	3.650	12.5	41.303	5.162	12.5	63.597	7.949	12.5
2	Bhopal	6.710	0.568	8.5	10.628	1.487 **	14.0	15.327	2.145	14.0
3	Chennai	42.893	13.769	32.1	54.220	15.251	28.1	69.823	19.620	28.1
4	Cochin	8.249	2.046	24.8	11.406	2.829 @	24.8	15.364	3.810	24.8
5	Coimbatore	9.204	0.801 +	8.7	11.007	0.958	8.7	13.283	1.156	8.7
6	Delhi	57.228	18.000	31.5	84.191	22.480	26.7	122.204	32.628	26.7
7	Greater Mumbai	89.887	30.831	34.3	125.962	43.205 @	34.3	170.701	58.550	34.3
8	Hyderabad	25.500	5.000	19.6	43.444	8.593	19.8	62.964	12.466	19.8
9	Indore	8.293	1.263	15.2	11.091	1.686 @	15.2	15.430	2.345	15.2
10	Jaipur	10.152	2.958	29.1	15.182	4.418 @	29.1	22.108	6.433	29.1
11	Kanpur	16.391	6.140	37.5	20.299	4.172	20.6	24.875	5.124	20.6
12	Kolkata	91.940	30.280	32.9	110.219	36.262 @	32.9	131.147	43.147	32.9
13	Lucknow	10.076	2.850	28.3	16.692	2.778	16.6	22.581	3.748	16.6
14	Ludhiana	6.071	3.104	51.1	10.427	3.687	35.4	16.342	5.785	35.4
15	Madurai	9.077	1.634 +	18.0	10.859	1.953	18.0	13.134	2.364	18.0
16	Nagpur	12.195	3.890	31.9	16.640	5.308 @	31.9	23.212	7.405	31.9
17	Patna	9.189	5.837	63.5	10.996	6.982 @	63.5	15.273	9.698	63.5
18	Pune	17.222	2.807	16.3	24.940	4.065 @	16.3	35.299	5.753	16.3
19	Surat	9.239	2.347	25.4	15.190	3.858 @	25.4	22.916	5.821	25.4
20	Vadodara	7.449	1.182	15.9	11.268	2.063	18.3	17.074	3.125	18.3
21	Varanasi	7.972	2.600	32.6	10.309	2.074	20.1	13.314	2.676	20.1
22	Vishakhapatnam	6.036	1.520	25.2	10.571	2.664	25.2	16.683	4.204	25.2
23										
Total		**490.191**	**143.077**	**29.2**	**676.844**	**181.935**	**26.9**	**922.651**	**245.952**	**26.7**

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. * : Estimated

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

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

7.6 SOLID WASTE AND HAZARDOUS MATERIAL MANANGEMENT

7.6.1 The categorisation of hazardous waste viz-a-viz respective regulatory is detaild in table 7.6.1

Table 7.6.1 : 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 : Central Pollution Control Board

7.6.2 When solid waste is not collected and disposed of efficiently and effectively, it attracts rodents and flies which 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.

7.6.3 **The State wise Status of hazardous waste generation in India can be assessed from the table 7.6.2**

7.6.4 **The details of quantities and waste generation rates (table 7.6.3), waste characterization (table 7.6.4) and status of landfill sites (table 7.6.5) in 59 cities as per a survey conducted by CPCB in the year 2004-05.**

Table 7.6.2 : State-wise status of hazardous waste generation

Sl. NO.	STATE/UT	Quantity of Hazardous Waste Generation			
		Landfill able	Incinerable	Recyclable	Total
1	2	3	4	5	6
1	Andhra Pradesh	211442	31660	313217	556319
2	Assam	3252		7480	10732
3	Bihar	3357	9	73	3439
4	Chattisgarh	5277	6897	283213	295387
5	Delhi (unverified)	3338	1740	203	5281
6	Gujarat	1107128	108622	577037	1792787
7	Goa	10763	8271	7614	26648
8	Haryana	30452	1429	4919	36800
9	Himachal Pradesh	35519	2248	4380	42147
10	Jammu & Kashmir	9946	141	6867	16954
11	Jharkhand	23135	9813	204236	237184
12	Karnataka	18366	3713	54490	76569
13	Kerala	59591*	223	23085	82899*
14	Madhya Pradesh	34945	5036	127909	167890
15	Maharashtra	568135	152791	847442	1568368
16	Manipur	-	115	137	252
17	Meghalaya	19	697	6443	7159
18	Mizoram	90	Nil	12	102
19	Nagaland	61	Nil	11	72
20	Odisha	74351	4052	18427	96830
21	Punjab	13601	14831	89481	117913
22	Rajasthan	165107	23025	84739	272871
23	Tripura	0	30	237	267
24	Tamil Nadu	157909	11145	89593	258647
25	Uttar Pradesh	36370	15697	117227	169294
26	Uttarakhand	17991	580	11	18582
27	West Bangal	120598	12583	126597	259777
	Union Territory				
28	Daman, Diu, Dadra & NH	17219	421	56350	73990
29	Puducherry	132	25	36235	36392
30	Chandigarh	232	-	723	955
	Total	**2728326**	**415794**	**3088387**	**6232507**

Source: Central Pollution Control Board, Hazardous Waste Management Division Delhi, Feb., 2009

Table 7.6.3 : Quantities and waste generation rates in 59 cities

Sl. No.	Name of city	Population (as per 2001 census)	Area (Sq. Km)	Waste Quantity (Tonnes Per Day)	Waste generation rate (Kcal/day)
1	Agartala	189998	63	77	0.40
2	Agra	1275135	140	654	0.51
3	Ahemdabad	3520085	191	1302	0.37
4	Aizwal	228280	117	57	0.25
5	Allahabad	975393	71	509	0.52
6	Amritsar	966862	77	438	0.45
7	Asansol	745439	127	207	0.44
8	Bangalore	4301326	226	1669	0.39
9	Bhopal	1437354	286	574	0.40
10	Bhubaneswar	648032	135	234	0.36
11	Chandigarh	808515	114	326	0.40
12	Chennai	4343645	174	3036	0.62
13	Coimbatore	930882	107	530	0.57
14	Daman	35770	7	15	0.42
15	Dehradun	426674	67	131	0.31
16	Delhi'	10306452	1483	5922	0.57
17	Dhanbad	199258	24	77	0.39
18	Faridabad	1055938	216	448	0.42
19	Gandhinagar	195985	57	44	0.22
20	Gangtok	29354	15	13	0.44
21	Greater Mumbai	11978450	437	5320	0.45
22	Guwahati	809895	218	166	0.20
23	Hyderabad	3843585	169	2187	0.57
24	Impal	221492	34	43	0.19
25	Indore	1474968	130	557	0.38
26	Itanagar	35022	22	12	0.34
27	Jabalpur	932484	134	216	0.23
28	Jaipur	2322575	518	904	0.39
29	Jammu	369659	102	215	0.58
30	Jamshedpur	1104713	64	338	0.31
31	Kanpur	2551337	267	1100	0.43
32	Kavarati	10119	4	3	0.30
33	Kochi	595575	98	400	0.67
34	Kohima	77030	30	13	0.17
35	Kolkata	4572876	187	2653	0.58
36	Lucknow	2185927	310	475	0.22
37	Ludhiana	1398467	159	735	0.53
38	Madurai	928868	52	275	0.30
39	Meerut	1068772	142	490	0.46
40	Nagpur	2052066	218	504	0.25
41	Nashik	1077236	269	200	0.19
42	Panjim	69066	69	32	0.54
43	Patna	1366444	107	511	0.37
44	Pondicherry	220865	19	130	0.59
45	Port Blair	99984	18	76	0.76
46	Pune	2538473	244	1175	0.46
47	Raipur	605747	56	184	0.30
48	Rajkot	967476	105	207	0.21
49	Ranchi	847093	224	208	0.25
50	Shillong	132867	10	45	0.34
51	Silvassa	50463	17	16	0.32
52	Simla	142555	20	39	0.27
53	Srinagar	989440	341	428	0.48
54	Surat	2433835	112	1000	0.41
55	Tiruvananantapuram	744983	142	171	0.23
56	Vadodara	1306227	240	357	0.27
57	Varanasi	1091918	80	425	0.39
58	Vijaywada	851282	58	374	0.44
59	Vishakhapatnam	982904	110	584	0.59

Source:Central Pollution Control Board (CPCB)

CPCB with the assistance of NEERI conducted survey of sloid waste management in 59 cities (35 metro cities and 24 State capital - 2004-05)

Table 7.6.4 : Waste characterisation in 59 cities						
Sr. No.	Name of City	Compostables (%)	Recyclables (%)	C/N Ratio	HCV* (Kcal/Kg)	Moisture in (%)
1	2	3	4	5	6	7
1	Agartala	58.57	13.68	30.02	2427	60
2	Agra	46.38	15.76	21.56	520	28
3	Ahemdabad	40.81	11.65	29.64	1180	32
4	Aizwal	54.24	20.97	27.45	3766	43
5	Allahabad	35.49	19.22	19.00	1180	18
6	Amritsar	65.02	13.94	30.69	1836	61
7	Asansol	50.33	14.21	14.08	1156	54
8	Bangalore	51.84	22.43	35.12	2386	55
9	Bhopal	52.44	22.33	21.58	1421	43
10	Bhubaneswar	49.81	12.69	20.57	742	59
11	Chandigarh	57.18	10.91	20.52	1408	64
12	Chennai	41.34	16.34	29.25	2594	47
13	Coimbatore	50.06	15.52	45.83	2381	54
14	Daman	29.60	22.02	22.34	2588	53
15	Dehradun	51.37	19.58	25.90	2445	60
16	Delhi'	54.42	15.52	34.87	1802	49
17	Dhanbad	46.93	16.16	18.22	591	50
18	Faridabad	42.06	23.31	18.58	1319	34
19	Gandhinagar	34.30	13.20	36.05	698	24
20	Gangtok	46.52	16.48	25.61	1234	44
21	Greater Mumbai	62.44	16.66	39.04	1786	54
22	Guwahati	53.69	23.28	17.71	1519	61
23	Hyderabad	54.20	21.60	25.90	1969	46
24	Impal	60.00	18.51	22.34	3766	40
25	Indore	48.97	12.57	29.30	1437	31
26	Itanagar	52.02	20.57	17.68	3414	50
27	Jabalpur	58.07	16.61	28.22	2051	35
28	Jaipur	45.50	12.10	43.29	834	21
29	Jammu	51.51	21.08	26.79	1782	40
30	Jamshedpur	43.36	15.69	19.69	1009	48
31	Kanpur	47.52	11.93	27.64	1571	46
32	Kavarati	46.01	27.20	18.04	2242	25
33	Kochi	57.24	19.36	18.22	591	50
34	Kohima	57.48	22.67	30.84	2844	65
35	Kolkata	50.56	11.48	31.81	1201	46
36	Lucknow	47.41	15.53	21.41	1557	60
37	Ludhiana	49.80	19.32	52.17	2559	65
38	Madurai	55.32	17.25	32.69	1813	46
39	Meerut	54.54	10.96	19.24	1089	32
40	Nagpur	47.41	15.53	26.37	2632	41
41	Nashik	39.52	25.11	37.20	2762	62
42	Panjim	61.75	17.44	23.77	2211	47
43	Patna	51.96	12.57	18.62	819	36
44	Pondicherry	49.96	24.29	36.86	1846	54
45	Port Blair	48.25	27.66	35.88	1474	63
46	Pune	62.44	16.66	35.54	2531	63
47	Raipur	51.40	16.31	22.35	1273	30
48	Rajkot	41.50	11.20	52.56	687	17
49	Ranchi	51.49	9.86	20.23	1060	49
50	Shilong	62.54	17.27	28.86	2736	63
51	Silvassa	71.67	13.97	35.24	1281	42
52	Simla	43.02	36.64	23.76	2572	60
53	Srinagar	61.77	17.76	22.46	1264	61
54	Surat	56.87	11.21	42.16	990	51
55	Tiruvananantapuram	72.96	14.36	35.19	2378	60
56	Vadodara	47.43	14.50	40.34	1781	25
57	Varanasi	45.18	17.23	19.40	804	44
58	Vijaywada	59.43	17.40	33.90	1910	46
59	Vishakhapatnam	45.96	24.20	41.70	1602	53

Source :Central Pollution Control Board (CPCB)
CPCB with the assistance of National Environmental Engineering Research Institute (NEERI)conducted sourvey of solid waste management in 59 cities (35 metro cities and 24 State capital -2004-05)
HCV : High colorific value
C/N Ratio : Carbon to Nitrogen Ratio

Table 7.6.5 : Status of landfill sites in 59 cities					
Sr. No.	Name of City	No. of landfill sites	Area of landfill (ha)	Life of landfill (years)	New site proposed
1	2	3	4	5	6
1	Agartala	1	6.80	14	Yes
2	Agra	1	1.50	30	No
3	Ahemdabad	1	84.00	30	Yes
4	Aizwal	1	-	-	No
5	Allahabad	2	-	-	No
6	Amritsar	1	-	-	Yes
7	Asansol	1	2.00	7	No
8	Bangalore	2	40.70	-	No
9	Bhopal	1	-	-	No
10	Bhubaneswar	4	-	-	Yes
11	Chandigarh	1	18.00	-	No
12	Chennai	2	465.50	1	No
13	Coimbatore	2	292.00	-	No
14	Daman	2	-	-	No
15	Dehradun	1	4.5	-	Yes
16	Delhi'	3	66.40	-	No
17	Dhanbad	3	-	-	No
18	Faridabad	3	2.40	-	No
19	Gandhinagar	-	-	-	Yes
20	Gangtok	1	2.80	-	No
21	Greater Mumbai	3	140.00	-	No
22	Guwahati	1	13.2	-	No
23	Hyderabad	1	121.50	-	No
24	Imphal	1	-	-	No
25	Indore	1	59.50	-	No
26	Itanagar	1	-	-	No
27	Jabalpur	1	60.70	-	Yes
28	Jaipur	3	31.40	-	No
29	Jammu	1	-	10	Yes
30	Jamshedpur	2	4.10	-	No
31	Kanpur	1	27.00	-	No
32	Kavarati	1	0.20	-	No
33	Kochi	1	-	-	No
34	Kohima	1	-	-	No
35	Kolkata	1	24.70	35	Yes
36	Lucknow	1	1.40	3	Yes
37	Ludhiana	1	40.4	-	No
38	Madurai	1	48.60	35	No
39	Meerut	2	14.20	-	No
40	Nagpur	1	-	-	No
41	Nashik	1	34.40	15	No
42	Panjim	1	1.20	30	No
43	Patna	-	-	-	Yes
44	Pondicherry	-	-	-	Yes
45	Port Blair	1	0.20	6	Yes
46	Pune	1	-	-	No
47	Raipur	1	14.60	-	Yes
48	Rajkot	2	1.20	-	Yes
49	Ranchi	1	15.00	-	No
50	Shillong	1	-	-	No
51	Silvassa	1	-	-	No
52	Simla	1	0.60	-	No
53	Srinagar	1	30.40	-	No
54	Surat	1	200.00	-	No
55	Thiruvananthpuram	1	12.15	-	No
56	Vadodara	1	8.1	-	Yes
57	Varanasi	1	2.00	-	Yes
58	Vijayawada	-	-	-	No
59	Vishakhapatnam	1	40.5	25	No

Source :Central Pollution Control Board (CPCB)
CPCB with the assistance of NEERI conducted survey of solid waste management in 59 cities (35 metro cities and 24 State capital -2004-05)

Table 7.7.1: Criteria for direct disposal of hazardous waste into secured landfill

Leachate Quality	Concentration	
pH	,4-12	
Total Phenols	<100	mg./l.
Arsenic	<1	mg./l.
Lead	<2	mg./l.
Cadmium	<0.2	mg /l.
Chromium-VI	<0.5	mg./l.
Copper	<10	mg./l.
Nickel	<3	mg./l.
Mercury	<0.1	mg./l.
Zinc	<10	mg./l.
Fluoride	<50	mg./l.
Ammonia	<1,000	mg./l.
Cyanide	<2	mg./l
Nitrate	<30	mg./l
Absorbable organic bound Chlorine	<3	mg./l
Water soluble compounds except salts	<10	%
Strength		
Transversal Strength (Vane Testing)	>25	KN/m2
Unconfined Compression Test	>50	KN/m2
Axial Deformation	<20	%
Degree of Mineralization or Content of Organic Materials (original sample)		
Annealing loss of the dry residue at 550^{o}	C <20	Wt. % (for non- biodegradable waste) <5 Wt. % (for biodegradable waste)
Extractable Lipophylic contents (Oil & Grease)	<4	Wt. %

Source: CPCB-2010, Hazardous waste management series/2010-11

Note:

1). leachate quality is based on water leachate test i.e. Leachability tests are conducted by preparing a suspension of waste and water i.e. taking 100 gm of waste and filling up to 1 liter with distilled water, stirring or shaking for 24 hrs, filtering the solids and analyzing the filtrate.

2) Calorific value of the land disposable hazardous waste should be less than 2500 K. Cal/Kg

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)

Tot. Dis. : Total Dissolved Tot. kj : Total Killo joule

7.8 PLASTICS WASTE MANAGEMENT

Plastic waste has attracted widespread attention in India, particularly in the last five years, due to the widespread littering of plastics on the landscape of India. The environmental issues due to plastic waste arise predominantly due to the throwaway culture that plastics propagate, and also the lack of an efficient waste management system.

7.8.1 Plastics are difficult to destroy and are classified as non- bio degradable. 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. Stringent measures lare required to be taken by the States to reduce the menace of Pollution through Plastic waste.

7.8.2. The status of management of plastic waste is depicted in table 7.8.3

Table 7.8.1 :Plastic waste management status in India

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, CPCB