Compendium
of
Environment Statistics India - 2015

Government of India
Ministry of Statistics & Programme Implementation
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Preface

The Central Statistics Office, Ministry of Statistics and Programme Implementation is bringing out rgular 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. This issue is Sixteenth edition in the series.

Through this annual publication, Central Statistics Office is trying to bring out the environment related data to the extent which exhibit the pattern of changes and their magnitude in the Indian context. It has been our endeavour to bring more disaggregated data as per the requirement of users. The Compendium is expected to serve the needs of Environment planners and policy makers as well as other Government and Non-Government organisations and research institutions working in the field. It is expected that the readers will find this publication useful.

The data given in this publication is based on the information provided by the Union Government Ministries / Departments / Organisations and their published records / websites. I express my deep gratitude to all data source agencies which contributed the valuable data / information and supported our efforts to bring out the publication.

I thank Shri Krishna Kumar, Deputy Director General, Shri James Mathew, Director, Shri Rakesh Kumar Maurya, Director, Ms. Soumya P. Kumar, Deputy Director, Ms. Avneet Kaur, Deputy Director and Shri Rajesh Kumar Panwar, Senior Statistical Officer, Ms. Kulpreet Sokhi, Junior Statistical Officer, who have put in commendable efforts in bringing out this Publication in its present form.

I hope the Compendium will be found useful by these involved in the policy, planning, management, administration and research in the areas related to environment.

Suggestions/comments for improvement of the Publication will be highly appreciated and may be sent at ddg.ssd-mospi@nic.in.

Amarjeet

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CHAPTER ONE

ENVIRONMENT STATISTICS: FRAME WORK AND INDICATORS

1.1 Introduction

Universally the rapid pace of economic growth has been accompanied by resource depletion and environmental degradation. Air and water pollution, water scarcity, desertification, and the depletion of natural resources are beginning to have an adverse impact on almost all forms of economic activity by causing frequent disasters such as floods and landslides, and generally diminishing the quality of life in the region. To address those problems, a broad-based program of environmental policies and regulations is needed. Such programs require that we collect and compile authentic environment data for use by government officials and other decision makers. Data relating to existing environmental conditions is crucial for environmental planning and decision making. India is in the path of a rapid economic development and will therefore need to vigorously collect and collate environment statistics.

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

GDP and per capita income are the standard indicators for measuring the economic progress of the country. 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. Globally, environmental degradation is manifesting itself through the loss of fertile soils, desertification, decreasing forest cover, reduction of fresh water availability, and an extreme loss of bio-diversity. These are serious consequences, and it has become clear today that economic development must be environmentally sustainable. Table 1.3.2 below gives some impacts of development activities on environment.

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 agreed on the List of environmental and related socioeconomic indicators given below.

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	% of urban population exposed to concentrations of SO_2, particulates, ozone, CO and Pb		Population living in absolute poverty Adult literacy rate

	Calorie supply per capita	Infant mortality rate Incidence of environmentally related diseases		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 of marine species Loading of N and P		

	Discharges of oil into coastal waters	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 urbanpopulation** **% 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 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 in 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 CSO(SSD) was a member of the Expert Group.

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.

Chart1.4.1: Component of FDES 2013

Chart 1shows 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 1.4.1: 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: **Environment Protection, Management and Engagement**	Sub-component 6.1: 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.

The Compendium of Environment Statistics will be revised in consistent with the revised UN frame work.UN Statistics Division (UNSD) is in the process of developing a work plan for its implementation. An Expert Group on Environment Statistics was established in December 2013. India is also participating in the work of the Expert Group on Environment Statistics, which is assisting the Statistics Division in methodological development, in particular with the Manual on the Basic Set of Environment Statistics that will provide detailed guidance on how to compile environment statistics. The Expert Group held its second meeting in New York in March 2015.

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CHAPTER TWO

DEVELOPMENT OF ENVIRONMENT STATISTICS IN INDIA

2.1 Introduction

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, 2011,2012,2013 and 2014 presenting available data relating to environment of the country. The present issue is sixteenth in its series covering the data upto 2015. 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 Environmental-Economic Accounting

Environmental-Economic Accounting describes the interaction between the economy and the environment, and the stocks and changes in stocks of environmental assets. While System of National Accounts (SNA) provides a comprehensive accounting framework for analyzing and evaluating the performance of an economy, a growing recognition that contemporary national accounts has limitations in the sense that these accounts do not take into consideration all aspects of economic evaluation e.g.: human capital, environment. Often, economic policies designed to promote growth have been implemented without considering their full environmental consequences, presumably on the assumption that these consequences would either take care of themselves or

could be dealt with separately. There is evidence to suggest that such policies may actually result in a net decrease in human well-being. Globally, environmental degradation is manifesting itself through the loss of fertile soils, desertification, decreasing forest cover, reduction of fresh water availability, and an extreme loss of bio-diversity. These are serious consequences, and it has become clear today that economic development must be environmentally sustainable. Contemporary national accounts systems do not adequately account for the costs arising out of the use of environmental and natural resources . The pursuit of growth can be at the cost of degradation of environment.

As a possible solution to the limitations of national income accounting, integrated environmental and economic accounting has emerged as a new concept. The main objectives of this concept are segregation and elaboration of all environmental and economic accounts with assessment of environmental costs and benefits, and accounting for the maintenance of tangible wealth**.**

Evolution of Environmental-Economic Accounting in India

As a first global initiative to account the Environmental costs, UNSD published the Handbook of National Accounting-Integrated Environmental and Economic Accounting in 1993 as an Interim version. In 2012 UN Statistical Commission has accepted System of Environmental Economic Accounts(SEEA) Central Framework as an International statistical standard.

The SEEA is a multipurpose system and is relevant in a number of ways for policy development and evaluation as well as decision-making. First, the summary information (provided in the form of aggregates and indicators) can be applied to issues and areas of the environment that are the focus of decision makers. Second, the detailed information, which covers some of the key drivers of change in the environment, can be used to provide a richer understanding of the policy issues. Third, data contained in the SEEA can be used in models and scenarios designed to assess the national and international economic and environmental effects of different policy scenarios within a country, between countries and at a global level. While the SEEA Central Framework is a system conceived as an integrated, internally consistent series of accounts, its design is such that it can be implemented equally well in part or as a whole. Depending upon the specific environmental issues faced, a country may choose to implement only a selection of the accounts included in the SEEA Central Framework. Even if a country desires eventually to implement the full system, it may decide to focus its initial efforts on those accounts that are most relevant to current issues.

Expert Group chaired by Sir Partha Dasgupta

An Expert Group under the Chairmanship of Professor Sir Partha Dasgupta, was set up in 2011 to develop a framework of green national accounts and prepare a roadmap for India to implement the framework. The Expert Group submitted its Report in March, 2013.The report is available in the MOSPI website: mospi.gov.in.

Recent Developments

Subsequent to the International Workshop held in New Delhi, the report of

Expert Group on Green National Accounts in India and the recommendations from Workshop were discussed in the National Statistical Commission. Taking inputs from the report of the Expert Group and also SEEA-Central Framework, the Central Statistics Office (CSO) has identified a list of indicators/statistics for compilation of asset accounts for the selected sectors. Framework for compilation of asset Accounts for selected sectors also were prepared based on SEEA Central Framework. The list of identified indicators and statistics has been shared with the concerned Union Ministries and other data source agencies for making an assessment of data availability and also to look into various related aspects with a view to make the requisite data available to Central Statistical Office.

Interaction with Ministries of Water Resources, Petroleum & Natural Gas, Agriculture, Environment and Forests was held on 24th Sep.2014. Ministries have informed about present state of availability of data and agreed to provide available data. Regular interaction with Union Ministries and other data source agencies is planned. The list of indicators and statistics has also been shared with international statistical community in the meeting of the London Group on Environmental Accounting held in New Delhi during 15-17 October 2014.

London Group Meeting on Environmental Economic Accounting

The 20th meeting of London Group on Environmental Accounting was held in New Delhi during 15-17 October 2014. The meeting was attended by about 40 international delegates and experts. The Indian participants included the senior officers of Central Statistics Office (CSO) and from various Ministries of Government of India.

The three day meeting had detailed deliberations on implementation of SEEA Central Framework, current initiatives related to harmonizing and integrating national and environmental accounts, development of indicators in the context of Post 2015 Development agenda, current developments in Ecosystem Accounting and provide input in the guidelines on the SEEA Experimental Ecosystem Accounting that are currently being developed and discuss how countries and international agencies can work together more effectively to build capacity.

Inter-Ministerial Group on Environmental Economic Accounting

An Inter-Ministerial Group (IMG) on Environmental Economic Accounting was constituted under the chairmanship of DG, CSO on 28.1.2015. The first meeting of the IMG was held on 4.3.2015.

In the IMG meeting Ministries were requested to provide their assessment based on the following criteria.

i. Data available through the official statistical system may only be considered.
ii. The account needs to be generated on annual basis (Financial Year). However, certain accounts also could be generated (based on the data availability with lesser frequency than a year).
iii. Ministries are required to compile the accounts in the SEEA-CF format and send it to CSO as per the specific periodicity.
iv. Monetary valuation of environmental assets will be required for integrating it into national accounts system.

v. Data is required for preparation of Asset Accounts, Physical Supply and Use Tables (PSUT) and Monitory Supply and Use Tables(MSUT) for each sector.
vi. For certain sectors like Agriculture, Energy, Waste and Emissions, SEEA framework is under development.

From the discussion in the meeting and inputs / feedback received from the Ministries, the following facts emerged.

(i) All Ministries/Organisations have welcomed and supported the efforts of CSO for compilation of the Environmental Economic Accounts and agreed that such accounts will help in assessing the environmental degradation and depletion of environmental assets and its integration with National Accounts Statistics.

(ii) The existing data collection systems in the Ministries are to be oriented to meet the data requirements for SEEA-CF. Data requirements are huge and they are required on regular basis for compilation of Environmental accounts. The present data system is not in a position to support this requirement and therefore, it needs a massive re-orientation in terms of efforts for collection, compilation and dissemination.

(iii) There is a need to formulate a well coordinated National Statistical effort around the overall objective of modernizing statistics and strengthening national statistical systems in order to respond more effectively and efficiently to the new requirements, such as Environmental Economic Accounting.

(iv) While Ministries will make efforts to explore the possibility of compiling the accounts and eventually develop action plan to fill up the data gaps, it would be difficult to draw a time frame for all the accounts under SEEA-CF keeping in view of the existing data gaps.

(v) In general, the Group, while highlighting the importance of the Environmental Economic Accounting, suggested to take a pragmatic approach towards this new area, where international standards are just recently developed, to guide the collection/compilation of the relevant statistics for an initial period of time until the system is standardized in the country. This would allow for testing and developing the statistical standards for the accounting. In this regard, the Group noted the importance of metadata to provide necessary explanation on the methodologies used for the data collection for the benefit of users to bring transparency of the data collection methods.

(vi) It was also pointed out that the SEEA is yet to be developed in certain sectors like Agriculture, Forestry, Emissions, Waste, Energy, etc. Hence the compilation of complete Environmental Economic Accounts as envisaged in the UN Statistical Commission's SEEA-CF is not feasible in short term.

(vii) Issue of Statistical Capacity Development in this new area is to be addressed by CSO.

Based on the discussion, it was agreed that

(i) Ministries and related organisations will continue their efforts to develop the Environmental - Economic Accounting Tables pertaining to their respective sectors. Ministries may develop a phase wise programme wherein accounts for sectors/components for which regular data are now available may be

attempted now and compilation of trial asset accounts may be explored. A suitable institutional mechanism to fill up the data gaps in other sectors/components would be developed by the concerned Ministries in due course.

(ii) CSO may devise appropriate training programme for officers of various concerned Ministries involved in the compilation of the accounts.

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CHAPTER THREE
BIODIVERSITY

3.1 Biodiversity

3.1.1 According to United Nations Environment Programme, Biodiversity (Biological diversity) reflects the number, variety and variability of living organisms and how these change from one location to another and over time. Biodiversity includes diversity within species (genetic diversity),between species (species diversity), and between ecosystems (ecosystem diversity). Biodiversity is essential for the benefits the ecosystems can provide to humans and hence for human well-being. Its role goes beyond ensuring the availability of raw materials to include security, resiliency, social relations, health and freedoms and choices.

3.1.2 India has taken significant steps in concerning it's vast and diverse biological heritage. India is one of the richest countries in the world in terms of biodiversity. This natural variation in life is also reflected in the demography of the land. A biodiversity hotspot is a biogeographic region with a significant reservoir of biodiversity that is under from humans. To qualify as a biodiversity hotspot on Myers 2000 edition of the hotspot-map, a region must meet two strict criteria: It must contain at least 0.5% or 1500 species of vascular plants as endemics, and it has to have lost at least 70% of its primary vegetation. Around the world, at least 34 areas qualify under this definition. Of the 34 global biodiversity hotspots, four are present in India, represented by the Himalaya, the Western Ghats, the North-east, and the Nicobar Islands.

3.1.3. 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 zealous participant in international efforts of biodiversity conservation like the Convention on International Trade in Endangered Species (CITES), the Convention on Biodiversity (CBD) and the country has evolved a National Action Plan for Combating Climate Change.

3.1.4 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 endeavouring to balance the two.

3.1.5 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.

3.1.6 India has devised a biogeographic classification for conservation planning, and has mapped biodiversity-rich areas in the country. Within India, the biogeographic classification recognized 10 zones, divided into 27 provinces. Large distinctive units of similar ecology, biome representation, community and species, e.g., The Himalaya, The Western Ghats are grouped as one biogeographic zone. The details of these are given in Table 3.1.1.

Table 3.1.1. India's Major Biogeographic Zones				
Sl. 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
8	Coasts		82182	
		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			**3284378**	

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

3.2 Plant and animal Biodiversity

3.2.1 Plant and animal 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.

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.

3.2.3 The number of flowering and non flowering plant species are given in Table 3.2.1. A summary threatened and various other categories of species is presented in Table 3.2.2, 3.2.3 and 3.2.4. Table 3.2.3 (a) and (b) give the world picture of Threatened Species. It may be seen in INCN country data, that in the number of species evaluated by 2015 globally by IUCN, India has the following no. of species threatened in each category indicated: Mammals-93, Birds-84, Reptiles-53, amphibians - 75, fishes - 216, Molluscs-7, Other invertebrates- 128 and plants -385. It is estimated that 11.20% of the world no. of species or described fauna are from India. This is evident from Table 3.2.6. Details of rare & threatened vertebrates are available in Table 3.2.8 and the definitions are present in Table 3.2.9.

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 Threatened Species	
		2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
1	2	3	4	5	6	7	8	9	10	11	12
I	**Flowering Plants**										
1	Gymnosperms	1021	1021	74	75	7.25	7.35	8	8	7	7
2	Angiosperms	268600	268600	17926	18043	6.67	6.72	ca. 4045	ca. 4036	1700	1700
II	**Non-flowering Plants**										
1	Bryophytes	16236	16236	2504	2523	15.42	15.54	629	629	ca.80	ca.80
2	Pteridophytes	12000	12000	1265	1268	10.54	10.57	47	47	414	414
III	**Others**										
1	Virus & Bacteria	11813	11813	986	1036	8.35	8.77	Not Known	Not Known	Not Known	Not Known
2	Algae	40000	40000	7244	7284	18.11	18.21	1924	1924	Not Known	Not Known
3	Fungi	98998	98998	14756	14883	14.91	15.03	ca.4100	ca.4100	ca.580	ca.580
4	Lichens	17000	17000	2390	2401	14.06	14.12	ca.520	ca.520	Not Known	Not Known

Source : Botanical Survey of India, Kolkata.

Note: 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 2013- New Genera, Species and New Records' compiled and edited by Paramjit Singh, D.K. Singh and S.S. Dash, published by Botanical Survey of India in 2014.

Table 3.2.2 : **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	**33779**	**1255**
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)]

3.2.4 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.

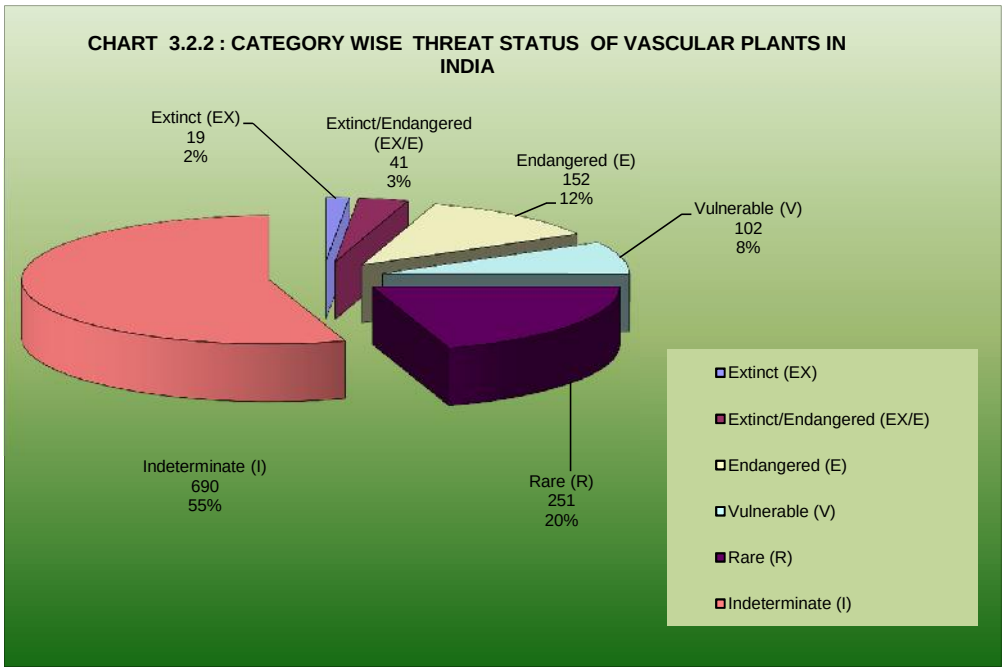


Table 3.2.3 (a): Number of threatened species by major groups of organisms (1996-2015)

	Estimated Number of described species [1]	Number of species evaluated by 2015 (IUCN Red List version 2015-4)	Number of threatened species[2]									
			2006	2007	2008	2009 (IUCN Red List version 2009.2)	2010 (IUCN Red List version 2010.4)	2011 (IUCN Red List version 2011.2)	2012 (IUCN Red List version 2012.2)	2013 (IUCN Red List version 2013.2)	2014 (IUCN Red List version 2014.3	2015 (IUCN Red List version 2015-4)
Vertebrates												
Mammals[5]	5515	5502	1093	1094	1141	1142	1131	1138	1139	1143	1199	1197
Birds	10424	10424	1206	1217	1222	1223	1240	1253	1313	1308	1373	1375
Reptiles	10272	4669	341	422	423	469	594	772	807	879	927	944
Amphibians	7448	6460	1811	1808	1905	1895	1898	1917	1933	1950	1957	1994
Fishes	33200	14462	1171	1201	1275	1414	1851	2028	2058	2110	2222	2271
Subtotal	**66859**	**41517**	**5622**	**5742**	**5966**	**6143**	**6714**	**7108**	**7250**	**7390**	**7678**	**7781**
Invertebrates												
Insects	1000000	5573	623	623	626	711	733	741	829	896	993	1046
Molluscs	85000	7216	975	978	978	1036	1288	1673	1857	1898	1950	1950
Crustaceans[6]	47000	3168	459	460	606	606	596	596	596	723	725	728
Corals	2175	862	1	4	235	235	235	235	236	235	235	237
Arachnids	102248	210	11	11	18	18	19	19	20	21	163	164
Velvet Worms	165	11	9	9	9	9	9	9	9	9	9	9
Horseshoe Crabs	4	4	0	0	0	0	0	0	0	0	0	0
Other	68658	472	24	24	24	24	24	24	23	40	65	67
Subtotal	**1305250**	**17516**	**2102**	**2109**	**2496**	**2639**	**2904**	**3297**	**3570**	**3822**	**4140**	**4201**
Plants[7]												
Mosses[8]	16236	102	80	80	82	82	80	80	76	76	76	76
Ferns and Allies[9]	12000	365	139	139	139	139	148	163	167	187	194	197
Gymnosperms	1052	1011	306	321	323	322	371	377	374	399	400	400
Flowering Plants	268000	19206	7865	7899	7904	7948	8116	8527	8764	9394	9905	10551
Green Alqae[10]	6050	13	-	0	0	0	0	0	0	0	0	0
Red Algae[10]	7104	58	-	9	9	9	9	9	9	9	9	9
Subtotal	**310442**	**20755**	**8390**	**8448**	**8457**	**8500**	**8724**	**9156**	**9390**	**10065**	**10584**	**11233**
Fungi & Protists												
Lichens	17000	9	2	2	2	2	2	2	2	7	4	7
Mushrooms	31496	25	1	1	1	1	1	1	1	22	1	22
Brown Algae[10]	**3784**	**15**	**-**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Subtotal	**52280**	**49**	**3**	**9**	**9**	**9**	**9**	**9**	**9**	**35**	**11**	**35**
Total	**1734831**	**79837**	**16117**	**16308**	**16928**	**17291**	**18351**	**19570**	**20219**	**21312**	**22413**	**23250**
Source : IUCN Website												
Note:												
1. The sources used for the numbers of described species in each taxonomic group are listed below												
2. Threatened species are those listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU).												
3. Where <80% of species within a group have been evaluated, figures for % threatened species are not provided because there is insufficient coverage for these groups. It is only possible to provide reliable figures for % threatened												
4. The percentage of threatened species can be calculated for those groups that are completely or almost completely evaluated (>90% of species evaluated), but the actual number of threatened species is often uncertain because it												
5. The number of described and evaluated mammals excludes domesticated species like sheep (Ovis aries), goats (Capra hircus), Dromedary (Camelus dromedarius), etc.												
6. Crustaceans include six classes: Malacostraca (crabs, lobsters, shrimp, woodlice, etc.); Branchiopoda (fairy shrimp, clam shrimp, etc.); Cephalocardia (horseshoe shrimp); Ostracoda (seed shrimp); Maxillopoda (barnacles,												
7. The plant numbers DO NOT include species from the 1997 IUCN Red List of Threatened Plants (Walter and Gillett 1998) as those were all assessed using the pre-1994 IUCN system of threat categorization. Hence the numbers of of threatened plants are very much lower when compared to the 1997 results. The results from this Red List and the 1997 Plants Red List should be combined together when reporting on threatened plants.												
8. Mosses include the true mosses (Bryophyta), the hornworts (Anthoceratophyta), and liverworts (Marchantiophyta).												
9. The ferns and allies include club mosses and spike mosses (Lycopodiopsida), quillworts (Isoetopsida), horsetails (Equisetopsida) and ferns (Marattiopsida, Polypodiopsida and Psilotopsida). Insufficient coverage Insufficient coverage Insufficient coverage Insufficient coverage NOTES (for rows and columns as indicated by the superscripted numbers):												

Table 3.2.3 (b): Status category summary by major taxonomic group (IUCN red list version 2015.4)

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
CYCADOPSIDA	0	4	53	65	74	0	63	3	45	307
EQUISETOPSIDA	0	0	0	0	0	0	0	0	5	5
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	11	12	0	1	0	10	45
LILIOPSIDA	3	4	394	592	600	16	253	428	1693	3983
LYCOPODIOPSIDA	0	0	1	2	9	0	3	0	5	20
MAGNOLIOPSIDA	93	28	1789	2662	4514	193	1177	1050	3717	15223
MARATTIOPSIDA	0	0	1	0	0	0	0	0	0	1
MARCHANTIOPSIDA	0	0	1	3	2	0	0	4	1	11
PINOPSIDA	0	0	28	96	79	0	98	7	298	606
POLYPODIOPSIDA	2	1	44	58	68	0	16	50	69	308
PSILOTOPSIDA	0	0	0	0	0	0	0	0	3	3
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	**102**	**37**	**2347**	**3510**	**5376**	**209**	**1622**	**1610**	**5942**	**20755**

Source : IUCN Website

*Plants: Anthocerotopsida (hornworts); Bryopsida, Sphagnopsida and Takakiopsida (true mosses); Charophyaceae, Chlorophyceae and 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 (includes **LR/lc** - Lower Risk, Least Concern).

Table 3.2.4 : Status category summary at global level (plants)						
STATUS	**IUCN Red List version 2010**	**IUCN Red List version 2011.1**	**IUCN Red List version 2012.1**	**IUCN Red List version 2013.1**	**IUCN Red List version 2014.1**	**IUCN Red List version 2015.4**
Extinct	86	87	91	90	97	102
Extinct in the Wild	28	31	31	29	37	37
Critically Endangered	1581	1716	1752	1920	2104	2347
Endangered,	2318	2528	2572	2871	3178	3510
Vulnerable,	4605	4854	4869	5038	5203	5376
Near Threatened (includes LR/nt - Lower Risk/near threatened)	1077	1230	1246	1447	1544	1622
Lower Risk/conservation dependent,	237	225	224	211	210	209
Data Deficient	744	1011	1070	1358	1526	1610
Least Concern (includes LR/lc - Lower Risk, least concern).	1531	2507	2727	4640	5481	5942
TOTAL	**12207**	**14189**	**14582**	**17604**	**19380**	**20755**

Source : IUCN

Note : International Union for Conservation of Nature (IUCN) Red List Categories

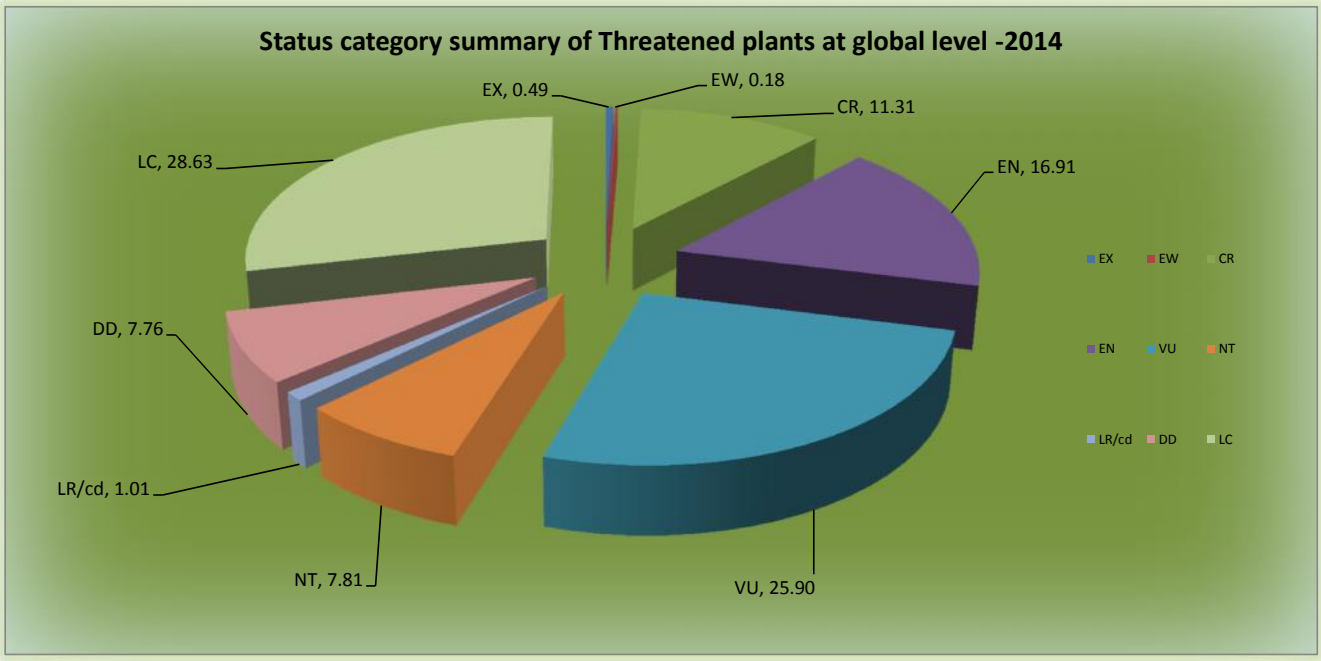


Table 3.2.5: Estimated number/percentage of endemic species in India

Sl. No.	Taxon	Number of Species		Percentage
		Total	Endemic	
1	2	3	4	5
1	**Protozoa**			
I	Free living	2099	90	4.30
II	Parasitic	1401	550	39.30
2	**Mesozoa**	10	10	100.00
3	**Porifera**	500		
I	Freshwater	31	13	41.94
4	**Cnidaria**	1052	10	1.00
5	**Platyhelminthes**	1653	1160	70.30
6	**Rotifera**	370	23	7.00
7	**Gastrotica**	100	64	64.00
8	**Kinorhyncha**	10	7	70.00
9	**Nematoda**	2911	400	13.80
10	**Acanthocephala**	229	203	88.60
11	**Mollusca**	5176		
I	Terrestrial	1487	498	33.50
II	Freshwater	183	77	42.10
12	**Echiura**	43	12	27.91
13	**Annelida**	1002		
I	Oligochaeta	473	368	77.80
II	Hirudinea	59	25	42.37
14	**Arthropoda**	73439		
I	Crustacea	3565	501	17.10
II	Insecta	63706	20765	34.00
III	Arachnida	5882	2623	45.10
15	**Phoronida**	3	1	33.30
16	**Bryozoa**	200	12	6.00
17	**Entoprocta**	10	1	10.00
18	**Chaetognatha**	30	3	10.00
19	**Chordata**	5665		
I	Pisces	3092	341	11.03
II	Amphibia	371	135	39.50
III	Reptilia	530	197	37.50
IV	Aves	1234	55	4.50
V	Mammalia	423	45	10.60

Source :Zoological Survey of India-2014

Table 3.2.6 : Estimated number of described fauna from India			
Taxonomic group	**No. of species**		**% in India**
	World	**India**	
PROTISTA (Protozoa)	**31259**	**3509**	**11.23**
ANIMALIA			
Mesozoa	71	10	14.08
Porifera	5000	500	10.00
Cnidaria	10107	1052	10.41
Ctenophora	100	12	12.00
Platyhelminthes	17513	1653	9.44
Rotifera	2044	370	18.10
Gastrotricha	3000	100	3.33
Kinorhyncha	100	10	10.00
Nematoda	30034	2911	9.69
Acanthocephala	800	229	28.63
Sipuncula	145	35	24.14
Mollusca	66535	5178	7.78
Echiura	127	43	33.86
Annelida	17002	1002	5.89
Onychophora	100	1	1.00
Arthropoda	**1169866**	**73439**	**6.28**
Crustacea	60003	3565	5.94
Insecta	1020169	63706	6.24
Arachnida	73470	5882	8.01
Pycnogonida	600	17	2.83
Chilopoda	8000	101	1.26
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	4	1.33
Chaetognatha	111	30	27.03
Tardigrada	514	30	5.84
Echinodermata	6600	779	11.80
Hemichordata	120	12	10.00
Chordata	**64669**	**5665**	**8.76**
Suphylum Cephalochordata	33	6	18.18
Tunicata	2073	113	5.45
Vertebrata	62563	5546	8.86
Pisces	32156	3092	9.62
Amphibia	6776	371	5.48
Reptilia	9232	530	5.74
Aves	9026	1234	13.67
Mammalia	5416	423	7.81
Total (Animalia)	**1398972**	**93382**	**6.68**
Grand (Protista+ Animalia)	**1430231**	**96891**	**6.77**

Source: Zoological Survey of India.

Animal Discovery 2014, Compiled by ZSI, June,2015.

Table 3.2.7 : 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) Glyphius 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 lV 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

Continued…

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).

Concluded.

Source :Ministry of Environment & Forests, Government of India/ Zoological Survey of India 2014.

S.O. 3653 E - In exercise of the powers conferred by sub-section (1) of Section 61 of the Wild Life (Protection)Act, 1972 (53 of 1973), the Central Government, being of the opinion that it is expedient so to do, hereby makes the following amendments in Schedule I, Schedule II, Schedule III and Schedule IV to the said Act, namely:-

1 In Schedule I to the said Act, -
(a) in Part I relating to "MAMMAL", after entry 43, the following entry shall be inserted, namely:"44. Hog Deer (Axis Porchinus)".
(b) in Part III relating to"BIRDS", the word" Collocatia fusiphaga" in the entry 19 shall be omitted.
2 In Schedule II to the said Act, in Part II, the entry 5 shall be omitted.
3 In Schedule II to the said Act, the entry 11 shall be omitted.
4 In Schedule IV to the said Act,
(a) In entry 11, for item 57 and entry relating thereto, the following item and the entry shall be substituted, namely:-
"57. Quails (Phasinidae)- except Coturnix japonica (Japanese Quails) of farm bred variety:,
(b) after entry 15, the following entry shall be inserted, namely:-
"15-A. Tokay gecko (Gecko gecko)".

Source: The Gazette of India, Extraordinary, Part-II, No 2765, New Delhi, Thursday, December 12, 2013/ Zoological Survey of India.

Table 3.2.8 : Rare and threatened species (vertebrates)

Sl. No.	Category	Approximate Number				
		Mammal	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-2014

Table 3.2.9 : Definitions -rare and threatened species

As per the Guidelines of the IUCN Red List Categories and Criteria (2014)

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 appropriate 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

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 Endangered, and it is therefore considered to be facing an extremely 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 Vulnerable 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.

Near Threatened (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Least Concern (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this

Data Deficient (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and /or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and /or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. IN many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Not Evaluated (NE)

A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

Source: IUCN<www.iucnredlist.org>/Zoological Survey of India

3.3 Forests, Trees and Mangroves

3.3.1 Forests are biologically diverse systems and represent some of the richest biological areas. They offer a variety of habitats for plants, animals and micro-organisms. Forest biological diversity can be considered at different levels, including the ecosystem, landscapes, species, populations and genetics. However, forest biodiversity is increasingly threatened as a result of deforestation, fragmentation, climate change and other stressors.

3.3.2 Forest area is the area recorded as a forest in government records. However, forest cover are all lands, one hectare and more in area with a Tree canopy density of 10percent or more irrespective of ownership or legal status. Such lands may not necessarily be recorded forest area. It also includes orchads , bamboo and palm. Details or recorded forest area and forest cover can be found in Table 3.3.1 to 3.3.8.

3.3.3 It is evident from Table 3.3.2 that the total forest cover of the country is only 21.34% of the total geographic area and as much as 77.4% is classified non forest. Area wise, Madhya Pradesh has the largest forest cover (Table 3.3.3) where as in terms of percentage of forest cover with respect to total geographical area, Mizoram with 88.93% has highest forest cover.

Table 3.3.1 : Recorded forest area in States and UT's

(Sq.km)

Sl. No.	State/UT	Geographical Area	Recorded Forest Area			Total Forest Area	Percentage of Forest to Geo. Area
			Reserved Forests	Protected Forests	Unclassed Forests		
1	2	3	4	5	6	7	8
1	Andhra Pradesh	160204	31959	5069	230	37258	23.26
2	Arunachal Pradesh	83743	10589	9779	31039	51407	61.39
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	24	0	102	6.88
7	Goa	3702	253	0	972	1225	33.09
8	Gujarat	196022	14373	2886	4388	21647	11.04
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	11309	0	0	11309	29.10
15	Madhya Pradesh	308245	61886	31098	1705	94689	30.72
16	Maharashtra	307713	49546	6733	5300	61579	20.01
17	Manipur	22327	1467	4171	11780	17418	78.01
18	Meghalaya	22429	1113	12	8371	9496	42.34
19	Mizoram	21081	4483	0	1158	5641	26.76
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	12475	18217	2045	32737	9.57
24	Sikkim	7096	5452	389	0	5841	82.31
25	Tamil Nadu	130058	20293	1782	802	22877	17.59
26	Telangana	114865	20353	5939	612	26904	23.42
27	Tripura	10486	4175	2	2117	6294	60.02
28	Uttar Pradesh	240928	12071	1157	3354	16582	6.88
29	Uttarakhand	53483	26547	9885	1568	38000	71.05
30	West Bengal	88752	7054	3772	1053	11879	13.38
	Union Territories						
31	A. & N. Islands	8249	5613	1558	0	7171	86.93
32	Chandigarh	114	32	0	3	35	30.70
33	Dadra & Nagar Haveli	491	199	5	0	204	41.55
34	Daman & Diu	112	0	0	8	8	7.14
35	Lakshadweep	32	0	0	0	0	0.00
36	Puducherry	480	0	2	11	13	2.71
Total		**3287263**	**424985**	**209420**	**130141**	**764546**	**23.26**

Source : India State of Forest Report 2015

*The figure includes 295 sq km of proposed RF and 1838 sq km of deemed RF

Table 3.3.2 : Forest cover in India 2015- classwise		
Class	**Area (Sq. Km)**	**Percentage of Geographic Area**
1	**2**	**3**
Forest Cover		
Very Dense Forest	85904	2.61
Moderately Dense Forest	315374	9.59
Open Forest	300395	9.14
Total Forest Cover*	**701673**	**21.35**
Scrub	41362	1.26
Non-forest	2544228	77.40
Total Geographic Area	**3287263**	**100**

Source : India State of Forest Report 2015

* Includes 4740 Sq km area under mangroves

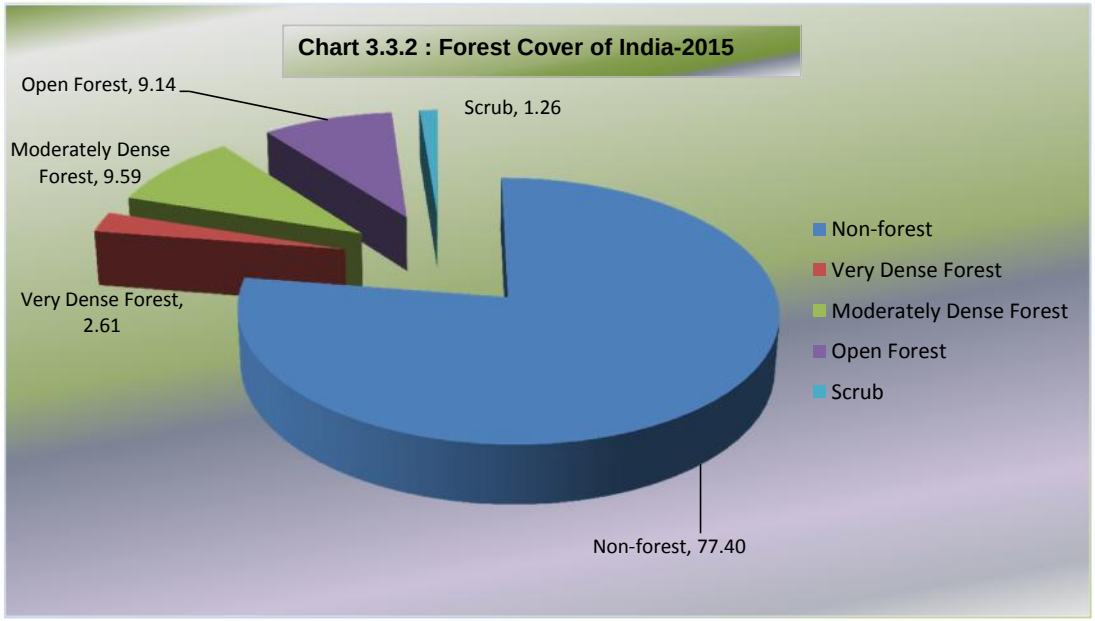


Table 3.3.3: Forest cover in states/UT's in India - 2015

(Area in Sq. km)

Sl. No.	State/UT	Geographic Area	Forest Cover			Total	Percent of G.A.
			Very Dense Forest	Moderate Dense Forest	Open Forest		
1	2	3	4	5	6	7	8
1	Andhra Pradesh	160204	375	13093	10956	24424	15.25
2	Arunachal Pradesh	83743	20804	31301	15143	67248	80.30
3	Assam	78438	1441	11268	14914	27623	35.22
4	Bihar	94163	248	3376	3664	7288	7.74
5	Chhattisgarh	135191	4152	34846	16588	55586	41.12
6	Delhi	1483	6.76	57.15	124.68	188.59	12.72
7	Goa	3702	542	580	1102	2224	60.08
8	Gujarat	196022	376	5220	9064	14660	7.48
9	Haryana	44212	27	452	1105	1584	3.58
10	Himachal Pradesh	55673	3224	6381	5091	14696	26.40
11	Jammu & Kashmir*	222236	4061	8815	10112	22988	10.34
12	Jharkhand	79714	2588	9663	11227	23478	29.45
13	Karnataka	191791	1781	20063	14577	36421	18.99
14	Kerala	38863	1523	9301	8415	19239	49.50
15	Madhya Pradesh	308245	6629	34902	35931	77462	25.13
16	Maharashtra	307713	8712	20747	21169	50628	16.45
17	Manipur	22327	727	5925	10342	16994	76.11
18	Meghalaya	22429	449	9584	7184	17217	76.76
19	Mizoram	21081	138	5858	12752	18748	88.93
20	Nagaland	16579	1296	4695	6975	12966	78.21
21	Odisha	155707	7023	21470	21861	50354	32.34
22	Punjab	50362	0	735	1036	1771	3.52
23	Rajasthan	342239	76	4426	11669	16171	4.73
24	Sikkim	7096	500	2160	697	3357	47.31
25	Tamil Nadu	130058	2993	10469	12883	26345	20.26
26	Telangana	114865	513	12712	8366	21591	18.80
27	Tripura	10486	113	4609	3089	7811	74.49
28	Uttar Pradesh	240928	2195	4060	8206	14461	6.00
29	Uttarakhand	53483	4754	13602	5884	24240	45.32
30	West Bengal	88752	2948	4172	9708	16828	18.96
31	A. & N. Islands	8249	5686	685	380	6751	81.84
32	Chandigarh	114	1.36	14.09	6.58	22.03	19.32
33	Dadra & Nagar Haveli	491	0	80	126	206	41.96
34	Daman & Diu	112	1.4	5.82	12.39	19.61	17.51
35	Lakshadweep	32	0	17.22	9.84	27.06	84.56
36	Puducherry	480	0	29.68	25.7	55.38	11.54
Total		**3287263**	**85903.52**	**315373.96**	**300395.19**	**701672.67**	**21.35**

Source:India State of Forest Report 2015

* Includes area outside LOC under illegal occupation of Pakistan and China.

3.3.4 Table 3.3.4 gives the forest cover in hill districts of India. These hill districts as identified by erstwhile Planning Commission for Hill areas and westaern Ghats Development prgrmamme. These hill districts contribute around 40% of forest cover as a percent of total geographical area.

3.3.5 Similar to the hill districts forest cover in tribal districts identified under Integrated Tribal Development Programme are presented in Table 3.3.5. It may be seen that about 40.59% of the geographical area of these districts has forest cover. Changes in forest cover between 2011 & 2013 are presented in Table 3.3.6, 3.3.7 and 3.3.8.

Table 3.3.4 : State/UT wise forest cover in hill districts

(Sq. km)

Sl. No.	Name of State/UT	Number of Hill Districts	Geographic Area	Forest Cover				Percentage of Geographic Area
				Very Dense Forest	Moderately Dense Forest	Open Forest	Total	
1	2	3	4	5	6	7	8	9
1	Arunachal Pradesh	13	83743	20804	31301	15143	67248	80.30
2	Assam	3	19153	739	5659	6611	13009	67.92
3	Himachal Pradesh	12	55673	3224	6381	5091	14696	26.40
4	Jammu & Kashmir (a)	14	101388	2716	6187	7101	16004	15.78
	(b)	*	120848	1345	2628	3011	6984	5.78
5	Karnataka	6	48046	1494	14853	6598	22945	47.76
6	Kerala	10	29572	1172	7070	7135	15377	52.00
7	Maharashtra	7	69905	318	7230	7981	15529	22.21
8	Manipur	9	22327	727	5925	10342	16994	76.11
9	Meghalaya	7	22429	449	9584	7184	17217	76.76
10	Mizoram	8	21081	138	5858	12752	18748	88.93
11	Nagaland	8	16579	1296	4695	6975	12966	78.21
12	Sikkim	4	7096	500	2160	697	3357	47.31
13	Tamil Nadu	5	22789	961	3269	3282	7512	32.96
14	Tripura	4	10486	113	4609	3089	7811	76.95
15	Uttarakhand	13	53483	4754	13602	5884	24240	45.32
16	West Bengal	1	3149	724	652	1002	2378	75.52
Total		**124**	**707747**	**41474**	**131663**	**109878**	**283015**	**39.99**

Source:India State of Forest Report, 2015

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

Table 3.3.5: State/UT wise forest cover in tribal districts

(Sq. km)

Sl. No.	State/UT	Number of Tribal Districts	Geographic Area (GA)	Forest Cover				Percentage of Geographic Area
				Very Dense Forest	Moderately Dense Forest	Open Forest	Total	
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	5	42086	89	5353	3822	9264	22.01
2	Arunachal Pradesh	13	83743	20804	31301	15143	67248	80.30
3	Assam	16	50137	647	4532	6746	11925	23.78
4	Chhattisgarh	9	92656	3605	24422	11964	39991	43.16
5	Gujarat	8	48409	322	2937	3516	6775	14.00
6	Himachal Pradesh	3	26764	950	1067	1219	3236	12.09
7	Jharkhand	8	44413	1705	6008	6590	14303	32.20
8	Karnataka	5	26597	1250	7624	4225	13099	49.25
9	Kerala	9	27228	1142	6754	6429	14325	52.61
10	Madhya Pradesh	18	139448	6629	34902	35931	77462	55.55
11	Maharashtra	12	144233	7256	11762	11670	30688	21.28
12	Manipur	9	22327	727	5925	10342	16994	76.11
13	Meghalaya	7	22429	449	9584	7184	17217	76.76
14	Mizoram	8	21081	138	5858	12752	18748	88.93
15	Nagaland	8	16579	1296	4695	6975	12966	78.21
16	Odisha	12	86124	5206	14409	14205	33820	39.27
17	Rajasthan	5	38218	0	2436	3884	6320	16.54
18	Sikkim	4	7096	500	2160	697	3357	47.31
19	Tamil Nadu	6	30720	726	2809	3630	7165	23.32
	Telangana	3	45004	176	10836	4616	15628	34.73
20	Tripura	4	10486	113	4609	3089	7811	74.49
21	Uttar Pradesh	1	7680	777	165	360	1302	16.95
22	West Bengal	11	69403	2934	3734	7909	14577	21.00
23	Andaman & Nicobar	2	8249	5686	685	380	6751	81.84
24	Dadra & Nagar Haveli	1	491	0	80	126	206	41.96
25	Daman & Diu	1	72	0	3.03	14.83	18	24.81
26	Lakshadweep	1	32	0	17	10	27	84.38
Total		**189**	**1111705**	**63127**	**204667**	**183429**	**451223**	**40.59**

Source:India State of Forest Report 2015

Table 3.3.6 : State/UT wise Forest Area (1987-2015)

Sl. No.	State/UT	Total Forest Area in Sq.Km														
		1987	1988	1989	1991	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Andhra Pradesh	63771	63771	63771	63726	63814	63814	63814	63814	63821	63821	63814	63814	63814	63814	37258
2	Arunachal Pradesh	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51541	51407
3	Assam	30708	30708	30708	30708	30708	30708	30708	27018	27018	26832	26832	26832	26832	26832	26832
4	Bihar	29230	29230	29230	29226	29226	29226	29226	6078	6473	6473	6473	6473	6473	6473	6493
5	Chhattisgarh#								59285	59772	59772	59772	59772	59772	59772	59772
6	Delhi	42	42	42	42	42	42	85	85	85	85	85	85	85	85	102
7	Goa	1053	1053	1053	1256	1424	1424	1424	1224	1224	1224	1224	1224	1224	1225	1225
8	Gujarat	18777	18777	18777	19388	19393	19393	19393	18999	19113	18962	18927	18927	18927	21647	21647
9	Haryana	1685	1685	1685	1687	1673	1673	1673	1551	1558	1559	1559	1559	1559	1559	1559
10	Himachal Pradesh	21325	21325	21325	37591	35407	35407	35407	37033	37033	37033	37033	37033	37033	37033	37033
11	Jammu & Kashmir	20892	20892	20892	20174	20182	20182	20182	20230	20230	20230	20230	20230	20230	20230	20230
12	Jharkhand#								23605	23605	23605	23605	23605	23605	23605	23605
13	Karnataka	38644	38644	38644	38646	38724	38724	38724	38724	43084	38284	38284	38284	38284	38284	38284
14	Kerala	11222	11222	11222	11222	11221	11221	11221	11221	11268	11265	11265	11265	11265	11309	11309
15	Madhya Pradesh	155414	155414	155414	155414	154497	154497	154497	95221	95221	94689	94689	94689	94689	94689	94689
16	Maharashtra	64055	64055	64055	63861	63842	63842	63842	61939	61939	61939	61939	61939	61939	61357	61579
17	Manipur	15155	15155	15155	15154	15154	15154	15154	17418	17418	17418	17418	17418	17418	17418	17418
18	Meghalaya	8514	8514	8514	9496	9496	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	16717	5641
20	Nagaland	8625	8625	8625	8625	8629	8629	8629	8629	8629	9222	9222	9222	9222	9222	9222
21	Odisha	59555	59555	59555	59555	57184	57184	57184	58135	58136	58136	58136	58136	58136	58136	58136
22	Punjab	2803	2803	2803	2842	2901	2901	2901	3059	3084	3084	3084	3058	3084	3084	3084
23	Rajasthan	31151	31151	31151	31559	31700	31700	31700	32494	32488	32488	32639	32639	32639	32737	32737
24	Sikkim	2650	2650	2650	2650	2650	2650	2650	5765	5841	5841	5841	5841	5841	5841	5841
25	Tamil Nadu	22319	22319	22319	22699	22628	22628	22628	22871	22877	22877	22877	22877	22877	22877	22877
26	Telangana**															26904
27	Tripura	6280	6280	6280	6292	6293	6293	6293	6293	6293	6294	6294	6294	6294	6294	6294
28	Uttar Pradesh	51269	51269	51269	51502	51663	51663	51663	16826	16826	16796	16583	16583	16583	16583	16582
29	Uttarakhand#								34662	34662	34651	34651	34651	34651	34651	38000
30	West Bengal	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879
31	A & N Islands	7144	7144	7144	7171	7171	7171	7171	7171	7171	7171	7171	7171	7171	7171	7171
32	Chandigarh	6	6	6	31	31	31	31	32	34	33	34	34	34	35	35
33	Dadra and Nagar Have	203	203	203	207	203	203	203	203	204	204	204	204	204	204	204
34	Daman & Diu	*	*	*	*	*	NA	0.7	1	1	6	8	8	8	8	8
35	Lakshadweep	nil	nil	nil	nil	nil	NA	0	0	0	0	0	0	0	0	0
36	Puducherry	nil	nil	nil	nil	nil	NA	0	0	0	0	13	13	13	13	13
Total		**751846**	**751346**	**751846**	**770078**	**765210**	**765210**	**765253**	**768436**	**774740**	**769626**	**769538**	**769512**	**769538**	**771821**	**764566**

Source:India State of Forests Report 2015, Ministry of Environment & Forests

* Included in Goa **Included in Andhra Pradesh for 1987-2013 #values included in Madhya Pradesh, Bihar, Uttar Pradesh respectively from 1987-1999

Table 3.3.7 : Change in forest cover of states/UTs between 2013 and 2015

State/UT	Geographical Area	2013				2015				Change			
		Very Dense Forest	Moderate Dense Forest	Open Forest	Total	Very Dense Forest	Moderate Dense Forest	Open Forest	Total	Very Dense Forest	Moderate Dense Forest	Open Forest	Total
1	2	4	5	6	7	5	6	7	8	9	10	11	12
Andhra Pradesh	160204	366	13163	10828	24357	375	13093	10956	24424	9	-70	128	67
Arunachal Pradesh	83743	20828	31414	15079	67321	20804	31301	15143	67248	-24	-113	64	-73
Assam	78438	1444	11345	14882	27671	1441	11268	14914	27623	-3	-77	32	-48
Bihar	94163	247	3380	3664	7291	248	3376	3664	7288	1	-4	0	-3
Chattisgarh	135191	4153	34865	16603	55621	4152	34846	16588	55586	-1	-19	-15	-35
Delhi	1483	6.76	49.38	123.67	180	6.76	57.15	124.68	188.59	0	7.77	1.01	8.59
Goa	3702	543	585	1091	2219	542	580	1102	2224	-1	-5	11	5
Gujarat	196022	376	5220	9057	14653	376	5220	9064	14660	0	0	7	7
Haryana	44212	27	453	1106	1586	27	452	1105	1584	0	-1	-1	-2
Himachal Pradesh	55673	3224	6381	5078	14683	3224	6381	5091	14696	0	0	13	13
Jammu & Kashmir*	222236	4140	8760	9638	22538	4061	8815	10112	22988	-79	55	474	450
Jharkhand	79714	2587	9667	11219	23473	2588	9663	11227	23478	1	-4	8	5
Karnataka	191791	1777	20179	14176	36132	1781	20063	14577	36421	4	-116	401	289
Kerala	38863	1529	9401	6992	17922	1523	9301	8415	19239	-6	-100	1423	1317
Madhya Pradesh	308245	6632	34921	35969	77522	6629	34902	35931	77462	-3	-19	-38	-60
Maharashtra	307713	8720	20770	21142	50632	8712	20747	21169	50628	-8	-23	27	-4
Manipur	22327	728	6094	10168	16990	727	5925	10342	16994	-1	-169	174	4
Meghalaya	22429	449	9689	7150	17288	449	9584	7184	17217	0	-105	34	-71
Mizoram	21081	138	5900	13016	19054	138	5858	12752	18748	0	-42	-264	-306
Nagaland	16579	1298	4736	7010	13044	1296	4695	6975	12966	-2	-41	-35	-78
Orissa	155707	7042	21298	22007	50347	7023	21470	21861	50354	-19	172	-146	7
Punjab	50362	0	736	1036	1772	0	735	1036	1771	0	-1	0	-1
Rajasthan	342239	72	4424	11590	16086	76	4426	11669	16171	4	2	79	85
Sikkim	7096	500	2161	697	3358	500	2160	697	3357	0	-1	0	-1
Tamil Nadu	130058	2948	10199	10697	23844	2993	10469	12883	26345	45	270	2186	2501
Telangana	114865	484	12916	8359	21759	513	12712	8366	21591	29	-204	7	-168
Tripura	10486	109	4641	3116	7866	113	4609	3089	7811	4	-32	-27	-55
Uttar Pradesh	240928	1623	4550	8176	14349	2195	4060	8206	14461	572	-490	30	112
Uttarakhand	53483	4785	14111	5612	24508	4754	13602	5884	24240	-31	-509	272	-268
West Bengal	88752	2971	4146	9688	16805	2948	4172	9708	16828	-23	26	20	23
A & N Islands	8249	3754	2413	544	6711	5686	685	380	6751	1932	-1728	-164	40
Chandigarh	114	1.36	9.66	6.24	17.26	1.36	14.09	6.58	22.03	0	4.43	0.34	4.77
Dadra and Nagar Haveli	491	0	114	99	213	0	80	126	206	0	-34	27	-7
Daman and DIU	112	0	1.87	7.4	9.27	1.4	5.82	12.39	19.61	1.4	3.95	4.99	10.34
Lakshadweep	32	0	17.18	9.88	27.06	0	17.22	9.84	27.06	0	0.04	-0.04	0
Puducherry	480	0	35.23	14.83	50.06	0	29.68	25.7	55.38	0	-5.55	10.87	5.32
India	**3287263**	**83502**	**318745**	**295651**	**697899**	**85904**	**315373.96**	**300395**	**701673**	**2401.4**	**-3371.36**	**4744.17**	**3774.02**

Source: India State of Forest Report 2015

* Includes Jammu & Kashmir area outside LOC that is under illegal occupation Pakistan and China.

Table 3.3.8: Changes in Forest Cover in North-Eastern States

Sl. No.	States/UT's	Forest Cover			Change in Forest Cover over assessment years		
		2015	2013	2011	2015	2013	2011
1	2	3	4	5	6	7	8
1	Arunachal Pradesh	67248	67321	67410	-73	-89	-74
2	Assam	27623	27671	27673	-48	-2	-19
3	Manipur	16994	16990	17090	4	-100	-190
4	Meghalaya	17217	17288	17275	-71	13	-46
5	Mizoram	18748	19054	19117	-306	-63	-66
6	Nagaland	12966	13044	13318	-78	-274	-146
7	Sikkim	3357	3358	3359	-1	-1	0
8	Tripura	7811	7866	7977	-55	-111	-8
Total		**171964**	**172592**	**173219**	**-628**	**-627**	**-549**

Source :India State of Forest Report, 2015

3.3.6 India's National Forest Policy 1988 aims at maintaining 33% of the country's geographical area under forest and tree cover. Tree cover comprises of tree patches outside the recorded area exclusive of forest cover and less than the minimum mappable area (1 ha). Such small patches comprising of block, linear and scattered trees are not delineated as forest cover during interpretation of satellite data.

3.3.7 Table 3.3.9 gives the physiographic zone wise tree cover estimates. Tree cover is maximum in the west coast. Himalayas have lowest tree cover as this zone is predominantly under natural forests. Also, it is evident from Table 3.3.10 that the state having maximum tree cover is Maharashtra (9558 km^2). Considering the percentage of geographical area of the state/UT Lakshadweep shows highest percentage of tree cover (12.50%).

Table 3.3.9 : Physiographic zone wise tree cover estimate

Sl. No.	Physiographic Zone	Geographic Area (Sq Km)	2015		2013		2011	
			Tree Cover		Tree Cover		Tree Cover	
			Area (Sq Km)	% of Geog. Area	Area (Sq Km)	% of Geog. Area	Area (Sq Km)	% of Geog. Area
1	2	3	4	5	6	7	8	9
1	Western Himalayas	329255	9835	2.99	9035	2.74	7859	2.39
2	Eastern Himalayas	74618	537	0.72	448	0.60	356	0.48
3	North East	133990	3132	2.34	2655	1.98	2275	1.70
4	Northern Plains	295780	8756	2.96	8609	2.91	9366	3.17
5	Eastern Plains	223339	4628	2.07	4722	2.11	5168	2.31
6	Western Plains	319098	6297	1.97	6245	1.96	7038	2.21
7	Central Highlands	373675	11004	2.94	10127	2.71	9886	2.65
8	North Deccan	355988	7912	2.22	6762	1.90	7007	1.97
9	East Deccan	336289	10120	3.01	9644	2.87	10718	3.19
10	South Deccan	292416	7531	2.58	8244	2.82	8012	2.74
11	Western Ghats	72381	3678	5.08	4189	5.79	4083	5.64
12	Eastern Ghats	191698	4041	2.11	4194	2.19	4420	2.31
13	West Coast	121242	9744	8.04	10391	8.57	8863	7.31
14	East Coast	167494	5358	3.20	6001	3.58	5791	3.46
Total		**3287263**	**92573**	**2.82**	**91266**	**2.78**	**90844**	**2.76**

Source : India State of Forest Report-2015

Table 3.3.10: 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**	**4**	**5**
1	Andhra Pradesh	160204	3965	2.47
2	Arunachal Pradesh	83743	761	0.91
3	Assam	78438	1613	2.06
4	Bihar	94163	2182	2.32
5	Chhattisgarh	135191	3629	2.68
6	Delhi	1483	111	7.48
7	Goa	3702	325	8.78
8	Gujarat	196022	7914	4.04
9	Haryana	44212	1355	3.06
10	Himachal Pradesh	55673	757	1.36
11	Jammu & Kashmir	222236	8354	3.76
12	Jharkhand	79714	2783	3.49
13	Karnataka	191791	5552	2.89
14	Kerala	38863	2951	7.59
15	Madhya Pradesh	308245	7773	2.52
16	Maharashtra	307713	9558	3.11
17	Manipur	22327	243	1.09
18	Meghalaya	22429	710	3.17
19	Mizoram	21081	535	2.54
20	Nagaland	16579	381	2.30
21	Odisha	155707	3986	2.56
22	Punjab	50362	1544	3.07
23	Rajasthan	342239	8269	2.42
24	Sikkim	7096	35	0.49
25	Tamil Nadu	130058	4505	3.46
26	Telangana	114865	2549	2.22
27	Tripura	10486	233	2.22
28	Uttar Pradesh	240928	7044	2.92
29	Uttarakhand	53483	752	1.41
30	West Bengal	88752	2088	2.35
31	A. & N. Islands	8249	37	0.45
32	Chandigarh	114	9	8.51
33	Dadra & Nagar Haveli	491	28	5.95
34	Daman & Diu	112	10	8.46
35	Lakshadweep	32	4	16.69
36	Puducherry	480	27	5.63
Total		**3287263**	**92571**	**2.82**

Source :India State of Forest Report, 2015

3.3.8 Growing stock refers to the sum of all trees growing/living in the forest or part of it by number or volume. The physiographic zone wise growing stock in given in Table 3.3.11 for 2015. Total growing stock in the country is estimated to be 5768 million cum comprising of 4195 m.cum inside forest area & 1573 m. cum outside recorded forest area. The statewise breakup is available in Table 3.3.12.

Table 3.3.11: Physiographic Zone Wise Growing Stock

Sl. No.	Physiographic Zone	Area of Phy.Zone (Km^2)	Growing Stock (volume in million Cum)		
			Forest	Tree Outside Forest	Total
1	2	3	4	5	6
1	Western Himalayas	329255	985.52	187.92	1173.44
2	Eastern Himalayas	74618	410.52	82.24	492.76
3	North East Ranges	133990	265.75	125.90	391.65
4	Northern Plains	295780	142.46	99.58	242.04
5	Eastern Plains	223339	192.01	76.81	268.82
6	Western Plains	319098	10.26	63.82	74.08
7	Central Highlands	373675	118.53	113.96	232.49
8	North Deccan	355988	287.80	94.07	381.87
9	East Deccan	336289	698.55	226.06	924.61
10	South Deccan	292416	217.36	106.41	323.77
11	Western Ghats	72381	384.00	111.86	495.86
12	Eastern Ghats	191698	247.34	69.18	316.52
13	West Coast	121242	132.84	139.53	272.43
14	East Coast	167494	102.11	75.96	178.07
Total		**3287263**	**4195.05**	**1573.3**	**5768.41**

Source :India State of Forest Report, 2015

Table 3.3.12 : States/UTs wise growing stock

Sl. No.	States	Geographical Area (Km^2)	Recorded Forest Area (Km^2)	Growing Stock (volume in million Cum)		
				Forest	Tree Outside Forest	Total
1	2	3	4	5	6	7
1	Andhra Pradesh	160204	37258	148.113	64.28	212.393
2	Arunachal Pradesh	83743	51407	413.118	89.102	502.220
3	Assam	78438	26832	143.672	33.018	176.690
4	Bihar	94163	6493	29.312	37.232	66.544
5	Chhattisgarh	135191	59772	362.878	82.077	444.955
6	Delhi	1483	102	0.493	1.152	1.645
7	Goa	3702	1225	9.434	4.033	13.467
8	Gujarat	196022	21647	52.104	112.801	164.905
9	Haryana	44212	1559	5.381	15.383	20.764
10	Himachal Pradesh	55673	37033	317.576	21.003	338.579
11	Jammu & Kashmir	222236	20230	236.816	147.082	383.898
12	Jharkhand	79714	23605	122.650	61.176	183.826
13	Karnataka	191791	38284	296.988	86.588	383.576
14	Kerala	38863	11309	154.985	49.063	204.048
15	Madhya Pradesh	308245	94689	276.883	91.919	368.802
16	Maharashtra	307713	61579	227.131	155.896	383.027
17	Manipur	22327	17418	51.383	9.015	60.398
18	Meghalaya	22429	9496	39.718	19.079	58.797
19	Mizoram*	21081	5641	20.659	48.842	69.501
20	Nagaland	16579	9222	36.854	12.197	49.051
21	Odisha	155707	58136	243.966	79.91	323.876
22	Punjab	50362	3084	13.010	18.141	31.151
23	Rajasthan	342239	32737	38.247	84.993	123.240
24	Sikkim	7096	5841	25.276	2.037	27.313
25	Tamil Nadu	130058	22877	122.984	63.366	186.350
26	Telangana	114865	26904	57.386	37.596	94.982
27	Tripura	10486	6294	22.743	7.067	29.810
28	Uttar Pradesh	240928	16582	139.714	80.159	219.873
29	Uttarakhand	53483	38000	440.718	19.56	460.278
30	West Bengal	88752	11879	84.324	37.688	122.012
31	Andaman & Nicobar Islands	8249	7171	58.299	0.569	58.868
32	Chandigarh	114	35	0.334	0.091	0.425
33	Dadra & Nagar Haveli	491	204	1.805	0.751	2.556
34	Daman & Diu	112	8	0.001	0.114	0.115
35	Lakshadweep	32	0	0.000	0.058	0.058
36	Puducherry	480	13	0.092	0.302	0.394
Total		**3287263**	**764566**	**4195.047**	**1573.340**	**5768.387**

Source :India State of Forest Report, 2015

3.3.9 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.

In India, the major mangrove areas are mainly in 10 State/ UTs of India and their details are given at table 3.3.13. The current assessment in Table 3.3.14 shows that mangrove cover in the country is 4628 sq km: Table 3.3.15 shows the class-wise mangrove cover in 2013.

Table 3.3.13: 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	Andaman & Nicobar	North Andamans, Nicobar
6	Kerala	Vembanad, Kannur (Northern Kerala)
7	Karnataka	Coondapur, Dakshin Kannada/Honnavar, Mangalore Forest Division, Karwar
8	Goa	Goa
9	Maharashtra	Achra-Ratnagiri, Devgarh-Vijay Durg, Veldur, Kundalika-Revdanda, Mumbra-Diva, Vikroli, Shreevardhan, Vaitarna, Vasasi-Manori, Malvan
10	Gujarat	Gulf of Kutch, Gulf of Khambat, Dumas-Ubhrat

Source : Ministry of Environment & Forests

Table 3.3.14: 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	2013	2015
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Andhra Pradesh	495	405	399	378	383	383	397	333	329	354	353	352	352	1057
2	Goa	0	3	3	3	3	5	5	5	16	16	17	22	22	61
3	Gujarat	427	412	397	419	689	901	1031	911	916	991	1046	1058	1103	3207
4	Karnataka	0	0	0	0	2	3	3	2	3	3	3	3	3	9
5	Maharashtra	140	114	113	155	155	124	108	118	158	186	186	186	186	558
6	Odisha	199	192	195	195	195	211	215	219	203	217	221	222	213	656
7	Tamil Nadu	23	47	47	21	21	21	21	23	35	36	39	39	39	117
8	West Bengal*	2076	2109	2119	2119	2119	2123	2125	2081	2120	2136	2152	2155	2097	6404
9	Andaman & Nicobar	686	973	971	966	966	966	966	789	658	635	615	617	604	1836
10	Puducherry	0	0	0	0	0	0	0	1	1	1	1	1	1	3
11	Kerala	0	0	0	0	0	0	0	0	8	5	5	6	6	17
12	Daman & Diu	0	0	0	0	0	0	0	0	1	1	1	1.56	1.63	4.19
Total		**4046**	**4255**	**4244**	**4256**	**4533**	**4737**	**4871**	**4482**	**4448**	**4581**	**4639**	**4663**	**4628**	**13929**

Source: India State of Forest Report 2015

*: 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.

Table 3.3.15 : State/UT wise class-wise mangrove cover, 2015						
						(Sq. km)
Sl No.	State/UT	Very Dense Mangrove	Moderately Dense Mangrove	Open Mangrove	Total	Change w.r.t. 2013 Assessment
1	2	3	4	5	6	7
1	Andhra Pradesh	0	129	238	367	15
2	Goa	0	20	6	26	4
3	Gujarat	0	174	933	1107	4
4	Karnataka	0	3	0	3	0
5	Kerala	0	5	4	9	3
6	Maharashtra	0	79	143	222	36
7	Odisha	82	95	54	231	18
8	Tamil Nadu	1	18	28	47	8
9	West Bengal	990	700	416	2106	9
10	Andaman & Nicobar	399	168	50	617	13
11	Daman & Diu	0	0	3	3	1
12	Puducherry	0	0	2	2	1
Total		**1472**	**1391**	**1877**	**4740**	**112**

Source:India State of Forest Report 2015

3.4 Conservation Measures of Agro Biodiversity

3.4.1 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 of collections and specimens of flora in India are shown at table 3.3.1.

Table 3.4.1 : Reference collections of flora			
Sl. No.	Category	Total Number	Total Holdings of Collections and Specimens
1	2	3	4
1	Herbarium	79*	3543633

Source : Botanical Survey of India, Kolkata.

* Index Herbarium online

3.4.2 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.

3.4.3 Table 3.4.2 to Table 3.4.5 give the details of conservation measures of agro-biodiversity in India.

Tables : Status of germplasm holding in the base collection (-18^{o} C) at National Genebank (as December 31, 2014)

Crop/Crop group	No. of accns. Conserved during (January 1 - December 31. 2014)			Present status of total accns. Conserved
	Regenerated	New accession	No. of Species	
Cerelas	4933	3559	106	156266
Millets	26	948	17	52003
Forages	119	253	169	6287
Pseudocereals	0	147	39	6927
Legumes	2266	1673	79	63983
Oilseeds	272	1546	71	56714
Fibre corps	0	280	59	12724
Vegetables	83	614	175	24615
Fruits & Nuts	0	1	63	272
Medicinal, Aromatic plants & Narcotics	0	476	649	6902
Ornamentals	0	6	116	610
Spices and Condiments	158	123	26	2658
Agro-forestry	0	3	186	1649
Duplicate safety samples (Lentil, Pigeonpea)	0	0	0	10235
Trial Magerial (Wheat, Barley)	0	0	0	10771
Total	**7857**	**9629****	**1755**	**412616**

Source : National Bureau of Plant Genetic Resources, Annual Report 2013-14

* The figure includes 3581 released and 7175 genetic stocks: Regenerated accns. Not included in total figure.

** The gigure includes 172 released varieties and 89 genetic stocks.

Table 3.4.3 : Status of in-vitro conserved germplasm

Crop group	2012				2013				2015			
	Genera (no.)	Species (no.)	Cultures (no.)	Accessions (no.)	Genera (no.)	Species (no.)	Cultures (no.)	Accessions (no.)	Genera (no.)	Species (no.)	Cultures (no.)	Accessions (no.)
1	2	3	4	5	6	7	8	9	10	11	12	13
Tropical Fruits (banana, grape)	2	14	10000	416	1	14	11000	420	1	14	10000	420
Temperate and Minor Fruits (mulberry, strawberry, apple,pear,blackberry)	9	41	6700	327	9	41	7000	305	9	41	7000	310
Tuber crops (sweet potato, yam, taro)	5	12	9800	618	5	12	10000	619	5	12	10000	620
Bulbous and other crops (garlic, gladiolus)	4	12	3300	171	4	12	3300	171	4	12	3300	171
Medicinal and Aromatic Plants (species of bacopa, mentha, rauvolfia, tylophora)	21	28	5000	174	21	28	4500	153	21	28	4000	153
Spices and Industrial crops (ginger, turmeric, pepper, cardamom, hops, jojoba)	7	27	5800	380	NA	NA	NA	NA	7	19	5000	235
Total	**48**	**134**	**40680**	**2086**	**40**	**107**	**35800**	**1668**	**47**	**126**	**39300**	**1909**

NA: Not Available

Source : National Bureau of Plant Genetic Resources, New Delhi

Table 3.4.4 : Status of cryopreserved germplasm				
Sl. No.	**Category**	**No. of Accessions**		
		2012	**2013**	**2014**
		(As on 31st December)		
1	Dormant Buds	373	387	387
2	Pollen grains	345	446	484
3	Wild Relatives*	1018	1024	1024
4	Rare & Endangered plants	80	99	99
5	Varieties*	655	732	770
6	Elite*	4	4	4
7	Registered germplasm*	23	26	23
8	Number of Species	729	732	787

Source : National Bureau of Plant Genetic Resources, Annual Report -2014-15

* included in respective Categories stored as orthodox seeds.

Table 3.4.5 : Status of germplasm at national cryobank				
Sl. No.	**Category**	**No. of Accessions**		
		2012	**2013**	**2014**
		(As on 31st December)		
1	**2**	**3**	**4**	**5**
I	**Intermediate & Recalcitrant**			
1	Fruits & Nuts	2876	2923	3037
2	Spices & Condiments	151	151	151
3	Plantation Crops	22	22	22
4	Agroforestry & Forestry species	1640	1644	1644
5	Industrial crops	1325	1325	1325
6	Medicinal & Aromatic Plants	6	6	10
II	**Orthodox**			
1	Cereals	248	248	248
2	Millets and Forages	287	287	287
3	Pseudocereals	76	76	76
4	Grain Legumes	636	636	808
5	Oilseeds	471	500	668
6	Fibres	66	66	66
7	Vegetables	433	433	475
8	Medicinal & Aromatic Plants	941	946	946
9	Narcotics & dyes	34	34	34
10	Miscellaneous	16	16	16
Total		**9228**	**9313**	**3624**

Source : National Bureau of Plant Genetic Resources, Annual Report -2014-15

3.5 Conservation measures in India

3.5.1 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 3.5.1**.** Summary of protected areas is given in Table 3.5.2

3.5.2 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. Details of tiger reserve are given in Table 3.5.3 and Table 3.5.4 Estimated Population of Elephants in the wild is presented in Table 3.5.5. Location of major zoos in India & growth of wild life sanctuaries & national parks is given yearwise in Table 3.5.6 and Table 3.5.7 respectively.

Table 3.5.1 : 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	Khangchendzonga	2931.00	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	28.08.2009	Pin Valley National Park and surroundings; Chandratal and Sarchu & Kibber Wildlife Sanctuary in Himachal Pradesh.
17	Seshachalam	4755.99	20.09.2010	Seshachalam hill range in Eastern Ghats encompassing part of Chador and Kakapo district in Andhra Pradesh
18	Pinna	2998.98	25.08.2011	Part of Panna and Chhattarpur district in Madhya Pradesh

Source: Ministry of Environment and Forests

Table 3.5.2 - Summary of Protected Area Statistics in India						
States/UT's	**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
Arunachal 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	16	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	15	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**	**670**	**161221.59**

NPs- National Parks : WLS- Wild Life Sanctuary: PAs- Protected Areas.

Source: Ministry of Environment and Forests

Table 3.5.3 : Tiger Reserves in India (as on 24.6.2015)

Area in sq. Kms.

Sl. No.	Year of Creation	Name of Tiger Reserve	State	Area of core/critical tigher habitat	Area of the buffer/peripheral	Total area
1	2	3	4	5	6	7
1	1973-74	Bandipur	Karnataka	872.24	584.06	1456.30
2	1973-74	Corbett	Uttarakhand	821.99	466.32	1288.31
		Amangarh (buffer of Corbett TR)	Uttar Pradesh		80.60	80.60
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	715.85	1129.93
7	1973-74	Ranthambore	Rajasthan	1113.36	297.93	1411.29
8	1973-74	Similipal	Odisha	1194.75	1555.25	2750.00
9	1973-74	Sunderbans	West Bengal	1699.62	885.27	2584.89
10	1978-79	Periyar	Kerala	881.00	44.00	925.00
11	1978-79	Sariska	Rajasthan	881.11	332.23	1213.34
12	1982-83	Buxa	West Bengal	390.58	367.32	757.90
13	1982-83	Indravati	Chhattisgarh	1258.37	1540.70	2799.07
14	1982-83	Namdapha	Arunachal Pradesh	1807.82	245.00	2052.82
15	1987-88	Dudhwa	Uttar Pradesh	1093.79	1107.98	2201.77
16	1988-89	Kalakad-Mundanthurai	Tamil Nadu	895.00	706.54	1601.54
17	1988-89	Valmiki	Bihar	598.45	300.93	899.38
18	1989-90	Pench	Madhya Pradesh	411.33	768.30	1179.63
19	1992-93	Tadoba-Andhari	Maharashtra	625.82	1101.77	1727.59
20	1993-94	Bandhavgarh	Madhya Pradesh	716.90	820.04	1536.94
21	1993-94	Panna	Madhya Pradesh	576.13	1021.97*	1598.10
22	1994-95	Dampa	Mizoram	500.00	488.00	988.00
23	1994-95	Bhadra	Karnataka	492.46	571.83	1064.29
24	1998-99	Pench	Maharashtra	257.26	483.96	741.22
25	1999-2000	Pakke	Arunachal Pradesh	683.45	515.00	1198.45
26	1999-2000	Nameri	Assam	320.00	144.00	464.00
27	1999-2000	Satpura	Madhya Pradesh	1339.26	794.04	2133.31
28	2008-09	Anamalai	Tamil Nadu	958.59	521.28	1479.87
29	2008-09	Udanti-Sitanadi	Chattisgarh	851.09	991.45	1842.54
30	2008-09	Satkosia	Odisha	523.61	440.26	963.87
31	2008-09	Kaziranga	Assam	625.58	548.00	1173.58
32	2008-09	Achanakmar	Chattisgarh	626.20	287.82	914.02
33	2008-09	Dandeli-Anshi	Karnataka	814.88	282.63	1097.51
34	2008-09	Sanjay-Dubri	Madhya Pradesh	812.57	861.93	1674.50
35	2008-09	Mudumalai	Tamil Nadu	321.00	367.59	688.59
						Continued

Table 3.5.3 : Tiger Reserves in India (as on 24.6.2015)

Area in sq. Kms.

Sl. No.	Year of Creation	Name of Tiger Reserve	State	Area of core/critical tigher habitat	Area of the buffer/peripheral	Total area
1	2	3	4	5	6	7
36	2008-09	Nagarahole	Karnataka	643.35	562.41	1205.76
37	2008-09	Parambikulam	Kerala	390.89	252.77	643.66
38	2009-10	Sahyadri	Maharashtra	600.12	565.45	1165.57
39	2010-11	Biligiri Ranganatha Temple	Karnataka	359.10	215.72	574.82
40	2012-13	Kawal	Telangana	893.23	1125.89	2019.12
41	2013-14	Sathyamangalam	Tamil Nadu	793.49	614.91	1408.40
42	2013-14	Mukandra Hills	Rajasthan	417.17	342.82	759.99
43	2013-14	Nawegaon-Nagzira	Maharashtra	653.67	0.00	653.67
44	1982-83	Nagarjunsagar Srisailam (part)*	Andhra Pradesh	2595.72	700.59	3296.31
45	2014	Nagarjunasagar Srisailam (part) *	Telangana	2166.37	445.02	2611.39
46	2014	Pilibhit	Uttar Pradesh	602.80	127.45	730.25
47	2014	Bor	Maharashtra	138.12	0.00	138.12
48	2015	Rajaji Tiger Reserve	Uttarakhand	819.54	255.63	1075.17
TOTAL				**39709.84**	**30161.80**	**69913.24**

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

*Revised area details are awaited from the State Governments concerned after reorganization.

** Notifed vide notification No. F. 15-21/2010/10-2 dated 24.7.2014 by the State Government of Madhya Pradesh (old area of the buffer was 1002.42 sq.km.)

Table 3.5.4 : Population estimates of Tiger

State	Tiger Population			Tiger Km^2	
	2006	2010	2014	2006	2010
Shivalik-Gangetic Plain Landscape Complex					
Uttarakhand	178	227	340	1901	3476
Uttar Pradesh	109	118	117	2766	2511
Bihar	10	8	28	510	750
Shivalik Gangetic	**297**	**353**	**485**	**5177**	**6712**
Central Indian Landscape Complex and Eastern Ghats Landscape Complex					
Andhra Pradesh	95	72	68	14126	4495
Chhattisgarh	26	26	46	3609	3514
Madhya Pradesh	300	257	308	15614	13833
Maharashtra	103	169	190	4273	11960
Odisha	45	32	28	9144	3398
Rajasthan	32	36	45	356	637
Jharkhand	-	10	3+	1488	1180
Central Indian	**601**	**601**	**688**	**48610**	**39017**
Western Ghats Landscape Complex					
Karnataka	290	300	406	**18715**	14414
Kerala	46	71	136	6168	6804
Tamil Nadu	76	163	229	9211	8389
Goa	-	-	5		
Western Ghats	**412**	**534**	**776**	**34094**	**29607**
North East Hills and Brahmaputra Flood Plains					
Assam	70	143	167	1164	2381
Arunachal Pradesh	14	-	28$	1685	1304
Mizoram	6	5	3	785	416
Northern West Bengal	10	-	3+	596	799
North East Hills, and Brahmaputra	100	148	201	4230	4900
Sunderbans	-	70	76	1586	1645
Total Tiger Population	**1411**	**1706**	**2226**	**93697**	**81881**

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

\+ From scat DNA

$ From camera trap data and scat DNA

Table 3.5.5 : Estimated Population of Wild Elephants						
		ELEPHANT POPULATION				
REGION	STATE	1993	1997	2002	2007	2012
North-East	Arunachal	2102	1800	1607	1690	890
	Assam	5524	5312	5246	5281	5620
	Meghalaya**	2872	1840	1868	1811	1811
	Nagaland	178	158	145	152	212
	Mizoram	15	22	33	12	NA
	Manipur	50	30	12	Nil	NA
	Tripura	100	70	40	59	59
	West Bengal (North)	186	250	292	300-350	647
Total for North-East		**11027**	**9482**	**9243**	**9305-9355**	**9239**
East	West Bengal (South)	14	26	36	25	NA
	Jharkhand	550*	618*	772	624	688
	Odisha	1750	1800	1841	1862	1930
	Chhattisgarh	-	-	-	122	247
Total for East		**2314**	**2444**	**2649**	**2633**	**2865**
North	Uttarakhand**	828*	1130*	1582	1346	1346
	U.P.	47	70	85	380	291
Total for North		**875**	**1200**	**1667**	**1726**	**1637**
South	Tamil Nadu	2307	2971	3052	3867	4015
	Karnataka	5500	6088	5838	4035	5648-6488
	Kerala	3500	3600	3850	6068	5942-6422
	Andhra Pradesh	46	57	74	28	41
	Maharashtra	-	-	-	7	4
Total for South		**11353**	**12716**	**12814**	**14005**	**15650-16970**
Islands	Andaman & Nicobar	35	35	40	NA	NA
Grand Total		**25604**	**25877**	**26413**	**27669-27719 Mid value - 27694**	**29391-30711 Mid value -1320**

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

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

** Meghalaya and Uttarakhand has not conducted elephant census after 2007. Therefore the figure of 2007 has been maintained for 2012 as well.

NA: Not available.

Table 3.5.6: State wise location of major zoos

Sl. No	State	Name of Zoo	Location
1	2	3	4
1	Andaman & Nicobar Islands	Biological Park, Chidyatapu	Port Blair
2	Andhra Pradesh	Indira Gandhi Zoological Park	Visakhapatnam
3		Nehru Zoological Park	Hyderabad
4		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		Maitri Baagh Zoo	Bhilai
10	Delhi	National Zoological Park	Delhi
11	Goa	Bondla Zoo	Usgao
12	Gujarat	Dr. Shyamaprasad Mukharjee Zoological Garden	Surat
13		Indoda Nature Park	Gandhi Nagar
14		Kamla Nehru Zoological Garden	Ahemdabad
15		Sakkarbaug Zoo	Junagarh
16		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		Kashmir Zoo	Srinagar
21	Jharkhand	Bhagwan Birsa Biological Park	Ranchi
22		Jawaharlal Nehru Biological Park	Bokaro
23		Tata Steel Zoological Park	Jamshedpur
24	Karnataka	Bellary Childrens Park-Cum-Zoo (Bellary Zoo)	Bellary
25		Children Park & Zoo (Gadag Zoo)	Gadag
26		Dr. K.Shivarma Karanth Pilikula Biological Park	Mangalore
27		National Park, Bannerghatta Zoological Garden	Bangalore
28		Sri Chamarajendra Zoological Gardens	Mysore
29		Tiger & Lion Safari, Thyyarekoppa	Shimoga
30	Kerala	State Museum & Zoo	Thrissur
31		Thiruvananthapuram Zoo	Thiruvananthapuram
32	Madhya Pradesh	Gandhi Zoological Park	Gwalior
33		Kamla Nehru Prani Sanghrahalay Zoo	Indore
34		Van Vihar National Park	Bhopal
35	Maharashtra	Aurangabad Municipal Zoo	Aurangabad
36		Mahatma Gandhi Rashtriya Udyan Zoo	Solapur
37		Nisargakavl Bahlnabai Choudhary Pranisansangahralay	Pune

Continued….

Table 3.5.6: State wise location of major zoos

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

Concluded.

Source : Central Zoo Authority, Ministry of Environment & Forests


Table 3.5.7 : National parks and wildlife sanctuaries of India					
Year	National Parks		Wildlife Sanctuaries		Total Area
	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
2014	102	39888.00	517	120208	160096.00
2015*	103	40500.00	531	117607	158107.00

Source: M/o Environment & Forests

*: Data as of July 2015. Data taken from ENVIS Centre on Wildlife & Protected Areas website



3.6 Livestock

3.6.1 Despite its wide range environmental impacts, livestock is major force in Indian economy. FAO reports that livestock production is one of the major causes of world's most pressing environmental problems including global warming

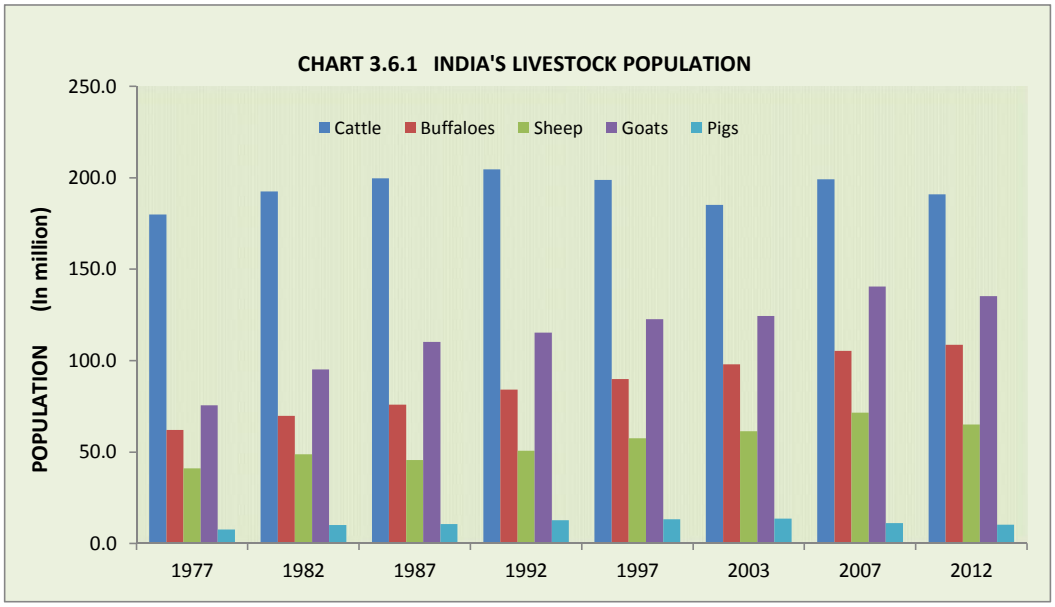
3.6.2 In India, livestock census is conducted every 5 years by Ministry of Agriculture. As seen in Table 3.6.1, the total livestock population in the country is 512.05 million in 2012. There is a decrease of about 3.33% over the previous census year 2007. A break-up of various categories with change in percentage over 2007 is given in Table 3.6.2.

Table 3.6.1: India's livestock population

Million numbers

Sl. No.	Species	Number of Animals							
		1977	1982	1987	1992	1997	2003	2007	2012
1	2	3	4	5	6	7	8	9	10
1	Cattle	180.00	192.45	199.70	204.58	198.88	185.18	199.08	190.90
2	Buffaloes	62.00	69.78	75.97	84.21	89.92	97.92	105.30	108.70
3	Sheep	41.00	48.76	45.70	50.78	57.49	61.47	71.56	65.07
4	Goats	75.60	95.25	110.21	115.28	122.72	124.36	140.50	135.17
5	Horses & Ponnies	0.90	0.90	0.80	0.82	0.83	0.75	0.61	0.63
9	Camels	1.10	1.08	1.00	1.03	0.91	0.63	0.52	0.40
6	Pigs	7.60	10.07	10.63	12.79	13.29	13.52	11.13	10.29
7	Mules	0.09	0.13	0.17	0.19	0.22	0.18	0.14	0.20
8	Donkeys	1.00	1.02	0.96	0.97	0.88	0.65	0.44	0.32
10	Yaks	0.13	0.13	0.04	0.06	0.06	0.06	0.80	0.80
	TOTAL	**369.00**	**419.59**	**445.29**	**470.86**	**485.39**	**485.00**	**529.70**	**512.06**
11	Poultry	159.20	207.74	275.32	307.07	347.61	489.01	648.83	729.21
12	Dogs	NC	18.54	17.95	21.77	25.48	29.03	19.09	11.67
13	Rabbits	NC	NC	NC	NC	NC	0.48	0.42	0.59

Source : Live Stock Census, Ministry of Agriculture



3.6.3 The trend and extent in growth of livestock population from 1977 to 2012 at all India level are evident from the above chart.

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.

A brief analysis of diseases in livestock is given in Table 3.6.3

Table 3.6.2 Total Livestock in 2007 and 2012

Category	2007	2012	% Change
Cattle			
Exotic/Crossbred			
Male	6844	5971	-12.76
Female	26216	33760	28.78
Total Exotic/Crossbred	**33060**	**39732**	20.18
Indigenous			
Male	76779	61949	-19.32
Female	89236	89224	-0.01
Total Indigenous	166015	151172	-8.94
Total Cattle#	**199075**	**190904**	-4.10
Buffalo			
Male	19597	16103	-17.83
Female	85745	92599	7.99
Total Buffalo	**105342**	**108702**	3.19
Yaks			
Male	38	35	-7.89
Female	45	42	-6.67
Total Yaks	**83**	**77**	-7.23
Mithuns			
Male	127	129	1.57
Female	137	169	23.36
Total Mithuns	**264**	**298**	12.88
Bovine			
Male	103385	84187	-18.57
Female	201379	215794	7.16
Total Bovine	**304764**	**299981**	-1.57
Sheep			
Exotic/Crossbred			
Male	1144	1207	5.51
Female	2586	2574	-0.46
Total Exotic/Crossbred	**3730**	**3781**	1.37
Indigenous			
Male	16730	13916	-16.82
Female	51098	47372	-7.29
Total Indigenous	67828	61288	-9.64
Total Sheep	**71558**	**65069**	-9.07
Goat			
Male	40793	37617	-7.79
Female	99744	97556	-2.19
Total Goat	**140537**	**135173**	-3.82
Horses & Ponies			
Male	336	350	4.17
Female	276	275	-0.36
Total Horses & Ponies	**612**	**625**	2.12
Mules			
Total Mules	**137**	**196**	43.07
Donkey			
Male	227	186	-18.06
Female	211	133	-36.97
Total Donkeys	**438**	**319**	-27.17

Continued

Table 3.6.2 Total Livestock in 2007 and 2012				
Category		**2007**	**2012**	**% Change**
Camels				
	Male	243	191	-21.40
	Female	274	210	-23.36
Total Camels		**517**	**400**	-22.63
Pigs				
	Exotic/Crossbred			
	Male	1209	1283	6.12
	Female	1180	1174	-0.51
	Total Exotic/Crossbred	**2389**	**2456**	2.80
	Indigenous			
	Male	4134	3681	-10.96
	Female	4610	4156	-9.85
	Total Indigenous	8744	7837	-10.37
Total Pigs		11133	10294	-7.54
Dogs				
	Female			#DIV/0!
	Male	12432	8444	-32.08
	Female	6656	3228	-51.50
Total Dogs#		**19088**	**11673**	-38.85
Rabbit				
	Male	183	255	39.34
	Female	241	337	39.83
Total Rabbits		424	592	39.62
Total Elephants		**1**	**22**	2100.00
Poultry				
	Fowls	617734	692646	12.13
	Ducks	27643	23539	-14.85
	Turkeys & others	3452	13025	277.32
Total Poultry		**648829**	**729209**	12.39

Source: Department Animal Husbandry Dairying and Fishery,Ministry of Agriculture. Concluded

Excluding stray cattle and stray dogs.

Table 3.6.3 Species-wise incidence of livestock diseases in India during 2015					
S. No.	**Disease**	**Species**	**Outbreak**	**Attack**	**Death**
1	**Foot & Mouth Disease**	Bov	88	2333	63
		Buff	12	193	28
		O/C	6	327	1
		Swi	3	15	0
		Total	**109**	**2868**	**92**
2	**Haemorrhagic Septicaemia**	Bov	53	1192	319
		Buff	16	543	99
		Camel	1	21	21
		O/C	19	379	147
		Total	**89**	**2135**	**586**
3	**Black Quarter**	Bov	90	782	262
		O/C	2	42	21
		Buffalo	6	27	18
		Total	**98**	**851**	**301**
4	**Anthrax**	Bov	20	57	57
		Buf	1	1	1
		O/C	28	196	196
		Total	**49**	**254**	**254**
5	**Fascioliasis**	Bov	60	2096	0
		O/C	11	389	0
		Buff	9	264	0
		Total	**80**	**2749**	**0**
6	**Enterotoxaemia**	O/C	36	753	179
		Bov	11	30	5
		Buff	1	2	0
		Total	**48**	**785**	**184**
7	**Sheep & Goat Pox**	O/C	114	2071	175
		Bov	3	267	0
		Avian	1	1	0
		Total	**118**	**2339**	**175**
8	**Blue Tongue**	O/C	22	60787	6263
9	**C.C.P.P.**	O/C	14	416	48
10	**Amphistomiasis**	Bov	73	7645	2
		O/C	19	1499	41
		Buff	3	9	0
		Total	**95**	**9153**	**43**
11	**Swine Fever**	Swi	34	778	259
12	**Salmonellosis**	Avi	36	60474	1827
		Bov	3	48	0
		Buff	1	2	0
		Swi	2	27	0
		Total	**42**	**60551**	**1827**
13	**Coccidiosis**	Bov	6	4199	0
		O/C	3	47	2
		Buff	1	2	0
		Avian	206	129282	5012
		Swi	3	14	0
		Total	**219**	**133544**	**5014**

S. No.	Disease	Species	Outbreak	Attack	Death
14	**Ranikhet Disease**	Avian	198	693840	12615
15	**Fowl Pox**	Avian	141	28160	1114
16	**Fowl Cholera**	Avian	15	11033	6700
17	**Marek's Disease**	Avian	14	932000	1530
18	**I.B.D.**	Avian	116	642444	9974
19	**Duck Plague**	Avian	16	332	78
20	**CRD**	Avian	413	2644673	18785
		Swi	1	60	12
		Total	**414**	**2644733**	**18797**
21	**Canine Distemper**	Can	37	622	1
22	**Rabies**	Bov	22	94	94
		Can	1	1	1
		Buff	1	1	1
		Total	**24**	**96**	**96**
23	**Babesiosis**	Bov	62	1523	5
		Avian	5	7	0
		Buff	9	31	1
		O/C	6	156	0
		Can	2	3	0
		Total	**84**	**1720**	**6**
24	**Mastitis**	Bov	158	13464	6
		Buff	8	33	0
		O/C	11	51	0
		Total	**177**	**13548**	**6**
25	**Trypanosomosis**	Bov	30	240	1
		Camel	1	2	0
		Equine	1	9	3
		Buff	18	99	1
		Total	**50**	**350**	**5**
26	**Mange**	Bov	29	996	0
		O/C	9	99	0
		Swine	2	22	0
		Can	3	68	0
		Total	**43**	**1185**	**0**
27	**PPR**	O/C	116	4905	1021
28	**Anaplasmosis**	Bov	14	203	10
		O/C	2	26	0
		Buff	3	7	0
		Total	**19**	**236**	**10**
29	**Brucelliosis**	Bov	5	271	0
30	**Coryza**	Avian	32	282180	1686
31	**Avian Influenza (Domestic) ***	Avian	4		197400
32	**Glanders**	Equine	9	20	8

*Birds Culled

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

3.7 Fishery

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

Table 3.7.1 : 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 2014-15, Department of Animal Husbandry and Dairying, Ministry of Agriculture (Marine Fisheries Census,2005)

3.7.2 The fish production (marine & inland) at all India level over the years, is presented at Table 3.7.2. 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 3.7.2 : Year Wise Fish Production-India

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	48.94	79.13
34	2010-11	32.50	49.81	82.90
35	2011-12	33.72	52.95	86.66
36	2012-13	33.21	57.19	90.40
37	2013-14	34.39	61.32	95.72

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

3.7.3 It is seen that Andhra Pradesh & West Bengal are the largest fish producing states over the past years. In 2013-14 also, Andhra Pradesh has the highest production of 2018.42 Thousand Tonnes.

Table 3.7.3 : State-wise fish production

('000 Tonnes)

Sl. No.	States/UT's	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	2	3	4	5	6	7	8	9	10	11	12
1	Andhra Pradesh	853.05	891.09	856.93	1010.09	1252.78	1293.86	1368.20	1603.17	1808.08	2018.42
2	Arunachal Pradesh	2.70	2.75	2.77	2.83	2.88	2.65	3.15	3.30	3.71	3.63
3	Assam	186.31	188.01	181.48	190.32	206.15	218.82	227.24	228.62	254.27	266.70
4	Bihar	267.51	279.53	267.04	319.10	300.65	297.40	299.91	344.47	400.14	432.30
5	Goa	990.44	104.95	102.39	33.43	86.21	85.36	93.27	89.96	77.88	114.06
6	Gujarat	635.21	733.81	747.33	721.91	765.90	771.52	774.90	783.72	788.49	798.49
7	Haryana	42.05	48.20	60.08	67.24	76.29	100.46	96.20	106.00	111.48	105.58
8	Himachal Pradesh	6.90	7.30	6.89	7.85	7.79	7.85	7.38	8.05	8.56	9.83
9	Jammu & Kashmir	19.10	19.15	19.20	17.33	19.27	19.30	19.70	19.85	19.95	20.00
10	Karnataka	251.23	297.57	292.46	297.69	361.85	408.05	526.58	546.44	525.57	555.31
11	Kerala	678.31	636.89	677.63	667.33	685.99	663.12	681.61	693.21	679.74	708.65
12	Madhya Pradesh	62.06	61.08	65.04	63.89	68.47	66.12	56.45	75.41	85.17	96.26
13	Maharashtra	548.02	580.54	595.94	556.45	523.10	538.35	595.25	578.79	586.37	602.68
14	Manipur	17.80	18.22	18.61	18.60	18.80	19.20	20.20	22.22	24.50	28.54
15	Meghalaya	5.64	4.12	5.49	4.00	3.96	4.21	4.56	4.77	5.42	5.75
16	Mizoram	3.68	3.75	3.76	3.76	2.89	3.04	2.90	2.93	5.43	5.94
17	Nagaland	4.90	5.50	5.80	5.80	6.18	6.36	6.59	6.84	7.13	7.47
18	Odisha	315.59	325.45	342.04	349.48	374.82	370.54	386.19	381.18	410.14	413.79
19	Punjab	77.70	85.64	86.70	78.73	86.21	122.86	97.04	97.62	99.13	104.02
20	Rajasthan	16.39	18.50	22.20	25.70	24.10	26.91	28.20	47.85	55.16	35.10
21	Sikkim	0.14	0.15	0.15	0.18	0.17	0.17	0.18	0.28	0.49	0.42
22	Tamil Nadu	459.43	463.03	542.28	559.36	534.17	534.17	614.81	611.49	620.40	624.30
23	Tripura	19.84	23.87	28.63	36.25	36.00	42.27	49.23	53.34	57.46	61.95
24	Uttar Pradesh	277.07	289.58	306.73	325.95	349.27	392.93	417.48	429.72	429.95	464.48
25	West Bengal	1215.00	1250.00	1359.10	1447.26	1484.00	1505.00	1443.26	1472.05	1490.02	1580.65
26	A & N Islands	32.68	12.10	28.68	28.69	32.49	33.16	33.92	35.26	36.62	36.95
27	Chandigarh	0.08	0.09	0.17	0.21	0.24	0.24	0.24	0.10	0.05	0.11
28	Dadar & Nagar Haveli	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
29	Daman & Diu	12.51	17.79	16.41	26.36	14.14	15.88	16.98	17.43	19.01	19.86
30	Delhi	1.41	0.70	0.61	0.61	0.72	0.72	0.82	0.74	0.69	0.88
31	Lakshadweep	11.96	11.96	11.75	11.04	12.59	12.37	12.37	12.37	12.37	18.72
32	Pondicherry	36.75	21.45	39.66	39.01	40.30	41.95	41.95	42.40	41.07	42.08
33	Chattisgarh	120.07	131.75	137.75	139.37	158.70	174.25	228.21	250.70	255.61	284.96
34	Uttaranchal	2.57	2.79	3.03	3.09	3.16	3.49	3.82	3.83	3.85	3.89
35	Jharkhand	22.00	34.27	34.27	67.89	75.80	70.50	71.89	91.68	96.60	104.82
Total		**6304.75**	**6571.63**	**6869.05**	**7126.83**	**7616.09**	**7851.61**	**8230.71**	**8666.49**	**9040.36**	**9572.27**

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

CHAPTER FOUR

ATMOSPHERE

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	Krypton	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

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 Sulphur 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 revised national ambient air quality standards (NAAQS) as per NAAQS notification dated 2009 is given in table 4.2.1

4.2.5 The state-wise concentration of major pollutants under national Ambient Air Quality Monitoring Programme (NAMP) during 2012 is presented in Table 4.2.2. A summary of the observation are as follows.

a. With respect to Sulphur dioxide it is observed that annual average is well within the limit in all States.

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 Delhi, Bihar,West Bengal, Rajasthan and Maharastra are higher.

c. In case of Particulate Matter (PM103), annual average value indicated that except few states such as Kerala, Mizoram and Puducherry all are exceeding the limits. The maximum value indicates in Delhi followed by Uttar Pradesh, Rajasthan and Bihar. The States/UTs like Manipur, Sikkim, Dadar & Nagar Haveli and Daman & Diu where data has not been received.

Table 4.2.1 : National ambient air quality standards (NAAQS)

Sl. No.	Pollutant	Time Weighted Average	Concentration Ambient Air		Methods of Measurement
			Industrial, Residential, Rural and other Areas	Ecologically Sensitive Area (Notified by Central Government)	
1	2	3	4	5	6
1	Sulphur Dioxide (SO_2) µg/m^3	Annual*	50	20	1. Improved West and Gaeke
		24 Hours**	80	80	2. Ultraviolet Fluorescence
2	Nitrogen Oxides (NO_2) µg/m^3	Annual*	40	30	1. Modified Jacob & Hochheiser
		24 Hours**	80	80	2. Chemiluminescence
3	Particulate Matter (Size <10µm) or µg.m^3	Annual*	60	60	1. Gravimetric
		24 Hours**	100	100	2. TEOM 3. Beta attenuation
4	Particulate Matter (Size <2.5µm) or PM2.5 µg/m^3	Annual*	40	40	1. Gravimetric
		24 Hours**	60	60	2. TEOM 3. Beta attenuation
5	Ozone (O_3),µg/m^3	8 hours**	100	100	1. UV photometric
		1 hours **	180	180	2. Chemiluminescence 3. Chemical Method
6	Lead (Pb),µg/m^3	Annual*	0.5	0.5	1. AAS/ICP Method after sampling using EPM 2000 or equivalent filter paper
		24 Hours**	1	1	2. ED-XRF using Teflon filter
7	Carbon Monoxide (CO), mg/m^3	8 hours**	2	2	Non dispersive Infra Red (NDIR) Spectroscopy
		1 Hour**	4	4	
8	Ammonia (NH3),µg/m^3	Annual*	100	100	1. Chemiluminescence 2. Indophemol blue method
		24 Hours**	400	400	
9	Benzene (C_6H_6),µg/m^3	Annual*	5	5	1. Gas chromatography based continuous analyzer 2. Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene(BaP)-particulate phase only,ng/m^3	Annual*	1	1	Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m^3	Annual*	6	6	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m^3	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

Source : Central Pollution Control Board

* : Annual Arithmetic 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 : Micrometre µg : Microgram

Note :

Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limit specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

Table 4.2.2 : State wise level of SO_2, NO_2 and RSPM in residential areas during 2012 and 2013

Sl	Name of the State	2012									2013								
		SO_2 µg/m^3 (Annual)			NO_2 µg/m^3 (Annual)			RSPM µg/m^3 (Annual)			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.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Andhra Pradesh	34	4	7	37	10	18	156	30	72	2	75	7	5	131	18	8	538	75
2	Assam	13	4	6	21	9	13	229	28	72	3	31	7	8	29	15	12	450	124
3	Bihar	26	2	6	126	8	36	456	25	166	-	-	-	-	-	-	-	-	-
4	Chandigarh	3	2	2	44	6	19	314	26	110	3	18	10	8	60	23	40	373	118
5	Chhattisgarh	12	10	11	32	23	26	168	121	151	2	5	2	5	73	28	19	464	101
6	Dadra & Nagar Haveli	9	7	8	25	18	20	@	@	@	7	9	8	18	25	21	41	48	44
7	Daman & Diu	9	7	8	23	18	20	@	@	@	7	22	8	18	23	20	37	46	44
8	Delhi	21	3	5	101	30	59	644	59	237	2	40	4	21	199	66*	28	670	221
9	Goa	17	7	11	27	11	17	228	28	96	2	21	7	5	21	12	3	113	53
10	Gujarat	23	12	15	37	20	26	199	72	94	7	29	12	11	33	19	36	259	84
11	Haryana	17	4	9	45	12	23	306	62	147	5	22	11	5	45	24	53	306	178
12	Himachal Pradesh	7	2	2	42	9	15	217	56	99	0	30	2	2	240	14	6	526	91
13	Jammu & Kashmir	17	2	6	26	3	12	280	46	119	5	35	15	2	14	5	63	179	118
14	Jharkhand	37	17	23	52	28	41	280	87	173	12	42	22	29	125	41	54	291	151
15	Karnataka	15	6	9	46	15	20	233	26	83	2	32	9	5	76	18	10	440	82
16	Kerala	13	3	4	25	7	13	172	22	55	2	20	4	5	111	11	7	712	55
17	Madhya Pradesh	20	9	14	39	14	22	236	54	128	2	50	12	2	74	22	15	728	144
18	Maharashtra	46	9	17	72	17	33	260	38	105	1	122	16	1	138	31	1	582	101
19	Manipur	@	@	@	@	@	@	@	@	@	2	45	5	5	28	10	10	181	59
20	Meghalaya	15	6	9	19	6	11	117	42	73	2	7	2	4	55	7	1	253	48
21	Mizoram	3	2	2	32	4	7	152	20	54	-	-	-	-	-	-	-	-	-
22	Nagaland	3	2	2	15	5	6	169	22	86	2	2	2	5	25	5	21	252	93
23	Odisha	5	3	4	25	13	17	132	51	82	2	19	4	5	74	16	7	393	82
24	Punjab	17	7	10	40	23	27	282	113	162	4	22	10	8	48	25	50	748	153
25	Puducherry	10	5	8	20	10	14	88	23	42	2	9	6	5	28	14	24	68	43
26	Rajasthan	22	7	8	65	31	34	373	176	173	4	20	7	14	73	30	16	707	173
27	Sikkim	@	@	@	@	@	@	@	@	@	-	-	-	-	-	-	-	-	-
28	Tamil Nadu	24	6	11	48	12	21	184	32	73	2	56	12	5	118	22	3	414	69
29	Uttar Pradesh	27	8	12	52	19	29	341	99	184	2	121	10	2	203	27	12	704	182
30	Uttarakhand	30	22	26	46	23	28	534	58	162	2	30	23	5	31	26	24	966	142
31	West Bengal	35	5	12	91	25	58	324	39	137	2	66	10	5	240	65*	13	981	162

Source : Central Pollution Control Board µg/m^3 : Micrograms per metre cube @ : Data not received

NB. '-' data not received, National Air Quality Standard (NAAQS) of 50 µg/m3 for SO2, 40 µg/m3 for NO2, and 60 µg/m3 for PM10 for Residential/ industrial / other area & 20 µg/m3 for SO2, 30 µg/m3 for NO2, and 60 µg/m3 for PM10 for Ecologically sensitive area. Data of monitoring stations with monitoring days ≥50 has only been considered. The data furnished in the table is as available on date.

4.3 Industries and Pollution

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, West Bengal The highest concentration of sulphur dioxide and oxides of nitrogen is, therefore, often found in cities located in these states. Some other industrial estates in Delhi, Rajasthan, Andhra Pradesh, Karnataka and Tamil Nadu are also becoming critical.

The ambient air quality in major cities is presented at table 4.3.1 and 4.3.2.

Table 4.3.1: Ambient air quality in major cities 2013

(residential/industrial/rural/other areas, annual average concentration in microgram cubic meter)

(µg/m^3)

City	SO_2	NO_x	PM_{10}(µg/m^3)
Ahmedabad	12.0	17	79
Bangalore	13.0	26	113
Chennai	14.0	22	75
Delhi	4.0	66	221
Hyderabad	5.0	24	90
Kolkata	11.0	70	159
Mumbai	3.0	13	117

Source: Central Pollution Control Board

PM : Particulate Matter

SO_2 : Sulphur dioxide No_x : Oxides of nitrogen

The trend in ambient air quality in major cities (pollutant wise) over time is presented in table 4.3.2

4.3.2 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 71.26 % in the number of registered factories in India from 1987-88 to 2011-12.The details of registered factories sector wise are in Table 4.3.3.

Table 4.3.2: Year wise ambient air quality in major cities

(µg/m3)

Sulphur dioxide (SO_2)

City	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008	2009	2012	2013
Ahmedabad	25.0	15.1	-	12.2	8.4	10	12.3	16	15.7	12.3	16	12	12.0
Bangalore	20.7	27.9	20.3	38.2	20.7	20	13.4	12	8.5	15.2	14	14	13.0
Chennai	8.1	15.9	12.6	11.9	12.5	17	19.9	15	12.2	9.5	9	12	14.0
Delhi	17.3	16.3	15.4	17.5	15.2	13	11.3	10	9.89	6.6	6	5	4.0
Hyderabad	16.8	16.4	11.8	14	12.4	10	7.27	6	5.63	5.5	5	4	5.0
Kolkata	21.3	0	34.3	44.5	17.4	18	11.4	17	9.33	7.7	11	12	11.0
Mumbai	18	25.1	11.5	14.9	12.1	16	9.07	8	6.67	8.7	6	5	3.0

(µg/m3)

Oxides of Nitrogen (NO_x)

City	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008	2009	2012	2013
Ahmedabad	14.8	20	-	33	28.6	39	31.8	25	24.3	20.0	21	24	17
Bangalore	28	20.4	25	27.1	40.2	23	25.5	35	51.8	40.8	37	28	26
Chennai	9	13	16.7	10.7	14.4	18	18.4	26	16.8	15.4	17	21	22
Delhi	39.7	34	33.9	35.7	39.9	37	37.3	42	46.1	56.7	19	59	66
Hyderabad	25	30.7	30.8	24.3	25.2	31	25.5	26	30.3	26.2	23	28	24
Kolkata	29.3	0	32	30.5	34.8	74	81.7	71	59.7	64.0	68	70	70
Mumbai	35.3	34.3	19.5	29.6	25.5	23	17.4	21	18.3	39.3	41	20	13

(µg/m3)

Suspended Particulate Matter (SPM)

City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008
Ahmedabad	251	254	235	-	351	393	343	281	256	244	220
Bangalore	-	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	2009	2012	2013
Ahmedabad	161	237	198	169	154	152	88	94	83	79
Bangalore	0	89.7	68	64.3	76	69	100	112	121	113
Chennai	71.7	65	77.6	74.8	86	60	63	73	57	75
Delhi	172	155	146	158	151	149	214	252	237	221
Hyderabad	127	98	68.8	71	64	71	85	81	79	90
Kolkata	140	145	117	128	121	134	103	126	135	159
Mumbai	115	107	67.2	68.7	70	78	127	117	117	117

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

Table 4.3.3 : 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
25	2011-12	164316	693	10700	175710
26	2012-13	167197	673	11233	179102

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

Summary Results of Factory Sector' for ASI 2011-12

Note: Factories registered under Factory Act 1948

Source : Economics Statistics Division, Central Statistics Office

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	Maximum 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	500 mg/litre
	Total organic chloride	2.0 kg/tonne of paper produced
	Flow (total waste water discharge)	
	i. Large pulp and paper[a]	200 m^3/tonne of paper produced
	ii. Large rayon grade newsprint	150 m^3/tonne of paper produced

Source : Central Polution Control Board, Pollution Control Act, Rules & Notification issued thereunder series PCLS/02/2010.

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) rules, 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**		
i)	Raw material handling	Primary and secondary crusher particulate matter	150 mg/m^3
ii)	Precipitation area : calcination	Particulate matter	250 mg/m^3
		Carbon Mono-oxide	1 % maximum
		Stack Height[a]	a
2	**Smelter plant**	Particulate matter	
i)	Green anode shop	Particulate matter	150
ii)	Anode bake oven	Particulate matter	50 mg/Nm^3
		Total fluoride	0.3kg/tonne at Aluminium
3	**Potroom**	Particulate matter	150 mg/m^3
		Total fluoride for Soderberg* Technology	2.8Kg/ton by 31st December 2006
		For Pre-baked Technology	0.8 Kg/t by 31st December 2006

Source : Central Polution Control Board. (Environment (Protection) Rules, 1986

a is $H = 14\ Q^{0.3}$, where Q is the emission rate of sulphur dioxide in Kg/hr 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 given below in 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 (3 days at 27 ^{0}C)[a]	50.0
3	Phenol[b]	5.0
4	Sulphide (as S)	2.0
5	Chemical Oxygen Demand	250.0
6	Cyanide (as CN)	0.2
7	Fluoride (as F)[c]	15.0
8	Total Suspended Solids	100.0
9	Hexavalent Chromium	0.1
10	Total Chromium (as Cr)[d]	2.0

Source : Central Polution Control Board, Environment (Protection) rules, 1986

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

4.4.6 The detail of Indian standards for maximum permissible limits for Industrial effluent discharges is shown in the table 4.4.6.

Table 4.4.6 : 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

4.5 Grossly Polluting Industries

4.5.1 In addition to air pollution, industries cause water pollution also. The table 4.5.1 shows that at all India level, 68.16% 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

Sl. No.	Name of the State/UT	2010				2011			
		Total	Complying	Closed	Defaulting	Total	Complying	Not Complying*	Closed
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	17	11	6	0	17	11	0	6
2	Assam	9	9	0	0	9	4	5	0
3	Bihar	22	16	6	0	22	16	0	6
4	Chattisgarh	1	1	0	0	1	1	0	0
5	Gujarat	17	12	4	1	3	2	1	0
6	Haryana	76	71	1	4	142	112	17	13
7	Jharkhand	38	38	0	0	5	2	3	0
8	Karnataka	10	8	1	1	10	8	1	1
9	Kerala	36	18	7	11	29	20	2	7
10	Madhya Pradesh	1	0	0	1	1	1	0	0
11	Maharashtra	214	139	2	73	214	139	73	2
12	Odisha	20	6	5	9	19	6	8	5
13	Puducherry	1	0	0	1	1	1	0	0
14	Punjab	20	9	4	7	20	14	2	4
15	Tamil Nadu	366	248	118	0	1	1	0	0
16	Uttar Pradesh	432	294	89	49	569	391	62	116
17	Uttarakhand	45	25	4	16	49	29	16	4
18	West Bengal	31	19	3	9	32	21	7	4
19	Daman Diu & Dadar Nagar Haveli	2	2	0	0	2	2	0	0
20	Himachal Pradesh	-	-	-	-	2	2	0	0
21	Tripura	-	-	-	-	12	7	3	2
22	Goa	-	-	-	-	2	2	0	0
	Total	**1358**	**926**	**250**	**182**	**1162**	**792**	**200**	**170**

Source : Ministry of Environment & Forests,(Central Pollution Control Board)

* : Not complying : industries with effluent treatment installed but found not complying with few parameter of prescribed standard at the time of monitoring.

Not : Up-dated information in respect of Maharashtra, Andhra Pradesh, Chhattisgarh and Daman are awaited. The status of these states is based on previous available data.

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 which are revisited frm time to time.

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. 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.

h. Source apportionment studies for particulate matter (PM10) under taken is six cities namely Delhi, Mumbai, Chennai, Bangalore and Kanpur out came the stage is available CPCB website.

4.7. Up-coming initiatives

4.7.1 There are some up-coming initiatives that the government of India has taken up in the past few years. There are:

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.

4.8 Road Transport

4.8.1 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. The state-wise total registered moter vehical (Transport and Non- Transport) in India from 2006 to 2012 is given on table 4.8.1.

Table 4.8.1 : Total registered motor vehicles in India by State/Uts

Sl. No.	States/UT	Transport															
		Multi-exied/Articulated Vehicles/Trucks & Lorries								Light Motor Vehicles (Goods)							
		2006	2007	2008	2009	2010	2011	2012	2013	2006	2007	2008	2009	2010	2011	2012	2013
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Andhra Pradesh	181832	196703	218733	233415	236211	241663	2,53,415	2,53,471	85112	131782	165918	194746	219332	257147	3,02,124	3,01,439
2	Arunachal Pradesh*	2355	2355	2355	2355	2355	..	..	..	601	601	601	601	601	..	..	..
3	Assam	91801	97790	105565	114485	124132	136090	1,44,183	2,175	19371	22587	25451	29703	32473	35788	47,296	67,167
4	Bihar	50016	52005	54414	58012	66485	73472	83,191	89,754	0	48123	54153	62576	..	..	…	13457
5	Chhattisgarh	51716	59112	67634	73843	78488	83674	91,068	97,515	21858	25515	29803	33948	38434	43936	50,373	58,466
6	Goa (c)	34043	33120	33596	35495	37040	39422	42,395	42,759	0	4220	6316	7260	8218	9402	11,447	13,486
7	Gujarat	204362	223022	239404	247772	259231	276290	3,01,533	3,19,207	253340	285858	314388	338826	367113	402514	4,48,958	4,99,277
8	Haryana	176046	200977	220470	230858	249991	275162	2,92,735	3,07,509	74494	83921	90793	96558	102541	114384	1,24,897	1,37,511
9	Himachal Pradesh	31803	27239	30409	47339	49582	51899	53,763	71,843	20623	21738	24097	39058	42877	47395	43,092	56,174
10	Jammu & Kashmir	33174	35697	38977	41696	35109	35414	38,482	40,751	16843	20004	22674	24768	43238	46792	51,412	56,230
11	Jharkhand	68915	97967	106463	116835	156196	172371	1,91,253	2,09,790	0	53866	59451	66160	160778	180934	2,02,638	2,02,638
12	Karnataka	210432	181587	198955	205497	200316	217113	2,33,422	2,47,639	65581	130685	145809	161100	177179	198378	2,21,160	2,58,701
13	Kerala	264262	64454	65707	66868	68777	72534	76,330	78,796	0	247799	271763	291514	251471	288447	3,23,891	3,64,323
14	Madhya Pradesh	83293	88755	94661	99242	105025	112954	1,21,916	1,31,098	39943	46754	55057	62984	72029	82673	95,702	1,11,713
15	Maharashtra	287230	316502	344267	366642	374705	389941	4,11,418	4,02,366	334741	383854	436725	478975	521692	583847	6,56,407	7,39,725
16	Manipur	6746	7078	7216	7216	7639	8249	8,599	10,732	1854	2005	2245	2245	2871	3207	4,054	6,445
17	Meghalaya	17060	17937	18572	19747	21372	23064	25,451	26,827	2565	3222	3781	4425	4955	6058	7,210	8,873
18	Mizoram	4475	3000	3167	3343	3507	3844	4,285	4,630	5	2566	2981	3397	4003	4862	6,194	6,880
19	Nagaland	47089	51466	55974	60684	65729	77968	84,008	90,225	11804	13319	14043	15068	16345	25158	17,799	19,569
20	Odisha	74432	83093	91154	100279	109804	119145	1,30,030	1,34,990	47843	56534	66429	78370	86729	100546	1,09,719	1,32,625
21	Punjab	68154	119630	129797	139065	149367	149367	1,25,898	1,25,898	59566	20186	20186	20186	20186	20186	75,860	75,860
22	Rajasthan	206381	152223	169486	179631	198089	222959	3,62,028	4,01,983	22966	116861	127937	138487	148892	162837	69,509	76,396
23	Sikkim	1915	2270	2490	2755	3214	3457	3,930	3,051	489	585	605	750	795	823	947	1353
24	Tamil Nadu	315564	340950	366658	387336	404652	433579	4,67,225	4,92,741	231491	243904	254321	261800	280388	311084	3,53,883	4,04,244
25	Telangana								1,20,442								1,68,851
26	Tripura	8138	8593	9000	9524	10432	10934	11,166	9,674	2535	3336	4037	4819	6199	7568	8,452	12,338
27	Uttarakhand	12092	14816	17014	17354	18026	19474	23,786	25,174	8336	7086	8481	10453	16393	19695	26,670	26,924
28	Uttar Pradesh	106760	107559	115552	122520	137436	150670	1,62,813	1,86,404	77668	85906	100273	117913	131181	156388	1,76,164	2,13,657
29	West Bengal	235269	256072	253389	251120	222716	248776	2,81,995	1,93,943	--	$	$	$	$	$	$	242896
	Union Territory:	**2875355**	**2841972**	**3061079**	**3240928**	**3395626**	**3649575**	**40,26,318**	**41,21,387**	**1399629**	**2062817**	**2308318**	**2546690**	**2756913**	3110049	34,35,858	42,77,218
1	A & N Islands	1716	2152	2303	2355	2366	2429	2,484	2,519	76	0	0	0	.	..	…	..
2	Chandigarh	1766	1775	1865	1952	2210	2490	2,689	2,794	8039	8455	8725	9586	15466	21841	23,015	24,283
3	Dadra & Nagar Haveli	6072	6537	7123	7604	8048	8591	8,935	9,355	1750	2043	2298	2496	2761	3036	3,380	3,809
4	Daman & Diu	2223	2568	2791	2934	3112	3646	3,818	3,946	2316	2670	2854	2973	3130	3274	3,434	3,629
5	Delhi	57682	82525	83770	84114	85384	86301	4,792	5,176	67144	91698	105331	124180	140872	156030	1,24,547	1,26,539
6	Lakshadweep	0	0	0	0	0	0	0	0	347	419	452	452	494	590	728	879
7	Puducherry	6965	7517	7622	7671	7745	7832	7,849	4,593	4903	5732	6407	6989	7799	8811	10,544	10,635
	Uts	**76424**	**103074**	**105474**	**106630**	**108865**	**111289**	**30,567**	**28,383**	**84575**	**111017**	**126067**	**146676**	**170522**	**193582**	**1,65,648**	**1,69,774**
	Total	**2951779**	**2945046**	**3166553**	**3347558**	**3504491**	**3760864**	**40,56,885**	**41,49,770**	**1484204**	**2173834**	**2434385**	**2693366**	**2927435**	**3303631**	**36,01,506**	**44,46,992**

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 4.8.1 : Total registered motor vehicles in India by State/Uts

Sl. No.	States/UT	Transport															
		Buses								Taxies							
		2006	2007	2008	2009	2010	2011	2012	2013	2006	2007	2008	2009	2010	2011	2012	2013
1	2	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	Andhra Pradesh	18368	45359	49480	53820	56664	60,622	70,075	73,787	113693	71559	84150	95554	103290	114923	1,29,322	1,25,962
2	Arunachal Pradesh*	682	682	682	682	682	…	..	..	343	343	343	343	343	…	..	..
3	Assam	11378	11936	12570	13257	13859	14,741	15,787	18,982	12671	14343	16382	19680	24088	28161	33,999	42,827
4	Bihar	16271	17192	18533	19654	21209	22,703	24,097	25,992	22698	24024	27066	30857	38204	43623	52,218	66,564
5	Chhattisgarh	24955	33033	36814	41098	7658	8,596	12,049	13,071	5036	5241	5811	6589	7499	8723	13,515	15,247
6	Goa (c)	5689	6376	6770	7644	8332	8,907	9,513	9,956	9361	10241	11901	12768	13143	13306	14,338	15,427
7	Gujarat	54446	54214	56214	58253	60023	62,386	67,546	70,615	47914	53237	58412	62915	67740	74512	83,038	92,455
8	Haryana	19986	22101	26906	29516	33520	35,646	39,153	42,800	16344	17738	13869	14791	15081	19978	23,793	27,946
9	Himachal Pradesh	6859	3265	3681	5398	5714	6,186	14,592	13,510	14542	14407	15718	20582	21993	23791	25,030	33,043
10	Jammu & Kashmir	21435	22161	23149	24051	23480	25,858	25,765	26,888	13656	14715	16815	18971	15939	21307	25,577	31,285
11	Jharkhand	10238	10792	11270	11699	12256	12,847	13,561	14,329	24693	34464	37439	41828	259542	296771	3,33,420	2,52,268
12	Karnataka	40819	45211	49586	44308	53874	58,012	62,501	69,718	67385	85064	137064	147489	115410	129272	1,42,700	1,62,894
13	Kerala	127574	396980	414678	430162	383229	3,90,430	3,96,826	4,04,153	119753	63992	69263	75313	84792	96666	1,08,877	1,21,825
14	Madhya Pradesh	27997	29177	30516	31520	35105	36,647	40,551	40,633	72760	77723	85295	94199	99241	110730	1,22,969	1,40,260
15	Maharashtra	66754	71187	77042	79073	83816	89,861	1,00,097	1,10,121	122389	133309	149526	157916	168307	168496	1,75,797	1,84,066
16	Manipur	2570	2634	2727	2727	2769	2,776	2,868	3,732	377	407	412	412	1595	1896	2,567	2,956
17	Meghalaya	3497	3639	3779	3905	4007	4,116	4,323	4,945	8432	9579	10385	11352	12607	14507	16,205	18,133
18	Mizoram	704	907	954	1003	1036	1,088	1,141	1,187	4988	5323	5763	5992	6465	7246	8,183	9,225
19	Nagaland	4060	4262	4422	4694	5041	5,573	5,542	5,750	5004	5246	5435	5921	6428	6716	6,970	7,437
20	Odisha	15996	16951	17694	18464	19335	20,616	21,917	23,004	30426	33540	36123	38716	41828	44585	56,464	68,641
21	Punjab	21136	22373	24457	25682	27146	27,146	30,160	30,160	9937	12940	13538	14314	15837	15837	18,539	18,539
22	Rajasthan	60979	63320	65605	69298	73257	77,980	83,345	88,616	42679	47701	54321	60941	67542	76317	89,053	1,03,690
23	Sikkim	365	429	434	294	524	586	613	633	6052	6499	6745	7108	7569	8011	8,816	9,378
24	Tamil Nadu	89991	97396	105897	114671	123999	1,34,887	1,44,251	1,56,470	134580	149774	170377	188795	209689	243425	2,78,005	3,07,079
	Telangana								38,245								65,226
25	Tripura	1961	2079	2182	2223	2194	2,295	2,312	2,291	1316	1370	1373	1380	3199	3468	3,530	2,286
26	Uttarakhand	5949	2780	3745	4032	7527	8,066	8,504	8,997	16069	11458	15008	17058	18660	20896	25,415	28,536
27	Uttar Pradesh	26549	25134	25339	26331	28124	31,922	34,428	40,501	28443	25762	39274	34107	38629	47364	59,379	89,393
28	West Bengal	43599	42737	35924	35023	31996	34,184	35,603	51,660	68926	72702	65153	66240	73696	80012	84,591	1,05,542
	Union Territory:	**730807**	**1054307**	**1111050**	**1158482**	**1126376**	**11,84,677**	**12,67,120**	**13,90,746**	**1020467**	**1002701**	**1152961**	**1252131**	**1538356**	**1720539**	**19,42,310**	**21,48,130**
1	A & N Islands	658	757	775	811	825	846	903	958	246	439	439	489	489	489	489	489
2	Chandigarh	2307	2141	2252	2375	3062	3,684	5,170	2,265	1771	2273	2606	2810	3017	3275	3,491	3,519
3	Dadra & Nagar Haveli	176	214	262	278	295	314	321	352	123	126	129	133	142	146	151	154
4	Daman & Diu	420	422	439	451	461	474	512	543	43	43	44	44	45	46	49	55
5	Delhi	25963	38500	39622	41142	43250	45,757	20,142	19,912	15569	35041	43887	50351	55530	62839	62,335	63,082
6	Lakshadweep	13	15	19	19	0	0	0	0	0	0	0	0	105	140	207	262
7	Puducherry	1997	2066	2149	2235	2373	2,493	2,596	3,987	1626	1724	1796	1847	**1892**	1943	1,990	762
	Uts	**31534**	**44115**	**45518**	**47311**	**50266**	**53,568**	**29,644**	**28,017**	**19378**	**39646**	**48901**	**55674**	**61220**	**68878**	**68,712**	**68,323**
	Total	**762341**	**1098422**	**1156568**	**1205793**	**1176642**	**12,38,245**	**12,96,764**	**14,18,763**	**1039845**	**1042347**	**1201862**	**1307805**	**1599576**	**1789417**	**20,11,022**	**22,16,453**

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 4.8.1 : Total registered motor vehicles in India by State/Uts

Sr. No.	States/UT	Transport															
		Light Motor Vehicles (Passengers)								Total Transport							
		2006	2007	2008	2009	2010	2011	2012	2013	2006	2007	2008	2009	2010	2011	2012	2013
1	2	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
1	Andhra Pradesh	299776	275124	323293	381488	434448	513266	5,76,480	5,46,813	5039449	720527	841574	959023	1049945	1187621	13,31,416	13,01,472
2	Arunachal Pradesh*	1449	1449	1449	1449	1449	…	..	..	21358	5430	5430	5430	5430	…	..	..
3	Assam	34906	37691	41267	45266	51185	59742	67,921	71,633	1435630	184347	201235	222391	245737	274522	3,09,186	2,02,784
4	Bihar	45365	0	0	0	74968	92390	1,13,088	1,41,174	1221936	141344	154166	171099	200866	232188	2,72,594	3,36,941
5	Chhattisgarh	9194	10669	12245	13589	15047	17566	17,913	21,890	1159522	133570	152307	169067	147126	162495	1,84,918	2,06,189
6	Goa (c)	10035	11667	12826	14863	4238	4309	3,853	3,955	531938	65624	71409	78030	84134	90751*	100,749 *	106035*
7	Gujarat	336695	371792	396828	426616	464862	511270	5,61,740	6,05,194	6341724	988123	1065246	1134382	1218969	1326972	14,62,815	15,86,748
8	Haryana	45858	52620	63914	73134	83745	94770	1,03,995	1,14,465	3223889	377357	415952	444857	484878	539940	5,84,573	6,30,231
9	Himachal Pradesh	2825	2459	2611	2744	2771	2805	3,963	5,557	890085	69108	76516	115121	122937	132076	1,40,440	1,80,127
10	Jammu & Kashmir	15919	16562	18440	19673	10958	12420	13,759	16,407	948252	109139	120055	129159	128724	141791	1,54,995	1,71,561
11	Jharkhand	46834	0	0	0	160778	180934	2,02,638	2,27,414	3470528	197089	214623	236522	766936	863333*	965,287 *	930461*
12	Karnataka	213721	214574	243034	247077	237295	259429	2,85,408	3,20,482	4678606	657121	774448	805471	887999	973110^^	1,062,081 ^^	1180736^^
13	Kerala	342527	381872	410637	448649	491879	544485	6,01,507	6,66,808	6824002	1155097	1232048	1312506	1394162	1507041*^^	1,622,543 * ^	1751514*^^
14	Madhya Pradesh	51049	54561	57395	60751	67488	76207	86,068	96,817	2530199	296970	322924	348696	378888	419211	4,67,206	5,20,521
15	Maharashtra	534535	555118	574625	598013	626332	640700	6,40,040	6,55,299	9501359	1459970	1582185	1680619	1774852	1872845	19,83,759	2091627*
16	Manipur	2721	3787	4071	4071	7266	9954	11,854	14,030	124579	15911	16671	16671	22140	26082	29,942	37,895
17	Meghalaya	3569	4081	4433	4842	5348	6000	6,744	7,674	35123	38458	40950	44271	48290	53746*	59,934 *	66453*
18	Mizoram	1534	1758	1931	2105	2219	2477	2,955	3,554	123914	13554	14796	15840	17230	19517	22,758	25,476
19	Nagaland	9548	10408	12939	13143	13403	14284	14,429	15,328	764335	84701	92813	99510	106946	129699	1,28,748	1,38,309
20	Odisha	34360	38436	43265	49896	57456	62830	74,313	78,131	2060422	228554	254665	285725	315152	347722	3,92,443	4,37,391
21	Punjab	43280	46399	50428	53670	57879	57879	66,734	66,734	1690455	221528	238406	252917	270415	270415	3,17,191	3,17,191
22	Rajasthan	79576	88509	95899	103270	112986	123328	1,34,345	1,45,422	3960929	468614	513248	551627	600766	663421	7,38,280	8,16,107
23	Sikkim	0	0	0	0	..	..	…	..	93531	9783	10274	10907	12102	12967	14,306	14,415
24	Tamil Nadu	174646	186290	202995	215542	238682	291605	3,01,982	3,19,074	8373800	1018314	1100248	1168144	1257410	1414580	15,45,346	16,79,608
	Telangana								2,36,625								6,29,389
25	Tripura	13237	14544	15829	16968	15749	18074	19,203	23,599	175491	29922	32421	34914	37773	42339	44,663	50,188
26	Uttarakhand	7906	9641	10971	12755	11622	13820	13,004	14,077	482432	45781	55219	61652	72229	81951	97,379	1,03,708
27	Uttar Pradesh	91346	97696	87549	105096	123706	146351	1,75,649	1,95,194	2840943	342057	367987	405967	459076	532695	6,08,433	7,25,149
28	West Bengal	40315	42195	37121	42312	48370	58633	63,424	78,452	3154135	413706	391587	394695	376778	421605	4,65,613	6,72,493
	Union Territory:	**2492726**	**2529902**	**2725995**	**2956982**	**3422129**	3815528	**41,63,009**	**46,91,802**	**72403618**	**9491699**	**10359403**	**11155213**	**12487890**	**13740635**	**151,07,598**	**169,10,719**
1	A & N Islands	2997	2441	2705	2884	2950	3248	3,803	4,107	31501	5789	6222	6539	6630	7012	7,679	8,073
2	Chandigarh	2000	0	0	0	..	..	0	2664	184973	14644	15448	16723	23755	31290	34,365	35,525
3	Dadra & Nagar Haveli	539	557	568	579	605	620	632	647	87699	9477	10380	11090	11851	12707	13,419	14,317
4	Daman & Diu	976	1091	1120	1151	1173	1216	1,230	1,245	54393	6794	7248	7553	7921	8668*	9,043	9457*
5	Delhi	96149	158242	168073	179640	182784	190693	68,653	11,407	2185166	406006	440683	479427	507820	541620	2,80,469	317963^^
6	Lakshadweep	273	291	321	321	321	366	420	479	5426	725	792	792	920	1096	1,355	1,620
7	Puducherry	4665	4925	5039	5062	5124	5217	5,221	6,321	157769	21964	23013	23804	24933	26296	28,200	26,298
	Uts	**107599**	**167547**	**177826**	**189637**	**192957**	**201360**	**79,959**	**26,870**	**2706927**	**465399**	**503786**	**545928**	**583830**	**628689**	**3,74,530**	**4,13,253**
	Total	**2600325**	**2697449**	**2903821**	**3146619**	**3615086**	**4016888**	**42,42,968**	**47,18,672**	**75110545**	**9957098**	**10863189**	**11701141**	**13071720**	**14369324**	**154,82,128**	**173,23,972**

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 4.8.1 : Total registered motor vehicles in India by State/Uts

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	5707383	4686543	5262086	5851893	6514593	7488771	92,91,132	576329	535649	619092	701920	777746	880817	10,58,184
2	Arunachal Pradesh*	11112	11112	11112	11112	11112	…	..	2595	2595	2595	2595	2595	…	..
3	Assam	541275	610529	667788	740420	830836	958935	11,01,265	145029	165255	184088	203000	232546	269605	3,11,917
4	Bihar	964594	1077579	1197875	1364757	1606613	1899017	22,30,069	76896	84305	92528	103077	188031	136845	1,60,340
5	Chhattisgarh	1247658	1395935	1553104	1686424	1964769	2232929	25,03,781	59591	69080	79616	92437	108326	131862	1,54,529
6	Goa	375571	408269	436662	467827	502042	541934	5,89,377	89547	99191	109215	120425	133717	149869	1,67,544
7	Gujarat	6352109	7003860	7579457	8087416	8716981	9507556	105,12,304	703968	784686	869808	952400	1057383	1218030	14,11,898
8	Haryana	1881174	2172669	2463672	2768197	2975418	3370426	37,55,349	373659	449285	541380	618942	720441	855596	9,89,519
9	Himachal Pradesh	187883	188166	200163	249994	283081	331418	3,84,832	58005	61928	69482	80224	95791	116176	1,71,382
10	Jammu & Kashmir	297656	320754	341834	363029	407928	446791	4,80,815	98309	112135	128398	145060	172071	198238	2,30,328
11	Jharkhand	1164854	1302967	1428934	1570575	1738566	1947572	18,51,060	113500	126179	139053	154803	174320	201269	2,27,386
12	Karnataka	4512910	3755719	4230864	4796587	6404905	7033045	77,37,366	635205	694252	791014	892160	1005291	1131201	12,69,430
13	Kerala	2099652	2056472	2367602	2612341	2900238	3294953	38,11,343	498472	533494	603842	692628	826538	985736	11,51,566
14	Madhya Pradesh	3526416	3895557	4292649	4691218	5165023	5783120	64,11,155	185700	208052	237022	272009	314464	366674	4,24,644
15	Maharashtra	7691856	8573679	9394869	10212360	11181762	12429011	139,21,763	1165365	1308088	1462518	1603728	1790259	2027080	23,07,841
16	Manipur	86931	93595	105465	105465	139650	145286	1,48,942	11233	11475	12077	12077	15113	17019	17,299
17	Meghalaya	31008	36112	40953	45747	51709	56790	65,712	22351	25268	28335	32995	37981	43901	49,728
18	Mizoram	24737	27776	30062	32267	39902	47978	60,278	6286	8061	8716	9326	10382	11583	13,839
19	Nagaland	42851	45961	48976	52119	55208	61085	61,546	37513	40574	43129	45549	47984	50249	53,074
20	Odisha	1530295	1701981	1874644	2052980	2302694	2614980	29,46,118	82686	90258	99350	112490	133529	161024	1,86,323
21	Punjab	2975198	3173433	3385088	3581837	3956279	3956279	47,29,594	335284	367655	406966	444465	484064	484064	6,16,549
22	Rajasthan	3393916	3833746	4261695	4715835	5230454	5859719	66,29,743	269561	310101	355122	402239	455924	520385	5,91,069
23	Sikkim	5282	5549	5793	5956	6308	6843	7,447	3053	3759	4226	5704	8905	12264	13,933
24	Tamil Nadu	7936778	8689876	9446469	10223233	11156048	12393788	138,46,378	840433	911752	996220	1091231	1204156	1350722	15,04,735
	Telangana														
25	Tripura	61968	69830	76952	85455	97895	117486	1,29,343	6656	7798	8836	9966	10095	11224	12,390
26	Uttarakhand	486734	474666	533443	570359	583927	708595	8,97,651	59368	74101	84706	98355	119859	147591	1,88,152
27	Uttar Pradesh	6083655	7138789	7737237	8521198	9493677	10563850	124,10,064	615739	641939	703071	775569	873251	10563850	11,08,100
28	West Bengal	1833820	2081355	1748253	2017198	1864861	2260657	27,17,713	556230	602420	547738	560875	435352	492454	5,75,085
	Union Territory:	**61055276**	**64832479**	**70723701**	**77483799**	**86182479**	**96058814**	**1092,32,140**	**7628563**	**8329335**	**9228143**	**10236249**	**11436114**	**12956415**	**149,66,784**
1	A & N Islands	23079	34458	37993	42386	43762	48819	54,220	2441	5803	6785	8263	10988	12863	14,632
2	Chandigarh	454308	474595	493380	511568	686316	711007	7,37,263	176387	188786	203052	218857	239014	265135	2,86,584
3	Dadra & Nagar Haveli	23607	27541	31424	35059	38635	43010	48,550	11820	13402	15728	17210	17507	19687	21,762
4	Daman & Diu	33379	38751	42373	42861	43991	47247	52,339	15007	15952	17191	18297	19332	20501	22,175
5	Delhi	2851920	3377073	3616417	3846721	4107912	4395086	46,61,714	1222706	1536897	1668880	1802251	1956574	2116107	21,72,069
6	Lakshadweep	4822	5227	5639	5639	6206	6888	7,698	38	44	48	48	64	87	122
7	Puducherry	296735	338638	385090	434072	488490	**553711**	6,25,251	52593	56249	60315	64631	69813	76678	85,418
		3687850	**4296283**	**4612316**	**4918306**	**5415312**	**5805768**	**61,87,035**	**1480992**	**1817133**	**1971999**	**2129557**	**2313292**	**2511058**	**26,02,762**
	Total	**64743126**	**69128762**	**75336017**	**82402105**	**91597791**	**101864582**	**1154,19,175**	**9109555**	**10146468**	**11200142**	**12365806**	**13749406**	**15467473**	**175,69,546**

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 4.8.1 : Total registered motor vehicles in India by State/Uts

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	65377	27500	28476	29494	29587	29652	30,400	45214	38722	41959	45421	49130	53531	60,897
2	Arunachal Pradesh*	2284	2284	2284	2284	2284	…	..	0	0	0	0	0	…	..
3	Assam	15080	15230	15347	18131	20742	20861	20,968	0	1155	1162	1203	1225	1243	1,248
4	Bihar	41863	46293	50522	56270	66132	75878	84,949	0	0	0	0	…	…	…
5	Chhattisgarh	8575	9392	10395	11637	13277	15062	16,561	0	0	0	0	30879	33739	33,739
6	Goa	@	357	730	1065	^	…	^	**0**	**0**	**0**	0	0	0	0
7	Gujarat	122864	128247	135014	141565	152985	160800	1,67,991	0	0	0	0	…	…	…
8	Haryana	95450	101735	108885	111602	115852	113384	1,21,202	0	0	0	0	0	0	0
9	Himachal Pradesh	9544	13497	14589	18932	20693	22756	12,704	402	201	259	262	634	949	…
10	Jammu & Kashmir	11058	11222	11295	11402	11601	118301	24,920	219	219	219	219	1219	1818	2,687
11	Jharkhand	30962	35762	40269	45455	52155	59892	67,139	0	0	0	0	…	…	…
12	Karnataka	41989	36739	38319	39669	40225	41229	42,179	54808	53991	60972	70708	105503	109075	1,13,204
13	Kerala	73158	120300	128082	137547	137547	137547	1,37,547	0	3252	3559	3712	3748	3798	3,798
14	Madhya Pradesh	38291	37449	38181	39652	41396	49566	51,197	0	0	0	0	…	…	…
15	Maharashtra	300023	322053	341782	356986	373958	394647	4,23,305	0	18238	18158	18477	18752	18677	19,021
16	Manipur	8568	8937	9146	9146	11472	11901	12,241	801	915	1250	1250	1524	1600	1,605
17	Meghalaya	11300	12229	12917	13652	14328	15011	15,682	0	0	0	0	1	1	3
18	Mizoram	3712	7486	7888	8233	8813	9211	4,082	0	0	0	0	0	0	0
19	Nagaland	22481	23372	24433	25211	25888	26313	27,083	350	421	474	478	497	501	505
20	Odisha	30547	31555	32591	34111	36726	41966	44,396	2567	2784	2989	3220	3451	3668	3,668
21	Punjab	41670	46957	49555	52193	54798	54798	63,527	0	0	0	0	…	…	…
22	Rajasthan	147840	157574	169601	182922	203692	227910	2,54,840	0	0	0	0	…	…	….
23	Sikkim	3769	4177	4310	4557	4869	5251	6,086	1070	1380	1384	1389	1393	1399	1,484
24	Tamil Nadu	55673	56461	56825	57207	57417	58080	58,718	19957	19957	19957	19957	19957	19957	19,957
	Telangana														
25	Tripura	4358	4485	4733	4977	12340	14434	15,542	13	18	18	18	…	…	…
26	Uttarakhand	6944	4526	4269	4385	8103	8876	9,762	1629	1292	5612	1651	1289	1302	1,903
27	Uttar Pradesh	112837	109981	122120	135149	159128	*984937*	2,00,316	19015	16982	20240	19305	18740	984937	23,473
28	West Bengal	@	@	@	#	^	**^**	^	0	0	0	0	…	**…**	…
	Union Territory:	**1306217**	**1375800**	**1462558**	**1553434**	**1676008**	**1889724**	**19,13,337**	**146045**	**159527**	**178212**	**187270**	**257942**	**272817**	**2,87,192**
1	A & N Islands	779	1948	2181	2235	^	…	^	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	78884	477	499	542	38	38	38	38	42	42	51
5	Delhi	65028	77847	78711	94	79418	79488	68,648	80277	89320	89345	89367	89367	89368	89,373
6	Lakshadweep	88	90	94	3881	95	99	121	73	87	87	87	0	0	0
7	Puducherry	3865	3866	3880		3881	3882	3,882	2918	2784	2867	2931	2958	3045	3,123
		70527	**84564**	**85267**	**85541**	**84420**	**84529**	**73,761**	**83698**	**92306**	**92441**	**92542**	**92517**	**92764**	**92,547**
	Total	**1376744**	**1460364**	**1547825**	**1638975**	**1760428**	**1974253**	**19,87,098**	**229743**	**251833**	**270653**	**279812**	**350459**	**365581**	**3,79,739**

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 4.8.1 : Total registered motor vehicles in India by State/Uts

Sr. No	States/UT	Non- Transport													
		Tractors							Trailers						
		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
1	Andhra Pradesh	66613	184441	212904	242305	261509	292427	3,42,416	51881	167206	193524	218860	229149	242270	2,89,422
2	Arunachal Pradesh*	345	345	345	345	345	…	..	155	155	155	155	155	…	..
3	Assam	11270	12231	13170	14586	16177	18714	19,655	9050	9386	9830	10307	10805	11620	15,290
4	Bihar	130477	136637	144801	156004	175500	196555	2,19,509	75594	80875	86233	93743	104272	115214	1,26,618
5	Chhattisgarh	58733	66077	73489	82175	91621	102699	1,15,524	50684	56248	61412	67077	72839	78940	85,129
6	Goa	..	0	0	20	2562	2890	3,114	..	0	0	0	…	…	#
7	Gujarat	311385	336986	362799	386951	410516	442737	4,95,136	217790	232509	248751	263807	278921	294885	3,17,509
8	Haryana	382581	405605	430365	473438	490828	487321	5,16,658	0	0	0	0	0	0	0
9	Himachal Pradesh	0	7424	8197	9039	9292	9576	20,916	0	1423	1689	1834	1836	1853	220
10	Jammu & Kashmir	12818	14109	15615	16640	11640	13538	15,574	587	610	622	633	2861	3242	3,289
11	Jharkhand	20968	23977	26785	30665	35431	41116	47,114	16819	0	0	0	…	…	…
12	Karnataka	166685	132142	142521	152964	318844	341559	3,63,993	167622	122749	138919	143629	215575	233297	2,51,553
13	Kerala	15162	9644	10207	10641	10665	11209	11,602	2264	3196	3503	3653	3653	3656	3,656
14	Madhya Pradesh	376771	394356	411424	432618	458445	498997	5,45,115	192742	200719	206640	210903	215333	219731	2,24,033
15	Maharashtra	229362	250950	276438	302249	331694	371075	4,19,291	204733	220284	238080	252409	270078	293576	3,24,824
16	Manipur	1446	1604	1686	1686	3155	3185	3,326	612	626	664	664	680	715	394
17	Meghalaya	487	516	525	567	609	665	751	2607	2613	2649	2680	2713	2765	2,794
18	Mizoram	246	199	209	216	227	252	274	264	70	70	86	90	92	79
19	Nagaland	1891	1998	2073	2163	2260	2340	2,482	772	786	821	943	1020	1023	1,072
20	Odisha	42189	47327	52070	57384	64354	74439	83,079	34679	39577	44318	48771	55370	65016	73,110
21	Punjab	472873	478057	485044	491358	497551	497551	5,17,743	481	564	737	862	966	966	1,172
22	Rajasthan	464443	504002	537735	569807	605539	644305	6,99,881	59564	62086	65088	67134	69287	70525	71,665
23	Sikkim	24	34	38	38	49	59	76	…	0	0	0	0	0	2
24	Tamil Nadu	102744	115260	126358	137829	150432	167066	1,86,670	44015	49607	54652	58175	62260	66269	71,403
	Telangana														
25	Tripura	89	97	127	189	976	1010	1,015	100	101	102	103	326	349	357
26	Uttarakhand	34155	29215	30934	32271	42921	46164	41,847	1401	2710	3228	3536	1508	839	5,883
27	Uttar Pradesh	791411	797990	847329	893683	953959	176398	10,64,284	14579	9549	10245	10696	15373	176398	15,278
28	West Bengal	58828	#	#	@	51233	**57505**	70,980	#	63430	59298	54516	…	#	…
	Union Territory:	**3753996**	**3951223**	**4213188**	**4497831**	**4998334**	5303581	**58,08,025**	**1148995**	**1327079**	**1431230**	**1515176**	**1615070**	1721969	**18,84,752**
1	A & N Islands	229	0	0	0	^	…	^	22	0	0	0	^	…	^
2	Chandigarh	0	0	0	0	149	173	196	0	0	0	0	0	0	#
3	Dadra & Nagar Haveli	57	86	0	0	152	177	36	46	46	0	0	77	77	186
4	Daman & Diu	224	248	273	287	300	313	352	138	165	176	186	195	205	213
5	Delhi	4706	5027	5091	5206	5294	5384	1,343	99	99	99	99	99	99	…
6	Lakshadweep	63	72	78	78	72	84	102	0	0	0	0	0	0	0
7	Puducherry	478	567	705	793	900	**993**	1,077	1655	1683	1702	1722	1732	1759	1,781
		5757	**6000**	**6147**	**6364**	**6867**	**7124**	**3,106**	**1960**	**1993**	**1977**	**2007**	**2103**	**2140**	**2,180**
	Total	**3759753**	**3957223**	**4219335**	**4504195**	**5005201**	**5310705**	**58,11,131**	**1150955**	**1329072**	**1433207**	**1517183**	**1617173**	**1724109**	**18,86,932**

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 4.8.1 : Total registered motor vehicles in India by State/Uts

Sr. No.	States/UT	Non- Transport						
		Others						
		2006	2007	2008	2009	2010	2011	2012
1	2	87	88	89	90	91	92	93
1	Andhra Pradesh	6617	6268	8331	10032	11480	14258	20,461
2	Arunachal Pradesh*	180	180	180	180	180	…	..
3	Assam	22192	22903	23802	24713	25653	26628	27,591
4	Bihar	8569	10350	13015	14603	15572	17512	18,801
5	Chhattisgarh	2849	3507	4548	5772	6936	8311	9,857
6	Goa	4773	5310	5943	6542	4587	4631	4,825
7	Gujarat	17417	22926	27981	32130	36818	42155	46,064
8	Haryana	21434	21646	13030	8185	4408	10336	10,809
9	Himachal Pradesh	1042	0	0	18992	4077	6910	6,110
10	Jammu & Kashmir	1869	2114	2209	2303	2861	3242	4,290
11	Jharkhand	7268	0	0	0	…	…	…
12	Karnataka	43213	33343	40318	51363	65634	67967	69,795
13	Kerala	15880	75837	81386	86890	121101	128079	1,51,259
14	Madhya Pradesh	13665	13990	14618	15595	17027	18403	20,809
15	Maharashtra	29446	17729	21331	24080	27066	27188	32,557
16	Manipur	270	423	435	435	718	714	774
17	Meghalaya	1240	1339	1660	1965	2482	2858	3,234
18	Mizoram	4925	3758	3914	3914	3812	4015	520
19	Nagaland	353	12273	13044	13900	929	1443	1,908
20	Odisha	5975	6278	9805	12680	20556	29223	29,393
21	Punjab	7581	5662	6783	7899	10181	10181	17,163
22	Rajasthan	5822	0	0	0	…	…	…
23	Sikkim	…	0	0	0	…	…	…
24	Tamil Nadu	108041	119441	128814	135221	153853	167783	1,79,041
	Telangana							
25	Tripura	5397	7310	7723	8201	714	831	908
26	Uttarakhand	2802	10910	13440	15143	1536	1843	1,465
27	Uttar Pradesh	21132	28412	17902	17245	15145	21559	15,326
28	West Bengal	34812	37391	15008	16335	18914	28403	31,350
	Union Territory:	**394764**	**469300**	**475220**	**534318**	**572240**	**636954**	**7,04,310**
1	A & N Islands	8237	97	107	306	394	406	532
2	Chandigarh	0	0	0	0	…	…	…
3	Dadra & Nagar Haveli	0	0	0	0	41	116	0
4	Daman & Diu	31	31	31	69	84	113	141
5	Delhi	169	187	195	212	364	519	76,504
6	Lakshadweep	546	495	497	497	498	499	499
7	Puducherry	5850	6330	6427	6414	6422	6439	6,544
		14833	**7140**	**7257**	**7498**	**7803**	**8092**	**84,220**
	Total	**409597**	**476440**	**482477**	**541816**	**580043**	645046	**7,88,530**

Table 4.8.1 : Total registered motor vehicles in India by State/Uts

Sr. No.	States	Total Non- Tpt.								Grand Total (Transport +Non- Tpt.)							
		2006	2007	2008	2009	2010	2011	2012	2013	2006	2007	2008	2009	2010	2011	2012	2013
1	2	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1	Andhra Pradesh	53529045	5646329	6366372	7099925	7873194	9001726	11092912	11386231	58568494	6366856	7207946	8058948	8923139	10189347	12424328	12687703
2	Arunachal Pradesh*	82641	16671	16671	16671	16671	...	..	..	103999	22101	22101	22101	22101	144534	151279	151279
3	Assam	7300375	836689	915187	1012360	1137984	1307606	1497934	1674738	8736005	1021036	1116422	1234751	1383721	1582128	1807120	1877522
4	Bihar	13455046	1436039	1584974	1788454	2156120	2441021	2840286	3280286	14676982	1577383	1739140	1959553	2356986	2673209	3112880	3617227
5	Chhattisgarh	14528808	1600239	1782564	1945522	2288647	2603542	2919120	3231053	15688330	1733809	1934871	2114589	2435773	2766037	3104038	3437242
6	Goa	469891	513127	552550	595879	642908	699324	764860	832337	1001829	578751	623959	673909	727042	790075	865609	938372
7	Gujarat	70385442	8509214	9223810	9864269	10653604	11666163	12950902	14185705	76727166	9497337	10289056	10998651	11872573	12993135	14413717	15772453
8	Haryana	27912091	3150940	3557332	3980364	4306947	4837063	5393537	5969363	31135980	3528297	3973284	4425221	4791825	5377003	5978110	6599594
9	Himachal Pradesh	2668315	272639	294379	379277	415404	489638	596164	695934	3558400	341747	370895	494398	538341	621714	736604	876061
10	Jammu & Kashmir	4063422	461163	500192	539286	610181	785170	761903	849225	5011674	570302	620247	668445	738905	926961	916898	1020786
11	Jharkhand	12722848	1488885	1635041	1801498	2000472	2249849	2192699	2486316	16193376	1685974	1849664	2038020	2767408	3113182	3157986	3416777
12	Karnataka	48673860	4828935	5442927	6147080	8155977	8957373	9847520	10882950	53352466	5486056	6217375	6952551	9043976	9930483	10909601	12063686
13	Kerala	25447102	2802195	3198181	3547412	4003490	4564978	5270771	6106308	32271104	3957292	4430229	4859918	5397652	6072019	6893314	7857822
14	Madhya Pradesh	40670969	4750123	5200534	5661995	6211688	6936491	7676953	8239518	43201168	5047093	5523458	6010691	6590576	7355702	8144159	8760039
15	Maharashtra	91708790	10711021	11753176	12770289	13993569	15561254	17448602	19396525	101210149	12170991	13335361	14450908	15768421	17434099	19432361	21488152
16	Manipur	1022744	117575	130723	130723	172312	180420	184581	258032	1147323	133486	147394	147394	194452	206502	214523	295927
17	Meghalaya	687946	78077	87039	97606	109823	121991	137904	153568	723069	116535	127989	141877	158113	175737	197838	220021
18	Mizoram	387971	47350	50859	54042	63226	73131	79072	95860	511885	60904	65655	69882	80456	92648	101830	121336
19	Nagaland	885879	125385	132950	140363	133786	142954	147670	157566	1650214	210086	225763	239873	254483	272653	291438&	311231&
20	Odisha	1728938	1919760	2115767	2321636	2616680	2990316	3366087	3778149	3789360	2148314	2370432	2607361	2931832	3338038	3758530	4215540
21	Punjab	32713822	4072328	4334173	4578614	5003839	5003839	5945748	5945748	34404277	4293856	4572579	4831531	5274254	5274254	6262939	6262939
22	Rajasthan	4341446	4867509	5389241	5937937	6564896	7322844	8247198	9255838	8302375	5336123	5902489	6489564	7165662	7986265	8985478	10071945
23	Sikkim	137929	14899	15751	17644	21524	25816	29028	21862	231460	24682	26025	28551	33626	38783	43334	36277
24	Tamil Nadu	83632752	9962354	10829295	11722853	12804123	14223665	15866902	17552453	92006552	10980668	11929543	12890997	14061533	15638245	17412248	19232061
25	Telangana								5747088								6376477
26	Tripura	777243	89639	98491	108909	122346	145334	159555	194734	952734	119561	130912	143823	160119	187673	204218	244922
27	Uttarakhand	5368542	597420	675632	725700	759143	915210	1146663	1356428	5850974	643201	730851	787352	831372	997161	1244042	1460136
28	Uttar Pradesh	85955534	8743642	9458144	10372845	11529273	21559	14836841	16323035	88796477	9085699	9826131	10778812	11988349	978627	15445274	17048184
29	West Bengal	18744697	2784596	2370297	2648924	2370360	2839019	3395128	5438241	21898832	3198302	2761884	3043619	2747138	3260624	3860741	6110734
30	Union Territory:	650004088	80444743	87712252	96008077	106738187	118840274	134796540	155495091	721702654	89936442	98071655	107163290	119239828	132725443	150070437	172572445
1	A & N Islands	362461	42306	47066	53190	55144	62088	69384	77369	393962	48095	53288	59729	61774	69100	77063	85442
2	Chandigarh	5647538	663452	696536	730544	925609	976602	1024043	1070824	5832511	678096	711984	747267	949364	1007892	1058408	1106349
3	Dadra & Nagar Havel	369001	41552	47152	52716	56981	63650	71102	79129	456700	51029	57532	63806	68832	76357	84521	93446
4	Daman & Diu	514453	55527	60483	140622	64421	68920	75813	82088	568846	62321	67731	148175	72342	77588	84856	91545
5	Delhi	40430807	5086450	5458738	5743950	6239028	6686051	7069651	7467320	42615973	5492456	5899421	6223377	6746848	7227671	7350120	7785283
6	Lakshadweep	48485	6015	6443	10230	6935	7657	8542	9485	53911	6740	7235	11022	7855	8753	9897	11105
7	Puducherry	3654984	410117	460986	510563	574196	646507	727076	673316	3812753	432081	483999	534367	599129	672803	755276	699614
		51027729	6305419	6777404	7241815	7922314	8511475	9045611	9459531	53734656	6770818	7281190	7787743	8506144	9140164	9420141	9872784
	Total	701031817	86750162	94489656	103249892	114660501	127351749	143842151	164954622	775437310	96707260	105352845	114951033	127745972	141865607	159490578	182445229

rt 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)

Motor cycles on hire ^ :included in Cars

4.8.2 The Total number of registered motor vehicle in India is increasing year by years. Table 4.8.2 shows

(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 4.8.2 : Total number of registered motor vehicles in india (1992-2013)

(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	3492	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
22	2013	182445	132550	24853	1894	8597	14551

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

* Two wheelers 'include auto-rickshaws for the years ending 31st March 1959,1960,1962,1963,1964,

** Others include tractors, trailers, three wheelers (passenger vehicles_/LML and other miscellanceous

Includes Omni buses since 2001. Totals may not tally due to rounding off of data

4.8.3 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 4.8.3: Total registered motor vehicles (category -wise) in Million plus cities of India

(in number)

Sl. No.	Name of City	2011			2012			2013		
		Transport	Non-Transport	Total	Transport	Non- Transport	Total	Transport	Non-Transport	Total
1	2	6	7	8	9	10	11	12	13	14
1	Agra	29994	610064	640058	32,528	6,71,233	7,03,761	32,984	719210	7,52,194
2	Ahmedabad							1,95,712	1599936	17,95,648
3	Allahabad	23711	659303	683014	28,211	7,09,529	7,37,740	31805	714863	7,46,668
4	Aurangabad	27317	225482	252799	28,918	2,51,697	2,80,615	32621	276891	3,09,512
5	Bengaluru#	368953	3422365	3791318	398,939 ^^	37,57,193	41,56,132	447040^^	4144136	45,91,176
6	Bhopal	51714	703369	755083	56,612	7,71,957	8,28,569	61923	814757	8,76,680
	Chandigarh							35525	1070824	11,06,349
7	Chennai	382592	3073197	3455789	4,05,421	33,61,873	37,67,294	428244	3643735	40,71,979
8	Coimbatore	52470	1188626	1241096	61,065	13,25,064	13,86,129	70212	1457830	15,28,042
9	Delhi	541620	6686051	7227671	2,80,469	70,69,651	73,50,120	317963^^	7467320	77,85,283
10	Dhanbad*	25100	15812	40912	118,468 *	3,43,455	4,61,923	118478*	371945	4,90,423
	Durg Bhilai							21531	468196	4,89,727
11	Ghaziabad	37673	432408	470081	42,790	4,82,181	5,24,971	38341	589438	6,27,779
12	Greater Mumbai	232766	1637545	1870311	2,38,730	17,89,770	20,28,500	244713	1942685	21,87,398
13	Gwalior	35666	413591	449257	38,975	4,50,541	4,89,516	41470	488283	5,29,753
14	Hyderabad	347143	2685596	3032739	4,03,448	29,83,127	33,86,575	181483	1858475	20,39,958
15	Indore	122399	1090566	1212965	1,35,057	12,02,899	13,37,956	148271	1342498	14,90,769
16	Jabalpur	37914	521242	559156	41,975	5,63,513	6,05,488	45771	600709	6,46,480
17	Jaipur	143346	1550626	1693972	1,60,299	17,10,750	18,71,049	157305	1804322	19,61,627
18	Jamshedpur*	43423	23465	66888	154,921 *	5,27,156	6,82,077	155115*	527156	6,82,271
19	Jodhpur	70645	565496	636141	1,03,868	7,64,583	8,68,451	87337	705662	7,92,999
20	Kanpur	37693	964091	1001784	28,069	10,39,371	10,67,440	31286	1112114	11,43,400
21	Kochi	58633	349889	408522	68,798	4,11,540	4,80,338	78963	468191	5,47,154
22	Kolkata**	67670	377048	444718	70,787	4,25,519	4,96,306	178773	1099585	12,78,358
23	Kota	32406	440743	473149	53,281	8,99,250	9,52,531	37477	516396	5,53,873
24	Lucknow	35401	1175488	1210889	37,623	12,77,082	13,14,705	40598	1383880	14,24,478
25	Madurai	53950	548902	602852	59,241	6,20,269	6,79,510	76504	691235	7,67,739
26	Meerut	11177	411965	423142	13,817	4,06,124	4,19,941	27655	384755	4,12,410
27	Nagpur	58830	1098204	1157034	62,700	11,74,399	12,37,099	61023	1208654	12,69,677
28	Nasik	35623	362202	397825	37,809	4,06,580	4,44,389	40635	448963	4,89,598
29	Patna	97758	559898	657656	82,469	6,60,420	7,42,889	93573	735148	8,28,721
30	Pune	183313	1910577	2093890	1,51,581	21,15,542	22,67,123	158040	2188843	23,46,883
31	Raipur	46058	481249	527307	50,292	5,28,227	5,78,519	56057	582758	6,38,815
32	Rajkot							61324	765376	8,26,700
33	Ranchi							209041*	475413	6,84,454
34	Srinagar	43438	140334	183772	45,740	1,55,266	2,01,006	48475	169932	2,18,407
35	Surat							102724	1138129	12,40,853
36	Tiruchirapalli	35632	421111	456743	39,910	4,81,468	5,21,378	44479	548566	5,93,045
37	Varanasi	39234	498782	538016	44,710	5,42,823	5,87,533	49661	583418	6,33,079
38	Vijayawada	70394	395890	466284	29,379	5,24,034	5,53,413	69484	447435	5,16,919
39	Vadodara							85193	828730	9,13,923
40	Visakhapatnam	63085	553553	616638	72,533	6,10,822	6,83,355	55968	586553	6,42,521
	Total	**3544741**	**36194700**	**39739441**	**75934141**	**115673582**	**191607723**	**4500777**	**48972945**	**534,73,722**

Source: Transport Research Wing, Ministry of Road Transport & Highways .(Transport year book-2012-13)

Includes other vehicles which are not covered in 'Transport

* Includes motor cycles on hire

Table 4.8.4 : Total registered motor vehicle in million plus cities of India

as on 31st March 2013

(In thousands)

Sl No.	Million Plus Cities	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	Agra	.	.	.	.	.	.	.	.	580	640	704	752
2	Ahmedabad	899	978	1075	1632	1780	1451	1586	1691	-	-	1682	1796
3	Allahabad	-	-	-	-	-	-	-	-	-	-	738	747
4	Amritsar	-	-	-	-	-	-	-	-	-	-	803	-
5	Aurangabad	-	-	-	-	-	-	-	-	-	253	281	310
6	Bengaluru	1680	1771	1891	2232	2617	2179	2640	3016	3491	3791	4156	4591
7	Bhopal	333	361	392	428	476	524	571	617	674	755	829	877
8	Chandigarh	-	-	-	-	-	-	-	-	-	-	1058	1106
9	Chennai	1356	1895	2015	2167	2338	2518	2701	2919	3149	3456	3767	4072
10	Coimbatore	448	578	630	682	750	827	910	1002	1110	1241	1386	1528
11	Delhi	3699	3971	4237	4186	4487	5792	5899	6302	6747	7228	7350	7785
12	Dhanbad	-	-	-	-	-	-	-	-	31	41	462	490
13	Durg Bhilai	-	-	-	-	-	-	-	-	-	-	445	490
14	Ghaziabad	-	-	-	-	-	-	-	-	409	470	525	628
15	Greater Mumbai	1069	1124	1199	1295	1394	1503	1605	1674	1768	1870	2029	2187
16	Gwalior	-								412	449	490	530
17	Hyderabad	1241	1319	1356	1433	1522	2181	2444	2682	2728	3033	3387	2040
18	Indore	550	592	645	705	771	844	929	1007	1098	1213	1338	1491
19	Jabalpur	-	-	-	-	-	-	-	-	516	559	605	646
20	Jaipur	693	753	824	923	1051	1177	1289	1387	1549	1694	1871	1962
21	Jamshedpur	-	-	-	-	-	-	-	-	56	67	682	682
22	Jodhpur	-	-	-	-	-	-	-	-	577	636	868	793
23	Kanpur	385	425	425^	425^	425^	553	598	642	940	1002	1067	1143
24	Kochi	152	166	166^	166^	166^	257	247	303	322	409	480	547
25	Kolkata**	801	842	875	911	948	987	573	581	411	445	496	1278
26	Kota	-	-	-	-	-	-	-	-	440	473	953	554
27	Lucknow	556	615	615^	615^	615^	801	962	1025	1107	1211	1315	1424
28	Ludhiana	-	-	-	-	-	-	-	-	-	-	1337	-
29	Madurai	240	281	304	330	364	402	440	478	530	603	680	768
30	Meerut	-	-	-	-	-	-	-	-	387	423	420	412
31	Nagpur	459	503	543	770	824	884	946	1009	1079	1157	1237	1270
32	Nashik	-	-	-	-	-	-	-	-	358	398	444	490
33	Patna	313	336	336^	378	405	437	471	516	581	658	743	829
34	Pune	658	697	755	827	874	930	1141	1153	1908	2094	2267	2347
35	Raipur	-	-	-	-	-	-	-	-	469	527	579	639
36	Rajkot	-	-	-	-	-	-	-	-	-	-	760	827
37	Ranchi	-	-	-	-	-	-	-	-	-	-	729	684
38	Srinagar	-	-	-	-	-	-	-	-	172	184	201	218
39	Surat	575	633	692	692*	692*	912	982	1036	-	-	1145	1241
40	Tiruchirapalli	-	-	-	-	-	-	-	-	400	457	521	593
41	Varanasi	339	366	366^	366^	366^	456	482	522	497	538	588	633
42	Vijayawada	-	-	-	-	-	-	-	-	523	466	553	517
43	Vadodara	506	546	586	586	586*	861	934	1009	-	-	839	914
44	Visakhapatnam	365	393	412	435	462	472	515	559	586	617	683	643
		17317	19145	20339	22184	23913	26948	28865	31130	35605	39058	53493	53474

Source: Office of State Transport Commissioner/UT Administrations

- Not report ^ : Data relates to the year 2003 * : Data relates to the year 2004

4.8.4 The quantum of road transport is an indicator of pollution caused by vehicles. The detail registered motor vehicle in million plus cities from 2002- to 2012 presented in the table 4.8.4 and category wise details of registered motor vehicle in major metropoiliton cities from 2010 to 2012 is presented in the table 4.8.5

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

Table 4.8.5 : 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, M/o 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 4.8.5 : 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 4.8.5 : 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	1,84,123
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	1,34,343	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	1,04,388	4,05,421
10	Coimbatore	10,632	15,406	6,281	16,654	12,092	61,065
11	Delhi	4,792	1,24,547	20,142	62,335	68,653	2,80,469
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	1,09,495	2,38,730
16	Gwalior	8,633	5,945	11,993	2,266	10,138	38,975
17	Hyderabad	1,20,718	96,642	27,686	32,917	1,25,485	4,03,448
18	Indore	46,760	27,741	7,541	35,366	17,649	1,35,057
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	1,60,299
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	1,03,868
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	1,51,581
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	2,08,398
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	**9,95,975**	**10,90,319**	**3,35,168**	**6,49,835**	**13,49,863**	**44,72,613**

... : 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 register

Table 4.8.5 : Total registered motor vehicle in million plus cities of India
(as on 31st March, 2013) 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	4,329	15,540	1,619	3,691	7,805	32,984
2	Ahmedabad	23,389	47,749	26,328	9,210	89,036	1,95,712
3	Allahabad	9,768	9,314	1,623	1,450	9,650	31,805
4	Aurangabad	4,969	13,617	3,355	714	9,966	32,621
5	Bengaluru	81,992	84,296	31,974	56,890	1,51,011	447040^^
6	Bhopal	7,398	13,356	4,123	22,551	14,495	61,923
7	Chandigarh	2,794	24,283	2,265	3,519	2664	35,525
8	Chennai	1,00,938	89,225	39,330	91,234	1,07,517	4,28,244
9	Coimbatore	12,058	19,343	7,136	18,465	13,210	70,212
10	Delhi	5,176	1,26,539	19,912	63,082	11,407	317963^^
11	Dhanbad	28,674	28,731	1,396	27,654	28,731	118478*
12	Durg Bhilai	9,209	7,725	888	2,796	913	21,531
13	Ghaziabad	5,237	9,930	2,645	3,888	16,641	38,341
14	Greater Mumbai	7,553	55,161	13,313	57,095	1,11,591	2,44,713
15	Gwalior	9,121	6,714	6,295	8,494	10,846	41,470
16	Hyderabad	25,697	54,807	8,982	20,157	71,840	1,81,483
17	Indore	49,376	32,380	8,388	38,657	19,470	1,48,271
18	Jabalpur	10,833	12,594	1,620	12,812	7,912	45,771
19	Jaipur	66,364	18,098	22,252	24,663	25,928	1,57,305
20	Jamshedpur	20,199	50,420	1,766	27,389	50,420	155115*
21	Jodhpur	46,193	10,989	7,174	9,439	13,542	87,337
22	Kanpur	19,737	3,167	751	497	7,134	31,286
23	Kochi	6,205	29,006	7,905	11,247	24,600	78,963
24	Kolkata**	8,347	74786	13,251	55,465	26,924	1,78,773
25	Kota	17,582	2,477	3,347	3,374	10,697	37,477
26	Lucknow	6,797	16,285	3,181	7,089	7,246	40,598
27	Ludhiana	12,671	24,390	5,933	15,045	18,465	76,504
28	Madurai	8,768	7,479	2,421	2,010	6,977	27,655
29	Meerut	13,950	22,073	5,222	3035	16,743	61,023
30	Nagpur	5,211	14,878	1,305	2,194	17,047	40,635
31	Nashik	30,762	2,027	6,264	12,154	42,366	93,573
32	Patna	25,809	57436	18,336	12,759	43,700	1,58,040
33	Pune	29,240	13,985	1,961	3,182	7,689	56,057
34	Raipur	15,725	25,172	3,434	3,597	13,396	61,324
35	Rajkot	42,622	57,489	4,376	36,694	63,090	209041*
36	Ranchi	12,880	10,017	7,090	8,075	10,413	48,475
37	Srinagar	16,407	29,378	2,617	2,120	52,202	1,02,724
38	Surat	11,168	13,914	3,880	7,882	7,635	44,479
39	Varanasi	10,119	16,171	3,306	5,329	14,736	49,661
40	Vijayawada	22,739	14,283	3481	6371	22,610	69,484
41	Vadodara	17,916	23,051	3,847	6,714	33,665	85,193
42	Visakhapatnam	10,769	9,016	2,675	6,144	27,364	55,968
TOTAL		**8,76,691**	**11,97,291**	**3,16,967**	**7,14,827**	**12,49,294**	**45,00,777**

Source: Transport year book- 2012-13

... : 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

Table 4.8.5 : 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 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 4.8.5 : 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 4.8.5 : 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	5,68,470	56,817	3,647	3,503	36,987	134	1,675	6,71,233	7,03,761
2	Ahmedabad	12,13,454	2,39,558	18,254	...	13,073	7,694	5,955	14,97,988	16,82,111
3	Allahabad	6,26,716	61,057	8,878	29	10,198	66	2,585	7,09,529	7,37,740
4	Amritsar	6,23,329	92,108	3,745	...	39,945	9	1,282	7,60,418	8,03,007
5	Aurangabad	2,17,410	13,869	7,988	...	6,685	4,507	1,238	2,51,697	2,80,615
6	Bengaluru	28,67,646	8,00,866	7,313	46,888	7,875	6,151	20,454	37,57,193	41,56,132
7	Bhopal	6,57,590	94,389	1,232	...	12,771	4,531	1,444	7,71,957	8,28,569
8	Chandigarh	7,37,263	2,86,584			196			10,24,043	10,58,408
9	Chennai	26,30,752	6,53,270	12,420	8,769	2,584	11,739	42,339	33,61,873	37,67,294
10	Coimbatore	11,37,785	1,57,977	5,443	303	8,104	880	14,572	13,25,064	13,86,129
11	Delhi	46,61,714	21,72,069	68,648	89,373	1,343	...	76,504	70,69,651	73,50,120
12	Dhanbad	2,79,839	46,440	7,485	1,328	2,710	2,481	3,172	3,43,455	4,61,923
13	Durg Bhilai	3,85,079	29,748	1,469	7,179	325	175	1,089	4,25,064	4,44,685
14	Ghaziabad	3,67,327	93,934	1,366	1,914	17,630	0	10	4,82,181	5,24,971
15	Greater Mumbai	11,39,363	6,17,556	26,496	3,957	680	206	1,512	17,89,770	20,28,500
16	Gwalior	3,85,142	32,722	5,676		17,773	6,600	2,628	4,50,541	4,89,516
17	Hyderabad	23,70,955	5,58,081	8,975	28,855	7,019	1,691	7,551	29,83,127	33,86,575
18	Indore	10,21,757	1,46,433	4,379	...	17,870	9,634	2,826	12,02,899	13,37,956
19	Jabalpur	4,99,044	43,000	2,055	...	12,570	3,014	3,830	5,63,513	6,05,488
20	Jaipur	13,74,316	2,35,310	53,496	...	44,594	3,034	...	17,10,750	18,71,049
21	Jamshedpur	4,38,285	56,429	13,787	1,628	3,408	2,646	10,973	5,27,156	6,82,077
22	Jodhpur	6,07,449	60,747	24,808	...	62,954	8,625	...	7,64,583	8,68,451
23	Kanpur	9,07,649	1,12,445	6,658	4,432	8,185	2	0	10,39,371	10,67,440
24	Kochi	2,62,258	1,32,628	6,228	5,456	276	27	4,667	4,11,540	4,80,338
25	Kolkata**	2,02,602	2,22,069	^	...	#	46	802	4,25,519	4,96,306
26	Kota	7,44,548	50,313	20,518	...	67,499	16,372	...	8,99,250	9,52,531
27	Lucknow	10,52,717	1,83,288	16,932	181	19,012	1,361	3,591	12,77,082	13,14,705
28	Ludhiana	10,17,038	1,81,023	12,772	...	49,996	368	1,797	12,62,994	13,36,866
29	Madurai	5,57,828	44,802	1,551	77	6,095	2,044	7,872	6,20,269	6,79,510
30	Meerut	2,94,357	51,578	630	0	59,559	0	0	4,06,124	4,19,941
31	Nagpur	10,32,607	99,233	29,727	842	5,402	5,348	1,240	11,74,399	12,37,099
32	Nashik	3,35,145	39,818	9,184	73	14,163	7,462	735	4,06,580	4,44,389
33	Patna	5,05,940	98,425	26,604	...	15,070	10,160	4,221	6,60,420	7,42,889
34	Pune	17,05,573	3,32,293	41,327	877	18,213	11,514	5,745	21,15,542	22,67,123
35	Raipur	4,52,257	42,262	712	5,758	7,095	17,115	3,028	5,28,227	5,78,519
36	Rajkot	6,13,766	63,613	2,932	...	9,902	9,374	3,215	7,02,802	7,59,573
37	Ranchi	4,05,459	69,794	22,393	4,376	11,001	6,135	1,590	5,20,748	7,29,146
38	Srinagar	85,752	62,423	3,850	0	1,755	0	1,486	1,55,266	2,01,006
39	Surat	8,97,366	1,32,559	8,985	...	5,129	3,169	1,742	10,48,950	11,45,492
40	Tiruchirapalli	4,31,016	39,557	992	70	4,547	1,396	3,890	4,81,468	5,21,378
41	Varanasi	4,63,952	43,953	9,921	382	14,332	9,341	942	5,42,823	5,87,533
42	Vijayawada	4,62,507	43,964	1,221	1,873	7,634	5,760	1,075	5,24,034	5,53,413
43	Vadodara	6,44,069	92,057	9,737	...	8,331	4,877	2,780	7,61,851	8,38,750
44	Visakhapatnam	5,16,577	72,939	3,471	2,443	2,960	10,478	1,954	6,10,822	6,83,355
	TOTAL	**384,01,668**	**87,60,000**	**5,23,905**	**2,20,566**	**6,63,450**	**1,96,166**	**2,54,011**	**490,19,766**	**534,92,379**

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

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

Table 4.8.5 : Total registered motor vehicle in million plus cities of India

(as on 31st March, 2013) **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	6,11,502	60,840	3,796	2,655	38,796	125	1,496	7,19,210	7,52,194
2	Ahmedabad	12,90,032	2,63,695	18,419	..	13,455	8,013	6,322	15,99,936	17,95,648
3	Allahabad	6,31,163	61,523	9,060	29	10,434	66	2,588	7,14,863	7,46,668
4	Aurangabad	2,41,325	15,395	8,867	151	4,715	162	6,276	2,76,891	3,09,512
5	Bengaluru	31,58,133	8,94,865	7,343	47,373	8,450	6,635	21,337	41,44,136	45,91,176
6	Bhopal	6,85,967	1,07,984	1,195	.	13,474	4,534	1,603	8,14,757	8,76,680
7	Chandigarh	7,60,327	3,10,273	^	.	224	.	.	10,70,824	11,06,349
8	Chennai	28,56,248	7,08,522	12,481	8,769	2,616	11,745	43,354	36,43,735	40,71,979
9	Coimbatore	12,48,759	1,78,533	5,493	303	8,490	1048	15,204	14,57,830	15,28,042
10	Delhi	49,80,507	24,16,974	67,821	5	1,630	.	383	74,67,320	77,85,283
11	Dhanbad	3,02,884	50,295	8,693	1,328	3,061	2,512	3,172	3,71,945	4,90,423
12	Durg Bhilai	4,24,426	33,350	1,505	7,205	329	204	1,177	4,68,196	4,89,727
13	Ghaziabad	4,49,119	1,20,554	1,762	798	17,190	0	15	5,89,438	6,27,779
14	Greater Mumbai	12,35,282	6,72,223	29,490	3,839	201	95	1,555	19,42,685	21,87,398
15	Gwalior	4,16,406	36,347	6,316	.	19,743	6,761	2,710	4,88,283	5,29,753
16	Hyderabad	14,59,184	3,48,157	6,988	20,144	1,262	25	22,715	18,58,475	20,39,958
17	Indore	11,36,652	1,69,665	4,384	.	19,025	9,793	2,979	13,42,498	14,90,769
18	Jabalpur	5,30,262	48,301	1,915	.	13,154	3,034	4,043	6,00,709	6,46,480
19	Jaipur	14,49,265	2,53,982	56,420	.	41,744	2,911	.	18,04,322	19,61,627
20	Jamshedpur	4,38,285	56,429	13,787	1,628	3,408	2,646	10,973	5,27,156	6,82,271
21	Jodhpur	5,57,013	61,785	22,148	.	56,444	8,272	.	7,05,662	7,92,999
22	Kanpur	9,65,398	1,24,636	7,345	5,180	9,554	0	1	11,12,114	11,43,400
23	Kochi	3,03,359	1,51,987	6,624	559	303	46	5,313	4,68,191	5,47,154
24	Kolkata**	5,43,352	4,89,377	512	39689	4607	259	21789	10,99,585	12,78,358
25	Kota	4,31,413	41,526	11,406	.	23,526	8,525	0	5,16,396	5,53,873
26	Lucknow	11,36,822	2,01,628	19,612	275	20,417	1,421	3,705	13,83,880	14,24,478
27	Ludhiana	6,21,530	51,398	1,575	77	6,462	2105	8,088	6,91,235	7,67,739
28	Madurai	3,20,717	32,668	289	0	8,367	0	22,714	3,84,755	4,12,410
29	Meerut	10,57,682	1,04,745	30746	842	5,430	5399	3810	12,08,654	12,69,677
30	Nagpur	3,68,878	45,923	9,825	73	15,764	7,257	1,243	4,48,963	4,89,598
31	Nashik	5,64,074	1,10,962	28,344	0	16,689	10,853	4226	7,35,148	8,28,721
32	Patna	17,67,498	3,40,564	41,429	877	18,250	11,491	8,734	21,88,843	23,46,883
33	Pune	4,97,337	49,330	860	6335	7,145	18,127	3,624	5,82,758	6,38,815
34	Raipur	6,65,555	73,174	2932	.	10,481	9,576	3,658	7,65,376	8,26,700
35	Rajkot	3,81,609	51,122	19,194	4376	11,492	6,030	1,590	4,75,413	6,84,454
36	Ranchi	93,087	69,561	3,870	0	1,755	0	1,659	1,69,932	2,18,407
37	Srinagar	9,69,817	1,48,370	9,401	.	5,346	3227	1,968	11,38,129	12,40,853
38	Surat	4,92,208	44,385	993	70	5,308	1,461	4,141	5,48,566	5,93,045
39	Varanasi	4,98,572	47,452	11,515	409	15,100	9,353	1017	5,83,418	6,33,079
40	Vijayawada	3,90,772	43,384	1,026	1,572	6,006	4,675	..	4,47,435	5,16,919
41	Vadodara	6,98,852	1,03,133	10,424	.	8,504	4,956	2,861	8,28,730	9,13,923
42	Visakhapatnam	5,08,933	68,114	1,384	1,935	1,143	39	5,005	5,86,553	6,42,521
	TOTAL	**381,40,206**	**92,63,131**	**5,07,189**	**1,56,496**	**4,79,494**	**1,73,381**	**2,53,048**	**489,72,945**	**534,73,722**

Source: Transport year book- 2012-13

... : 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

4.8.5 The physical performance of State Road Transport Undertaking (STRUs) during 2010-11 to 2013-14 is presented in table 4.8.6

4.8.6 The lightening of exhaust emission standards for Indian Automobiles is presented in table 4.8.7.

Table: 4.8.6 : Working of States Transport Undertaking

Name of State Road Transport Undertaking (SRTU)	Fuel Efficiency(km/litre)				Passenger kms performed(Lakh)				Passenger carried (Lakhs)			
	2010-11	2011-12	2012-13	2013-14	2010-11	2011-12	2012-13	2013-14	2010-11	2011-12	2012-13	2013-14
Ahmedabad MTS	3.5	3.3	3.2	3.1	21021	21288	19023	15352	2904	2935	2396	2023
Andhra Pradesh SRTC	5.2	5.1	5.2	5.2	973944	1001924	1017163	882441	46388	50014	51675	50381
Andaman & Nicobar ST		26.2	3.5	3.8	-	-	-	100	-	117	133	102
Assam STC		3.8	4.0		-	5928	7128	-	-	45	55	-
BEST Undertaking	2.9	2.9	2.9	2.8	123071	123353	144458	98432	15352	14395	14096	13068
Bangalore Metropolitan TC	4.0	4.0	3.8	3.8	197604	232759	214586	198797	15603	15920	17112	17938
Bihar SRTC	4.2	4.3	4.3	4.3	4317	4075	3575	2678	55	53	53	27
Calcutta STC	3.4	3.0	3.0	3.0	12108	11996	12175	10120	1686	1164	1077	865
Chandigarh TU	4.1	3.8	3.6	3.4	20216	19614	17165	15419	788	794	672	612
Delhi TC		2.5	2.8	2.8	138011	90237	180220	155144	11066	16177	17072	15868
Gujarat SRTC	5.5	5.5	5.5	5.5	325907	351240	351521	336104	8053	8559	8411	8050
Haryana ST	4.8	4.8	4.8	4.7	134796	139868	164849	152849	4183	4028	4527	4466
Himachal RTC		3.6	3.6	3.6	72840	71619	72111	74419	39044	40413	-	-
J&K SRTC		4.2	4.2	4.3	-	-	6929	6436	-	57	51	52
Kadamba TC Ltd.		4.4	4.5	4.3	-	1150	7902	7782	-	306	301	317
Karnataka SRTC	4.9	4.9	4.8	4.8	329638	351240	368679	354625	8476	8867	9391	9566
Kerala SRTC	4.3	4.2	4.3	4.2	6331	6558	-	--		12579	12156	11634
Maharashtra SRTC	4.9	4.9	4.9	4.8	543987	556295	536151	528386	25380	26004	26064	25630
Meghalaya STC	4.0	4.5	3.6	4.6	514	352	275	394	6	4	3	4
Metro TC (Chennai) Limited	4.4	4.4	4.3	4.3	217963	213249	187962	192169	20145	19769	17544	18068
Mizoram ST	3.5	3.5	3.2	3.0	204	176	-	-	2	1	1	1
Nagaland ST	3.8	3.7	3.8	3.8	1715	2560	-	-	0	18	15	15
Navi Mumbai MT		3.0	3.0	2.8	232	-	-	-	812	856	858	746
North Bengal STC	4.2	4.1	4.0	3.9	13951	13427	15614	14560	575	589	672	645
North Eastern Karnataka RTC	5.3	5.3	5.2	5.1	137650	153477	154908	153732	4563	4745	4836	4873
North Western Karnataka RTC	5.0	5.1	5.1	5.1	167753	151141	171826	172959	6753	7686	8213	8395
Odisha SRTC Odisha SRTC	4.5	4.6	4.6	4.7	10588	11161	-	-	48	57	57	55
Pune Mahamandal	3.4	3.3	3.3	3.2	36395	38690	43985	47931	4500	4497	4352	4249
Rajasthan SRTC	5.1	5.0	4.9	4.9	222004	303312	211371	222145	3391	3308	3129	3466
South Bengal STC	4.1	4.1	4.1	4.1	14916	14875	16040	16734	927	944	948	9575
State Exp.TC TN Ltd.	5.0	5.1	5.1	5.1	67286	61070	67143	75716	270	235	242	270
TN STC (Coimbatore) Ltd.	2.7	5.1	5.2	5.2	249006	233316	223705	227784	10656	9963	9142	9023
TN STC (Kumbakonam) Ltd.	5.0	5.5	5.6	5.6	303226	296609	264658	268500	11822	11528	10617	10750
TN STC (Madurai) Ltd.	5.5	5.4	5.4	5.4	306149	222214	188091	190221	12289	7696	6797	6714
TN STC (Salem) Ltd.	5.5	5.4	5.4	5.5	178818	169389	167153	165293	6966	6941	5880	5655
TN STC (Villupuram) Ltd.	5.5	5.5	5.6	5.6	322239	309167	280069	284794	10746	9718	8568	8498
Tripura RTC	5.5	4.1	5.0	5.0	501	464	393	354	-	9	9	7
Uttar Pradesh SRTC	5.3	5.2	5.2	5.2	337453	372918	384369	365953	4705	4911	5265	5356
Uttrakhand TC			4.7	4.7	-	-	1298	1377	-	-	359	351
Total					**5494355**	**5556712**	**5528951**	**5298052**	**278154**	**295902**	**255206**	**2511119**

Source: Ministry of Road Transport and Highways (Review of the performance of State Road Transport undertakings (Passenger services) for April 2013 -March 2014)

.- Not reported

Table 4.8.7: Exhaust emissiion standards for Indian Automobiles

Emission norms for passenger cars		
Norms	**CO(g/km)**	**HC+ NOx(g/km)**
1991Norms	14.3-27.1	2.0(Only HC)
1996 Norms	8.68-12.40	3.00-4.36
1998Norms	4.34-6.20	1.50-2.18
India stage 2000 norms	2.72	0.97
Bharat stage-II	2.2	0.5
Bharat Stage-III	2.3	0.35(combined)
Bharat Stage-IV	1	0.18(combined)

Emission norms for Heavy Diesel vehicles				
Norms	**CO(g/kmhr)**	**HC (g/kmhr)**	**NOx (g/kmhr)**	**PM(g/kwhr)**
1991Norms	14	3.5	18	-
1996 Norms	11.2	2.4	14.4	-
India stage 2000 norms	4.5	1.1	8	0.36
Bharat stage-II	4	1.1	7	0.15
Bharat Stage-III	2.1	1.6	5	0.1
Bharat Stage-IV	1.5	0.96	3.5	0.02

Emission Norms for 2/3 wheeler		
Norms	**CO(g/km)**	**HC+ NOx)(g/km)**
1991Norms	12--30	8-12 (only HC)
1996 Norms	4.5	3.6
India stage 2000 norms	2	2
Bharat stage-II	1.6	1.5
Bharat Stage-III	1	1

Source: Central Pollution Control Board

4.9 Harmful Effects of Emissions

4.9.1 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.

4.10 Areas of Concern

4.10.1 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.

4.11 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.

4.12 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 Delhi

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.

4.13 Environment Pollution due to fossil fuels- Coal, Lignite, Petroleam and Natural Gas

4.13.1 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.

4.13.2 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.

4.13.3 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 years is presented in table 4.13.1 (a) to 4.13.1 (c).

4.12.4 The State wise production of raw coal and by types (coking, non - coking) over the years is depicted in table 4.13.2(a) and 4.13.2(b) .

4.13.5 Coal production increased rapidly after the nationalisation of coal mines. From about 296.7 million ton in 1997-98, it raised to 565.77 million ton in 2013-14 making India, one of the major coal producers of the world. The increase is predominantly in non-coking coal production.

4.13.6 One of the major constraints on the profitability of the coal sector is the low productivity levels in underground mines. The productivity in Coal mines during 2007 to 2012 can be viewed in Table 4.13.3

4.13.7 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 4.13.4

4.13.8 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 4.13.5

Table 4.13.1(a) : Statewise production of coal and lignite

(Million tonnes)

Sl. No.	States	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
I.	**Coal**	**327.8**	**341.2**	**361.2**	**382.6**	**407**	**430.8**	**457**	**492.8**	**532.1**	**532.7**	**539.907**	**556.402**	**565.766**
1	Andhra Pradesh	30.8	33.2	33.9	35.3	36.1	37.7	40.6	44.5	50.4	51.3	52.21	53.190	50.479
2	Arunachal Pradesh	—	—	—	—	—	—	—	0.1	0.2	0.3	0.22	0.073	0.000
3	Assam	0.6	0.6	0.7	0.6	1.1	1.1	1.1	1.2	1.1	1.1	0.6	0.605	0.664
4	Chhatisgarh	53.6	56.8	61.5	69.3	76.4	83	90.2	101.9	110	113.8	113.95	117.830	127.095
5	Jharkhand	76.8	78.6	79.5	78	85.4	88.8	90.9	96.3	105.9	108.9	109.56	111.274	113.094
6	Meghalaya	5.1	4.4	5.4	5.3	5.6	5.8	6.5	5.7	5.8	7	7.206	5.640	5.732
7	Madhya Pradesh	44.2	45.7	49.8	52.5	55.6	60	67.8	71.3	74.07	71.1	71.123	75.948	75.59
8	Maharashtra	30.8	31.4	32.9	34.5	36.1	36.2	36.4	38.7	41	39.3	39.158	39.134	37.223
9	Odisha	47.8	52.2	60.1	66.6	70.5	81.2	89.5	98.4	106.4	102.6	105.475	110.132	112.917
10	Uttar Pradesh	16.5	17.8	15.8	16.8	15.7	12.2	11.4	12	14	15.5	16.178	16.090	14.721
11	West Bengal	21.4	20.5	21.5	23.6	24.5	24.9	22.5	22.9	23.1	21.7	24.227	26.467	28.242
II.	**Lignite**	**24.8**	**26**	**28**	**30.5**	**30.1**	**31.1**	**34**	**32.4**	**34.1**	**37.7**	**43.105**	**46.453**	**44.271**
1	Gujarat	6.2	6.9	6.7	8.3	8.9	9.7	11.8	10.1	10.5	13.1	14.779	14.528	11.594
2	Rajasthan	0.3	0.5	0.7	0.5	0.7	0.5	0.6	1	1.2	1.5	3.735	7.081	7.621
3	Tamil Nadu	18.4	18.6	20.6	21.6	20.4	21	21.6	21.3	22.3	23.1	24.591	24.844	25.056

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

(P): Provisional

Table 4.13.1(b): Share of Lignite production by States

(in Million Tonnes)

Year	State									All India	
	Tamil Nadu			Gujarat			Rajasthan				
	Quantity	Share(%)	Growth %	Quantity	Share(%)	Growth %	Quantity	Share(%)	Growth %	Quantity	Growth %
1	2	3	4	5	6	7	8	9	10	11	12
2000-01	18.172	74.90	3.50	5.858	24.20	24.60	0.217	0.90	-2.30	24.247	7.90
2001-02	18.369	74.00	1.10	6.167	24.90	5.30	0.277	1.10	27.60	24.813	2.30
2002-03	18.624	71.60	1.40	6.921	26.60	12.20	0.473	1.80	70.80	26.018	4.90
2003-04	20.556	73.50	10.40	6.724	24.10	-2.80	0.678	2.40	43.30	27.958	7.50
2004-05	21.567	71.10	4.90	8.222	27.10	22.30	0.548	1.80	-19.20	30.337	8.50
2005-06	20.435	68.00	-5.20	8.944	29.70	8.80	0.687	2.30	25.40	30.066	-0.90
2006-07	21.014	67.20	2.80	9.808	31.40	9.70	0.463	1.50	-32.60	31.285	4.10
2007-08	21.586	63.50	2.70	11.788	34.70	20.20	0.606	1.80	30.90	33.980	8.60
2008-09	21.308	65.70	-1.30	10.114	31.20	-14.20	0.999	3.10	64.90	32.421	-4.60
2009-10	22.338	65.60	4.80	10.526	30.90	4.10	1.207	3.50	20.80	34.071	5.10
2010-11	23.144	61.30	3.60	13.064	34.60	24.10	1.525	4.10	26.30	37.733	10.70
2011-12	24.590	58.09	6.25	14.779	34.90	13.10	2.963	7.00	94.30	42.332	12.19
2012-13	24.844	53.50	1.03	14.528	31.30	-1.70	7.081	15.24	138.98	46.453	9.73
2013-14	25.056	56.60	0.85	11.588	26.20	-20.24	7.621	17.20	7.63	44.271	-4.70

Source : Office of the Coal Controller, Kolkata, Ministry of Coal

Table 4.13.1(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	2010-11	2011-12	2012-13	2013-14
1	2	3	4	5	6	7	8	9	10
Coking									
Chattisgarh	0.150	0.157	0.159	0.146	0.150	0.163	0.189	0.157	0.125
Jharkhand	30.295	31.098	33.566	33.877	43.666	48.945	51.108	51.065	55.088
Madhya Pradesh	0.932	0.775	0.676	0.730	0.545	0.403	0.319	0.330	0.249
West Bengal	0.134	0.067	0.054	0.056	0.052	0.036	0.044	0.030	1.356
Total Coking	**31.511**	**32.097**	**34.455**	**34.809**	**44.413**	**49.547**	**51.660**	**51.582**	**56.818**
Non-Coking									
Andhra Pradesh	36.138	37.707	40.604	44.546	50.429	51.333	52.211	53.190	50.469
Arunachal Pradesh			0.079	0.142	0.251	0.299	0.221	0.073	0.000
Assam	1.101	1.050	1.101	1.009	1.113	1.101	0.602	0.605	0.664
Chhatisgarh	76.208	83.084	90.013	101.776	109.803	113.661	113.769	117.673	126.970
Jammu & Kashmir	0.019	0.016	0.017	0.011	0.023	0.024	0.020	0.019	0.019
Jharkhand	55.128	57.666	57.329	62.395	62.251	60.004	58.458	60.209	58.003
Madhya Pradesh	54.647	58.951	67.165	70.595	73.529	70.701	70.804	75.618	75.341
Maharashtra	36.119	36.215	36.403	38.705	41.005	39.336	39.159	39.134	37.223
Meghalaya	5.566	5.787	6.541	5.489	5.767	6.974	7.206	5.640	5.732
Odisha	70.540	81.160	89.482	98.402	106.409	102.565	105.476	110.132	112.917
Uttar Pradesh	15.721	12.228	11.426	12.029	13.968	15.526	16.178	16.090	14.721
West Bengal	24.341	24.871	22.467	22.849	23.081	21.623	24.186	26.437	26.888
Total Non-Coking	**375.528**	**398.735**	**422.627**	**457.948**	**487.629**	**483.147**	**488.290**	**504.820**	**508.947**

Source : Office of the Coal Controller, Kolkata, Ministry of Coal

Table 4.13.2 (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)**	1-4-2008	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
		1-4-2013	9604	9554	3049	22207
		1-4-2014	9729	9670	3068	22468
2	**Arunachal Pradesh (Tertiary)**	1-4-2008	31	40	19	90
		1-4-2009	31	40	19	90
		1-4-2010	31	40	19	90
		1-4-2011	31	40	19	90
		1-4-2012	31	40	19	90
		1-4-2013	31	40	19	90
		1-4-2014	31	40	19	90
3	**Assam (Tertiary)**	1-4-2008	315	24	34	373
		1-4-2009	349	33	3	385
		1-4-2010	349	33	3	385
		1-4-2011	465	43	3	511
		1-4-2012	465	43	3	511
		1-4-2013	465	43	3	511
		1-4-2014	465	43	3	511
4	**Assam (Gondawana)**	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
		1-4-2013	0	3	0	3
		1-4-2014	0	4	0	4
5	**Jharkhand (Gondawana)**	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
		1-4-2013	41155	32986	6559	80701
		1-4-2014	41377	32780	6559	80716
6	**Bihar (Gondawana)**	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
		1-4-2013	0	0	160	160
		1-4-2014	0	0	160	160

Sl No.	State	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
7	**Madhya Pradesh (Gondawana**	1-4-2008	7896	9882	2782	20560
		1-4-2009	8041	10295	2645	20981
		1-4-2010	8505	11267	2216	21988
		1-4-2011	8871	12192	2063	23126
		1-4-2012	9309	12291	2777	24377
		1-4-2013	9818	12355	2889	25061
		1--2014	10411	12382	2879	25673
8	**Chhatisgarh (Gondawana)**	1-4-2008	10419	29272	4443	44134
		1-4-2009	10911	29192	4381	44484
		1-4-2010	12441	30230	4011	46682
		1-4-2011	12789	32390	4011	49190
		1-4-2012	13988	33448	3410	50846
		1-4-2013	14779	34107	3283	52169
		1-4-2014	16052	33253	3228	52533
9	**Maharashtra (Gondawana)**	1-4-2008	5004	2822	1992	9818
		1-4-2009	5255	2907	1992	10154
		1-4-2010	5360	2984	1965	10309
		1-4-2011	5490	3094	1950	10534
		1-4-2012	5667	3104	2110	10881
		1-4-2013	5667	3186	2110	10964
		1-4-2014	5667	3186	2110	10964
10	**Meghalaya (Tertiary)**	1-4-2008	89	70	301	460
		1-4-2009	89	17	471	577
		1-4-2010	89	17	471	577
		1-4-2011	89	17	471	577
		1-4-2012	89	17	471	576
		1-4-2013	89	17	471	576
		1-4-2014	89	17	471	576
11	**Nagaland (Tertiary)**	1-4-2008	3	1	15	19
		1-4-2009	9	0	13	22
		1-4-2010	9	0	307	316
		1-4-2011	9	0	307	316
		1-4-2012	9	0	307	315
		1-4-2013	9	0	307	315
		1-4-2014	9	0	307	315
12	**Odisha**	1-4-2009	19944	31484	13799	65227
	(Gondawana)	1-4-2010	21507	32074	12726	66307
		1-4-2011	24492	33987	10680	69159
		1-4-2012	25548	36466	9434	71448
		1-4-2013	27284	37110	9316	73710
		1-4-2014	27791	37873	9408	75073
13	**Sikkim**	1-4-2008	0	58	43	101
	(Gondawana)	1-4-2009	0	58	43	101
		1-4-2010	0	58	43	101
		1-4-2011	0	58	43	101
		1-4-2012	0	58	43	101
		1-4-2013	0	58	43	101
		1-4-2014	0	58	43	101

Sl No.	State	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
14	**Uttar Pradesh (Gondawana)**	1-4-2008	766	296	0	1062
		1-4-2009	766	296	0	1062
		1-4-2010	866	196	0	1062
		1-4-2011	866	196	0	1062
		1-4-2012	884	178	0	1062
		1-4-2013	884	178	0	1062
		1-4-2014	884	178	0	1062
15	**West Bengal (Gondawana)**	1-4-2008	11584	11680	5071	28335
		1-4-2009	11653	11603	5071	28327
		1-4-2010	11753	13030	5071	29854
		1-4-2011	11753	13132	5071	29956
		1-4-2012	12425	13358	4832	30615
		1-4-2013	13396	12995	4892	31283
		1-4-2014	13403	13022	4893	31318
16	**Gondawana**	1-4-2008	101391	124081	38121	263593
		1-4-2009	105243	123480	37415	266138
		1-4-2010	109320	130564	35559	275443
		1-4-2011	114002	137471	34390	285863
		1-4-2012	117551	142070	32384	292005
		1-4-2013	122588	142532	32301	297421
		1-4-2014	125315	142407	32350	300072
17	**Tertiary Coalfields**	1-4-2008	438	135	369	942
		1-4-2009	478	90	506	1074
		1-4-2010	478	90	799	1367
		1-4-2011	594	99	799	1492
		1-4-2012	594	99	799	1493
		1-4-2013	594	99	799	1493
		1-4-2014	594	99	799	1493
	India (Total)	**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**	**34390**	**285863**
		1-4-2012	**118145**	**142169**	**33183**	**293497**
		1-4-2013	**123182**	**142632**	**33100**	**298914**
		1-4-2014	**125909**	**142506**	**33149**	**301564**

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 Tertiary coalfields.
Source : Geological Survey of India

Table 4.13.2 (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	1-4-2008	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**
		1-4-2014	4614	699	0	**5313**
	II. Medium coking	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**
		1-4-2014	13303	11867	1879	**27049**
	III. Blendable/semi-coking	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**
		1-4-2014	482	1004	222	**1708**
2	**Non-coking** (Including High Sulphur)	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**
		1-4-2014	107509	128937	31047	**267494**
	Total	**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**
		1-4-2014*	**125909**	**142506**	**33148**	**301564**

Source : Office of the Coal Controller, Kolkata

* Including Sikkim

Table 4.13.3 :Productivity in coal mines

(Tonnes)

Sl. No.	State	2007						2008						2009					
		Output Per Man Year			Output Per Manshift			Output Per Man Year			Output Per Manshift			Output Per Man Year			Output Per Manshift		
		Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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**
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
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
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
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
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
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
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
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
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
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
11	Meghalaya	x	13067	11876	x	36.6	33.27	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**
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
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
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

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

Table 4.13.3 :Productivity in coal mines

(Tonnes)

Sl. No.	State	2010						2011						2012					
		Output Per Man Year			Output Per Manshift			Output Per Man Year			Output Per Manshift			Output Per Man Year			Output Per Manshift		
		Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall	Below ground	Open cast	Overall
1	2	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
I	**COAL**	**385**	**6702**	**1592**	**1.21**	**20.29**	**4.94**	**388**	**6535**	**1607**	**1.23**	**19.74**	**4.99**	**374**	**6443**	**1656**	**1.18**	**19.42**	**5.14**
1	Andhra Pradesh	475	4146	1074	1.57	12.91	3.49	487	4614	1192	1.67	14.28	3.96	511	4514	1197	1.7	14.02	3.9
2	Assam	1	1231	503	0.00	3.95	1.61	7	913	363	0.02	2.87	1.16	7	751	350	0.02	2.38	1.12
3	Chhattisgarh	656	20285	3835	1.89	59.74	11.14	588	20971	3786	1.63	67.22	10.87	544	17458	3624	1.53	52.72	10.41
4	Jharkhand	215	4515	1213	0.71	13.71	3.84	255	4374	1193	0.83	13.15	3.75	199	4403	1308	0.65	13.09	4.11
5	Jammu & Kashmir	40	x	32	0.13	x	0.14	42	x	33	0.14	x	0.11	45	x	34	0.15	x	0.12
6	Madhya Pradesh	532	6094	1353	1.61	18.04	4.09	515	5784	1277	1.55	17.25	3.85	516	3803	1039	1.53	11.57	3.12
7	Maharashtra	391	5643	1491	1.17	16.65	4.39	366	5455	1534	1.11	16.3	4.58	354	5230	1479	1.04	15.89	4.45
8	Odisha	549	11986	5502	1.68	35.31	16.42	577	11029	5242	1.75	31.25	15.31	490	12075	5475	1.49	34.55	16.13
9	Uttar Pradesh	x	5822	3630	x	18.14	11.27	x	4626	3337	x	14.22	10.26	x	5640	3448	x	17.68	10.75
10	West Bengal	214	3287	369	0.67	10.23	1.16	231	3368	389	0.67	10.52	1.22	202	5122	497	0.66	15.84	1.6
11	Meghalaya	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
II	**LIGNITE**	**x**	**4201**	**2592**	**x**	**13.35**	**8.04**	x	4187	3066	x	13.17	9.69	x	4941	3501	x	15.5	11
1	Gujarat	x	6178	4810	x	19.33	15.08	x	6647	5049	x	20.75	15.89	x	8232	6040	x	25.51	18.91
2	Rajasthan	x	3769	3035	x	11.03	9.07	x	2134	1705	x	6.15	4.97	x	5935	3778	x	16.94	10.84
3	Tamil Nadu	x	3535	2005	x	11.35	6.22	x	3679	2628	x	11.77	8.41	x	3834	2739	x	12.26	8.76

(concluded)

Table 4.13.4 : 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 Mechanise d	
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 4.13.5 : 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	7710	10502	16087	9242	6196	47586	923
37	2006-07	8408	12539	18145	8634	7805	53476	803
38	2007-08*	8792	14167	17964	7970	9107	58376	671
39	2008-09	9158	16020	16452	8391	8071	62905	606
40	2009-10	10334	22537	18788	8703	9304	73298	472
41	2010-11	9708	26138	19196	7809	9589	78057	590
42	2011-12	9547	27186	18825	7861	10065	82880	502
43	2012-13	9825	30118	19018	7971	10088	91103	400
44	2013-14	10030	30275	18505	7418	11220	93759	423
45	2014-15 (P)	9840	32325	17391	7559	11103	94428	358

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

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

* : Estimated from calendar year figures

(P) : Provisional

Table 4.13.5 : Domestic production of petroleum products in India - concluded

('000 Tonne)

Sl. No.	Year	Heavy Ends				Others**	Total
		Fuel Oil	Lubricants	Petroleum	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	3576	3182	4419	124405
37	2006-07	15697	825	3891	3779	5746	139748
38	2007-08*	15804	881	4507	4129	7104	149472
39	2008-09	17684	874	4713	4241	6033	155148
40	2009-10	18346	950	4889	3709	13279	184610
41	2010-11	20519	884	4478	2711	15142	194821
42	2011-12	18433	1028	4610	7837	14429	203202
43	2012-13	15054	896	4670	10943	17650	217736
44	2013-14	13405	941	4785	12068	17927	220756
45	2014-15(P)	11919	946	4632	12448	18188	221136

Source : Ministry of Petroleum & Natural Gas.

* : Estimated from calendar year figures

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

(P) : Provisional

Table 4.13.6: 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	124405	-10020	114385
37	2006-07	33988	111502	145490	139748	-15964	123784
38	2007-08	34118	121672	155790	149472	-18317	131155
39	2008-09	33508	132775	166283	155148	-20358	134789
40	2009-10	33690	159259	192949	184610	-36490	148120
41	2010-11	37684	163595	201279	194821	-41698	153123
42	2011-12	38090	171729	209819	203202	-44988	158214
43	2012-13	37862	184795	222657	217736	-47634	170103
44	2013-14	37788	189238	227027	220756	-51146	169610
45	2014-15(P)	37460	189432	226892	221136	-43505	177630

Source : Ministry of Petroleum & Natural Gas.

(P) : Provisional

'@ :Excludes LPG production from natural gas.

4.13.9 The details of production and utilization of Natural Gas in India from 1970-71 to 2013-14 is depicted in Table 4.13.7 Natural gas is also an important fuel in India as evident from the following table 4.13.7

The time series data of Industry wise off –take of Natural gas in India is available in table 4.13.8

Table 4.13.7 Gross and net production (utilisation) of natural gas in India

(Million cubic metres)

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

Continued…

Table 4.13.7 Gross and net production (utilisation) of natural gas in India

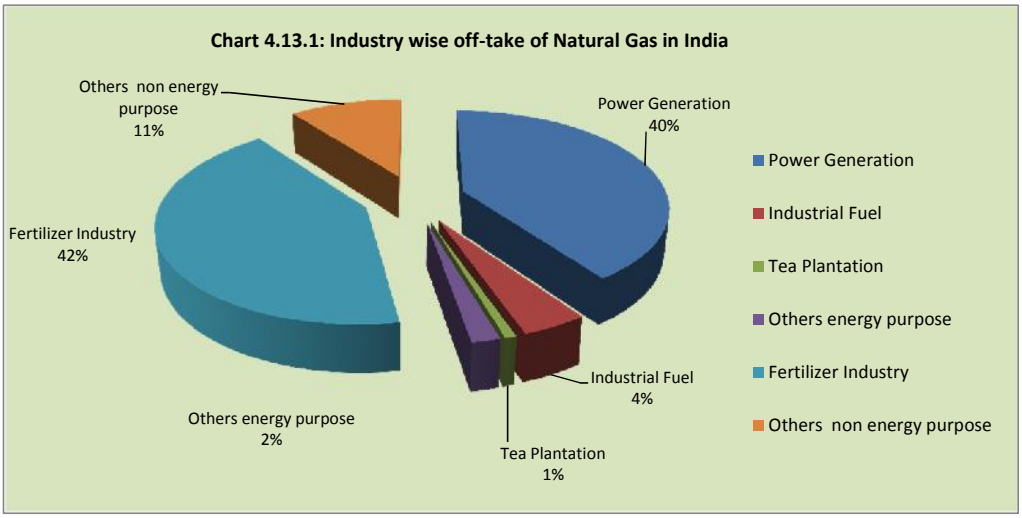
(Million cubic metres)

Sl. No.	Year	Gross Production	Re-injected	Flarred	Net Production (Utilisation)
1	2	3	4	5	6
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	4467	877	26858
37	2006-07	31747	4372	956	26419
38	2007-08	32417	4499	938	26981
39	2008-09	32845	4680	1099	27066
40	2009-10	47496	5660	975	40874
41	2010-11	52219	5214	968	46040
42	2011-12	47559	5313	1077	41168
43	2012-13	40679	5429	902	34348
44	2013-14	35407	5590	769	28984
45	2014-15(P)	33656	5904	873	26781

Source : Ministry of Petroleum & Natural Gas. concluded

Note: Reinjected's (internal use) figures for the year 1995-96 to 2004-05 is not available.

(P) : Provisional



As evident from the chart 4.12.1 in India, 32.89% of natural gas is being utilized by fertiliser industry sector followed by power generation (31.33), Captive use/LPG shrinkage(13.90)and Domestic fuel (8.34) during 2013-14(P).

Table 4.13.8 : 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	3323	160	38	1804	1324	18686	9823	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	25787	903	193	2525	6781	765	36954	11464	2838	51256
42	2011-12	22628	1694	175	4189	1068	1333	31087	14003	15593	60683
43	2012-13	16078	1059	182	4990	1027	1106	24442	14733	14739	53914
44	2013-14	11284	1077	196	4983	982	274	18796	15869	14330	48995
45	2014-15(P)	10720	NA	NA	5810	1005	154	17689	15190	14076	49845

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.

^ Incudes total off-take by CGD entities for Domestic (PNG), Transport (CNGo and Industial & commercial sector

Neg: Negligible * Sponge iron use. ** Includes refineries, Heavy Water Plants

(P) :Provisional

4. 14 Power Sector

4.14.1 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.

4.14.2 The State /UT wise installed capacity of power utilities (thermal, nuclear, hydro renewable, Renewable Energy Sources) in India during 2015 is given in the table 4.14.1

Table 4.14.1 ALL INDIA GROSS ELECTRICAL ENERGY GENERATION CAPACITY OF ELECTRICITY DEPARTMENTS,GOVT. UNDERTAKINGS,CENTRAL SECTOR,MUNICIPALITIES AND PRIVATE SECTOR MODEWISE -31.03.2015

State/U.Ts.	Hydro	Thermal Steam	Diesel	Gas	Total Thermal	Nuclear	R E S	Total
1	2	3	4	5	6	7	8	9
PUBLIC SECTOR								
Haryana	884.51	3160	3.92	25	3188.92	0	59.3	4132.73
Himachal Pradesh	393.6	0	0.13	0	0.13	0	245.61	639.34
Punjab	2230.23	2630	0	25	2655	0	127.8	5013.03
Rajasthan	987.96	4715	0	603.8	5318.8	0	23.85	6330.61
Jammu & Kashmir	780	0	8.94	175	183.94	0	106.53	1070.47
Uttar Pradesh	524.1	4923	0	0	4923	0	25.1	5472.2
Uttarakhand	1252.15	0	0	0	0	0	62.87	1315.02
Delhi	0	135	0	2050.4	2185.4	0	0	2185.4
Chandigarh	0	0	0	0	0	0	0	0
Central Sector (NR)	7866.22	10765	0	2344.06	13109.06	1620	0	22595.3
Sub Total (NR)	14918.8	26328	12.99	5223.26	31564.25	1620	651.06	48754.1
Gujarat	772	4720	17.28	2321.82	7059.1	0	8	7839.1
Madhya Pradesh	1703.66	4195	0	0	4195	0	83.96	5982.62
Chhattisgarh	120	2780	0	0	2780	0	11.05	2911.05
Maharashtra	2884.84	9560	0	672	10232	0	208.13	13325
Goa	0	0	0	0	0	0	0.05	0.05
Central Sector (WR)	1520	11340	0	3533.59	14873.59	1840	0	18233.6
Sub Total (WR)	7000.5	32595	17.28	6527.41	39139.69	1840	311.19	48291.4
Andhra Pradesh	1237.92	4410	0	0	2348.15	0	89.5	4172.06
Telangana	2496.6	2282.5	0	0	2744.35	0	0	4875.99
Karnataka	3599.8	2720	127.92	0	2847.92	0	137.33	6585.05
Kerala	1881.5	0	234.6	0	234.6	0	123.92	2240.02
Tamil Nadu	2182.2	4770	0	523.2	5293.2	0	122.7	7598.1
Lakshadweep	0	0	9.97	0	9.97	0	0	9.97
Puducherry	0	0	0	32.5	32.5	0	0	32.5
Central Sector (SR)	0	9590	0	359.58	9949.58	2320	0	12269.6
Sub Total (SR)	11398	23772.5	372.49	915.28	23460.27	2320	473.45	37651.7
Bihar	0	210	0	0	210	0	70.7	280.7
Jharkhand	130	1190	0	0	1190	0	4.05	1324.05
Odisha	2061.93	420	0	0	420	0	6.3	2488.23
West Bengal	977	5220	12.06	100	5332.06	0	91.95	6401.01
Sikkim	0	0	5	0	5	0	52.11	57.11
D.V.C.	143.2	6200	0	90	6290	0	0	6433.2
A.& N. Islands	0	0	40.05	0	40.05	0	5.25	45.3
Central Sector (ER)	702	10235	0	0	10235	0	0	10937
Sub Total (ER)	4014.13	23475	57.11	190	23722.11	0	230.36	27966.6
Assam	100	60	20.69	276.2	356.89	0	30.01	486.9
Manipur	0	0	45.41	0	45.41	0	5.45	50.86
Meghalaya	282		2.05		2.05		31.03	315.08
Nagaland	0	0	2	0	2	0	29.67	31.67
Tripura	0	0	4.85	169.5	174.35	0	16.01	190.36
Arunachal Pradesh	0	0	15.88	0	15.88	0	104.61	120.49
Mizoram	0	0	51.86	0	51.86	0	36.47	88.33
Central Sector (NER)	**860**	**0**	**0**	**1192.5**	**1192.5**	**0**	**0**	**2052.5**
Sub Total (NER)	**1242**	**60**	**142.74**	**1638.2**	**1840.94**	**0**	**253.25**	**3336.19**
Total-I, (All India)	**38573.4**	**106231**	**602.6**	**14494.2**	**119727.25**	**5780**	**1919.31**	**166000**

(Contd.)

Table 4.14.1 ALL INDIA GROSS ELECTRICAL ENERGY GENERATION CAPACITY OF ELECTRICITY DEPARTMENTS,GOVT. UNDERTAKINGS,CENTRAL SECTOR,MUNICIPALITIES AND PRIVATE SECTOR MODEWISE -31.03.2015

State/U.Ts.	Hydro	Thermal Steam	Diesel	Gas	Total Thermal	Nuclear	R E S	Total
1	2	3	4	5	6	7	8	9
PRIVATE SECTOR								
Haryana	0	1720	0	0	1720	0	77.3	1797.3
Himachal Pradesh	1748	0	0	0	0	0	478.3	2226.3
Jammu & Kashmir	0	0	0	0	0	0	50	50
Punjab	0	2560	0	0	2560	0	365.62	2925.62
Rajasthan	0	2800	0	0	2800	0	4362.4	7162.4
Uttar Pradesh	0	2850	0	0	2850	0	964.76	3814.76
Uttarakhand	400	0	0	0	0	0	181.45	581.45
Delhi	0	0	0	108	108	0	21.47	129.47
Chandigarh	0	0	0	0	0	0	4.5	4.5
Gujarat	0	8620	0.2	4160	12780.2	0	4709.55	17489.8
Madhya Pradesh	0	6425	0	0	6425	0	1480.68	7905.68
Chhattisgarh	0	8323	0	0	8323	0	313.45	8636.45
Maharashtra	447	11796	0	180	11976	0	5980.17	18403.2
Goa	0	0	0	48	48	0	0	48
Andhra Pradesh	0	1560	36.8	3370.4	4967.2	0	1856.5	6823.7
Telangana	0	0	0	0	0	0	61.25	61.25
Karnataka	0	2060	106.5	0	2166.5	0	4372.9	6539.4
Kerala	0	0	21.84	174	195.84	0	80.03	275.87
TamilNadu	0	1150	411.659	503.1	2064.759	0	8273.04	10337.8
Lakshadweep	0	0	0	0	0	0	0.75	0.75
Puducherry	0	0	0	0	0	0	0.03	0.03
Bihar	0	0	0	0	0	0	43.42	43.42
Jharkhand	0	900	0	0	900	0	16	916
Odisha	0	4650	0	0	4650	0	110.09	4760.09
DVC	0	1050	0	0	1050	0	0	1050
West Bengal	0	1941.38	0.14	0	1941.52	0	39.76	1981.28
A&N Islands	0	0	20	0	20	0	5.1	25.1
Sikkim	99	0	0	0	0	0	0	99
Assam	0	0	0	24.5	24.5	0	4.1	28.6
Tripura	0	0	0	0	0	0	5	5
Arunachal Pradesh	0	0	0	0	0	0	0.03	0.03
Total-II, (All India)	**2694**	**58405.4**	**597.14**	**8568**	**67570.52**	**0**	**33857.7**	**104122**
All India Total (I+II)	**41267.4**	**164636**	**1199.74**	**23062.2**	**188897.77**	**5780**	**35777**	**271722**

Source : Central Electricity Authority

Table 4.14.2 ALL INDIA GROSS ELECTRICAL ENERGY GENERATION BY ELECTRICITY DEPARTMENTS, GOVT. UNDERTAKINGS, CENTRAL SECTOR, MUNICIPALITIES AND PRIVATE SECTOR MODEWISE 2014-15

(GWh)

State/U.Ts.	Hydro	Thermal Steam	Diesel	Gas	Total Thermal	Nuclear	R E S	Total
1	2	3	4	5	6	7	8	9
PUBLIC SECTOR								
Chandigarh	0	0	0	0	0	0	0	0
Delhi	0	423.54	0	4571.06	4994.6	0	0	4994.6
Haryana	3304.43	13616.77	0	223.51	13840.28	0	164.75	17309.46
Himachal Pradesh	1735.3	0	0	0	0	0	687.71	2423.01
Jammu & Kashmir	4216.66	0	0	0	0	0	298.28	4514.94
Punjab	8537.78	11671.82	0	223.51	11895.33	0	311.94	20745.05
Rajasthan	2999.05	25250.66	0	2097.26	27347.92	0	43.53	30390.5
Uttar Pradesh	1288.95	25098.49	0	0	25098.49	0	72.76	26460.2
Uttarakhand	4199.36	0	0	0	0	0	176.23	4375.59
Central Sector (NR)	30748.9	70530.6	0	7419.16	77949.76	10612.93	0	119311.59
Sub Total (NR)	57030.43	146591.88	0	14534.5	161126.38	10612.93	1755.2	230524.94
Chhattisgarh	258.18	15592.41	0	0	15592.41	0	32.47	15883.06
Gujarat	1367.67	21466.24	0	501.29	21967.53	0	14.46	23349.66
Madhya Pradesh	4318.68	17074.22	0	0	17074.22	0	156.56	21549.46
Maharashtra	4696.55	40707.46	0	3567.16	44274.62	0	426.99	49398.16
Goa	0	0	0	0	0	0	0.14	0.14
Central Sector (WR)	3670.83	76959.57	0	3349.75	80309.32	13799.29	0	97779.44
Sub Total (WR)	14311.91	171799.9	0	7418.2	179218.1	13799.29	630.62	207959.92
Andhra Pradesh	2372.43	21034.57	0	0	21034.57	0	192.18	23599.18
Telangana	4400.92	16059.87	0	0	16059.87	0	0	20460.79
Karnataka	13014.22	16786.45	0	0	16786.45	0	305.75	30106.42
Kerala	6852.65	0	207.69	0	207.69	0	325.69	7386.03
Tamil Nadu	5058.96	27378.22	0	1982.88	29361.1	0	234.16	34654.22
Puducherry	0	0	0	102.14	102.14	0	0	102.14
Lakshadweep	0	0	45.75	0	45.75	0	0	45.75
Central Sector (SR)	0	59713.99	0	819.12	60533.11	11689.32	0	72222.43
Sub Total (SR)	31699.18	140973.1	253.44	2904.14	144130.68	11689.32	1057.78	188576.96
Bihar	0	0	0	0	0	0	203.34	203.34
D.V.C.	267.3	25283.81	0	0	25283.81	0	0	25551.11
Jharkhand	33.73	3153.95	0	0	3153.95	0	7.95	3195.63
Odisha	6555.63	2798.93	0	0	2798.93	0	16.05	9370.61
West Bengal	1755.62	25261.11	0	0	25261.11	0	255.81	27272.54
Sikkim	0	0	0	0	0	0	145.91	145.91
A.& N. Islands	0	0	181.45	0	181.45	0	11.98	193.43
Central Sector (ER)	3308.62	59133.73	0	0	59133.73	0	0	62442.35
Sub Total (ER)	11920.9	115631.53	181.45	0	115812.98	0	641.03	128374.91
Arunachal Pradesh	0	0	0	0	0	0	292.88	292.88
Assam	402.43	0	0	1526.91	1526.91	0	84.03	2013.37
Manipur	0	0	0	0	0	0	15.26	15.26
Meghalaya	775.29	0	0	0	0	0	86.88	862.17
Mizoram	0	0	0	0	0	0	102.12	102.12
Nagaland	0	0	0	0	0	0	83.08	83.08
Tripura	0	0	0	726.46	726.46	0	40.83	767.29
Central Sector (NER)	**2364.39**	**0**	**0**	**4839.02**	**4839.02**	**0**	**0**	**7203.41**
Sub Total (NER)	**3542.11**	**0**	**0**	**7092.39**	**7092.39**	**0**	**705.07**	**11339.57**
Total-I, (All India)	**118504.5**	**574996.41**	**434.89**	**31949.23**	**607380.53**	**36101.54**	**4789.71**	**766776.31**

Table 4.14.2 ALL INDIA GROSS ELECTRICAL ENERGY GENERATION BY ELECTRICITY DEPARTMENTS, GOVT. UNDERTAKINGS, CENTRAL SECTOR, MUNICIPALITIES AND PRIVATE SECTOR MODEWISE 2014-15

(GWh)

State/U.Ts.	Hydro	Thermal Steam	Diesel	Gas	Total Thermal	Nuclear	R E S	Total
1	2	3	4	5	6	7	8	9
PRIVATE SECTOR								
Chandigarh	0	0	0	0	0	0	7.88	7.88
Delhi	0	0	0	0	0	0	37.57	37.57
Haryana	0	9195.24	0	0	9195.24	0	214.75	9409.99
Himachal Pradesh	6985.46	0	0	0	0	0	1339.24	8324.7
Jammu & Kashmir	0	0	0	0	0	0	140	140
Punjab	0	10572.21	0	0	10572.21	0	892.44	11464.65
Rajasthan	0	17875.93	0	0	17875.93	0	7962.03	25837.96
Uttar Pradesh	0	19624.94	0	0	19624.94	0	2796.48	22421.42
Uttarakhand	1815.94	0	0	0	0	0	508.62	2324.56
Chhattisgarh	0	18785.05	0	0	18785.05	0	921.13	19706.18
Gujarat	0	55807.09	0	3119.95	58927.04	0	8510.81	67437.85
Madhya Pradesh	0	22264.77	0	0	22264.77	0	2761.03	25025.8
Maharashtra	1506.9	49332.93	0	1148.5	50481.43	0	12268.78	64257.11
Goa	0	0	0	12.61	12.61	0	0	12.61
Andhra Pradesh	0	4761.77	0	2561.07	7322.84	0	3986.49	11309.33
Telangana	0	0	0	0	0	0	107.19	107.19
Karnataka	0	13754.38	0	0	13754.38	0	9735.62	23490
Kerala	0	0	0	154.71	154.71	0	210.34	365.05
TamilNadu	0	4348.98	1045.97	2128.98	7523.93	0	15788.4	23312.33
Puducherry	0	0	0	0	0	0	0.05	0.05
Lakshadweep	0	0	0	0	0	0	1.31	1.31
Bihar	0	0	0	0	0	0	124.88	124.88
DVC	0	6684.08	0	0	6684.08	0	0	6684.08
Jharkhand	0	4750.12	0	0	4750.12	0	31.39	4781.51
Odisha	0	13584.71	0	0	13584.71	0	280.49	13865.2
West Bengal	0	8952.17	0	0	8952.17	0	110.61	9062.78
Sikkim	430.86	0	0	0	0	0	0	430.86
A.& N. Islands	0	0	94.8	0	94.8	0	11.64	106.44
Arunachal Pradesh	0	0	0	0	0	0	0.08	0.08
Assam	0	0	0	0	0	0	11.48	11.48
Tripura	0	0	0	0	0	0	12.75	12.75
Total-II, (All India)	**10739.16**	**260294.37**	**1140.77**	**9125.82**	**270560.96**	**0**	**68773.49**	**350073.61**
All India Total (I+II)	**129243.7**	**835290.78**	**1575.66**	**41075.05**	**877941.49**	**36101.54**	**73563.2**	**1116849.92**

Source : Central Electricity Authority

Table 4.14.3 : Growth of installed generating capacity in India

(Megawatt)

Sr. No.	As on	Hydro	Thermal				Nuclear	RES	Total
			Coal $	Gas	Diesel	Total			
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
25	31.03.14	40532	145273	21782	1200	168255	4780	31692	245259
26	31.03.15	41267	164636	23062	1200	188898	5780	35777	271722

Source: Central Electricity Authority
: RES:- Renewable Energy Sources includes Hydro capacity of 25.00 MW and below

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

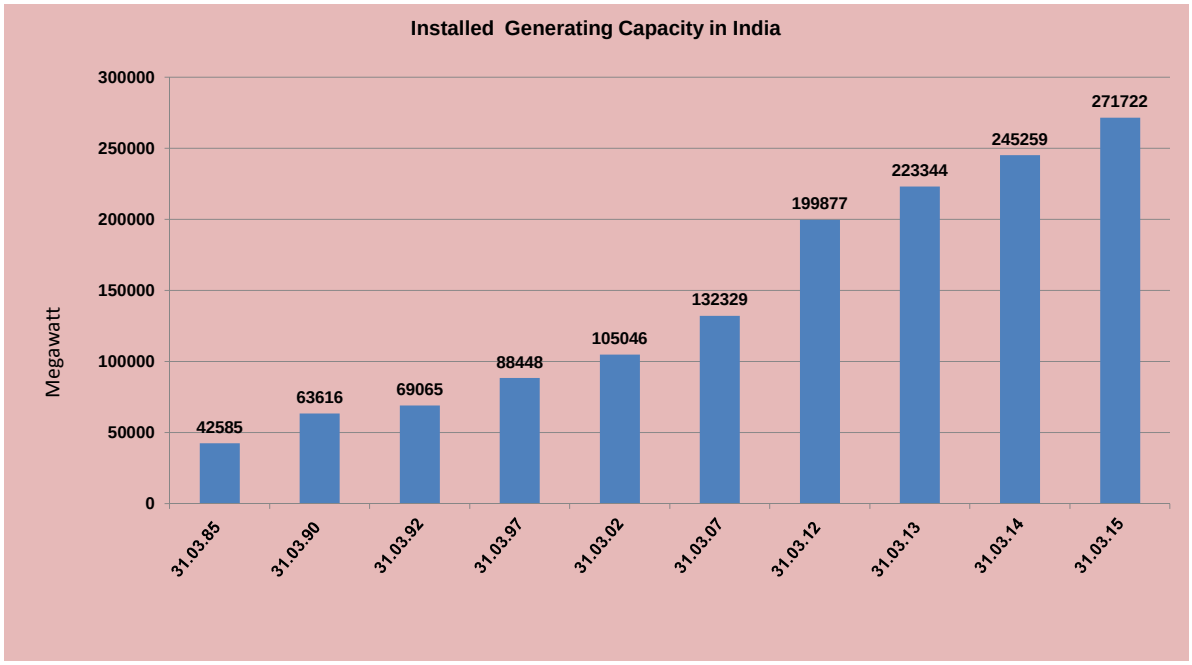


Table 4.14.4 Cumulative comparison of power supply position

Region/State/U.Ts.	Peak Demand (MW)	Peak Met (MW)	Surplus(+)/Deficit(-)	
			(MW)	%
NORTHERN REGION				
Chandigarh	367	367	0	0
Delhi	6,006	5,925	-81	-1.35
Haryana	9,152	9,152	0	0
Himachal Pradesh	1,422	1,422	0	0
Jammu & Kashmir	2,554	2,043	-511	-20.01
Punjab	11,534	10,023	-1511	-13.1
Rajasthan	10,642	10,642	0	0
Uttar Pradesh	15,670	13,003	-2667	-17.02
Uttarakhand	1,930	1,930	0	0
NORTHERN REGION	**51,977**	**47,642**	**-4,335**	**-8.34**
Chhattisgarh	3,817	3,638	-179	-4.69
Gujarat	13,603	13,499	-104	-0.76
Madhya Pradesh	9,755	9,717	-38	-0.39
Maharashtra	20,147	19,804	-343	-1.7
Daman & Diu	301	301	0	0
Dadra & Nagar Haveli	714	714	0	0
Goa	501	489	-12	-2.4
WESTERN REGION	**44,166**	**43,145**	**-1021**	**-2.31**
Andhra Pradesh	7,144	6,784	-360	-5.04
Telangana	7,884	6,755	-1129	-14.32
Karnataka	10,001	9,549	-452	-4.52
Kerala	3,760	3,594	-166	-4.41
Tamil Nadu	13,707	13,498	-209	-1.52
Puducherry	389	348	-41	-10.54
Lakshadweep #	8	8	0	0
SOUTHERN REGION	**39,094**	**37,047**	**-2,047**	**-5.24**
Bihar	2,994	2,874	-120	-4.01
DVC	2,653	2,590	-63	-2.37
Jharkhand	1,075	1,055	-20	-1.86
Orissa	3,920	3,892	-28	-0.71
West Bengal	7,544	7,524	-20	-0.27
Sikkim	83	83	0	0
Andaman Nicobar #	40	32	-8	-20
EASTERN REGION	**17,040**	**16,932**	**-108**	**-0.63**
Arunachal Pradesh	139	126	-13	-9.35
Assam	1,450	1,257	-193	-13.31
Manipur	150	146	-4	-2.67
Meghalaya	370	367	-3	-0.81
Mizoram	90	88	-2	-2.22
Nagaland	140	128	-12	-8.57
Tripura	310	266	-44	-14.19
NORTH EAST REGION	**2,528**	**2,202**	**-326**	**-12.9**
ALL INDIA	**1,48,166**	**1,41,160**	**-7006**	**-4.73**

:# Lakshadweep & A & N Islands are stand-alone systems, power supply position of these does not form part of regional requirement and availability.

Source : Central Electricity Authority 2015

Table 4.14.5 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
26	2013-14	140445.4	746086.7	1868.2	44522.2	34227.8	792477.1	967150.3
27	2014-15	129243.7	835290.8	1576.7	41075.5	36101.5	73563.2	1116849.9

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

P : Provisional

Table 4.14.6 : 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	1,57,887	45.9
5	31.03.66 (End of the 3rd Plan)	9,027	45,148	5,41,704	73.9
6	31.03.69 (End of the 3rd Annual Plans)	12,957	73,739	8,86,301	97.9
7	31.03.74(End of the 4th Plan)	16,664	1,56,729	15,18,884	126.2
8	31.03.79(End of the 5th Plan)	26,680	2,32,770	21,45,919	171.6
9	31.03.80 (End of the Annual Plan)	28,448	2,49,799	23,51,609	172.4
10	31.03.85 (End of the 6th Plan)	42,585	3,70,332	32,11,956	228.7
11	31.03.90 (End of the 7th Plan)	63,636	4,70,838	44,07,501	329.2
12	31.03.92(End of the 2nd Annual PlanPlans)	69,065	4,87,170	45,74,200	347.5
13	31.03.97(End of the 8th Plan)	85,795	4,98,836	51,41,413	464.6
14	31.03.02(End of the 9th Plan)	1,05,046	5,12,153	60,30,148	559.2
15	31.03.03 (End of 1st year of the 10th Plan)	1,07,877	4,92,325	65,51,737	566.7
16	31.03.04 (End of 2st year of the 10th Plan)	1,12,684	4,95,031	63,45,421	592.0
17	31.03.05 (End of 3st year of the 10th Plan)	1,18,426	4,39,800	65,70,823	612.5
18	31.03.06 (End of 4st year of the 10th Plan)	1,24,287	4,41,347	67,78,359	631.4
19	31.03.07 (End of 10th Plan)	1,32,329	4,82,864	69,39,529	671.9
20	31.03.08 (1 year of 11th Plan)	1,43,061	4,87,347	72,87,413	717.1
21	31.03.2009(2nd year 0f 11th Plan)	1,47,965	4,97,236	74,87,977 ^	733.3
22	31.03.2010 (3rd year 0f 11th Plan)	1,59,398	5,00,920	78,46,496 *	778.7
23	31.03.2011(4th year of 11th Plan)	1,73,626	5,37,947	79,51,486 *	813.3*
24	31.03.2012 (End of 11th Plan)	1,99,877	5,56,633	87,26,092	883.6
25	31.03.2013 (End of Ist year of 12th Plan)	2,23,344	593,132*	89,70,112 *	917.2*
26	31.03.2014 (End of IInd year of 12th Plan)	2,45,259	572,414^	95,34,584 *	956.77*
27	31.03.2015	2,67,637	580934		

.Source: Central Electricity Authority , 2014

* 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

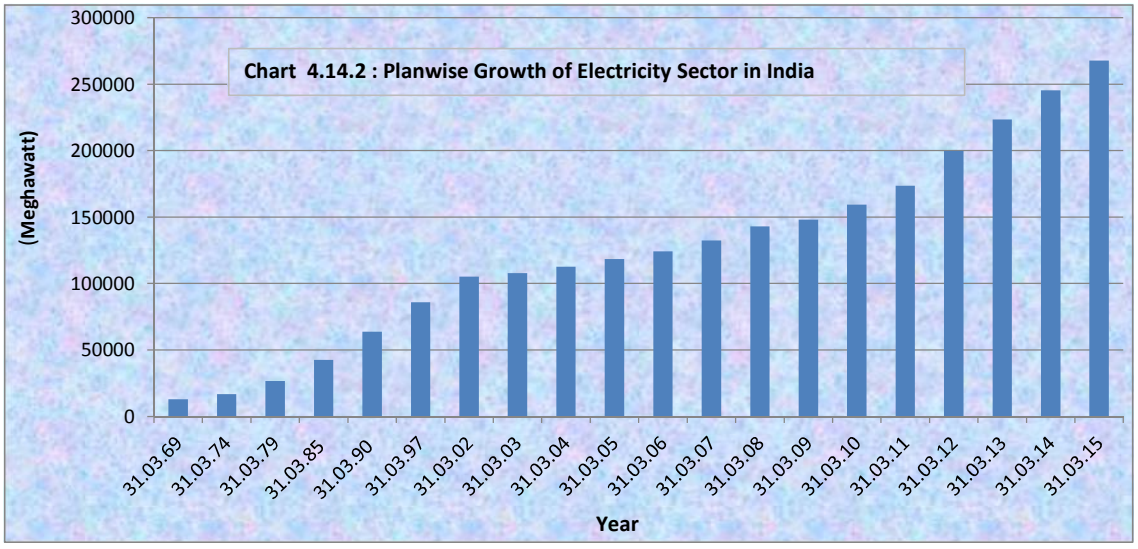


Table 4.14.7 (a) : Plan wise progress of village electrification	
Period	**No of villages electrified upto the period ending**
Upto August 1947	1500
Upto August 1951	3061
First Plan (1951-56)	7294
Second Plan (1956-61)	21754
Third Plan (1961-66)	45148
Annual Plan (1996-69)	73739
Fourth Plan (1969-74	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)	556633
31.3.2013 (1st year or the 12th Plan)	560552
31.3.2014(IInd year or the 12th Plan)	572414^
31.3.2015	580934

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 electrified has been revised as per list of villages as per 1991 census from the earliar figure of 505674 to 498836

^ As per revised definition of village electrification and 2001 census.

TABLE 4.14.7(b) : Number of towns and villages electrified in India

(As on 31.03.2014) P

Sl. No.	State/Union Territory	Towns		Villages	
		Total (as per 2011 Census)	Electrified 2013-14	Total (as per 2011 Census)	Electrified as on 31.03.2014*
1	2	3	4	5	6
I.	**Northern Region**	**1470**	**1470**	**199959**	**194220**
1	Haryana	106	106	6642	6642
2	Himachal Pradesh	57	57	17882	17880
3	Jammu & Kashmir	75	75	6337	6224
4	Punjab	157	157	12168	12168
5	Rajasthan	222	222	43264	39045
6	Uttar Pradesh	704	704	97813	96515
7	Uttarakhand	86	86	15745	15638
8	Chandigarh	1	1	5	5
9	Delhi	62	62	103	103
II.	**Western Region**	**1159**	**1159**	**130699**	**128696**
1	Gujarat	242	242	17843	17843
2	Madhya Pradesh	394	394	51929	50437
3	Chhattisgharh	97	97	19567	19092
4	Maharashtra	378	378	40956	40920
5	Goa	44	44	320	320
6	Daman & Diu	2	2	19	19
7	Dadra & Nagar Haveli	2	2	65	65
III.	**Southern Region**	**1480**	**1480**	**69845**	**69152**
1	Andhra Pradesh	210	210	26286	26286
2	Karnataka	270	270	27397	26704
3	Kerala	159	159	1017	1017
4	Tamil Nadu	832	832	15049	15049
5	Puducherry	6	6	90	90
6	Lakshadweep	3	3	6	6
IV.	**Eastern Region**	**807**	**807**	**154526**	**141598**
1	Bihar	130	130	39073	37316
2	Jharkhand	152	152	29492	27167
3	Odisha	138	138	47677	38921
4	West Bengal	375	375	37463	37461
5	A & N Islands	3	3	396	308
6	Sikkim	9	9	425	425
V.	**North-Eastern Region**	**245**	**245**	**42435**	**38046**
1	Assam	125	125	25372	24546
2	Manipur	33	33	2379	2061
3	Meghalaya	16	16	6459	5146
4	Nagaland	9	9	1400	1261
5	Tripura	23	23	863	837
6	Arunachal Pradesh	17	17	5258	3596
7	Mizoram	22	22	704	599
Total (All India)		**5161**	**5161**	**597464**	**571712**

Source : Central Electricity Authority P - Provisional

* Based on information furnished by State Government/Discoms

4.14.7 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 4.14.8(a), (b) & (c) depict the enormous situation of harmful emissions by power sector.

Table 4.14.8 a: Total absolute emissions of CO_2 from the power sector by region for the year 2005-06 to 2012-13

(Million tonne CO_2)

Grid	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
NEWNE	368.2	385.7	406.9	430.7	453.2	468.4	491.9	539.5
Southern	101.6	109	113.6	117.9	126.8	129.1	145.4	156.8
India	**469.7**	**494.7**	**520.5**	**548.6**	**580.0**	**597.5**	**637.3**	**696.3**

Table 4.14.8 (b): Emission factors of CO_2 (in tonne CO_2/MWh)

Grid	2011-12				2012-13			
	Average	OM	BM	CM	Average	OM	BM	CM
NEWNE	0.78	0.97	**0.92**	**0.94**	0.83	1.00	0.97	0.98
Southern	0.76	0.96	**0.85**	**0.91**	0.85	1.00	0.95	0.97
India	**0.78**	**0.97**	**0.9**	**0.93**	**0.83**	**1.00**	**0.96**	**0.98**

CM is a weighted average of the OM and BM (here weighted 50:50)
OM: (operating margin) is the average emission from all stations excluding the low cost/must run sources.
BM: (build margin) is the average emission of the 20% (by net generation) most recent capacity addition in the grid.
CM:(combined margin) is a weighted average of the OM and BM (here weighted 50:50)
Note: Average is the average emission of all stations in the grid, weighted by net generation.

Table 4.14.8 (c): Specific emissions (weighted average) of CO_2 for fossil fuel -fired stations

(tCO_2/MWh)

Grid	2011-12						2012-13					
	Coal	Diesel	Gas	Lignite	Naphtha	Oil	Coal	Diesel	Gas	Lignite	Naphtha	Oil
NEWNE	1.06	1.07	0.45	1.42	0.38	0.65	1.05	-	0.47	1.36	0.4	0.63
Southern	1.0	0.58	0.43	1.43	0.72	0.62	1.01	0.59	0.46	1.41	0.56	0.61
India	**1.05**	**0.59**	**0.45**	**1.42**	**0.38**	**0.64**	**1.04**	**0.59**	**0.47**	**1.4**	**0.4**	**0.62**

Source : Central Electricity Authority CO/MWh: Carbon Dioxide/meghawatt horss.
Note: NEWNE Grid : Integrated Grid of Northern, Eastern, Western and North Eastern Region.

4.15 Renewable energy

4.15.1 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 4.15.1

Table 4.15.1 : Estimated potential and cumulative achievements - Renewable Energy programmes

Sl. No.	Renewable Energy Programmes/Systems	Achivements 31.3.2013	Achivements 31.3.2014	Achivements 31.3.2015
A.	**A. Grid-interactive renewable power (Capacities in MW)**			
1	Wind Power	19051.5	21136.3	23444
2	Small Hydro Power (up to 25 MW)	3632.3	3803.7	4055.36
3	Biomass Power (Agro-wastes/ residues)	1264.8	1365.2	1410.2
4	Bagasse Cogeneration	2337.4	2648.4	3008.35
5	Waste to Power	96.1	106.6	115.08
6	Solar Power	1686.4	2647	3743.97
	Total	**28068.5**	**31707.2**	**35776.96**
B	**Off -grid/ Distributed renewable power (including captive/CHP plants)**			
7	Biomass Power / Cogen.(non-bagasse)	471.2	531.8	591.87
8	Biomass Gasifier			
	Bio gas based energy system	3.22	3.77	4.07
	Rural	16.8	17.5	17.95
	Urban/Industries	141.6	147.2	152.05
9	Waste-to- Energy	115.6	132.7	154.47
10	Solar PV Power Plants and Street Lights (>1kW)			
	SVP Systems	124.7	174.4	234.35
11	Aero-generator /Hybrid Systems	2.1	2.3	2.43
12	Water mills/micro hydel	10.6 (2131 nos)	13.21 (2643 nos)	17.21
	Total	**885.8**	**1022.8**	**1174.4**
C	**Others Renewable Energy Systems**			
13	Family Type Biogas Plants	46.7	47.4	48.35
	Solar Water Heating-collector area (Million m^2)	7.0	8.1	8.82

Source: Ministry of New and Renewable Energy,

Note: MWe = Megawatt equivalent; MW = Megawatt; 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 renewable energy potential from agro-residues.

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.

4.15.2 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 wind power capacity of 2079MW has been added during 2013-14 taking the cumulative installed capacity of 21132 MW mainly in Tamil Nadu, Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Rajasthan. Though it was feared that wind installation in the country will decline signification in current year due to obsence of acceelerated depreciation and take annoucment of contrinution of generation based incentive the progress has been modest . 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 7 States.

The State wise wind power installed capacity (upto 31.3.2014) is presented in table 4.15.2.

Table 4.15.2 : State wise wind power installed capacity (MW)

Sl No.	State	upto 31-12-14
1	Andhra Pradesh	913
2	Gujarat	3581
3	Karnataka	2549
4	Kerala	35
5	Madhya Pradesh	567
6	Maharashtra	4369
7	Rajasthan	3053
8	Tamil Nadu	7394
9	Others	4
Total		**22465**

Source : Ministry of New And Renewable Energy, Annual Report 2014-15

4.15.3 Biomass Power and Bagasse Co-generation Project: The project aims at efficient utilization of biomass such as agro redidue in the form of stalks tems and straw " agro industrial residuese such as shells, husks, deoiled cakes and wood from dedicated energy plantation for power generation. At present in India, Biomass Power, Bagasse Cogeneration Projects are installed in 15 states. The state-wise cumulative commissioned Biomass Power and Bagasse Cogeneration Projects is given in the Table 4.15.3(a) and Cumulative Development of various Renewable Energy System/Devices in the country is given in Table 4.15.3(b).

Table 4.15.3 : State wise cumulative connissioned Biomass Power and Bagasse cogeneration Projects.

Sr. No	State	Cumulative Capacity (MW)
1	Andhra Pradesh	380.75
2	Bihar	43.42
3	Chattisgarh	264.90
4	Gujarat	43.90
5	Haryana	45.30
6	Karnataka	603.28
7	Madhya Pradesh	26.00
8	Maharashtra	940.40
9	Odisha	20.00
10	Punjab	140.50
11	Rajasthan	101.30
12	Tamil Nadu	571.30
13	Uttar Pradesh	30.00
14	Uttrtakhand	776.50
15	West Bengal	26.00
	Total	**4013.55**

Source: Ministry of New and Renewable Energy, Annual Report-2014-15.

4.15.4 Small Hydro power Projects: as on 31.3.2014 In India, nearly 997 small hydro power projects (capacity upto 25 MW) have been already set up and 254 are under implementation. The total capacity of the existing power plants is nearly 3803.68.15 MW and the total capacity of the projects under implementation is 985.40 MW. The State wise details of small hydro power projects set up and under implementation are shown in table 4.15.4

4.15.5 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 approximately31692.14 MW till 31.03.2013. The State- wise details of cumulative installed capacity of grid interactive renewable power projects in India during 2013 and 2014 is depicted in table 4.15.5 (a) and 4.15.5(b).

The details of decentralized / off –grid renewable systems devices installed in various States of India is depicted in table 4.15.6

4.15.6 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 4.15.7

TABLE 4.15.4 : State wise numbers and Aggregate Capacity of Installed and under implementation Small Hydro Power projects

Sr. No	States	Projects set-up (31.3.2014)		Project under Implementation (31.3.2014)		Projects set-up (31.12.2015)		Project under Implementation (31.12.2015)	
		No.s	Capacity (MW)	No.s	Capacity (MW)	No.s	Capacity (MW)	No.s	Capacity (MW)
1	Andhra Pradesh	68	221.030	13	32.04	68	221.030	13	32.040
2	Arunachal Pradesh	149	103.905	44	22.23	149	103.905	44	22.230
3	Assam	6	34.110	3	12.00	6	34.110	3	12.000
4	Bihar	29	70.700	5	17.70	29	70.700	5	17.700
5	Chhattisgarh	9	52.000	4	115.25	9	52.000	4	115.250
6	Goa	1	0.050	-	-	1	0.050	-	
7	Gujarat	5	15.600	-	-	6	16.600	-	-
8	Haryana	7	70.100	2	3.35	7	70.100	2	3.350
9	Himachal Pradesh	158	638.905	33	76.20	165	696.105	26	59.000
10	Jammu & Kashmir	37	147.530	7	17.65	38	149.030	6	16.150
11	Jharkhand	6	4.050	8	34.85	6	4.050	8	34.850
12	Karnataka	147	1031.658	23	173.09	154	1104.980	16	99.750
13	Kerala	25	158.420	11	52.75	27	168.920	8	39.250
14	Madhya Pradesh	11	86.160	3	4.90	11	86.160	3	4.900
15	Maharashtra	58	327.425	9	43.70	59	335.425	8	35.700
16	Manipur	8	5.450	3	2.75	8	5.450	3	2.750
17	Meghalaya	4	31.030	3	1.70	4	31.030	3	1.700
18	Mizoram	18	36.470	1	0.50	18	36.470	1	0.500
19	Nagaland	11	29.670	3	3.20	11	29.670	3	3.200
20	Odisha	10	64.625	4	3.60	10	64.625	4	3.600
21	Punjab	47	156.200	11	19.45	48	157.400	10	18.250
22	Rajasthan	10	23.850	-	-	10	23.850	-	-
23	Sikkim	17	52.110	1	0.20	17	52.110	1	0.200
24	Tamil Nadu	21	123.050	-	-	21	123.050	-	-
25	Tripura	3	16.010	-	-	3	16.010	-	-
26	Uttar Pradesh	9	25.100	-	-	9	25.100	1	10.500
27	Utrakhand	99	174.820	46	174.04	101	209.320	44	139.540
28	West Bengal	23	98.400	17	84.25	23	98.400	17	84.250
29	Andaman and Nicobar Islands	1	5.250	-	-	1	5.250	-	-
	Total	**997**	**3803.678**	**254**	**895.400**	**1019**	**3990.900**	**233**	**756.660**

Source: Ministry of New And Renewable Energy

Table 4.15.5(a): State wise and source wise installed capacity of grid interactive renewable power as on 31.03.2013

Sr. No.	State/UT	Small Hydro power	Wind Power	Bio-Power		Solar Power	Total Capacity
				Biomass Power	Waste to Energy		
		(MW)	(MW)	(MW)	(MW)	(MWp)	(MW)
1	2	3	4	5	6	7	8
1	Andhra Pradesh	219.03	447.65	380.75	43.16	23.35	1113.94
2	Arunachal Pradesh	103.91				0.03	103.94
3	Assam	31.11					31.11
4	Bihar	70.70		43.30			114.00
5	Chhattisgarh	52.00		249.90		4.00	305.90
6	Goa	0.05					0.05
7	Gujarat	15.60	3174.58	30.50		857.90	4078.58
8	Haryana	70.10		45.30		7.80	123.20
9	Himachal Pradesh	587.91					587.91
10	Jammu & Kashmir	130.53					130.53
11	Jharkhand	4.05				16.00	20.05
12	Karnataka	963.76	2135.15	491.38	1.00	14.00	3605.29
13	Kerala	158.42	35.10			0.03	193.55
14	Madhya Pradesh	86.16	386.00	16.00	3.90	37.30	529.36
15	Maharashtra	299.93	3021.85	756.90	9.72	100.00	4188.40
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		124.50	9.25	9.33	297.58
22	Rajasthan	23.85	2684.65	91.30		552.90	3352.70
23	Sikkim	52.11					52.11
24	Tamil Nadu	123.05	7162.18	538.70	8.05	17.11	7849.09
25	Tripura	16.01					16.01
26	Uttar Pradesh	25.10		776.50	5.00	17.38	823.98
27	Uttarakhand	174.82		10.00		5.05	189.87
28	West Bengal	98.40		26.00		2.05	126.45
29	Andaman and Nicobar Islands	5.25				5.10	10.35
30	Chandigarh						0.00
31	Dadar & Nagar Haveli						0.00
32	Daman & Diu						0.00
33	Delhi				16.00	2.56	18.56
34	Lakshwadeep					0.75	0.75
35	Puducherry					0.03	0.03
36	Others		4.30			0.79	5.09
	Total	**3632.25**	**19051.46**	**3601.03**	**96.08**	**1686.44**	**28067.26**

Source : Planning & Coordination Division, Ministry of New and Renewable Energy
MW - Megawatt MWp - Megawatt peak;

Table 4.15.5 (b): State wise and source wise installed capacity of grid interactive renewable power as on 31.03.2014

Sr. No.	State/UT	Small Hydro power	Wind Power	Bio-Power		Solar Power	Total Capacity
				Biomass Power	Waste to Energy		
		(MW)	(MW)	(MW)	(MW)	(MWp)	(MW)
1	2	3	4	5	6	7	8
1	Andhra Pradesh	221.03	746.20	380.75	50.66	131.84	1530.48
2	Arunachal Pradesh	103.91				0.03	103.94
3	Assam	34.11				0.00	34.11
4	Bihar	70.70		43.42		0.00	114.12
5	Chhattisgarh	52.00		264.90		7.10	324.00
6	Goa	0.05				0.00	0.05
7	Gujarat	15.60	3454.30	43.90		916.40	4430.20
8	Haryana	70.10		45.30		10.30	125.70
9	Himachal Pradesh	638.91				0.00	638.91
10	Jammu & Kashmir	147.53				0.00	147.53
11	Jharkhand	4.05				16.00	20.05
12	Karnataka	1031.66	2318.20	603.28	1.00	31.00	3985.14
13	Kerala	158.42	35.20			0.03	193.65
14	Madhya Pradesh	86.16	423.40	26.00	3.90	347.17	886.63
15	Maharashtra	327.43	4100.40	940.40	12.72	249.25	5630.20
16	Manipur	5.45				0.00	5.45
17	Meghalaya	31.03				0.00	31.03
18	Mizoram	36.47				0.00	36.47
19	Nagaland	29.67				0.00	29.67
20	Odisha	64.63		20.00		30.50	115.13
21	Punjab	156.20		140.50	9.25	16.85	322.80
22	Rajasthan	23.85	2784.90	101.30		730.10	3640.15
23	Sikkim	52.11				0.00	52.11
24	Tamil Nadu	123.05	7269.50	571.30	8.05	98.36	8070.26
25	Tripura	16.01				0.00	16.01
26	Uttar Pradesh	25.10		776.50	5.00	21.08	827.68
27	Uttarakhand	174.82		30.00		5.05	209.87
28	West Bengal	98.40		26.00		7.05	131.45
29	Andaman and Nicobar Islands	5.25				5.10	10.35
30	Chandigarh					2.00	2.00
31	Dadar & Nagar Haveli					0.00	0.00
32	Daman & Diu					0.00	0.00
33	Delhi				16.00	5.15	21.15
34	Lakshwadeep					0.75	0.75
35	Puducherry					0.03	0.03
36	Others		4.30			0.82	5.12
	Total	**3803.68**	**21136.40**	**4013.55**	**106.58**	**2631.93**	**31692.14**

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

MW - Megawatt MWp - Megawatt peak;

Table 4.15.5 (c): State wise and source wise installed capacity of grid interactive renewable power as on 31.03.2015

Sr. No.	State/UT	Small Hydro power	Wind Power	Bio-Power		Solar Power	Total Capacity
				Biomass Power	Waste to Energy		
		(MW)	(MW)	(MW)	(MW)	(MWp)	(MW)
1	2	3	4	5	6	7	8
1	Andhra Pradesh	223.23	1032.00	389.75	58.16	242.86	1946.00
2	Arunachal Pradesh	104.61				0.03	104.64
3	Assam	34.11				0.00	34.11
4	Bihar	70.70		43.42		0.00	114.12
5	Chhattisgarh	52.00		264.90		7.60	324.50
6	Goa	0.05				0.00	0.05
7	Gujarat	16.60	3645.00	55.90		1000.05	4717.55
8	Haryana	71.50		52.30		12.80	136.60
9	Himachal Pradesh	723.91				0.00	723.91
10	Jammu & Kashmir	156.53				0.00	156.53
11	Jharkhand	4.05				16.00	20.05
12	Karnataka	1129.73	2638.00	664.28	1.00	77.22	4510.23
13	Kerala	168.92	35.00			0.03	203.95
14	Madhya Pradesh	86.16	880.00	36.00	3.90	558.58	1564.64
15	Maharashtra	335.43	4446.00	1033.40	12.72	360.75	6188.30
16	Manipur	5.45				0.00	5.45
17	Meghalaya	31.03				0.00	31.03
18	Mizoram	36.47				0.00	36.47
19	Nagaland	29.67				0.00	29.67
20	Odisha	64.63		20.00		31.76	116.39
21	Punjab	157.40		140.50	10.25	185.27	493.42
22	Rajasthan	23.85	3309.00	111.30		942.10	4386.25
23	Sikkim	52.11				0.00	52.11
24	Tamil Nadu	123.05	7455.00	662.30	8.05	142.58	8390.98
25	Telangana					61.25	61.25
26	Tripura	16.01				5.00	21.01
27	Uttar Pradesh	25.10		888.50	5.00	71.26	989.86
28	Uttarakhand	209.32		30.00		5.00	244.32
29	West Bengal	98.50		26.00		7.21	131.71
30	Andaman and Nicobar Islan	5.25				5.10	10.35
31	Chandigarh					4.50	4.50
32	Dadar & Nagar Haveli					0.00	0.00
33	Daman & Diu					0.00	0.00
34	Delhi				16.00	5.47	21.47
35	Lakshwadeep					0.75	0.75
36	Puducherry					0.03	0.03
	Others					**0.79**	**4.79**
	Total	**4055.36**	**23440.00**	**4418.55**	**115.08**	**3743.97**	**35772.96**

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

MW - Megawatt MWp - Megawatt peak;

Table 4.15.6:Decentralised/off-grid renewable energy systems devices

(as on 31.03.2015)

Sl. No.	State/UT	Biogas Plants	Biomass-Gasifiers		Biomass (non-bagasse)	Waste to Energy	Solar Photovoltaic (SPV) Systems				SPV Pumps	Aerogen/ hybrid System	Remote Village Electrification	
			Industrial	Rural			SLS	HLS	SL	PP			Village	Hamlet
		(Nos.)	(kw)	(kw)	(MW)	(MW)	(nos.)	(nos.)	(kWp.)	(kWp)	(Nos.)	(kW)	(nos)	(nos)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Andhra Pradesh	5.323	22914		78.59	23.01	0.065	0.356	0.414	1870.60	613	16.00	0	13
2	Arunachal Pradesh	0.035		750			0.011	0.189	0.144	217.10	18	6.80	297	
3	Assam	1.141	2933				0.001	0.071	0.012	910.00	45	6.00	1953	
4	Bihar	1.298	6264	5394	8.20	1.00	0.010	0.084	0.501	775.60	139		0	
5	Chhattisgarh	0.512	1210		2.50	0.33	0.020	0.073	0.033	18116.72	240		568	
6	Goa	0.041					0.007	0.004	0.011	1.72	15	193.80	0	19
7	Gujarat	4.300	20080	1450		15.83	0.020	0.093	0.316	9512.60	85	20.00	38	
8	Haryana	0.608	3503		57.56	4.00	0.220	0.578	0.939	1024.25	469	10.00	0	286
9	Himachal Pradesh	0.474			7.20	1.00	0.241	0.226	0.339	1208.50	6		21	
10	Jammu & Kashmir	0.031	200				0.058	0.844	0.592	4288.85	39	46.40	334	15
11	Jharkhand	0.073	500		4.30		0.006	0.111	0.234	480.90	0		700	
12	Karnataka	4.790	6297	1150	15.20	9.63	0.027	0.531	0.073	1596.41	551	39.20	16	14
13	Kerala	1.444			0.72		0.017	0.340	0.544	6714.39	810	8.00	0	607
14	Madhya Pradesh	3.535	10497	761	12.35	0.47	0.092	0.042	0.094	1983.00	87	24.00	577	
15	Maharashtra	8.715	7150		16.40	22.05	0.084	0.049	0.687	943.70	239	1498.50	340	
16	Manipur	0.021					0.009	0.041	0.048	456.00	40	140.00	237	3
17	Meghalaya	0.100	250		13.80		0.013	0.078	0.249	323.50	19	191.50	149	
18	Mizoram	0.050		250			0.004	0.068	0.096	290.00	37		20	
19	Nagaland	0.079		2100			0.003	0.010	0.068	1050.00	3	20.00	11	
20	Odisha	2.660	270		8.22	0.02	0.058	0.054	0.099	84.52	56		1600	14
21	Punjab	1.718			117.10	7.98	0.054	0.086	0.175	1058.00	1857	50.00	0	
22	Rajasthan	0.701	2431	261	2.00	3.70	0.069	1.446	0.047	8625.00	11603	14.00	292	90
23	Sikkim	0.089					0.005	0.151	0.233	795.00	0	15.50	0	13
24	Tamil Nadu	2.223	14090	2172	24.05	13.10	0.252	0.795	0.168	4079.60	829	24.50	0	131
25	Telangana	0.000					0.000	0.000	0.000	0.00	0		0	
26	Tripura	0.034		1050			0.012	0.327	0.643	365.00	151	2.00	60	782
27	Uttar Pradesh	4.388	24040	912	156.26	46.18	1.763	2.672	0.620	4278.46	1348		113	22
28	Utrakhand	0.185	2150		47.50	5.02	0.086	0.914	0.840	280.03	26	24.00	476	118
29	West Bengal	3.666	27268	1450	19.92	1.16	0.087	1.464	0.177	889.00	48	74.00	1177	2
30	Andaman and Nicobar	0.001					0.004	0.005	0.063	167.00	5			
31	Chandigarh	0.001					0.009	0.003	0.017	730.00	12			
32	Dadar & Nagar Haveli	0.002					0.000	0.000	0.000	0.00	0			
33	Daman & Diu	0.000					0.000	0.000	0.000	0.00	0			
34	Delhi	0.007					0.003	0.000	0.048	332.00	90			
35	Lakshwadeep	0.000		250			0.017	0.000	0.053	1090.00	0			
36	Puducherry	0.006					0.004	0.000	0.016	0.00	21	5.00		
37	Others*	0.000					0.098	0.240	1.258	35215.60	0			
	Total	**48.349**	**152047**	**17950**	**591.87**	**154.48**	**3.428**	**11.943**	**9.850**	**109753.05**	**19501**	**2429.20**	**8979**	**2129**

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 4.15.7 :State -wise estimated potential and cumulative achievements of family type biogas plants

(in numbers)

Sl. No.	State/UT	Estimated Potential(Plants in number)	Cumulative Achievement as on (31-03-2014)	Target and Achievements during (2014-15) (plants in numbers.)	
				Target	Achievements up to 01.12.2014)*
1	2	3	4	5	6
1	Andhra Pradesh	1065000	521756	10440	5448
2	Arunachal Pradesh	7500	3472	50	2
3	Assam	307000	108302	7500	4927
4	Bihar	733000	129825	-	-
5	Chhattisgarh	400000	48505	4000	1107
6	Delhi	12900	681	-	-
7	Goa	8000	4093	100	22
8	Gujarat	554000	428676	4000	522
9	Haryana	300000	59909	1700	629
10	Himachal Pradesh	125000	472270	250	81
11	Jammu & Kashmir	128000	3044	100	-
12	Jharkhand	100000	7237	100	-
13	Karnataka	680000	469760	15500	4526
14	Kerala	150000	141425	4000	1002
15	Madhya Pradesh	1491000	345829	10400	4130
16	Maharashtra	897000	856669	14400	7357
17	Manipur	38000	2128	-	-
18	Meghalaya	24000	9996	250	-
19	Mizoram	5000	4770	500	250
20	Nagaland	6700	7653	300	194
21	Odisha	605000	261830	5100	1308
22	Punjab	411000	164689	10250	5132
23	Puducherry	4300	578	-	-
24	Rajasthan	915000	69405	1100	333
25	Sikkim	7300	8735	200	76
26	Tamil Nadu	615000	221704	500	158
27	Telangana	990	-	9900	5302
28	Tripura	28000	3328	400	30
29	Uttar Pradesh	1938000	437556	1800	571
30	Uttrakhand	83000	17541	900	434
31	West Bengal	695000	366316	-	-
32	Andaman and Nicobar Islands	2200	137	-	-
33	Chandigarh	1400	97	-	-
34	Dadra and Nagar Haveli	2000	169	-	-
35	KVIC and others		-	6260	1605
	Total	**12340290**	**4753085**	**110000**	**45146***

Source : Annual Report 2014-15, Ministry of New and Renewable Energy

KVIC : Khadi and Village Industries Commission

* Figure are being firmed up

4.15.7 Energy Parks: Energy parks are set up under the Special Area Demonstration Project Scheme with aims to create publicity of the renewable energy technologies' system also to disseminate information on technological developments and popularise the renewable energy system sand devices to greater awareness in the area of New & Renewable Energy. The state wise number of SLEPs and SADP projects supported under special area demonstration project. (SADP) scheme is given

4.15.8 **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 554 renewable energy clubs functioning in all over India.

Table 4.15.8 : State -wise number of SLEP and SADP Projects supported under special area demonstration projects (SADP scheme (as on 15.01.2015)break-up of the energy parks as on 31.03.2012

Sl. No.	State/UT	State level energy park (SLEPs)	SADP project
1	Andhra Pradesh	-	1
2	Arunachal Pradesh	1	1
3	Assam	1	1
4	Chandigarh	1	1
5	Chhattisgarh	2	19
6	Delhi	1	5
7	Goa	-	1
8	Gujarat	1	3
9	Haryana	1	11
10	Himachal Pradesh	2	15
11	Jammu & Kashmir	2	7
12	Jharkhand	1	1
13	Karnataka	1	3
14	Kerala	1	-
15	Maharashtra	1	7
16	Madhya Pradesh	-	5
17	Manipur	-	1
18	Meghalaya	1	1
19	Mizoram	1	-
20	Nagaland	1	1
21	Odisha	1	5
22	Punjab	1	8
23	Puducherry	1	-
24	Rajasthan	-	4
25	Sikkim	1	1
26	Tamil Nadu	1	2
27	Tripura	1	1
28	Uttarakhand	1	4
29	Uttar Pradesh	1	13
30	West Bengal	1	5
31	A&N Islands	1	1
	Total	**29**	**128**

Source : Annual Report 2014-15 , Ministry of New and Renewable Energy

4.16 Noise Pollution

4.16.1 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.

4.16.2 The noise standards are specified separately for Industrial Commercial, Residential and Silent zones for Day and Night time. Table 4.16.1 shows the ambient air quality standards in respects of noise.

Table 4.16.1 : 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.

4.16.3 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 4.16.2. and effect of noise pollution on human health is given in table 4.16.3

Table 4.16.2 : 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 Pollution Control Board

* : 2003 Figures

Table 4.16.3 : 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

4.17 Green House Gases and Their Effects

4.17.1 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 vapour, carbon dioxide, methane, nitrous oxide and ozone in the troposphere and in the stratosphere. This natural greenhouse effect warms the lower atmosphere.

4.17.2 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.

4.17.3 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.

4.18 Ozone Depletion

4.18.1 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.

4.18.2 Table 4.18.1 at depicts the production of Ozone depleting substances in India and 4.18.2 presents the total consumption of Ozone depleting substances over the years.

Table 4.18.1: Production of ozone depleting substances in India

(MT: Metric tons)

Sl. No.	ODS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	CFC-11 Trichlorofluoromethane (CFCl3)	5634.0	4514.0	3689.0	2609.0	2429.0	1543.4	785.1	424.8	117.6	-	83.5	0.0	0.0	
2	CFC-12 Dichlorodifluromethane (CF2 Cl2)	14777.0	14164.0	13167.0	12373.0	10611.0	9702.2	6104.7	1869.9	549.6	-	234.8	0.0	0.0	
3	CFC-113 Trichlorotrifluoroethane (C2F3Cl3)	5.0	14.0	35.0	32.0	30.0	18.0	373.5	72.6	79.1	-	Nil	-	0.0	
4	H-1211 Bromochlorodifluoromethane CF2BrCl)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	H-1301 Bromotrifluoromethane (CF3Br)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	CTC Carbon tetrachloride	17509.0	16459.0	18957.0	18239.0	16631.0	17433.3	13877.8	9538.0	12035.7	11248.5	15222.8	17741.0	15412.0	17663.8
7	MCF Methyl chloroform	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	HCFC-22 Dichlorodifluromethane (CHF2Cl2)	14061	14868	14606	19216	25592.0	24789.2	30386.4	41213.6	45558.2	47657.1	47613.3	48476.6	47613.3	40650.6
9	MBr Methyl bromide	107	85	37914.0	-	-	-	-	-	-	-	-	0.0	0.0	
Total		**52093.0**	**50104.0**	**88368.0**	**52469.0**	**55293.0**	**53486.1**	**51527.5**	**53118.9**	**58340.2**	**58905.7**	**63154.4**	**66217.6**	**63025.3**	**58414.3**

Source : Ozone cell, Ministry of Environment and Forests

ODS: Ozone Depleting Substances * : For Essential Use Nominations (EUN) # : Recovered and recycled

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

Table 4.18.2: Total consumption of Ozone Depleting Substances
(MT: Metric tons)

Sl. No.	ODS	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1	2	3	4	5	6	7	8	9	10	11	11	12	13	14	15
1	CFC-11 Trichlorofluoromethane (CFCl3)	3002.0	2196	1680.0	829	426	337.3	514.9	274.9	101.6	43.5	78.616	0	0	0
2	CFC-12 Dichlorodifluromethane (CF2 Cl2)	2612.0	2315	2210.0	1777	1808	1609	3017.9	723.6	109.7	158.7	212.117	0	0	0
3	CFC-113 Trichlorotrifluoroethane (C2F3Cl3)	-	5	29.0	4	10	14.3	-	-	6.6	..	Nil	0	0	0
4	CTC Carbon tetrachloride	11043.0	8471	9510.0	9798	6781	1494.5	3636.8	634	1563.7	34.7	Nil	0	0	0
5	HCF-22 Dichlorodifluromethane (CHF2Cl2)	3583.0	2973	3207.0	3648	7228	8854.3	6137	14576.6	10831.7	9386.4	12503	10266.39	15645.5	8029.44
6	HCF-123	20.0	25	25.0	0	60	15.3	-	27.2	101	238	115.085	0	136	196.952
7	HCF-141b	483.0	359	1401.0	952	1357	2155.9	-	4711.9	12588.9	7900	7836.8	7924	6400	4568.22
8	MBr Methyl bromide	-	27	9510.0	-	-	-	-	-	-	..	…	0	0	0
Total		**20743**	**16371**	**27572.0**	**17008**	**17670**	**14480.6**	**13306.5**	**20948.2**	**25303.2**	**17761.3**	**20745.6**	**18190.39**	**22181.5**	**12794.6**

Source : Ozone cell, Ministry of Environment and Forests

ODS: Ozone Depleting Substances

4.19 Action Plan to combat Air Pollution

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

4.19.1 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.

Ø Comply with emission and liquid effluent standard.

Ø Submission of action plan for switching over the beneficiated coal with an ash content of not more than 34%.

Ø Submission of action plan to achieve 20% utilization of fly-ash by Dec. 1997.

Ø Installation of opacity meter in all units to ensure compliance with the standards.

Ø 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.

4.19.2 Major City Specific Action Plan in Mumbai

Ø Bharat Stage-III norms have been implemented in Mumbai.

Ø Unleaded gasoline and low sulphur diesel are being supplied in Mumbai.

Ø 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.

Ø 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.

Ø Pollution under Control certificate has been made mandatory for every vehicle owner.

Ø Implementation of rigorous inspection and maintenance measures periodically for all types of vehicles, involving vehicle manufacturers.

Ø From 15.10.99 'No Pollution Under Certificate- No Petrol' scheme is launched in Mumbai Metropolitan Region (MMR)

Ø Buses, taxis, autos are on CNG mode.

Ø Mass awareness Programme are being organized for creating awareness in public.

Ø 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.

Ø Auto exhaust checking are also done at entry points to Maharashtra State to check compliance to norms fixed under Central Motor Vehicles Act, 1989.

4.19.3 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.

4.18.4 Major City Specific Action plan in Bangalore

Ø To reduce traffic congestion, 108 roads have been converted to one way, 5 flyovers completed, 3 railway under pass on Outer rind road (ORR) limit completed, 2 railway over bridges completed and 206 Km of road has been asphalted.

Ø Low sulphur diesel (Green Diesel) and Green Petrol (Sulphur 0.05%)is being supplied in Bangalore ORR area from 1.4.2003.

Ø Bharat Stage – III norms have been introduced in Bangalore.

Ø Out of 70,131 (as on 31.07.2003) auto rickshaws registered in Bangalore city, 35000 auto rickshaws are running on LPG

Ø 6 Auto LPG dispensing stations (ALDS) are operating

Ø Transport department has approved Bajaj 4 stroke (rear engine) LPG auto rickshaw in Bi- fuel mode

Ø 5% ethanol blended petrol is being supplied in all districts from 01.10.2003.

Ø Regular check on adulteration of fuel is being conducted by Food and Civil Supplies Department.

Ø Goods vehicles carrying construction materials are allowed within ORR only during 10 PM to 6AM for unloading.

Ø 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.

Ø Karnataka State Pollution Control Board to take action to promote use of cleaner fuels used by major industries in Generator sets and boilers.

4.18.5 Major City Specific Action Plan in Chenna

Ø Bharat Stage – III norms have been introduced in Chennai.

Ø Unleaded gasoline and low sulphur diesel are being supplied in Chennai.

Ø Pollution Under Control Certificate has been made mandatory.

Ø Pre mixed 2T oil dispensers have been installed in most of the retail outlets in Chennai City.

Ø 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.,

Ø 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.

Ø Mass Rapid Transit System (MRTS) and electric trains are operated by Southern Railways.

Ø Power plants have been insisted to provide scrubber for the control of emissions

Ø 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.

Ø The industrial units are also insisted to switch over to cleaner fuels such as LSHS, LDO etc., to control the SO_2 emission.

4.18.6 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

4.18.7Major 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

CHAPTER FIVE
LAND AND SOIL

5.1 Crop and Land Use

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. Table 5.1.3 depicts the uses of Agriculture inputs in production of seeds, consumption of fertilizers, etc.**

5.1.4 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 5.1.4 and 5.1.5 at depicts the changing pattern of crop production in India.**

5.1.5 The pesticides and insecticides used in agriculture have a negative impact on the productivity conditions of the soil. **Tables 5.1.6 and Table 5.1.7 at shows the capacity and production of chemical industry for insecticides, fungicides, herbicides, weedicides, roddenticides and fumigents.**

5.1.6 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.

5.2 Soil Health

5.2.1 Traditionally Indian soils are divided into four major groups namely: (1) red, (2) black, (3) alluvial, and (4) laterite. Soild health is fundamental for agricultural sustainability. State of soil health is governed by number of physical, chemical and biological attributes/processes.

5.2.2 Soil and Land Use Survey of India (SLUSI) under Deptt. of Agriculture and Cooperation, Ministry of Agriculture has been engaged in conducting soil survey of the country since 1958 for National Land Based Developmental Programme. Soil survey aims at generating scientific database on soil and land resources for planning and implementation of soil and water conservation (through watershed programmes) for natural resource management.

5.2.3 Rapid Reconnaissance Survey (RRS) is to demarcate and identify priority watersheds in the catchment area on 1:50K scale based on either sediment yield index or runoff generation potential index. Detailed Soil Survey (DSS) is to generate information on soil and land characterization of the priority areas using cadastral map (1:4/1:8K) or large scale aerial photograph/satellite images (1:10k to 1:20k) for micro level developmental planning.

The details of this survey are given in Table 5.2.1(a), 5.2.1(b), 5.2.1(c), 5.2.2(a) and 5.2.2(b).

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	2002-03	2003-04
1	2	3	4	5	6	7	8	9	10
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)	**284.32**	**298.46**	**303.75**	**304.16**	**305.02**	**305.19**	**305.13**	**305.36**	**305.57**
1. Forests	40.48	54.05	63.83	67.46	67.70	69.84	69.72	69.82	69.97
2. Not Available for Cultivation (a+b)	**47.52**	**50.75**	**44.61**	**39.55**	**40.73**	**41.23**	**41.33**	**41.64**	**41.98**
(a) Non Agricultural Uses	9.36	14.84	16.48	19.60	21.22	23.75	23.91	24.12	24.52
(b) Barren and Unculturable Land	38.16	35.91	28.13	19.96	19.51	17.48	17.41	17.52	17.47
3. Other Uncultivated Land excluding fallow land (a+b+c)	**49.45**	**37.64**	**35.13**	**32.31**	**30.22**	**27.74**	**27.49**	**27.53**	**27.11**
(a) Permanent Pastures and Other Grazing Land	6.68	13.97	13.26	11.99	11.41	10.66	10.53	10.45	10.48
(b) Land Under Miscellaneous Tree Crops and Groves not Included in Net Area Sown	19.83	4.46	4.37	3.58	3.81	3.44	3.44	3.43	3.38
(c) Culturable Wasteland	22.94	19.21	17.50	16.74	15.00	13.63	13.52	13.65	13.24
4. Fallow Land (a+b)	**28.12**	**22.82**	**19.33**	**24.55**	**23.50**	**25.04**	**25.86**	**34.43**	**25.80**
(a) Fallow Lands Other Than Current Fallows	17.45	11.18	8.73	9.72	9.66	10.27	10.51	11.97	11.31
(b) Current Fallows	10.68	11.64	11.12	14.83	13.84	14.78	15.34	22.46	14.49
5. Net Area Sown (6-7)	118.75	133.20	140.86	140.29	142.87	141.34	140.73	131.94	140.71
6. Gross Cropped Area	131.89	152.77	165.79	172.63	185.74	185.34	188.01	173.89	189.66
7. Area Sown More Than Once	13.15	19.57	24.93	32.34	42.87	44.00	47.28	41.95	48.95
8. Cropping Intensity*	111.07	114.69	117.70	123.05	130.01	131.13	133.60	131.79	134.79
III. Net Irrigated Area	**20.85**	**24.66**	**31.10**	**38.72**	**48.02**	**55.20**	**56.94**	**53.90**	**57.10**
IV. Gross Irrigated Area	**22.56**	**27.98**	**38.20**	**49.78**	**63.20**	**76.19**	**78.37**	**73.10**	**78.00**

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

P : Provisional * : Cropping intensity is percentage of the gross cropped area to the net area sown.

2. 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, Orissa, Rajasthan, Tamil Nadu, West Bengal and Haryana. This was mainly due to deficient rainfall.

3. 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 and West Bengal. This was mainly due to deficient rainfall.

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

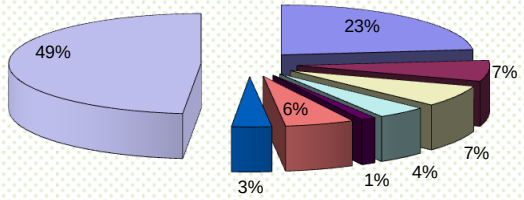
Classification	2004-05	2005-06	2006-07	2007-08	2008-09 (P)	2009-10 (P)	2010-11 (P)	2011-12 (P)	2012-13 (P)
1	11	12	13	14	15	16	17	18	19
I. Geographical Area	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**	**328.73**
II. Reporting Area for Land Utilisation Statistics (1 to 5)	**305.59**	**305.45**	**305.63**	**305.67**	**305.84**	**305.84**	**305.90**	**305.83**	**305.94**
1. Forests	69.96	69.99	70.03	69.96	69.98	69.99	70.01	70.03	70.01
2. Not Available for Cultivation (a+b)	**42.23**	**42.32**	**42.73**	**42.90**	**43.06**	43.33	43.57	43.53	43.74
(a) Non Agricultural Uses	24.76	24.99	25.45	25.88	26.21	26.16	26.39	26.31	26.45
(b) Barren and Unculturable Land	17.47	17.33	17.29	17.02	16.85	17.18	17.18	17.22	17.28
3. Other Uncultivated Land excluding fallow land (a+b+c)	**27.09**	**27.06**	**27.04**	**26.81**	**26.42**	**26.50**	**26.16**	**26.12**	**25.98**
(a)Permanent Pastures and Other Grazing Land	10.45	10.44	10.42	10.36	10.34	10.34	10.31	10.31	10.24
(b) Land Under Miscellaneous Tree Crops and Groves not Included in Net Area Sown	3.36	3.39	3.35	3.40	3.34	3.21	3.20	3.17	3.16
(c) Culturable Wasteland	13.27	13.22	13.27	13.04	12.73	12.95	12.65	12.64	12.58
4. Fallow Land (a+b)	**25.67**	**24.91**	**26.03**	**24.98**	**24.48**	**26.85**	**24.60**	**25.18**	**26.28**
(a) Fallow Land Other Than Current Fallows	10.88	10.70	10.52	10.33	10.29	10.84	10.32	10.66	11.00
(b) Current Fallows	14.79	14.21	15.51	14.65	14.19	16.01	14.28	14.52	15.28
5. Net Area Sown (6-7)	140.64	141.16	139.82	141.02	141.90	139.17	141.56	140.97	139.93
6. Gross Cropped Area	191.10	192.74	192.38	195.22	195.33	189.00	197.56	195.63	194.40
7. Area Sown More Than Once	50.46	51.58	52.56	54.21	53.43	49.83	56.00	54.66	54.47
8. Cropping Intensity*	135.88	136.54	137.59	138.44	137.65	135.80	139.56	138.77	138.92
III. Net Irrigated Area	**59.20**	**60.80**	**62.70**	**63.19**	**63.64**	**61.94**	**63.66**	**65.69**	**66.10**
IV. Gross Irrigated Area	**81.10**	**84.30**	**86.80**	**88.10**	**88.90**	**85.09**	**88.89**	**91.73**	**92.58**

Source : Directorate of Economics & Statistics, Dept of Agricultre & 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.

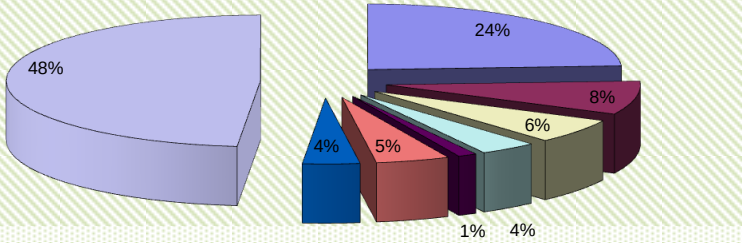
& In 2009-10 there is significant decline in total cropped area and net area sown due to decline in net area sown in the states of Andhra pradesh, Bihar, Jharkhand, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal. This was mainly due to deficient rainfall

Chart 5.1 : Land use in India -1980-81



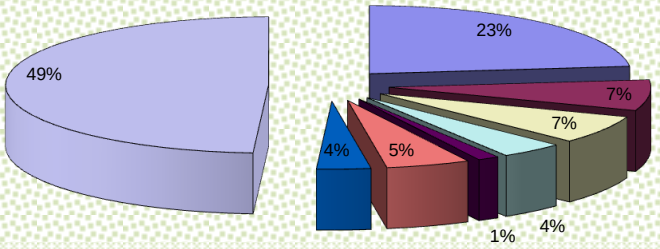
- Forests
- Non Agricultural Uses
- Barren and unculturable land
- Permanent Pastures and other grazing land
- Miscellaneous tree crops and groves
- Culturable Wasteland
- Fallow Land
- Net area sown

Land Use in India-2000-01



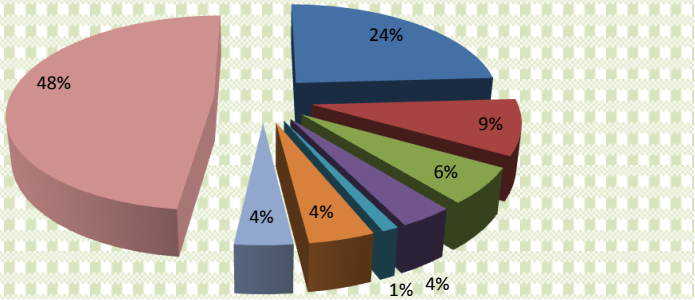
- Forests
- Non Agricultural Uses
- Barren and unculturable land
- Permanent Pastures and other grazing land
- Miscellaneous tree crops and groves
- Culturable Wasteland
- Fallow Land
- Net area sown

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 2012-13



- 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
- 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	142.64	185.62	42.97	50.30	66.76	16.47
1993-94	142.42	186.60	44.18	51.34	68.25	16.91
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	141.34	185.34	44.00	55.20	76.19	20.98
2001-02	140.73	188.01	47.28	56.94	78.37	21.44
2002-03	131.94	173.89	41.95	53.90	73.06	19.16
2003-04	140.71	189.66	48.95	57.06	78.04	20.98
2004-05	140.64	191.10	50.46	56.23	81.08	21.85
2005-06	141.16	192.74	51.58	60.84	84.28	23.44
2006-07	139.82	192.38	52.56	62.74	86.75	24.01
2007-08	141.02	195.22	54.21	63.19	88.06	24.87
2008-09(P)	141.90	195.33	53.43	63.64	88.90	25.26
2009-10(P)	139.17	189.00	49.83	61.94	85.08	23.15
2010-11(P)	141.56	197.56	56.00	63.66	88.89	25.23
2011-12(P)	140.97	195.63	54.66	65.69	91.73	26.04
2012-13 (P)	139.93	194.40	54.47	66.10	92.58	26.47

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

(P): Provisional

Table 5.1.3 : Use of agricultural inputs

Sl. No.	Programme	Unit	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-2001	2001-02
1	2	3	4	5	6	7	8	9	10	11	12	13	14
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	45.54
	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	5.44
	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	91.80
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	113.10
	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	43.82
	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	16.67
	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	173.59
	Per Hectare**	Kg	69.84	65.48	66.27	72.13	74.02	75.47	84.94	87.02	94.94	89.63	91.13
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	47.02
4	**Area covered under Soil Conservation**	Lakh ha	-	-	-	-	-	-	-	-	-	4.36	4.70

Source : Agricultural Statistics at a Glance 2014

2. Department of Agriculture & Cooperation, Ministry of Agriculture

3. States/UTs Zonal Conference, Kharif & Rabi

#updated as on 14 May 2015

**Based on 2009-10 Provisional Gross Cropped Area.

..Cntd

Table 5.1.3 : Use of agricultural inputs

Concluded

Sl. No.	Programme	Unit	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	2	3	15	16	17	18	19	20	21	22	23	24	25	26
1.	**Seeds**													
	I. Production of Breeder Seeds	Thousand Quintals	48.42	61.82	66.46	68.64	73.83	91.96	94.41	102	118.85	123.4	110.2	82.29
	II. Production of Foundation Seeds	Lakh Quintals	6.14	6.50	6.90	7.40	7.96	8.22	9.69	10.5	17.53	21.86	16.17	17.43
	III. Distribution of Certified/Quality Seeds	Lakh Quintals	98.03	108.59	120.26	126.75	155.01	179.05	215.81	257.11	277.34	294.9	313.4	301.39
2.	**Consumption of Chemical Fertilizers**													
	I. Nitrogenous(N)	Lakh Tonnes	104.74	110.77	117.13	127.23	137.73	144.19	150.91	155.8	165.58	173.00	168.2	167.5
	II. Phosphatic(P)	Lakh Tonnes	40.19	41.24	46.24	52.04	55.43	55.15	65.06	72.74	80.5	79.14	66.53	56.33
	III. Potassic(K)	Lakh Tonnes	16.01	15.98	20.60	24.13	23.35	26.36	33.13	36.32	35.14	25.76	20.62	20.99
	Total (N+P+K)	Lakh Tonnes	160.94	167.99	183.97	203.40	216.51	225.70	249.10	264.86	281.22	277.90	255.4	244.82
	Per Hectare**	Kg	91.45	88.05	94.52	105.50	111.76	115.27	127.53	140.15	142.52	142.3	130.8	125.39
3.	**Consumption of Pesticides(Technical Grade)**	Thousand Tonnes	48.30	41.00	40.67	39.77	43.41	41.64	43.86	41.82	55.54	52.98	45.62	60.28
4	**Area covered under Soil Conservation** (cumulative)	Lakh ha	4.30	5.55	7.37	8.67	11.41	7.34	6.90	5.32	7.49	4.72	5.46	5.46

Source : Agricultural Statistics at a Glance 2014

2. Department of Agriculture & Cooperation, Ministry of Agriculture

3. States/UTs Zonal Conference, Kharif & Rabi

#updated as on 14 May 2015

**Based on 2009-10 Provisional Gross Cropped Area.

Table 5.1.4 : Performance of crop production

Sl. No.	Crops	Year										
		2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15*
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Rice	83.13	91.79	93.35	96.69	99.18	89.09	95.98	105.30	105.24	106.65	102.54
2	Wheat	68.64	69.35	75.81	78.57	80.68	80.80	86.87	94.88	93.51	95.85	90.78
3	Coarse Cereals	33.47	34.07	33.92	40.76	40.03	33.55	43.40	42.01	40.04	43.29	40.42
4	**Total Cereals**	**185.24**	**195.21**	**203.08**	**216.02**	**219.89**	**203.44**	**226.25**	**242.19**	**238.79**	**245.79**	**233.74**
5	Total Pulses	13.13	13.39	14.23	14.76	14.57	14.66	18.24	17.09	18.35	19.25	17.38
6	**Total Foodgrain**	**198.37**	**208.60**	**217.31**	**230.78**	**234.46**	**218.10**	**244.49**	**259.28**	**257.14**	**265.04**	**251.12**
7	Sugarcane	237.08	281.17	355.52	348.19	285.03	292.30	342.38	361.04	341.20	352.14	356.56
8	Total Oilseeds	24.35	27.98	24.29	29.76	27.72	24.88	32.48	29.80	30.94	32.75	27.38
9	Cotton $	16.43	18.50	22.63	25.88	22.28	24.02	33.00	35.20	34.22	35.90	35.33
10	Jute & Mesta #	10.27	10.84	11.27	11.21	10.37	11.82	10.62	11.40	10.93	11.69	11.49

Source : Directorate of Economics & Statistics, Ministry of Agriculture

: Production in million bales of 180 kg. each

$: Production in million bales of 170 kg. eac * As per 3rd Advance Estimates

Table 5.1.5 :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

Continued

Table 5.1.5 :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
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	43535	8459	9577	7775	1329	28325	654	963	100617	7375	3342	12774	23491	124108
2007-08	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	100872	7920	3274	12570	23764	124636
2009-10(P)	42567	7809	9065	8166	1232	28548	622	902	98911	7998	3272	11301	22571	121482
2010-11(P)	43338	7361	9684	8415	1257	30000	710	851	101616	8780	4179	12381	25340	126956
2011-12 (P)	43698	6178	8831	8593	1172	30155	661	862	100150	7768	3765	11893	23426	123576
2012-13 (P)	42757	6301	7668	8562	1117	30495	702	795	98398	7974	3499	10486	21959	120357

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

P : Provisional

Concluded

Table 5.1.6 : Capacity and production in the chemical industry in India
(Fungicides, Herbicides, Weedicdes,Rodenticides, Fumigents)

Sl. No.	Products	2012-13		2013-14		2014-15	
		Capacity	Production	Capacity	Production	Capacity	Production
1	2	3	4	5	6	7	8
I	**Fungicides**						
1	Captan & Captafol	4.73	0.56	4.73	1.12	3.85	2.38
2	Ziram (Thio Barbamate)	0.45	0.55	0.65	0.60	0.70	0.58
3	Carbendazim (Bavistin)	0.98	0.34	0.98	0.31	0.98	0.36
4	Mancozab	69.76	45.30	71.56	57.82	71.56	61.40
5	Mexaconazole	0.50	0.44	0.50	0.58	0.5	0.59
6	Metconazole	0.75	0.63	0.75	0.70	0.75	0.61
II	**Herbicides**						
1	2, 4-D	22.00	15.44	22.00	17.90	22.00	11.62
2	Butachlor	0.50	0.18	0.50	0.04	0.50	0.00
3	Ethofumesate Technical	1.65	1.22	1.25	1.01	1.65	0.62
4	Thiamethoxam Technical	3.00	3.12	3.00	3.31	3.10	1.66
5	Pendimethalin	2.00	1.03	2.00	1.71	2	2.26
6	Metribuzin	0.75	0.24	0.75	0.74	0.75	0.52
7	Triclopyr Acid Tech	0.30	0.21	0.30	0.20	0.30	0.19
III	**Weedicides**						
1	Isoproturon	6.25	4.05	6.25	2.35	6.25	2.43
2	Glyphoshate	9.26	6.12	9.26	8.48	9.26	9.81
3	Diuron	0.05	0.14	0.05	0.07	0.33	0.12
4	Atrazine	0.50	0.65	0.50	1.24	0.50	1.20
IV	**Rodenticides**						
1	Zinc Phosphide	1.1	0.60	1.32	0.65	1.32	1.31
2	Aluminium Phosphide	3.9	4.16	3.9	4.47	3.9	5.07
V	**Fumigants**						
1	Dicofol	0.15	0.05	0.15	0.07	0.09	0.11

Source : Chemical and Petrochemical Statistics at a Glance-2015
Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers

Note: Among fertilizers, the conversion of fertilizer-N to gaseous forms-ammonia (NH_3) 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.

Table 5.1.7 : Capacity and production in the chemical industry in India (Insecticides) (in 000MT)

Sl. No.	Product	2012-13		2013-14		2014-15	
		Installed capacity	Production	Installed capacity	Production	Installed capacity	Production
1	2	3	4	5	6	7	8
1	D.D.T	6.34	3.87	6.34	2.79	3.60	3.63
2	Malathion	3.80	1.71	3.80	2.04	2.60	2.24
3	Dimethoate	5.65	0.81	5.65	1.36	5.65	1.43
4	D.D.V.P.	3.68	4.41	10.68	5.52	13.92	6.66
5	Quinalphos	2.80	1.35	2.80	1.74	2.80	1.88
6	Monocrotophos	12.84	8.25	12.24	4.27	13.18	6.97
7	Phosphamidon	3.20	0.02	3.20	0.05	3.20	0.13
8	Phorate	10.63	5.75	11.63	6.85	11.63	6.62
9	Ethion	4.02	0.94	4.02	1.51	4.02	1.60
10	Endosulphan	0.00	0.00	0.00	0.00	0.00	0.00
11	Fenvalerate	2.10	0.48	2.10	0.75	2.10	0.51
12	Cypermethrin	14.49	7.78	15.69	9.26	15.69	8.59
13	Acephate	11.86	15.76	16.58	14.51	18.25	17.97
14	Chlorpyriphos	34.10	7.52	34.20	9.54	36.36	9.88
15	Triazophos	3.90	0.93	3.90	0.99	3.90	1.00
16	Lindane	0.33	0.00	0.33	0.00	0.33	0.00
17	Temephos	0.50	0.20	0.25	0.25	0.25	0.00
18	Deltamethrin	0.58	0.52	0.63	0.52	0.63	0.51
19	Alphamethrin	0.33	0.54	0.35	0.56	0.51	0.75
20	Profenofos Technical	12.85	5.01	14.60	7.18	14.90	7.64
21	Pretilachlor Technical	1.40	1.93	2.84	2.22	2.56	1.88
22	Lambda Cyhalothrin	0	0.43	0.60	0.55	0.60	0.47
23	Phenthoate	0.90	0.96	0.90	1.24	0.90	1.40
24	Permethrin Tech	2.00	1.04	1.80	1.39	1.80	1.70
25	Imidacaloprid Tech	2.63	0.23	2.63	0.94	2.78	0.56

Source : Chemical and Petrochemical Statistics at a Glance-2015
Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers

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

(upto March 2015) **(Area in ha)**

Sl. No.	State	RVP	FPR	Non-RVP/FPR	Consultancy	Total
1	2	3	4	5	6	7
1	Andhra Pradesh	7766404	1454522	7229156		16450082
2	Arunachal Pradesh		2838213	1952958		4791171
3	Assam	58888	1223412	1264090		2546390
4	Bihar		4417870	5079614		9497484
5	Chandigarh		10437			10437
6	Chhattisgarh	9605094	2168115	86285	5000	11864494
7	Dadra & Nagar Haveli	12810				12810
8	Daman & Diu			3806		3806
9	Delhi		106025			106025
10	Goa			764057		764057
11	Gujarat	588961	108870	9574453		10272284
12	Haryana		1812850			1812850
13	Himachal Pradesh	3216445	644667			3861112
14	Jammu & Kashmir	1091767				1091767
15	Jharkhand	3400122	2477744	1555096	540715	7973677
16	Karnataka	11106666		5092032	8000	16206698
17	Kerala	399152		2898570		3297722
18	Madhya Pradesh	14080739	6194933	6129370	2289713	28694755
19	Maharashtra	20138101	451358	6982969	1721440	29293868
20	Manipur		210714	755909		966623
21	Meghalaya		527221			527221
22	Mizoram		4735	1220508		1225243
23	Nagaland		844554	619495		1464049
24	Odisha	2758843	1508770	4256444		8524057
25	Puducherry	7868		38621		46489
26	Punjab	8175	1024279			1032454
27	Rajasthan	2161700	4625839	3209825		9997364
28	Sikkim	1119806				1119806
29	Tamil Nadu	1795980		11033996		12829976
30	Tripura	58056		990453		1048509
31	Uttar Pradesh	1049373	6810010	5770018	288260	13917661
32	Uttarakhand	312821	3394513		8475	3715809
33	West Bengal	1085095	1510521	6311035		8906651
	G.Total	**81822866**	**44370172**	**82818760**	**4861603**	**213873401**

Source: Soil and Land Use Survey of India, Department of Agriculture & Cooperation, 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*	759772		354564		10115		1124451
3	Arunachal Pradesh	0		24990		10591		35581
4	Assam	24241				7834		32075
5	Bihar	0	111422	41		7623		119086
6	Chandigarh	0		318				318
7	Chhattisgarh	1103886	21574			18750	8506	1152716
8	Dadra & Nagar Haveli	9933		10471				20404
9	Delhi	0		21613				21613
10	Goa	0		164302	5			164307
11	Gujarat	242495		45250				287745
12	Haryana	0	22352					22352
13	Himachal Pradesh	420480	64550	490				485520
14	Jammu & Kashmir	16007				456		16463
15	Jharkhand	791460	327804	96589		595	2922	1219370
16	Karnataka	1862654		82843	289	2031		1947817
17	Kerala	88078		15277				103355
18	Madhya Pradesh	1895916	290479	68687		9979	13179	2278240
19	Maharashtra	1724386		33351			13535	1771272
20	Mizoram	0		166				166
21	Odisha	1129263		112109		21006		1262378
22	Punjab	1350		2490				3840
23	Rajasthan	389011	384331	27155				800497
24	Sikkim	110046						110046
25	Tamil Nadu	118856		23232				142088
26	Tripura	3970						3970
27	Uttar Pradesh	45481	333843	27299		6199		412822
28	Uttarakhand	30210	30957	4391	15006			80564
29	West Bengal	433537	279430	4905		9842	1430	729144
Total		**11201032**	**1866742**	**1120533**	**15300**	**109421**	**39572**	**14352600**

Source: Soil and Land Use Survey of India, Ministry of Agriculture (data up to March 2015)

RVP : Rivers valley Project , FPR Flood Prone Rivers * Including Telangana

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

(up to March 2015)

(Area in ha)

Sl. No.	State	RRS	DSS	LDM	SRM
1	Andaman & Nicobar Islands		4400		
2	Andhra Pradesh*	16450082	1124451	4561637	24576324
3	Arunachal Pradesh	4791171	35581		
4	Assam	2546390	32075		4873134
5	Bihar	9497484	119086	1864743	2395700
6	Chandigarh	10437	318		11400
7	Chhattisgarh	11864494	1152716		
8	Dadra & Nagar Haveli	12810	20404		
9	Daman & Diu	3806			
10	Delhi	106025	21613		146600
11	Goa	764057	164307	370200	370200
12	Gujarat	10272284	287745	2668091	19316516
13	Haryana	1812850	22352		1242685
14	Himachal Pradesh	3861112	485520	1238104	2829136
15	Jammu & Kashmir	1091767	16463		
16	Jharkhand	7973677	1219370	1940807	504380
17	Karnataka	16206698	1947817	5099718	1783191
18	Kerala	3297722	103355	448000	1788183
19	Madhya Pradesh	28694755	2278240	6194392	28575707.78
20	Maharashtra	29293868	1771272	3093380	
21	Manipur	966623		109700	196206
22	Meghalaya	527221		1198600	1615700
23	Mizoram	1225243	166	2108700	593081
24	Nagaland	1464049		1657900	1657900
25	Odisha	8524057	1262378		
26	Puducherry	46489			
27	Punjab	1032454	3840		
28	Rajasthan	9997364	800497	3653666	
29	Sikkim	1119806	110046	709600	710600
30	Tamil Nadu	12829976	142088	3675734	
31	Tripura	1048509	3970	1048600	1049100
32	Uttar Pradesh	13917661	412822	2305639.65	7876026.16
33	Uttarakhand	3715809	80564		5208479.94
34	West Bengal	8906651	729144	1969361	8851800
	G.Total	**213873401**	**14352600**	**45916572.65**	**116172049.89**

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

RRS: Rapid Reconnaissance Survey LDM : Land Degradation Mapping

DSS: Detailed Soil Survey SRM : Soil Resource Mapping

* Including Telangana

Table 5.2.2(a) :State wise coverage under soil resource mapping (Upto March 2015)		
State/UT	**District**	**Total Area (ha)**
Andhra Pradesh	Adilabad	1610500
	Anantpur	1913000
	Chittor	1515200
	Cuddapah	1535900
	East Godavari	1080700
	Karim nagar	1182300
	Khammam	1602900
	Krishna	872700
	Mahboob Nagar	1843200
	Medak	970000
	Nalgonda	1422324
	Nellore	1307600
	Nizamabad	795600
	Prakasham	1762600
	Ranga Reddy	749300
	Srikakulam	583700
	Visakhapatnam	1116100
	Vijaianagaram	653900
	Warangal	1284600
	West Godavari	774200
Total		**24576324**
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
Total		**4873134**
Bihar	Banka	301900
	Bhagalpur	257000
	Bhojpur	347400
	Buxar	162400
	Muzzaffapur	317200
	Patna	320200
	Saran	264100
	Siwan	221900
	Vaishali (Hajipur)	203600
Total		**2395700**
Chandigarh	Chandigarh	**11400**

Table 5.2.2(a) :State wise coverage under soil resource mapping (upto March 2015)		
State/UT	**District**	**Total Area (ha)**
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
Total		**146600**
Goa	North Goa	173600
	South Goa	196600
Total		**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
	Kuchchh	4565200
	Mehsana	438400
	Narmada	270583
	Navsari	221100
	Panchmahal	508300
	Patan	553724
	Porbander	232600
	Rajkot	1080186
	Sabarkantha	739000
	Surat	740994
	Suredernagar	999848
	Vadodara	755500
	Valsad	302900
Total		**19316516**
Haryana	Fatehabad	246165
	Hissar	394742
	Jhhajjar	186768
	Sirasa	415010
Total		**1242685**
Himachal Pradesh	Bilaspur	114143
	Hamirpur	109503
	Kangra	564164
	Kullu	538346
	Mandi	386529
	Shimla	501571

Table 5.2.2(a) :State wise coverage under soil resource mapping (upto March 2015)		
State/UT	**District**	**Total Area (ha)**
	Sirmour	275893
	Solan	188048
	Una	150939
Total		**2829136**
Jharkhand	Palamau	**504380**
Karnataka	Chickmangalur	723391
	Tumkur	1059800
Total		**1783191**
Kerala	Ernakulam	307331
	Kannur	296600
	Kottayam	220300
	Palakkad	447652
	Thrissur	303200
	Wayanad	213100
Total		**1788183**
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
	Mandsaur	533825
	Morena	474026
	Narshimhapur	493807
	Neemuch	412351
	Nimar East	718366
	Nimar Wast	772553
	Panna	713500
	Raisen	814618
	Rajgarh	592763
	Ratlam	466829
	Rewa	616469
	Sagar	985511
	Satna	713888
	Sehore	632025

Table 5.2.2(a) :State wise coverage under soil resource mapping (upto March 2015)		
State/UT	**District**	**Total Area (ha)**
	Seoni	842843
	Shahdol	538744
	Shajapur	596229
	Sheopur	643566
	Shivpuri	1005608
	Sidhi	1012105
	Tikamgarh	485006
	Ujjain	609100
	Umaria	446642
	Vidisha	702875
Total		**28575708**
Manipur	East Imphal	109700
	West Imphal	86506
Total		**196206**
Meghalaya	East Garo Hills	149000
	Jayantia Hills	381900
	South Garo Hills	188700
	West Khasi Hills	524700
	West Garo Hills	371400
Total		**1615700**
Mizoram	Kolasib	138251
	Lunglei	454830
Total		**593081**
Nagaland	Dimapur	75800
	Kohima	328300
	Mokokchung	161500
	Mon	178600
	Phek	202600
	Tuensang	422800
	Wokha	162800
	Zunheboto	125500
Total		**1657900**
Sikkim	East Sikkim	96400
	North Sikkim	422600
	South Sikkim	75000
	West Sikkim	116600
Total		**710600**
Tripura	Dhalai	240200
	North Tripura	203900
	South Tripura	305700
	West Tripura	299300
Total		**1049100**
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

Table 5.2.2(a) :State wise coverage under soil resource mapping (upto March 2015)		
State/UT	**District**	**Total Area (ha)**
	Gazipur	325078
	Ghaziabad	197345
	Gonda	385552
	JP Nagar	388351
	Jaunpur	212214
	Kanpur Dehat	306514
	Kanpur Nagar	288439
	Kausambi	193513
	Kushinagar	277859
	Lakhimpur Kheri	741529
	Maharajganj	283713
	Meerut	249500
	Rai Bareilly	443832
	Saharanpur	360831
Total		**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
Total		**5208480**
West Bengal	Bankura	688200
	Barddhaman	702400
	Birbhum	454500
	Coochbehar	338700
	Dakshin Dinajpur	221900
	Darjeeling	314900
	Howrah	146700
	Hoogli	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
	West Midnapur	929600
Total		**8851800**
Grand Total		**116172050**

(Concluded)

Source: Soil and Land use survey of India, Ministry of Agriculture.

Table 5.2.2(b) : State wise information on rapid reconnaissance survey (up to March 2015)

(Area in lakh hectares)

Sr. No	State/UT	Surveyed Area	Priority Area		Total Priority Area	% Priority
			Very high	High		
1	Andhra Pradesh	164.501	7.483	16.506	23.989	14.58
2	Arunachal Pradesh	47.912	17.619	10.004	27.624	57.66
3	Assam	25.464	1.467	2.004	3.471	13.63
4	Bihar	94.975	4.861	10.188	15.049	15.85
5	Chandigarh	0.104	0.041	0.000	0.041	39.16
6	Chhattisgarh	118.645	9.119	10.556	19.675	16.58
7	Dadara & Nagar Haveli	0.128	0.036	0.029	0.065	50.59
8	Daman -Diu	0.038	0.000	0.000	0.000	0.00
9	Delhi	1.060	0.087	0.079	0.166	15.66
10	Goa	7.641	0.210	0.747	0.957	12.52
11	Gujarat	102.723	5.942	7.806	13.748	13.38
12	Haryana	18.129	1.583	1.489	3.072	16.95
13	Himachal Pradesh	38.611	13.541	7.782	21.323	55.22
14	Jammu & Kashmir	10.918	4.961	1.090	6.051	55.42
15	Jharkhand	79.737	13.132	19.303	32.435	40.68
16	Karnataka	162.067	13.627	21.985	35.611	21.97
17	Kerala	32.977	2.158	8.685	10.843	32.88
18	Madhya Pradesh	286.948	36.893	46.743	83.636	29.15
19	Maharashtra	292.939	28.244	50.814	79.058	26.99
20	Manipur	9.666	3.310	2.811	6.122	63.33
21	Meghalaya	5.272	2.665	1.808	4.473	84.83
22	Mizoram	12.252	8.002	1.162	9.164	74.79
23	Nagaland	14.640	8.903	2.101	11.004	75.16
24	Odisha	85.241	11.635	13.094	24.728	29.01
25	Puducherry	0.465	0.016	0.017	0.033	7.03
26	Punjab	10.325	0.169	0.353	0.522	5.06
27	Rajasthan	99.974	8.890	12.598	21.488	21.49
28	Sikkim	11.198	3.872	0.693	4.565	40.77
29	Tamil Nadu	128.300	6.708	12.526	19.234	14.99
30	Tripura	10.485	0.366	2.081	2.447	23.34
31	Uttar Pradesh	139.177	10.431	13.253	23.684	17.02
32	Uttarakhand	37.158	7.372	9.952	17.324	46.62
33	West Bengal	89.067	2.692	5.985	8.677	9.74
	Total	**2138.734**	**236.034**	**294.244**	**530.278**	**24.79**

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

5.3 Land Degradation & Soil Erosion

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 or human causes or it may be due to combination of both. The State wise information of wetland and degraded land of the Districts is in table 5.3.1. and 5.3.2.

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

5.3.3 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 unfavourable 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.

5.3.4 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.

5.3.5 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.

5.3.6 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 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	
1	2	3	4	5	6	7	8	9	10	11
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
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**	**32340.38**	**27098.42**	**14.91**	**14.75**	**-0.17**

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

Table 5.3.2 : State wise information on degraded land in the districts

Upto March 2015 (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

Continued…

Table 5.3.2 : 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
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
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	194502	20.21
		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				**44423929**	**8853262**	**19.93**

Concluded

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

5.4 Mining and Quarrying

5.4.1 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. The state-wise distribution of mining leases is given in the Table 5.4.1.

Table 5.4.1 : State wise distribution of mining leases as on 31-03-2014*
(By Principal Status)

Sl. No.	State	No. of Mining Leases Gramted/Execited	% to Total Leases	Leases Area (in '000 ha)	% to Total Area
1	2	3	4	5	6
1	Andhra Pradesh	2038	19	62	14
2	Chhattisgarh	300	3	22	5
3	Goa	267	2	20	4
4	Gujarat	1100	10	30	7
5	Jharkhand	282	3	30	7
6	Karnataka	545	5	48	11
7	Madhya Pradesh	1001	9	33	7
8	Maharashtra	260	2	15	3
9	Odisha	461	4	74	16
10	Rajasthan	3306	30	84	18
11	TamilNadu	931	9	10	2
12	Others	491	4	27	6
	All States	**10982**	**100**	**455**	**100**

Source : Indian Bureau of Mines (IBM), Nagpur, Mineral Economics Division Bulletion of Mining Leases & Prospecting Licences, 2014

* : Excuding fuel, atomic and minor minerals.

5.4.2 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- 2014) in India is presented below in table 5.4.2.

Table 5.4.2 : Number of reporting Mines* in India Statewise[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	2011-12#	2012-13#	2013-14#(P)
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	409	415	418	469	456	456	621	774	660
2	Arunachal Pradesh				1	1	1	1	1	1
3	Assam	9	9	12	12	11	11	10	9	6
4	Bihar	9	8	6	5	6	10	6	6	5
5	Chhattisgarh	148	144	148	162	152	167	192	196	203
6	Goa	76	72	78	77	75	79	74	72	69
7	Gujarat	431	457	457	440	446	429	441	487	464
8	Haryana								1	1
9	Himachal Pradesh	27	26	26	26	26	24	25	20	21
10	Jammu & Kashmir	1	0	0	11	11	10	10	8	7
11	Jharkhand	7	11	11	300	299	297	299	293	233
12	Karnataka	297	293	294	241	233	251	207	219	187
13	Kerala	236	231	226	32	30	30	43	55	49
14	Madhya Pradesh	5	8	10	329	287	317	417	421	364
15	Maharashtra	333	336	331	158	158	161	158	151	168
16	Meghalaya	37	33	30	8	9	10	13	14	14
17	Odisha	150	154	163	239	220	192	183	192	179
18	Rajasthan	235	233	226	291	289	308	418	508	556
19	Tamil Nadu	235	217	243	178	175	192	305	368	355
20	Uttar Pradesh	173	177	171	26	25	24	25	22	19
21	Uttarakhand	23	26	26	32	34	40	37	34	17
22	West Bengal	36	37	32	113	112	109	124	127	121
Total		**2877**	**2887**	**2908**	**3150**	**3055**	**3119**	**3609**	**3978**	**3699**

Source : Indian Bureau of Mines

P: Provisional # : Excluding atomic minerals and minor minerals.

* 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.

5.4.3 The detail of underground mines in India is exhibited in table 5.4.3 below:

Table 5.4.3: Number of underground mines#

Mineral	2009-10 (P)			2010-11			2011-12			2012-13			2013-14		
	Total	A' Category	B' Category (Other than 'B')	Total	A' Category	B' Category (Other than 'B')	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	14	15	16	17	18	19
Apatite	1	-	1	1	-	1	1	-	1	-	1	1	1	-	1
Asbestos	3	1	2	3	1	2	3	1	2	1	2	3	3	1	2
Ball Clay	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-
Barytes	1	-	1	-	-	-	2	-	2	-	-		6	-	6
Chalk	1	-	1	1	-	1	1	-	1	-	1	1	-	-	-
Chromite	5	5	-	6	6	-	5	5	-	5		5	6	6	-
Copper Ore	3	3	-	3	3	-	3	3	-	3		3	4	4	-
Gold	4	3	1	4	3	1	4	3	1	3	1	4	4	3	1
Lead & Zinc Ore	6	6	-	5	5	-	6	6	-	5		5	8	8	-
Limestone				13			13	8	5	-	-	-	-	-	-
Manganese Ore	13	8	5	-	8	5	23	2	21	8	5	13	13	8	5
Mica	27	3	24	25	3	22	21	2	19	2	23	25	21	2	19
Ochre				1			-	-	-	-	-	-	-	-	-
Salt (Rock)	1	-	1	1	-	1	-	-	-	-	-	-	-	-	-
Sand (Others)	21			21			-	-	-	-	-	-	-	-	-
Steatite	21	2	19	21	2	19	-	-	-	1	18	19	17	2	15
Quartz											3	3			
Total	**87**	**31**	**56**	**84**	**31**	**53**	**82**	**30**	**52**	**28**	**54**	**82**	**83**	**34**	**49**

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.

5.4.4 The number of Mines in various States and production of minerals are presented in tables 5.4.4 & 5.4.5 .

5.4.5 The details of machinery and explosives used in Mining Industry is exhibited in tables 5.4.6 & 5.4.7 .

5.4.6 The details of production of coal and lignite, consumption of minerals in various industry are elaborated in tables 5.4.8 to 5.4.12 .

5.4.7 The condition of reserves and resources for various minerals in the Country is presented in table 5.4.13 .

5.4.8 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. The details of Afforestation in Metalliferrous Mines from 1989-90 to 2011-12 (By Principal Minerals) is given in Table 5.4.14.

Table 5.4.4 : Number of reporting mines By Mineral Groups (2000-01 to 2013-14)

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	3146	562	591	1993
2003-04	3131	562	612	1957
2004-05	3215	571	625	2019
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	3118	573	719	1826
2011-12	3609	573	682	2354
2012-13	3978	575	708	2695
2013-14 (P)	3699	552	663	2484

Source : Indian Bureau of Mines (IBM), Nagpur

* : Excluding petroleum (crude), atomic and minor minerals. 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 5.4.5: 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	2011-12	2012-13	2013-14(P)
1	2	3	4	5	6	7	8	9	10	11	12	13
	Fuel Minerals											
1	Coal	Thousnd Tonnes	407039	430832	457082	492757	532042	532694	539950	539950	556402	565765
2	Lignite	Thousnd Tonnes	30066	31285	33980	32421	34071	37733	42332	42332	46453	44271
3	Natural Gas (Ut.)	M.C.M.	32202	31747	32417	32845	47496	52222	47559	47559	40679	35407
4	Petroleum (Crude)	Thousnd Tonnes	32190	33988	34118	33508	33690	37712	38090	38090	37862	37788
	Metallic Minerals											
5	Bauxite	Tonne	12595803	15732535	22624960	15460202	14124093	12640785	12877394	13599566	16611610	2.2E+07
6	Chromite	Tonne	3714284	5295551	4872847	4073479	3425580	4262207	3764120	2923435	2833895	2852854
7	Copper Ore	Tonne	2642706	3273906	3242371	3452406	3271169	3615038	3478189	3479189	3635751	3777764
8	Copper Conc.	Tonne	125392	149584	216966	137514	124577	136856	130458	130456	123654	139306
9	Gold Ore	Tonne	479353	512609	681243	587215	517520	727020	492192	491562	502831	420777
10	Gold (Primary)	Kg.	2880	2361	2936	2438	2084	2239	2192	2194	1588	1564
11	Gold (by product)	Kg.	167	127	0	0	0	0				
12	Iron Ore (Total)	Thousnd Tonnes	165230	187696	213246	212960	218553	207998	167289	168582	136618	152433
13	Lead & Zinc Ore	Tonne	4801184	5139915	5783099	6680698	7101872	7489693	8041881	8041881	8633411	9252137
14	Lead Conc.	Tonne	95738	107334	125755	133768	133921	145043	161157	161854	184486	194426
15	Zinc Conc.	Tonne	889007	947387	1035828	1224077	1279880	1420105	1412291	1414009	1492781	1490662
16	Manganese Ore	Tonne	1906353	2115507	2696980	2789025	2491950	2881080	2349300	2411871	2342169	2588313
17	Silver	Kg.	27961	53271	80697	105284	138780	148288	207142	207144	374046	349774
18	Tin Conc.	Kg.	98734	100835	63218	59778	599016	61355	48971	48765	47774	34851
	Non-Metallic Minerals											
19	Agate	Tonne	9	38	25	-	11	19	476	476	493	100
20	Apatite	Tonne	9053	9464	6691	6415	5992	3846	3053	3053	572	1300
21	Phosphorite	Tonne	-	-	-	1803954	1605489	2097490	2326876	2259726	1941158	1383998
21	Asbestos	Tonne	2323	390	269	315	243	268	280	276	389	227
22	Ball Clay	Tonne	406675	626801	796134	997676	932993	958454	1594634	1646516	1750559	1874049
23	Barytes	Tonne	1156227	1680695	1076290	1686148	2152552	2333805	1722804	1776980	1789431	1136814
24	Calcite	Tonne	73558	105724	86364	67284	49309	39370	51499	54081	74488	92146
25	Chalk	Tonne	148352	210838	194934	203085	185218	174914	176010	178736	175516	126431
26	Clay (Others)	Tonne	805765	1224235	818993	1220783	1056273	590702	744561	1417684	2680726	2360871
27	Corundum	Kg.	58000	156000	89920	21000	6600	-	-	37000	5000	
28	Diamond	Carat	44170	2180	586	536	16891	19774	18489	18490	31988	37515
29	Diaspore	Tonne	24494	15944	21236	24642	25569	26905	24124	23818	16222	14781
30	Dolomite	Tonne	4750512	5171649	5852256	5509237	5911759	5064875	5416817	5968554	7233958	7108696
31	Dunite	Tonne	36621	29708	57989	50935	71642	18591	39223	38774	88274	65098
32	Felspar	Tonne	426498	479715	488458	534032	496997	472041	660371	835526	1459008	1412518
33	Fireclay	Tonne	535735	497315	544973	495781	548748	571421	759746	983155	999925	706639
34	Felsite	Tonne	981	642	550	1238	1337	1670	1018	1117	1266	549
35	Fluorite (Graded)	Tonne	5577	2053	3970	3176	4995	59954	4856	5010	3092	2486
36	Flint Stone									708	0.633	459
37	Fluorite (Conc.)	Tonne	3764	0	3794	6814	8786	4394	-			
38	Garnet (Abrasive)	Tonne	674541	858843	1275919	1151241	1580617	2126337	1824648	1717904	768248	457626
39	Garnet (Gem)	Kg.	0	0	0	-	-	-	-			

40	Graphite (R.O.M.)	Tonne	125651	162293	170813	117767	124625	115697	148974	153339	134735	146009
41	Gypsum	Tonne	3291478	3005572	3400050	3876671	3370322	4918170	3189229	3978806	3556723	2929912
42	Jasper	Tonne	536	0	0	99	-	-	-			
43	Kaolin	Tonne	1335744	1460363	1466442	2083731	2798340	2727946	2734349	3076795	4258697	4752643
44	Kyanite	Tonne	8869	8059	5102	4620	5495	5954	4064	4064	1048	1922
45	Laterite	Tonne	1040816	1373325	1478590	1237393	1300772	1220304	1665820	2815275	4121192	3491510
46	Lime Kankar	Tonne	291926	395817	336385	434332	335067	383817	311218	311219	192426	140088
47	Limeshell	Tonne	110296	103548	128250	97856	62215	30410	33226	33225	24044	18786
48	Limestone	Thousnd Tonnes	170029	196695	193089	221573	232950	246336	256669	262882	285030	278725
49	Magnesite	Tonne	340674	238981	252849	252880	301070	235762	217662	224104	224315	195105
50	Marl		-	-	4155925	4167452	5908226	4399379	4143975	4140577	4337009	3254162
51	Mica (Crude)	Tonne	2115797	1410576	4577835	1462	1061	1333	1807	1899	1256	1610
52	Mica (Waste & Scrap)[2]	Tonne	4754362	3169838	3504.865	5685	8098	7311	13690	14186	16255	17545
53	Moulding Sand									30	3118	29961
54	Ochre	Tonne	1007088	1047831	1233221	766382	1258207	1218261	1352812	1576265	1833783	1554680
55	Perlite	Tonne	122	68	0	-	-	-				
56	Pyrites	Tonne	-	-	-	-	-	-				
57	Phosphorite	Tonne	2049277	1586843	1849188	-	-	-				
58	Pyrophyllite	Tonne	182526	147807	203707	255699	240747	240082	239811	255891	247968	208454
59	Pyroxenite	Tonne	340953	301733	289321	281785	279332	253205	87310	86031	58562	2985
60	Quartz	Tonne	302259	293660	315281	430734	512320	497546	520146	782575	1384155	1395452
61	Quartzite	Tonne	109210	102711	95850	97458	112652	118177	181065	272141	501399	529988
62	Salt (Rock)	Tonne	1871	1714	1216	2011	1836	1200	-			
63	Sand (Others)	Tonne	2277632	1770235	1804306	1808185	2159405	2057119	2625329	2625111	2638424	2552918
64	Selenite	Tonne	0	0	3864	15224	14598	6736	12852	13047	7577	532
65	Shale	Tonne	2683853	2849877	2894922	3047063	3033948	3081622	3338919	3439775	3067718	2990579
66	Silica Sand	Tonne	2369977	2663289	4303513	2836804	2545988	3380968	4334925	4867667	4303883	3346114
67	Sillimanite	Tonne	33119	26366	40537		33687	48784	58043	59206	43736	61597
68	Slate	Tonne	2527	4	7827	8931	-	-	-	-	278	339
69	Steatite	Tonne	681534	739849	922505	15224	14598	6728	-	998438	971778	865126
70	Sulphur[3]	Tonne	152090	204186	227311	269572	263124	236998	381146	381146	449004	390325
71	Talc/steatite/soapstone	Tonne	-	-	-	-	876548	902686	958746			
72	Vermiculite	Tonne	6674	11827	8910	12647	11662	19234	9746	10194	7947	10176
73	Wollastonite	Tonne	128582	131572	118666	111581	132385	183381	184445	184445	145667	192642

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

- not availble * Obtained as by-product from fertilizer plants and oil refineries

Table 5.4.6 :Mining machinery in metalliferrous open mechanised cast mines during 2013-14

Sl. No.	Machinery	2008-09		2009-10		2010-11		2011-12		2012-13		2013-14	
		In Use	In Reserve	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	13	14
1	Hauler/Dumper	5789	323	6578	362	6482	360	6423	339	5921	422	5921	422
2	Drills/Blast Holes	839	100	723	83	791	84	839	89	758	111	758	111
3	Air Compressor	642	84	617	68	686	62	656	110	711	98	711	98
4	Front end loader	773	50	645	26	889	31	668	29	465	50	620	41
5	Dipper Shovels (Hydrl)	580	85	469	58	563	52	539	61	500	55	465	50
6	Bulldozer	513	17	381	24	512	22	349	19	441	25	441	25
7	Back Hoe	1001	58	816	54	1066	77	906	47	1031	70	1031	70
8	Crusher	398	13	347	7	198	3	392	11	465	20	465	20
9	Crane	176	3	154	3	414	14	217	3	181	4	181	4
10	Dipper Shovels (Mechl)	39	15	37	3	598	59	48	4	35	5	35	5
11	Motor Grader	88	2	82	1	109	2	101	4	110	4	110	4
12	Locomotives	17	0	19	-	23	-	23	-	16	2	16	2
13	Drag Lines	0	0	9	-	-	-						
14	Surface Miners	15	0	0	0	11	-	24	-	30	-	30	-

Source : Indian Bureau of Mines

Table 5.4.7: Consumption of explosives for mining, 2013-14 #

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	-	2199	239	36	351	1669
2	Chromite	-	-	1	5	36	14
3	Copper Ore	-	4584	7	226	31	859
5	Iron Ore	58	11804	159	22	56	1890
6	Lead & Zinc Ore	-	3573	684	484	0	1096
7	Manganese Ore	-	738	14	550	62	503
	Magnesite		271	145	-	106	154
8	Dolomite	-	821	326	360	332	447
9	Limestone	++	22067	425	725	408	4195
11	Steatite	-	484	157	7	338	209
	Gold	-	427	92	282	0	166
	Barytes	-	737	1	58	2	20
	Mica	-	-	18	31	17	0
	Quartzite	-	-	23	45	1	5
12	Others	-	92	13	11	24	11
	Total#	**58**	**47797**	**2304**	**2842**	**1764**	**11238**

Source : Indian Bureau of Mines

: Excluding fuel, atomic and minor minerals

* Includes other detonators

Table 5.4.8 : Production of coal 2000-01 to 2013-14				
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	51318	560	360705
2010-11	5327	62021	559	355721
2011-12	5400	70172	559	352930
2012-13	5564	74719	559	345302
2013-14 (P)	5658	82535	536	345302

Source : Indian Bureau of Mines (IBM), Nagpur

* : Excluding Meghalaya ** : Including Lignite.

Table 5.4.9 : Production of lignite 2000-01 to 2013-14

Year	Quantity (Lakh tonnes)	Value (Rs. Crores)	No. of Mines	Labours Employed (Av. Daily)
1	2	3	4	5
2000-01	242	1418	5	-
2001-02	248	1695	6	-
2002-03	260	1743	6	9127
2003-04	280	2038	8	11048
2004-05	305	2201	8	11698
2005-06	301	2153	9	14246
2006-07	313	2626	9	14246
2007-08	340	2961	11	14246
2008-09	324	3688	13	12566
2009-10	341	3776	13	13245
2010-11	377	4331	14	14406
2011-12	423	5338	14	13107
2012-13	465	5511	16	13212
2013-14(P)	443	5968	16	13212

Source : Indian Bureau of Mines (IBM), Nagpur P - Provisional

Table 5.4.10 : Consumption of minerals in Iron & steel industry (2000-01 to 2013-14)

Year	Iron Ore*	Coal*#	Limestone*	Dolomite **	Manganese Ore **	Ferro-Allyos**	Bauxite**	Fire Clay**	Flourite**
1	2	3	4	5	6	7	8	9	10
2000-01	313	222	48	2850	351	212	14	NA	NA
2001-02	322	240	52	2760	255	223	20	NA	NA
2002-03	338	224	50	3142	212	228	16	NA	NA
2003-04	374	252	54	2988	101	265	1	NA	NA
2004-05	378	252	53	3644	169	259	1	NA	NA
2005-06	402	252	59	3740	123	395	1	NA	NA
2006-07	484	217.7	69.6	4330	139	418	1	20	3
2007-08	513	179.7	73.2	4580	108	449	1	21	2
2008-09	516.6	177.7	62.3	4790	148	538	1	35	3
2009-10	564.2	185.7	72.5	4360	135	574	1	35	1
2010-11(R.)	629.5	186.3	72.5	5290+	151	571	1	29	3
2011-12 (R.)	990	160.5	93.2	5840+	254	630	1	11	2
2012-13 (P)	1020	150.7$	114.1	5940+	255	631	1	11	2
2013-14 (P)	1060	150.7^	119.6	5990+	262	630	1	11	2

Source : Indian Bureau of Mines (IBM), Nagpur

$ Provisional coal statistics,2012-13, Ministry of Coal Controller, Kolkata ^ Estimate

\+ The figures for iron & steel and pelletisation (iron & steel) added.

* Lakh Tonnes ** : Thousand Tonnes R - Revised P - Provisional

\# Relates to dispatches of Coal, since consumption data is not available.

Table 5.4.11 Consumption of minerals in cement industry (2002-03 to 2013-14)

('000 tonnes)

Year	Limestone*+	Coal*#	Gypsum*	Quartz **$$	Bauxite **	Iron Ore **	Kaolin/1**	Fireclay **
1	2	3	4	5	6	7	8	9
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	152.7	59.5	293	615	1022	270	247
2008-09	1720	131.2	65.6	298	1144	1074	339	245
2009-10	2030	131.2	69.8	279	1043	1294	642	245
2010-11(R.)	2320	141.8	82.1	332	1082	1494	665	286
2011-12 (R.)	2400	128.8	86.2	356	1041	1548	665	276
2012-13 (R.)	2530	135.5$	92.7	382	969	1586	666	253
2013-14 (P)	2530	135.5^	87.3	323	961	1449	665	293

Source : Indian Bureau of Mines (IBM), Nagpur R - Revised P - Provisional

* Lakh tonnes

** Thousand Tonnes

1 Pertains to raw/unprocessed china clay.

\+ Limestone and other calcerous material

$ Provisional coal statistics,2012-13, Ministry of Coal Controller, Kolkata ^ Estimate

$$ Includes Quartz, Quartzite and Silica Sand

\# Relates to dispatches of Coal, since consumption data is not available.

Table 5.4.12 Consumption of minerals in refractory industry (2002-03 to 2013-14)

('000 tonnes)

Year	Dolomite	Fireclay	Magnesite*	Quartz & Quartzite	Bauxite & Diaspore	Chromite *	Kyanite & Sillimanite	Kaolin
1	2	3	4	5	6	7	8	9
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	65	128	24	18	33
2010-11(R.)	213	171	163	43	118	45	15	34
2011-12 (R.)	213	182	112	46	280	25	15	35
2012-13 (R.)	375	181	91	69	313	41	21	33
2013-14 (P)	321	181	91	69	300	41	22	34

Source : Indian Bureau of Mines (IBM), Nagpur

* Includes consumption of iron & steel industry.

R - Revised P - Provisional

Table 5.4.13: 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#	Th. Tonnes		31	22630	22661
4	Asbestos	Th. Tonnes		2510.8	19655.8	22166.6
5	Ball Clay	Th. Tonnes		16778	66616	83394
6	Barytes	Th. Tonnes		31584	41150	72734
7	Bauxite	Th. Tonnes		592938	2886682	3479620
8	Bentonite	Th. Tonnes		25060	543307	568367
9	Borex	Tonnes		0	74204	74204
10	Calcite	Th. Tonnes		2664	18281	20945
11	Chalk	Th. Tonnes		4332	585	4917
12	Chromite#	Th. Tonnes		107221	214530	321751
13	Cobalt (Ore)#	Mill.Tonnes		0	44.91	44.91
14	Copper#	Th. Tonnes	Ore	237573	1273445	1511018
		Th. Tonnes	Metal	2996.97	9221.56	12218.53
15	Corundum#	Tonnes		597	267218	267815
16	Diamond#	Th. Carats		985	30876	31861
17	Diaspore	Th. Tonnes		2860	3125	5985
18	Diatomite	Th.Tonnes		0	2885	2885
19	Dolomite	Th.Tonnes		738185	6992372	7730557
20	Dunite	Th.Tonnes		17137	168232	185369
21	Feldsper	Th.Tonnes		44503	87832	132335
22	Fire Clay	Th.Tonnes		30104	683415	713519
23	Fluorite#	Th.Tonnes		4574	13614	18188
24	Fuller's Earth	Th.Tonnes		58	256594	256652
25	Garnet	Th.Tonnes		19325	37638	56963
26	Gold#	Th.Tonnes	Ore (Primary)	14616	480188	494804
		Tonnes	Metal (Primary)	71.91	568.48	640.39
		Th.Tonnes	Ore (Placer)		26121	26121
		Tonnes	Metal (Placer)		5.86	5.86
27	Granite (Dimension Stone)	Th. cu.m.		263692	45966608	46230300
28	Graphite	Th.Tonnes		8032	166818	174850
29	Gypsum	Th.Tonnes		39096	1247402	1286498
30	(Heamatite)#	Th.Tonnes		6608287	13967420	20575707
31	Iron Ore (Magnetite)#	Th.Tonnes		34592	10712763	10747355
32	Kaolin	Th.Tonnes		177158	2528049	2705207
33	Kyanite	Th.Tonnes		1575	101671	103246

(Contd…)

Table 5.4.13: Mineral reserves and resources (Contd...)__						
Sl.No.	Mineral/ Grades	Unit		As on 1.4.2010		
				Reserves (A)	Remaining Resources (B)	Total (A+B)
34	Laterite#	Th.Tonnes		58151	477309	535460
35	Lead & Zinc #					
		Th.Tonnes	Ore	102795	606248	709043
		Th.Tonnes	Lead Metal	2114.91	9888.89	12003.8
		Th.Tonnes	Zinc Metal	10893.1	24963	35856.1
		Th.Tonnes	Lead & Zinc Metal	0	140.82	140.82
36	Limestone	Th.Tonnes		14926392	170008720	184935112
37	Magnesite#	Th.Tonnes		20782	307339	328121
38	Manganese Ore	Th.Tonnes		141977	288003	429980
39	Marble	Th.Tonnes		276495	1654968	1931463
40	Marl	Th.Tonnes		139976	11705	151681
41	Mica	Tonnes		190741448	341495531	532236979
42	Molybdenum#	Tonnes	Ore	0	19371698	19371698
		Tonnes	Contained MOS_2	0	12668.37	12668.37
43	Nickel Ore#	Mill. Tonnes		0	188.71	188.71
44	Ochre	Th.Tonnes		54942	89319	144261
45	Perlite	Th.Tonnes		428	1978	2406
46	Pt. Grp of Metal	Tonnes	Metal	0	15.7	15.7
47	Potash	Mill. Tonnes		0	21816	21816
48	Pyri tes	Th.Tonnes		0	1674401	1674401
49	Phosphorite/Rock Phosphate#	Th.Tonnes		65392	249120	314512
50	Pyrophyllite	Tonnes		23275451	32807451	56082902
51	Quartz & Silica and Sand	Th.Tonnes		429223	3069808	3499031
52	Quartzite	Th.Tonnes		86599	1164649	1251248
53	Ruby	Kilogram		236	5112	5348
54	Rock Salt	Th.Tonnes		16026	0	16026
55	Sapphire	Kilogram		0	450	450
56	Shale	Th.Tonnes		15331	580	15911
57	Sillimanite	Th.Tonnes		4085	62902	66987
58	Silver#	Th.Tonnes	Ore	118281	401289	519570
		Tonnes	Metal	7907.97	21880.38	29788.35
59	Slate	Th.Tonnes		0	2369	2369
60	Sulpher	Th.Tonnes		0	210	210
61	Talc-Steatite - Soapstone	Th.Tonnes		90026	178996	269022
62	Tin#	Th.Tonnes	Ore	7	83719	83726
		Tonnes	Metal	1181.19	101093.65	102274.84
63	Titanium Minerals	Th.Tonnes		22030	371966	393996
64	Tungsten#	Tonnes	Ore	0	87387464	87387464
		Tonnes	Contained WO3	0	142094.35	142094.35
65	Vanadium#	Tonnes	Ore		24633855	24633855
		Tonnes	Contained V2O5		64594	64594
66	Vermiculite	Tonnes		1704007	803003	2507010
67	Wollastonite	Tonnes		2487122	14082751	16569873
68	Zircon	Tonnes		1347470	1786482	3133952

Source : Annual Report-2013-14, Indian Bureau of Mines (IBM), Nagpur

: Provisional as on 01-04-2013.

Table 5.4.14 : Afforestation in Metalliferous Mines during 2013-14 (By Principal Minerals)

Sl. No.	Minerals	Mines Covered	Area Covered (in Hects.)	Trees Planted (Nos.)	Trees Survived (Nos.)	Survival (%)	Survival ('000 trees per hectare)
1	2	3	4	5	6	7	8
1	Bauxite	87	160	270930	214957	79.34	1.34
2	Chromite	10	6	16190	14134	87.30	2.32
3	Copper	8	33	302500	180725	59.74	5.41
4	Dolomite	36	27	11434	7801	68.23	0.30
5	Iron Ore	105	67	306613	202913	66.18	3.05
6	Iron & Manganese	3	6	17500	11092	63.38	1.77
7	Lead & Zinc	4	24	28500	24810	87.05	1.30
8	Limestone	531	1225	1510536	1238126	81.97	1.01
9	Manganese Ore	12	5	6280	4298	68.44	0.87
10	Magnesite	4	35	20000	14170	70.85	0.40
11	Others	197	131	114233	69699	61.01	0.53
Total		**997**	**1719**	**2604716**	**1982725**	**76.12**	**1.15**

Source : Indian Mineral Industry at a glance 2013-14, Indian Bureau of Mines

5.5 Natural disasters in India

5.5.1 Many of the natural disasters occurring in India are related to the climate of the country. They cause massive losses of life and property. Droughts, flash floods, cyclones, avalanches, landslides brought on by torrential rains, and snowstorms pose great 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 5.5.1 gives the details of frequently occurring natural disasters in India. The details of the natural disasters occurred in India as depicted in Table 5.5.2.indicates the frequency and impact of major natural disasters.

Table 5.5.1 : 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, Ministry of Environment & Forests

5.5.2 The two thirds of India lies in the Seismic zones of moderate to severe intensity. The Himalayan Range, the Indo-gangetic plains and the Kutch 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 5.5.3 presents the major earthquakes in India.

5.5.3 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.

5.5.4 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 5.5.4 presents a record of damages due to floods in India.

5.5.5 The State wise details of damage to human lives and property due to heavy rains/ floods during 2011 in India is in table 5.5.5 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 5.5.6 .

5.5.6 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. To address the problems of drought prone areas, Drought Prone Area Development Programme (DPAP) was launched in 1973-74. It was launched to tackle problems like depletion of vegetative cover, increase in soil erosion and fall in ground water levels. The states where DPAP is under implementation along with no. of blocks in given in Table 5.5.7.

Table 5.5.2: India's major natural disasters since 1980

Sl. No.	Year	Type	Affected Population Location/Area	Loss of 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, Bihar 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 property 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 damaged
18	1996	Floods	Large parts of the country	1700	Property worth Rs. 22.0 Billion and crop in 20.0 Million Hectares damaged
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, Puducherry		over 10,749 persons were killed. 5640 person were expected missing. About 6.5 Lakhs person moved to different place
25	2005	Earthquake	Pakistan & Kashmir		over 87,000 people in Pakistan & Kashmir dead.
26	2008#	Kosi flods	North Bihar	527	19323 livestock perished, 223000 houses damaged, 3.3 million persons affected
		Cyclone Nisha	Tamil Nadu	204	
27	2009#	Floods	Andhra Pradesh, Karnataka, Odisha, Kerala, Delhi, Maharashtra	300	
		Drought	252 Districts in 10 States		
28	2010#	Cloudbrust	Leh, Ladakh in J&K		-
29	2011#	Sikkim Earthquake	North Eastern India with epicenter near Nepal Boarder and Sikkim		Most recent disaster

Source : Ministry of Home Affairs

: Disaster Data and Statistics,National Disaster Management Authority

Table 5.5.3 : 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
10	19.10.1991	30.75	78.86	6.6	West UP Hills(Uttarkashi)	Extensive damage in Northern Bihar 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 5.5.4 : 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	2.90	52.40
1954	7.49	12.92	2.61	40.52	200	6.56	23	279	10.15	57.23
1955	9.44	25.27	5.31	77.82	1667	20.95	72	865	3.98	102.73
1956	9.24	14.57	1.11	44.44	726	8.05	16	462	1.14	53.63
1957	4.86	6.76	0.45	14.12	318	4.98	7	352	4.27	23.37
1958	6.26	10.98	1.40	38.28	382	3.90	18	389	1.79	43.97
1959	5.77	14.52	1.54	56.76	649	9.42	73	619	20.02	86.20
1960	7.53	8.35	21.27	42.55	610	14.31	14	510	6.31	63.17
1961	6.56	9.26	1.97	24.04	533	0.89	16	1374	6.44	31.37
1962	6.12	15.46	3.39	83.18	514	10.66	38	348	1.05	94.89
1963	3.49	10.93	2.05	30.17	421	3.70	5	432	2.74	36.61
1964	4.90	13.78	2.49	56.87	256	4.59	5	690	5.15	66.61
1965	1.46	3.61	0.27	5.87	113	0.20	7	79	1.07	7.14
1966	4.74	14.40	2.16	80.15	217	2.54	9	180	5.74	88.43
1967	7.12	20.46	3.27	133.31	568	14.26	6	355	7.86	155.43
1968	7.15	21.17	2.62	144.61	683	41.11	130	3497	25.37	211.10
1969	6.20	33.22	2.91	281.90	1269	54.42	270	1408	68.11	404.44
1970	8.46	31.83	4.91	162.78	1434	48.61	19	1076	76.44	287.83
1971	13.25	59.74	6.24	423.13	2428	80.24	13	994	129.11	632.48
1972	4.10	26.69	2.45	98.56	897	12.46	58	544	47.17	158.19
1973	11.79	64.08	3.73	428.03	870	52.48	261	1349	88.49	569.00
1974	6.70	29.45	3.33	411.64	747	72.43	17	387	84.94	569.02
1975	6.17	31.36	3.85	271.49	804	34.10	17	686	166.05	471.64
1976	11.91	54.46	6.04	595.03	1746	92.16	80	1373	201.50	888.69
1977	11.46	49.43	6.84	720.09	1662	152.29	556	11316	328.95	1201.85
1978	17.50	70.45	9.96	911.09	3508	167.57	239	3396	376.10	1454.76
1979	3.99	19.52	2.17	169.97	1329	20.61	618	3637	233.63	614.20
1980	11.46	54.12	5.55	366.37	2533	170.85	59	1913	303.28	840.50
1981	6.12	32.49	3.27	524.56	913	159.63	82	1376	512.31	1196.50
1982	8.87	56.01	5.00	589.40	2397	383.87	247	1573	671.61	1644.88
1983	9.02	61.03	3.29	1285.85	2394	332.33	153	2378	873.43	2491.61

Table 5.5.4 : Flood damage/heavy rains in India (Contd…)

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)
1984	10.71	54.55	5.19	906.09	1764	181.31	141	1661	818.16	1905.56
1985	8.38	59.59	4.65	1425.37	2450	583.86	43	1804	2050.04	4059.27
1986	8.81	55.50	4.58	1231.58	2049	534.41	60	1200	1985.54	3748.53
1987	8.89	48.34	4.94	1154.64	2919	464.49	129	1835	950.59	2569.72
1988	16.29	59.55	10.15	2510.90	2277	741.60	151	4252	1377.80	4630.30
1989	8.06	34.15	3.01	956.74	782	149.82	75	1718	1298.77	2405.33
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	152.50	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	43.20	4.27	7307.23	775	756.48	15	2166	3262.15	11325.87
2004	5.31	43.73	2.89	778.69	1664	879.60	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	41.40	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	10809.80	63	1513	17509.35	32554.77
2010	2.62	18.30	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
2012	2.14	14.69	1.95	1534.11	175	240.57	32	933	9169.97	10944.65
2013	31.58	21.15	316.9	3214.99	662	526.12	157	2137	3938.12	11095.14
Total	**459.97**	**1949.22**	**542.42**	**70758.73**	**74879**	**34140.02**	**5887**	**100621**	**123311.37**	**232813.09**
Average	7.54	31.95	8.89	1159.98	1228	559.67	97	1650	2021.5	3816.61
Maximum (Year)	31.58 (2013)	70.45 (1978)	316.90 (2013)	7307.23 (2003)	3508 (1978)	10809.80 (2009)	618 (1979)	11316 (1977)	17509.35 (2009)	32551.76 (2009)

Source: Central Water Commission (FMP Directorate)

Nil:0

Table 5.5.5 : State wise details of damage due to flood/heavy rains during 2015 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	0.00	3.02	1.63	44.91	75304.00	2.24	2743.00	88.00	66.96	114.11
Arunachal Pradesh	30.67	0.31	313.57	8.25	986.00	12.85	75.00	52.00	854.42	875.52
Assam	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bihar	0.00	6.90	0.60	105.72	156518.00	24.02	6548.00	218.00	16.61	146.35
Chhattisgarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goa	0.00	0.00	0.00	0.00	4.00	0.01	0.00	0.00	0.00	0.01
Gujarat	0.00	0.18	0.00	7.75	407.00	0.14	274.00	186.00	0.00	7.89
Haryana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Himachal Pradesh	0.10	0.00	0.10	506.00	11243.00	200.00	24267.00	73.00	2228.37	2934.37
J & K	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jharkhand	0.00	0.20	0.02	3.89	528.00	0.20	1.00	3.00	0.00	4.09
Karnataka	0.00	0.00	0.23	1703.07	12310.00	10.00	368.00	124.00	0.00	1713.07
Kerala	0.00	2.84	0.01	138.80	26694.00	36.83	80059.00	198.00	499.90	675.53
Madhya Pradesh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maharashtra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manipur	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meghalaya	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nagaland	0.00	0.08	0.00	1.72	982.00	29.89	2680.00	0.00	1.80	33.41
Odisha	0.00	0.39	0.05	0.00	5857.00	0.22	34.00	24.00	0.00	0.22
Punjab	0.16	0.01	0.11	136.46	36206.00	25.04	954.00	44.00	195.42	356.92
Rajasthan	0.07	0.23	0.04	22.30	13108.00	3.86	157.00	14.00	60.86	87.02
Sikkim	0.00	0.20	0.00	0.00	34.00	0.00	106.00	16.00	0.00	156.2*
Tamil Nadu	0.00	0.00	0.00	0.00	1314.00	0.00	258.00	92.00	0.00	0.00
Tripura	0.00	0.02	0.00	2.16	3338.00	1.85	0.00	4.00	0.20	4.21
Uttar Pradesh	0.56	3.54	0.35	0.00	79600.00	0.00	550.00	380.00	0.00	3259.53*
Uttarakhand	0.00	0.11	0.00	0.00	4726.00	0.00	9470.00	580.00	0.00	0.00
West Bengal	0.00	3.11	0.18	533.95	233336.00	178.97	28311.00	41.00	13.58	726.50
Andaman & Nicobar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delhi	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
Lakshadweep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Puducherry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**31.57**	**21.16**	**316.89**	**3214.99**	**662495.00**	**526.12**	**156855.00**	**2137.00**	**3938.12**	**11094.96**

Sources: Central Water Commission (FFM Directorate) (as per the publication -Water Related Statistics-2015)

Nil: 0.000 * Breakdown of total damage is not available

Table 5.5.6: 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
2011-12	1600	9126	876168	18.87
2012-13	984	24345	671734	15.34
2013-14	5844	102950	1209533	63.74
2014-15	1696	92180	725390	26.86
2015-16#	1192	50075	1230791	32.00

Source: Ministry of Home Affairs (MHA) # As on 24.11.2015

Table 5.5.7: 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	**Chhattisgarh**			
	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	**a**			
	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 : Department of Land Resources, Ministry of Rural Development

CHAPTER SIX

WATER

6.1 **Water**

6.1.1 Water as a resource, is critical to sustainable development. Besides meetting basic human needs, 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 billion cubic meter. and the average flow in the river system is estimated to be 1869 cubic km. Because of concentration of rains in the three monsoon months, the utilizable quantum of surface water is about 690 BCM. 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

Table 6.1.2 : Water Availability in India

Sl.No	Items	Quanitity
1	**2**	**3**
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
	(iii) Per Capita Water Availability (2015) in cubic metres	1720.29Cu.M
4	Estimated Utilizable Water Resources	1123 BCM
	(i)Surface Water Resources	690 BCM
	(ii) Ground Water Resources	433 BCM

Source: Central Water Commission-2015
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 September, provide the majority of India's rainfall. The rainfall in the country is mostly confined to four monsoon months between June to September during which almost 80% of the total rainfall takes place.

The table 6.2.1 gives the detailed information about the year-wise monsoon performance (June- Sept.) in the Country.

Table 6.2.1 Monsoon performance 1998-2014

(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
16	2013	16	14	6	73	106
17	2014	24	1	11	54	88

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%

For the country as a whole, the rainfall for the season (June -September) was 88% of its long period average (LPA). Out of the total 36 meteorological subdivisions, only one subdivision received excess season rainfall, 24 subdivisions received normal season rainfall and the remaining 11 subdivisions received deficient/scanty rainfall.

As it is evident from the chart 6.2.1, the rainfall in India fluctuated considerably in the past.

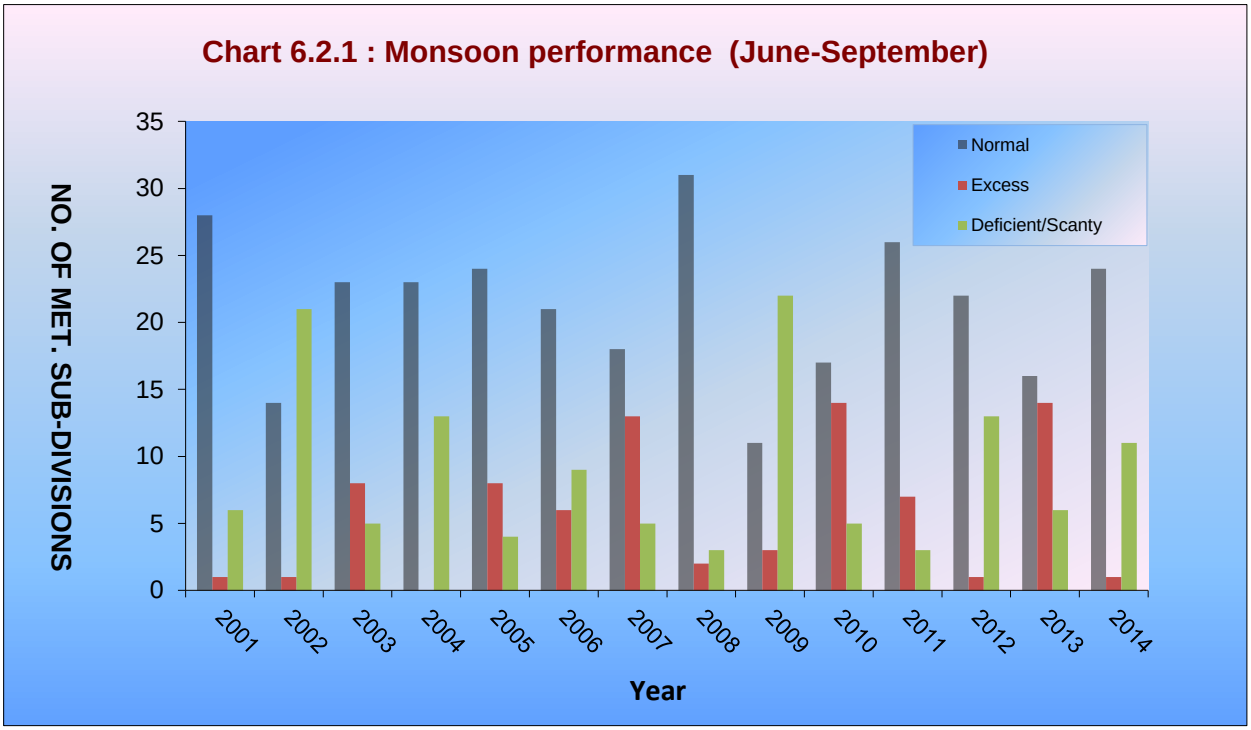


Table 6.2.2 : Sub divisional actual and normal rainfall

(Millimetre)

Sl. No.	Meteorological Sub-divisions	2002		2004		2006		2008		2009		2010		2011		2012		2013		2014	
		Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal
1	2	3	4	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	2508.1	3060.7	2447.9	3001.8	3335.2	3001.8	2614.3	3001.8	3147.8	2980.1	3833.6	2926.3	3515.9	2926.3	3757.8	2926.3	2622.4	2926.3
2	Arunachal Pradesh	2559.6	3329.8	2922.6	2927.5	2107.9	2935.9	2470.5	2935.9	2163.2	2935.9	2397.6	2785.9	1923.4	2933.7	2760.9	2933.7	2042.9	2933.7	2403.2	2933.7
3	Assam and Meghalaya	2530.7	3163.1	3055.7	2792.9	1777.5	2817.1	2271.1	2802.2	1863.0	2802.0	2499.7	2897.7	1758.5	2624.9	2321.3	2624.9	1811.5	2624.9	2171.9	2624.9
4	Nagaland, Mizoram, Manipur & Tripura	1960.8	2154.1	2075.1	1969.5	1561.5	1920.6	1481.7	1920.6	1446.5	1920.0	2023.3	2142.9	1655.1	2278.0	1669.2	2278.0	1557.2	2278.0	1599.9	2278
5	Sub-Himalayan West Bengal & Sikkim	2820.1	2683.6	2768.3	2644.9	2304.5	2617.0	2618.9	2617.0	2275.4	2617.0	2844.0	2603.8	2359.9	2708.9	2630.2	2708.9	2406.1	2708.9	2322.6	2708.9
6	Gangetic West Bengal	1597.6	1518.7	1488.0	1494.1	1587.2	1494.6	1580.6	1494.6	1322.5	1494.6	1081.4	1493.4	1671.7	1527.2	1258.3	1527.2	1804.7	1527.2	1241.7	1527.2
7	Odisha	1166.5	1415.8	1337.7	1459.1	1810.0	1472.5	1600.4	1472.5	1397.7	1472.5	1332.3	1478.6	1300.4	1460.5	1430.2	1460.5	1632.4	1460.5	1536.9	1460.5
8	Jharkhand	1315.5	1293.3	1157.8	1328.8	1356.0	1321.9	1200.6	1317.3	1061.1	1320.1	806.1	1307.4	1274.7	1296.3	1102.0	1296.3	1253.6	1296.3	1156.6	1296.3
9	Bihar	1193.3	1186.7	1077.0	1230.6	1000.4	1233.2	1306.7	1230.8	993.6	1230.8	943.4	1213.7	1217.3	1205.6	924.2	1205.6	1069.9	1205.6	1061.0	1205.6
10	East Uttar Pradesh	795.8	1013.3	849.3	1038.3	771.4	1041.9	1121.9	1041.9	711.1	1041.9	758.5	1035.9	874.7	1018.6	853.6	1018.6	1042.1	1018.6	701.4	1018.6
11	West Uttar Pradesh	729.0	880.5	647.2	887.1	510.6	888.8	840.5	888.8	552.5	888.8	818.9	885.0	775.9	886.2	582.8	886.2	925.9	886.2	487.0	886.2
12	Uttarakhand	2188.5	1556.0	1605.7	1553.8	1264.8	1582.6	1298.6	1582.6	1076.0	1582.6	1863.9	1562.8	1708.3	1580.9	1309.7	1580.9	1735.4	1580.9	1287.4	1580.9
13	Haryana, Chandigarh & Delhi	488.7	618.7	524.0	570.9	377.0	567.5	632.9	567.5	350.5	567.5	597.7	562.6	433.2	562.8	313.6	562.8	461.3	562.8	305.6	562.8
14	Punjab	446.1	643.2	445.1	649.1	544.7	648.8	708.9	648.8	403.9	648.8	502.1	640.4	533.5	635.9	338.9	635.9	586.6	635.9	382.7	635.9
15	Himachal Pradesh	1075.5	1370.7	766.4	1252.3	895.8	1323.8	1049.0	1323.8	805.6	1323.8	1220.2	1323.8	1051.7	1373.9	1035.1	1373.9	1216.9	1373.9	1019.9	1373.9
16	Jammu & Kashmir	750.5	900.5	919.5	1124.5	1477.3	1246.0	1087.2	1246.0	872.7	1246.0	1240.7	1227.6	1122.2	1205.3	1116.5	1205.3	1193.8	1205.3	1278.4	1205.3
17	West Rajasthan	118.9	330.7	190.4	298.9	362.4	297.0	309.6	297.0	166.6	297.0	473.2	295.7	426.6	299.2	318.3	299.3	389.4	299.3	302.4	299.2
18	East Rajasthan	307.1	703.2	627.5	677.7	711.7	678.2	627.1	678.2	460.6	678.2	741.5	684.7	849.1	671.3	695.8	671.3	834.9	671.3	683.0	671.3
19	West Madhya Pradesh	807.8	991.2	839.6	987.8	1140.5	987.9	747.8	987.9	797.2	987.9	818.2	987.8	1062.2	956.3	1012.3	956.3	1396.3	956.3	864.9	956.3
20	East Madhya Pradesh	1075.7	1254.0	946.8	1227.1	1007.7	1229.3	989.7	1229.3	910.5	1229.3	966.6	1219.3	1220.7	1169.4	1097.0	1169.4	1521.9	1169.4	924.1	1169.4
21	Gujarat Region	705.4	1002.6	1004.2	977.8	1458.1	979.1	932.4	979.0	649.6	979.1	1059.7	954.1	903.9	943.4	652.0	943.4	1250.5	943.4	792.2	943.4
22	Saurashtra, Kutch	402.7	570.7	498.5	517.4	702.9	518.3	572.3	518.3	616.9	518.3	1073.9	519.2	725.1	507.0	315.2	507.0	823.9	507.0	467.8	507
23	Konkan & Goa	2324.2	2964.4	2911.6	2981.7	3379.0	2978.5	3051.5	2778.5	2738.2	2978.5	3749.0	2975.4	3842.6	3100.2	2993.9	3100.5	3684.9	3100.5	2913.2	3100.2
24	Madhya Maharashtra	711.6	926.3	883.3	852.7	1180.5	850.4	858.9	850.4	918.1	850.4	1006.1	849.7	842.9	876.8	664.2	876.8	962.4	876.8	838.0	876.8
25	Marathwada	704.7	803.5	676.4	838.8	819.2	840.4	651.0	840.4	687.5	840.4	1039.3	845.9	685.7	821.6	538.4	821.6	888	821.6	548.9	821.6
26	Vidarbha	1045.4	1074.4	796.3	1104.7	1276.5	1104.6	855.7	1104.6	804.1	1104.6	1355.2	1103.7	958.5	1084.5	1090.3	1084.5	1520	1084.5	919.2	1084.5
27	Chhattisgarh	--	--	1174.3	1362.5	1231.4	1368.4	1144.0	1368.4	859.7	1368.4	1145.7	1363.8	1313.0	1290.7	1366.8	1290.7	1418.3	1290.7	1274.7	1290.7
28	Coastal Andhra Pradesh	757.3	1000.7	933.6	1012.7	1067.2	1011.2	1057.2	1011.2	745.2	1011.2	1614.0	1011.6	835.5	1024.2	1183.4	1024.2	1081.8	1024.2	777.4	1024.2
29	Telangana	767.7	945.7	761.7	942.3	1044.5	942.7	998.1	942.7	665.8	942.7	1247.6	941.7	739.6	942.6	972.8	942.6	1272.1	942.6	685.6	942.6
30	Rayalaseema	504.4	695.9	655.9	679.5	608.9	677.9	795.0	677.9	672.8	677.9	915.8	677.8	642.9	706.1	665.3	706.1	677.2	706.1	523.4	706.1
31	Tamilnadu & Puducherry	723.4	918.6	1104.5	911.4	911.8	911.6	1195.7	910.3	934.3	911.3	1118.8	908.7	1013.2	914.4	709.6	914.4	741.9	914.4	913.2	914.4
32	Coastal Karnataka	2920.9	3583.4	3061.6	3620.2	3865.9	3613.2	3050.9	3613.3	3798.2	3613.2	4007.6	3612.8	4146.4	3526.3	3395.0	3526.3	4044.6	3526.3	3563.9	3526.3
33	North Interior Karnataka	556.3	706.6	644.6	725.6	627.9	720.1	700.5	720.1	977.1	720.1	857.3	719.9	620.1	740.3	529.4	740.3	723.2	740.3	756.8	740.3
34	South Interior Karnataka	869.1	1305.8	1028.3	1018.4	951.0	1014.8	1105.7	1014.8	1177.3	1014.8	1308.7	1029.5	1040.6	1019.2	832.1	1019.2	1110.7	1019.2	1184.1	1019.2
35	Kerala	2457.3	2863.7	2977.3	3158.6	3297.8	3097.5	2534.1	3097.5	2816.0	3097.5	3141.9	3094.6	3041.2	2924.3	2187.5	2923.4	3255.4	2923.4	3046.4	2924.3
36	Lakshadweep	1034.4	1579.5	2096.8	1583.4	1695.4	1584.7	1726.4	1584.7	1572.5	1584.7	1725.4	1584.7	1531.4	1600.0	1433.2	1600.0	1426.3	1600.0	1395.0	1600

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

(01.10.2015 to 31.12.2015)

Sl. NO.	STATE/UT	Excess	Normal	Deficient	Scanty	No Rainfall	No data	Total
1	2	3	4	5	6	7	8	9
1	Andaman & Nicobar Islands	0	2	1	0	0	0	3
2	Arunachal Pradesh	0	1	6	4	0	5	16
3	Assam	1	6	11	8	0	1	27
4	Meghalaya	0	0	3	3	0	1	7
5	Nagaland	0	1	2	1	0	7	11
6	Manipur	0	0	2	1	0	6	9
7	Mizoram	0	0	2	0	0	7	9
8	Tripura	0	0	3	1	0	0	4
9	Sikkim	0	1	2	1	0	0	4
10	West Bengal	0	0	4	14	1	0	19
11	Odisha	0	1	5	24	0	0	30
12	Jharkhand	0	0	6	18	0	0	24
13	Bihar	0	0	2	26	10	0	38
14	Uttar Pradesh	0	1	16	51	3	0	71
15	Uttarakhand	0	0	3	10	0	0	13
16	Haryana	0	0	2	17	2	0	21
17	Chandigarh	0	0	0	1	0	0	1
18	Delhi	0	0	0	8	1	0	9
19	Punjab	0	0	2	15	3	0	20
20	Himachal Pradesh	0	2	7	3	0	0	12
21	Jammu & Kashmir	11	3	2	1	0	5	22
22	Rajasthan	1	4	3	12	13	0	33
23	Madhya Pradesh	3	4	16	24	3	0	50
24	Gujarat	0	0	1	17	8	0	26
25	D. & N. Haveli & Daman	0	0	0	1	0	0	1
26	Diu	0	0	0	1	1	0	2
27	Goa	0	0	2	0	0	0	2
28	Maharashtra	0	4	9	22	0	0	35
29	Chhattisgarh	1	0	1	15	1	0	18
30	Andhra Pradesh	4	0	8	1	0	0	13
31	Telangana	0	0	1	9	0	0	10
32	Tamil Nadu	21	11	0	0	0	0	32
33	Puducherry	2	0	0	0	0	2	4
34	Karnataka	8	7	12	3	0	0	30
35	Kerala	9	5	0	0	0	0	14
36	Lakshadweep	1	0	0	0	0	0	1
Total		**62**	**53**	**134**	**312**	**46**	**34**	**641**
Categorywise distribution of districts out of the 607 districts whose data was received		**10%**	**9%**	**22%**	**51%**	**8%**		

Source : India Meteorological Department, Ministry of Earth Sciences

Table 6.2.4 : List of districts with deficient or scanty rainfall

March-May 2015

MET. Sub Division	Districts	MET. Sub Division	Districts
1	2	1	2
Arunachal Pradesh	Changlang	**Bihar**	Jahanabad
	Dibang Valley		Monghyr
	East Kameng		Nawada
	Tirap		Patna
Assam & Meghalaya	Jaintia Hills		Saharsa
	Karimganj		Sheohar
	N.C. Hills		Sitamarhi
	Nagaon	**East Uttar Pradesh**	Kushi Nagar
Nagaland, Mizoram, Manipur and Tripura	Lungle	**Jammu and Kashmir**	Ladakh (Leh)
	Mamit	**Gujarat**	Panchmahal
	Saiha		Tapi
	Phek	**Maharashtra**	Mumbai Suburban
	Wokha		
	Chandel	**Dadra & Nagar Haveli Daman & Diu**	Jamnagar
	Imphal East		Surendranagar
	Thoubal	**Coastal Andhra Pradesh**	East Godavari
	Senapati		Vishakapatnam
	Kolasib		Vizianagaram
Sub-Himalayan West Bengal & Sikkim	West Sikkim		West Godavari
	South Dinajpur		Guntur
Odisha	Angul		Krishna
	Cuttack		Prakasam
	Jagatsinghpur		Srikakulam
	Balasore	**Jharkhand**	Chatra
	Jharsuguda		Simdega
	Kendrapara	**Chhattisgarh**	Kowardha
	Bolangir		Jashpur
	Boughgarh		Narayanpur
	Gajapati		Raigarh
	Ganjam	**Gangetic West Bengal**	Hooghly
	Kandhamal		South 24 Parganas
	Keonjhargarh		
	Khurda		
	Sundargarh		

Source: Indian Meteorological Department

6.2.2 The record of rainfall received over the years - Meterological Sub-division 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 and districts 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	1995	33	2
2	1996	32	3
3	1997	32	3
4	1998	33	2
5	1999	28	7
6	2000	28	7
7	2001	29	6
8	2002	15	21
9	2003	31	5
10	2004	23	13
11	2005	32	4
12	2006	27	9
13	2007	31	5
14	2008	33	3
15	2009	14	22
16	2010	31	5
17	2011	33	3
18	2012	23	13
19	2013	30	6
20	2014	25	11

Source : India Meteorological Department - Ministry of Earth Sciences

* Updated values for the years 1996 yo 2014 as per the available records at HQ.

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 can replenish 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	65	34
11	2001	68	32
12	2002	37	56
13	2003	76	25
14	2004	57	45
15	2005	72	28
16	2006	60	40
17	2007	73	27
18	2008	76	24
19	2009	41	59
20	2010	69	31
21	2011	76	24
22	2012	59	41
23	2013	72	28
24	2014	54	46
25	2015	51	49

Source : India Meteorological Department, Ministry of Earth Sciences.

6.3 Surface Water- River and Other Inland Water

6.3.1 Inland Water resources of the country are classified as rivers and canals; reservoirs; tanks & ponds; beels; oxbow lakes; derelict water; and brackish water. Approximately 74 Lakh Hectares of water bodies are available in the country. The state wise details of various types of inland water resources are given in table 6.3.1.

Table 6.3.1 : 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	2.99	0.72	-	0.12	3.83
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	1.23	1.80	4.30	9.89
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	-	-	NEG	-	0.33	0.34
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		**195095**	**29.26**	**24.33**	**7.98**	**11.55**	**73.13**

Source : Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture (Annual Report 2014-15)

NEG: Negligible

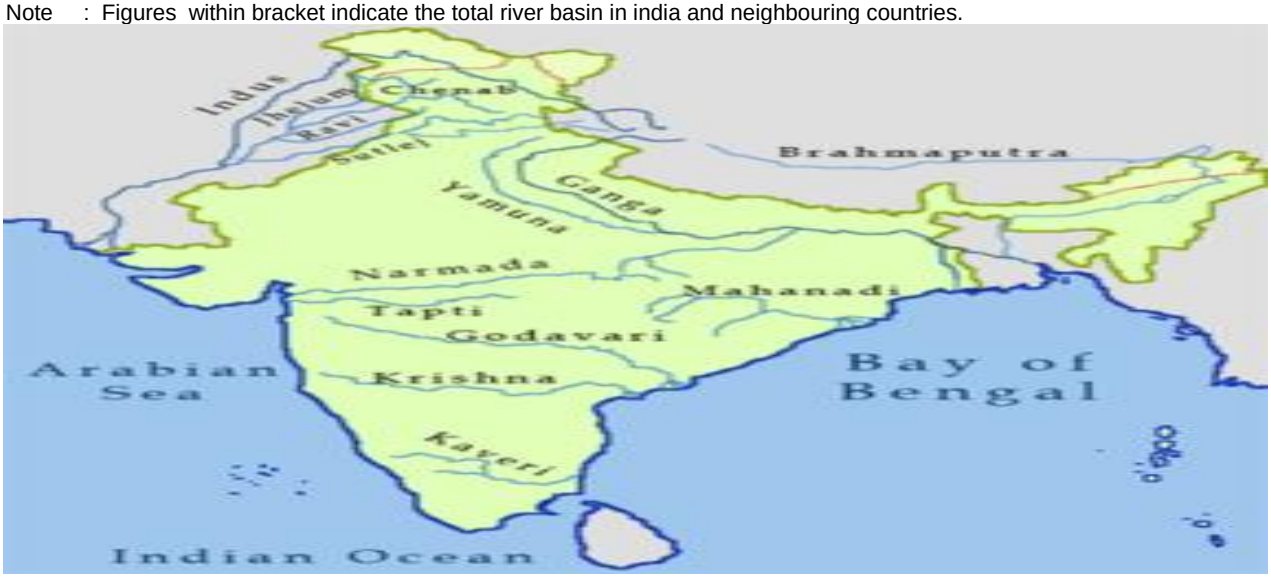
6.3.2 India is blessed with many rivers. Rivers are the lifeline of majority of population in cities, Towns and villages. Water resource development is a must for economic prosperity. Twelve of them are classified as major rivers i.e. rivers with catchment area more than 20,000 sq.kms. each. These account for total catchment area of 252.8 million hectare (M.Ha). Of the major rivers, the Ganga - Brahmaputra Meghana system is the biggest with catchment area of about 110 M.Ha which is more than 43 percent of the catchment area of all the major rivers in the country. The details on catchment area are presented in Table 6.3.2.

Table 6.3.2 : 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 : Ministry of Water Resource

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



6.3.3 The water resources potential of the country which occurs as natural run off in the rivers is estimated as about 1869 BCM, considering both surface and ground water as one system. The details are exhibited in Table 6.3.3.

Table 6.3.3: Water resources potential in river basins of India

(Unit :BCM)

Sl.No.	River Basin	Catchment Area (Sq. Km.)	Average Annual Potential in the River	Estimated Utilisable flow (excluding ground water)
1	2	3	4	5
1	Indus (Up to Border)	321289	73.31	46.00
2	a) Ganga	861452	525.02	250.00
	b) Brahmaputra	194413	537.24	24.00
	c) Barak & Others	41723	48.36	
3	Godavari	312812	110.54	76.30
4	Krishna	258948	78.12	58.00
5	Cauvery	81155	21.36	19.00
6	Subernarekha*	29196	12.37	6.80
7	Brahamani & Baitarni	51822	28.48	18.30
8	Mahanadi	141589	66.88	50.00
9	Pennar	55213	6.32	6.90
10	Mahi	34842	11.02	3.10
11	Sabarmati	21674	3.81	1.90
12	Narmada	98796	45.64	34.50
13	Tapi	65145	14.88	14.50
14	West Flowing Rivers From Tapi to Tadri	55940	87.41	11.90
15	West Flowing Rivers From Tadri to Kanyakumari	56177	113.53	24.30
16	East Flowing Rivers between Mahanadi & Pennar	86643	22.52	13.10
17	East Flowing Rivers between Pennar & Kanyakumari	100139	16.46	16.50
18	West Flowing Rivers of Kutch and Saurashtra including Luni	321851	15.10	15.00
19	Area of Inland drainage in Rajasthan	-	Negl	NA
20	Minor River Draining into Myanmar (Burma) & Bangladesh	36202	31.00	NA
	TOTAL		**1869.37**	**690.32**

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.

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 flow and water discharge in major river basins of India is presented in table 6.3.4 and table 6.3.5

6.3.5 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. Table 6.3.6 gives the details of sediment load in Major river basins in 2011-12

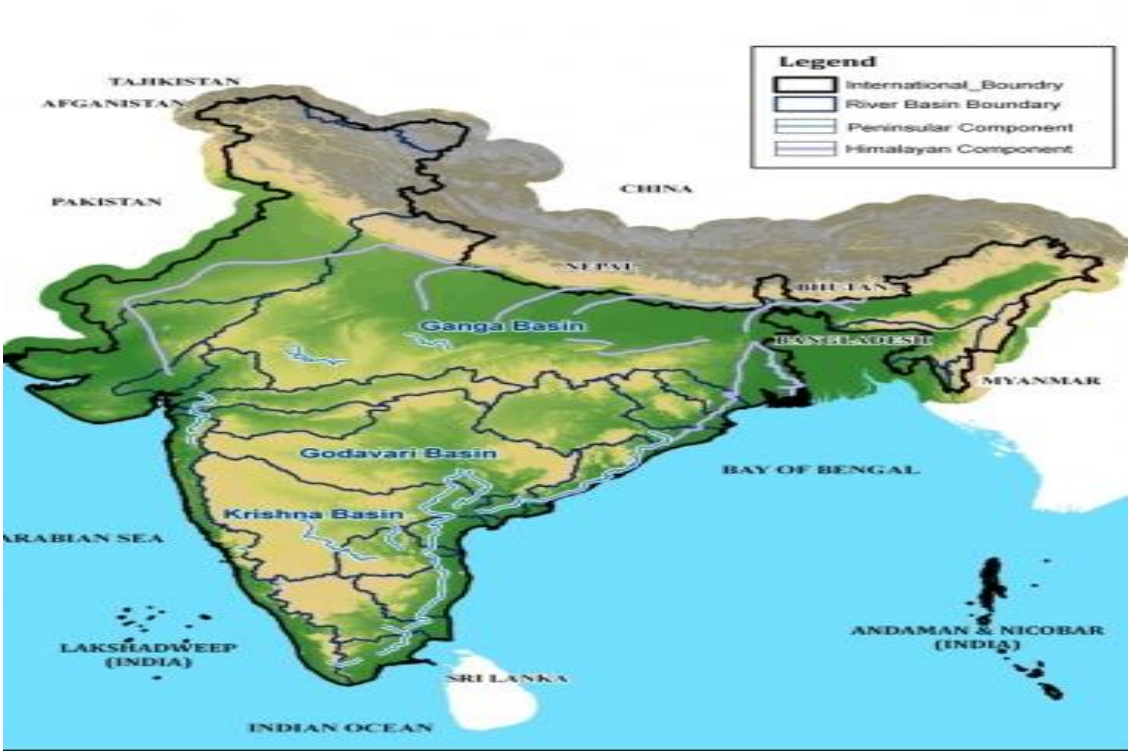


Table 6.3.4 : Water flow in stream

(MCM)

Sl. No.	Name of Basin/River	Average#			Minimum#			Maximum#		
		Monsoon	Non-Monsoon	Annual	Monsoon	Non-Monsoon	Annual	Monsoon	Non-Monsoon	Annual
1	2	3	4	5	6	7	8	9	10	11
1	Mahanadii	6419	410	6788	292	0	305	39915	5311	45227
2	Subernekha etc.	5355	319	5048	506	27	506	12681	1194	13876
3	Brahmani	10002	805	10807	831	68	899	18488	3428	21915
4	Rushikulia etc.	1333	113	1446	833	36	873	1797	213	1955
5	Godavari	6495	446	6941	62	0	62	50737	5171	55818
6	Krishna	3144	214	3358	0	0	0	13437	2257	14134
7	Cauveri	1363	320	1682	2	0	2	7154	2667	9820
8	East Flowing Rivers	220	85	305	0	0	0	2034	414	2448
9	West Flowing Rivers	2370	212	2583	4	0	4	11930	1513	12152
10	Tapi	3444	7	3452	600	0	601	6202	36	6202
11	Narmada	7626	985	9203	415	0	415	33194	4428	44849
12	Mahi, etc	947	70	1018	0	0	0	4787	732	5014

Sources :CWC, Intergrated Hydrological Data Book, 2015

Average, minimum and manimum values of respective sites of each Basin/River

Table 6.3.5 : 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	19	1971- 2012	Basantpur (26874.00)	Andhiyarkore (694.64)	Tikarpara (131.30)	Andhiyarkore (0.00)	694.64 to 26874.00	0.00 to 131.30
2	Brahmani	6	1972-2012	Jaraikela (12539.00)	Altuma (892.68)	Jaraikela (25.20)	Tilga (0.00)	892.68 to 12539.00	0.00 to 25.20
3	Godavari	34	1964-2012	Koida (70792.94)	Kosagumda (893.53)	Koida (85.10)	Ambabal (0.00)	893.53 to 70792.94	0.00 to 85.10
4	Krishna	36	1965- 2012	Bawapuram (36303.25)	Hoovinahole (111.90)	Vijaywada (13.52)	Arjunwad (0.00)	111.90 to 36303.25	0.00 to 13.52
5	Cauvery	34	2011-2012	Kollegal (2348.8)	Thoppur (0.663)	Kodumudi (40.30)	Bendrehalli (0.00)	0.663 to 2348.8	0.00 to 40.30
6	West Flowing River	29	2011-2012	Bentawal (2709.00)	Vandiperiyar (52.60)	Bentawal (123.10)	Addoor (0.00)	52.60 to 2709.00	0.00 to 123.10
7	Tapi	5	1972-2012	Burhanpur (26683.00)	Gopalkheda (1872.00)	Burhanpur (0.00)	Burhanpur (0.00)	1872.00 to 26683.00	0.00 to 0.00
8	Narmada	27	1971- 2012	Garudeswar (60642)	Dhulsar (616)	Garudeswar (55.00)	Chandawada (0.00)	616.00 to 60642.00	0.00 to 55.00
9	Mahi, Sabarmati & others	22	1970- 2012	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, 2015, CWC.

Table 6.3.6 : Sediment load in major river basins - 2011-2012

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	Kantamal (5.578)	Rajim (0.002)	Tikarapara (0.031)	Manendragarh (0.000)	Kantamal (5.578)	Rajim (0.002)	0.002 to 5.578	0.000 to 0.031	0.002 to 5.578
2	Brahmani	Panposh (18.823)	Tilga (0.721)	Jenapur (0.270)	Tilga (0.001)	Panposh (18.837)	Tilga (0.722)	0.721 to 18.823	0.001 to 0.270	0.722 to 18.837
3	Godavari	Perur (59.054)	Dhalegaon (0.034)	Konta (0.174)	Pathaguden (0.000)	Perur (59.062)	Dhalegaon (0.034)	0.034 to 59.054	0.000 to 0.027	0.034 to 59.062
4	Krishna	Kurundwad (1.987)	Byladahalli (0.804)	Wadenpalli (0.039)	Takali (0.000)	Kurundwad (1.987)	Byladahalli (0.005)	0.804 to 1.987	0.000 to 0.039	0.005 to 1.987
5	Cauvery	T. Narsinpur (0.251)	Thengudi (0.001)	Kudimodi (0.059)	Thengidi (0.002)	T. Narsinpur (0.263)	Thengudi (0.002)	0.001 to 0.251	0.002 to 0.059	0.002 to 0.263
6	West Flowing River	Kumbidi (0.401)	Karathodu (0.000)	Ramamanglam (0.013)	Kalampur (0.000)	Kumbidi (0.405)	Karathodu (0.00)	0.000 to0.255	0.000 to 0.013	0.00 to 0.256
7	Tapi	Sarankheda (5.232)	Yearli (1.281)	Burhanpur (0.000)	Burhanpur (0.000)	Sarankheda (5.232)	Yearli (1.281)	1.281 to 5.232	0.000 to 0.000	1.281 to 5.232
8	Narmada	Sandia (37.841)	Gurudeshwar (0.084)	Hoshangabad (0.122)	Chandwada (0.000)	Sandia (38.338)	Gurudeshwar (0.084)	0.084 to 37.841	0.000 to 0.122	0.084 to 38.338
9	Mahi, Sabarmati & Others	Durvesh (2.257)	Ganod (0.007)	Durvesh (0.001)	Derol Bridge (0.000)	Durvesh (2.258)	Ganod (0.007)	0.007 to 2.257	0.000 to 0.001	0.007 to 2.258

Source :CWC, Integrated Hydrological Data Book (Non- Classified River Basin)2015

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 6.4.1 : Ground water resources — Unit:BCM/Yr

Sr. No.	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	15
1	Andhra Pradesh	17.25	6.29	5.38	6.97	**35.89**	3.32	32.57	13.18	1.33	**14.51**	2.81	16.97	45
2	Arunachal Pradesh	3.36	0.00	1.15	0.00	**4.51**	0.45	4.06	0.00	0.00	**0.00**	0.01	4.05	0.08
3	Assam	17.90	1.64	8.64	0.34	**28.52**	2.73	25.79	2.86	0.64	**3.50**	0.78	22.14	14
4	Bihar	19.54	3.95	3.40	2.44	**29.33**	2.47	26.86	10.25	1.70	**11.95**	2.51	14.10	44
5	Chhattisgarh	9.90	0.70	0.87	0.94	**12.41**	0.79	11.63	3.43	0.62	**4.05**	0.76	7.44	35
6	Delhi	0.11	0.10	0.02	0.08	**0.31**	0.02	0.29	0.14	0.25	**0.39**	0.26	0.01	137
7	Goa	0.16	0.01	0.01	0.07	**0.25**	0.10	0.15	0.01	0.03	**0.04**	0.04	0.10	28
8	Gujarat	12.79	2.55	0.00	3.23	**18.57**	0.98	17.59	10.75	1.11	**11.86**	1.48	5.87	67
9	Haryana	3.65	2.77	1.01	3.35	**10.78**	0.99	9.79	12.35	0.71	**13.06**	0.76	-3.31	133
10	Himachal Pradesh	0.39	0.02	0.10	0.05	**0.56**	0.03	0.53	0.25	0.13	**0.38**	0.13	0.15	71
11	Jammu & Kashmir	1.45	2.06	0.36	0.37	**4.24**	0.43	3.83	0.20	0.61	**0.81**	0.76	2.87	21
12	Jharkhand	4.75	0.13	1.06	0.36	**6.30**	0.55	5.76	1.31	0.55	**1.86**	0.76	3.69	32
13	Karnataka	6.81	4.17	2.67	3.38	**17.03**	2.22	14.81	8.59	0.82	**9.41**	1.06	6.53	64
14	Kerala	4.85	0.06	0.63	1.15	**6.69**	0.61	6.07	1.30	1.53	**2.83**	1.71	3.07	47
15	Madhya Pradesh	28.22	1.17	0.79	4.87	**35.05**	1.75	33.29	17.48	1.35	**18.83**	1.91	13.90	57
16	Maharashtra	22.36	1.68	1.84	8.07	**33.95**	1.80	32.15	16.15	1.03	**17.18**	1.97	14.48	53
17	Manipur	0.23	0.01	0.19	0.01	**0.44**	0.04	0.40	0.00	0.00	**0.00**	0.05	0.35	1.02
18	Meghalaya	1.68	0.03	0.07	0.01	**1.79**	0.18	1.60	0.00	0.00	**0.00**	0.23	1.37	0.08
19	Mizoram	0.03	neglible	0.01	neglible	**0.04**	0.00	0.03	0.00	0.00	**0.00**	0.00	0.03	3.52
20	Nagaland	0.40	neglible	0.21	neglible	**0.61**	0.06	0.55	0.00	0.03	**0.03**	0.04	0.51	6.13
21	Odisha	11.29	2.53	1.33	2.63	**17.78**	1.09	16.69	3.81	0.92	**4.73**	1.24	11.64	28
22	Punjab	5.82	10.64	1.33	4.74	**22.53**	2.21	20.32	34.17	0.71	**34.88**	0.98	-14.83	172
23	Rajasthan	8.78	0.68	0.28	2.20	**11.94**	1.11	10.83	13.13	1.71	**14.84**	1.89	0.91	137
24	Sikkim	-	-	-	-	**-**	-	0.04	0.00	0.01	**0.01**	0.01	0.03	26
25	Tamil Nadu	7.38	10.28	1.69	2.18	**21.53**	2.15	19.38	13.17	1.76	**14.93**	1.82	4.39	77
26	Tripura	1.25	0.00	0.74	0.60	**2.59**	0.23	2.36	0.09	0.07	**0.16**	0.20	2.07	7
27	Uttar Pradesh	42.13	11.57	5.15	18.34	**77.19**	5.53	71.66	48.74	4.04	**52.78**	6.55	19.64	74
28	Uttarakhand	1.09	0.26	0.20	0.49	**2.04**	0.04	2.00	1.10	0.03	**1.13**	0.90	0.80	57
29	West Bengal	18.53	5.72	1.42	3.58	**29.25**	2.67	26.58	9.72	0.97	**10.69**	1.48	15.38	40
	TotalStates	**252.10**	**69.02**	**40.55**	**70.45**	**432.11**	**34.55**	**397.60**	**222.18**	**22.67**	**244.85**	**33.10**	**154.35**	**62**
30	Andaman & Nicobar	0.262	Nil	0.046	Nil	**0.308**	0.022	0.286	0.001	0.012	0.013	0.014	0.272	4.44
31	Chandigarh	0.015	0.001	0.005	0.001	**0.022**	0.002	0.019	0.000	0.000	0.000	0.000	0.000	0
32	Dadar & Nagar Haveli	0.043	0.003	0.009	0.007	**0.062**	0.003	0.059	0.007	0.006	0.013	0.010	0.042	22
33	Daman & Diu	0.014	0.002	0.000	0.002	**0.018**	0.001	0.017	0.014	0.002	0.016	0.003	0.000	97
34	Lakshadweep	0.000	0.000	0.000	0.000	**0.000**	0.007	0.004	0.000	0.002	0.002	0.000	0.000	67
35	Puducherry	0.089	0.060	0.008	0.032	**0.189**	0.019	0.170	0.124	0.029	0.153	0.032	0.057	90
	Union Territories	**0.42**	**0.07**	**0.07**	**0.04**	**0.60**	**0.05**	**0.55**	**0.15**	**0.05**	**0.20**	**0.06**	**0.37**	**36**
	Grand Total	**252.52**	**69.08**	**40.62**	**70.49**	**432.71**	**34.60**	**398.16**	**222.33**	**22.72**	**245.04**	**33.16**	**154.72**	**62**

BCM: Billion Cubic Meter.

Source: Central Ground Water Board, Dynamic Ground Water Resources of India, (as on 31st March, 2011)

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 6.4.2: 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 Rivers are also used 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 According to this concept, outnof several used water body is put to, the use which demands highest quality is termed as "designated best use" and accordingly the water body is designated. Primary water quality criteria for different uses have been identified. A summary of the use based clasification is given in Table 6.5.1.

Table 6.5.1 : Use based classification of surface waters in India

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 20oC 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 20oC 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 20oC 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 - 2012, Central Pollution Control Board

6.5.3 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. The Biological water quality criteria is shown in table 6.5.3.

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

6.5.4 The tables 6.5.4 and 6.5.5 present the water quality in major Indian rivers and selected major river basins. Table 6.5.6 presents the river basin wise distribution of water quality monitoring centres. Table 6.5.7 presents the state-wise river water quality.

Table 6.5.3: Water Quality in Indian Rivers – 2002 to 2012										
Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(^{o}C) (Min-Max)	pH	Conductivity(µ mhos/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^{5}	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^{5}	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}
		61	**2012**	**8-35**	**5.9-9.1**	**18-6220**	**0.6-14.1**	**0.7-27**	**30-5x10^{6}**	**21-3x10^{6}**
Yamuna	1376	23	2002	3-34	6.7-9.8	56-1959	0.1-22.7	1.0 – 36	27-26.3x10^{6}	11-17.2x10^{5}
		23	2003	2-38	6.6-10	45-3500	0.3-22.8	1-58	110-171x10^{7}	40-203x10^{6}
		23	2004	7-35	6.8-9	76-2150	0.3-19.5	1-40	21-1103x10^{6}	18-62x10^{6}
		23	2005	11-37	6.8-9.1	90-2290	0.5-17.3	0.8-59	14-307x10^{6}	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^{6}	11 -109x10^{5}
		27	2009	5-35	7.0 - 8.8	80 - 3040	0.0 - 17.9	0.2 - 103	4 - 23 x10^{9}	9 - 21 x10^{8}
		27	2010	5-35	6.1-9.4	100-2220	0.0-21.1	08-84	13 - 39x10^{7}	9 - 29x10^{6}
		27	2011	4-38	6.9-8.8	60-1905	0-17	0.2-41	10-16 x10^{7}	4-11 x10^{8}
		27	**2012**	**3.2-35**	**6.1-8.9**	**52-1110**	**0.0-11.4**	**0.8-113**	**12-20x10^{8}**	**6-20x10^{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
		11	**2012**	**23-32**	**7.43-8.6**	**192-1276**	**4.41-20**	**0.3-6**	**4-210**	**1-21**

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(^{o}C)	pH	Conductivity(µ mhos/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- 39400	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
		14	**2012**	**20-43**	**7.02-8.8**	**125-39720**	**3.3-7.7**	**0.8-18**	**26-1600**	**1-50**
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
		26	**2012**	**17-32**	**7.1-8.8**	**206-710**	**5.8-13**	**0.1-7.9**	**5-900**	**3-30**
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
		35	**2012**	**17-38**	**6.51-9.3**	**113-2985**	**0.0-12.6**	**0.1-40**	**3-2700**	**2-1600**

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(^{o}C)	pH	Conductivity(µ mhos/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 10^3	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 10^3	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
		26	**2012**	**17-36**	**6.15-8.8**	**77-14140**	**0.0-15**	**0.0-24**	**50-2700**	**2-900**
Cauvery	800	20	2002	21-37	2.0-9.2	31-53100	0.1-12.6	0.1 – 26.6	39-16 x 10^3	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
		31	**2012**	**20-37**	**6.6-9.1**	**5-4110**	**1.3-12.9**	**0.0-21.9**	**2-22000**	**2-11000**
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 - 160000	45 - 92000
		23	2011	18-36	7.1–8.5	90 - 13190	4.9 -10.5	0.6 -3.6	10- 160000	78-160000
		23	**2012**	**20-37**	**7.0-8.4**	**39-39030**	**4-12**	**0.4-4.9**	**11-200000**	**5-156000**

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(^oC)	pH	Conductivity(µ mhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Brahamani	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	490-28x10^3	22-13x10^3
		11	2005	16-34	6.3-8.7	65-850	5.1-13.8	0.3-5.2	490-16x10^4	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	210-54 x10^3	110-22 x10^3
		16	2008	18-38	6.4-8.4	93- 664	5.3- 9.7	0.4-6.2	750-21 x10^3	110- 14 x10^3
		16	2009	12-40	6.6-8.5	70-431	4.5-18.3	0.2-5.8	940-22000	460-13000
		16	2010	17-37	6.6-8.5	97-623	5.6-12	0.4-5.6	330-92000	130-35000
		16	2011	15-38	6.7–8.5	93 - 458	5.0 -9.9	0.6 - 6.6	330-92000	170-35000
		16	**2012**	**19-37**	**64-8.5**	**99-363**	**5.2-12.0**	**0.6-7**	**78-200000**	**20-92000**
Baitarni		5	2002	24-36	7.3-8.3	54-78400	6.8-9.3	2.0 – 6.8	900-22000	700-11000
-		5	2003	18-36	6.7-7.8	75-54802	5.4-11.3	0.3-3.5	330-16x10^3	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	790-24x10^3	3330-11x10^3
		5	2006	15-25	7.6-8.4	90-2287	7.4-8.0	0.3-1.8	1400-4300	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	470 - 16000	210 - 5400
		5	2011	15-36	7.1-8.4	83- 32540	5.2-11.9	0.3- 3.2	350 - 54000	140 - 24000
		5	**2012**	**19-37**	**7.1-8.4**	**93-42560**	**5.6-10**	**0.3-2.8**	**230-17000**	**130-11000**
Subarnarekha	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	750-43000	110-15000
		12	**2012**	**18-39**	**6-8.5**	**82-1211**	**3.6-8.4**	**0.3-8**	**640-92000**	**90-54000**

Name of the River	Length (Km)	No of Monitoring locations	Year	Observed Range of Water Quality Parameters						
				Temp.(^{o}C)	pH	Conductivity(µ mhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Brahmaputra	916	6	2002	15-32	6.5-9.0	104-684	1.1-10.5	0.1 – 3.9	360-240000	300-24000
		6	2003	14-32	6.4-8.4	77-570	1.2-11.5	0.4-3.5	360-24x10^4	300-24x10^4
		6	2004	15-34	5.2-9	91-445	1.1-9.4	0.4-4.3	360-24x104	300-24x10^4
		10	2005	-	5.9-7.6	20-408	2-10.5	0.3-6.2	300-24x10^4	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
		10	**2012**	**17-32**	**6.6-8.1**	**67-359**	**4.2-11**	**0.4-3.6**	**0-2800**	**0-910**
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	12- 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
		23	**2012**	**2.3-26.9**	**6.8-8.7**	**73-664**	**4-12**	**0-27**	**27-100000**	**4-70000**
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
		23	**2012**	**2-29.5**	**6.6-7.9**	**47-513**	**3.8-12**	**0.1-8.7**	**34-1600**	**11-900**

BOD : Biological Oxygen Demand ; DO- Dissolved Oxygen.

(µmhos/cm) : Micromhos per centimeter; MPN: Most Probable Number

Source: Central Pollution Control Board.

Table 6.5.4: 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	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	2011-2012	Tikarapara (7.6)	Bamnidhi (6.0)	Tikarapara (8.6)	Ranim (7.8)	N.A	N.A	N.A	N.A
2	Brahmani	2011-2012	Gomlai (7.5)	Tilga (7.0)	Kamalanga (8.6)	Tilga (8.3)	N.A	N.A	N.A	N.A
3	Godavari	2011-2012	P.G.Bridge (8.3)	Perur (7.5)	Asthi (9.0)	Konta (8.2)	N.A	N.A	N.A	N.A
4	Krishna	2011-2012	Wadenpathy (26)	Honnali (6.1)	Wadenpathy (28)	Takli (7.1)	N.A	N.A	N.A	N.A
5	Cauvery	2011-2012	Kudlur (8.2)	Sakaleshpur (6.2)	Menangudi (9.4)	Sakaleshpur (7.1)	N.A	N.A	N.A	N.A
6	West Flowing Rivers	2011-2012	Kuzhithwat (7.7)	Kalampur (5.3)	Mankara (8.5)	Kidangoor (6)	N.A	N.A	N.A	N.A
7	Tapi	2011-2012	Sarangkheda (7.6)	Burthanpur (6.6)	Gopalkheda (8.2)	Sarangkheda (7.6)	Gopalkheda (338)	Dedtali (178)	Ghala (1217)	Gidhade (397)
8	Narmada	2011-2012	Kegaon (8.4)	Chandwada (6.8)	Handia (8.7)	Chandwada (7.7)	Rajghat (247)	Mohgaon (130)	Rajghat (886)	Mandleshwar (229)
9	Mahi,Sabarmati & other Basins	2011-2012	Kamalpur (8.3)	Pingalwada (6.5)	Pingalwada (9.3)	Durvesh (7.5)	Motinaroli (451)	Durvesh (139)	Vautha (3692)	Durvesh (292)

TABLE 6.5.4 : 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	2011-2012	Jondra, Andhiyar Khore (18)	Mahendragarh (5)	Simga (67)	Baronda (10)	Andhiyar Khore (10.7)	Tikarapara (1.9)	Simga (39.7)	Rajim (5.8)
2	Brahmani	2011-2012	Rsp Nala (22)	Tilga (5)	Tilga (96)	Jenapur (26)	Panpash (1.0)	Rsp Nala (0.1)	Kamalanga (21.4)	Beahmani (6.8)
3	Godavari	2011-2012	Satrapur (33)	Pathagudem (5)	Pathagudem (59)	Konta (18)	Dhalegaon (21.3)	Pathaguder (1.9)	Satapur (46.5)	Konta (9.7)
4	Krishna	2011-2012	Chalachagudda (38)	Honnali (3)	T. Rampuram (80)	Simoga (11)	T. Ramapuram (19.9)	Honnali (1)	T.Ramapuram (45.2)	Simoga (1.0)
5	Cauvery	2011-2012	T. Bekuppe (58)	Nellithurai (3)	Elunuthimangalam (99)	Sakaleshpur (8)	Thoppur (34.4)	Nellithurai (1.0)	Elunuthimangalam (110.8)	Muthankera (3.5)
6	West Flowing Rivers	2011-2012	Pudur (28)	Yennehole (2)	Mankara (38.4)	Yennehole (3)	Pudur (12)	Ayilam (0.5)	Pudur (9.4)	Kuttyadi (1)
7	Tapi	2011-2012	Gopalkheda (35)	Sarangkheda (30)	Gopalkheda (36)	Sarangkheda (30)	Gopalkheda (608)	Burhanpur (5.8)	Patau (39.9)	Sarangkheda (5.8)
8	Narmada	2011-2012	Chanwada (32)	Bamni (11)	Patau (65)	Bamni (28)	Dhulsar(16)	Patan (3.2)	Kogaon (48.6)	Garudeshwar (8.2)
9	Mahi,Sabarmati & other Basins	2011-2012	Ganod (58)	Luwara (13)	Luwara (205)	Durvesh(31)	Voutha (12.6)	Mataji (5.8)	Luwara (92.3)	Kamalpur (6.8)

TABLE 6.5.4 : Water quality in major river basins ….contd

Sl. No	Name of Basin/River	Reference Period	Iron (Fe ***)				Free Amonia (NH_4**)			
			Max = 50.00 (mg/l)				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	2011-2012	Tikarpara (0.0)	Baribda (0.0)	Simga (0.4)	Baronda (0.0)	N.A	N.A	N.A	N.A
2	Brahmani	2011-2012	Jaraikela (0.0)	Tulga (0.0)	Panposh (0.2)	Tilga (0.0)	N.A	N.A	N.A	N.A
3	Godavari	2011-2012	Saigaon (0.3)	Konta (0.1)	Nandgaon (1.0)	Dhalegaon (0.11)	Dhalegaon (0.2)	P.G. Bridge (0.0)	Sastrapur (0.78)	Dhalegaon (0.11)
4	Krishna	2011-2012	Phulgaon (1.0)	Vijayawada (0.0)	Phulgaon (1.1)	Vijaywada (0.0)	Vijaywada (0.0)	Vijaywada (0.0)	Wadenpalli (0.32)	Vijaywada (0.0)
5	Cauvery	2011-2012	Thengudi (0.1)	Annavasal (0.000)	Muthankera (1.5)	Annavasal (0.0)	Muthankera (0.04)	Musiri (0.04)	T.Bekuppe (.35)	Akkihebbal (0.00)
6	West Flowing Rivers	2011-2012	Kuzhithural (1.5)	Haladi (0.000)	Ramamangalam (20)	Haladi (0.000)	Kuzhithural (0.6)	Mankara (0.0)	Ramamangalam (0.6)	Kunigil (0.06)
7	Tapi	2011-2012	-	-	-	-	Gopalkheda (0.08)	Burthanpur (0.05)	Buehanpur (0.16)	Sarangkheda (0.06)
8	Narmada	2011-2012	-	-	-	-	Chandwada (0.06)	Garudeshwar (0.05)	Chandwada (0.09)	Garudeshwar (0.1)
9	Mahi,Sabarmati & other Basins	2011-2012	Paderdibadi (0.5)	Derol Bridge (0.1)	Vautha (1.0)	Derol Bridge (0.1)	Vautha (1.01)	Mataji (0.05)	Vautha (37.45)	Durvesh (0.09)

Table 6.5.4: 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	2011-2012	Jondhra (6.5)	Baronda (1.1)	Simga (52.3)	Baronda (5.7)	Pathardih (0.16)	Basantpur (0.05)	Andhiyar Khore (0.40)	Tikarpara (0.05)
2	Brahmani	2011-2012	Jaraikela (11.3)	Gomlai (7.5)	Rsp Nala (60.4)	Jaikaikeal (30.7)	Jaraikela (0.05)	Tilga (0.05)	Jaraikela (0.08)	Panposh (0.05)
3	Godavari	2011-2012	Dhalegaon I (24.3)	Jagdalpur (1.0)	Bamni (114.3)	Konta (9.1)	Dhalegaon (0.39)	Polavaram (0.05)	Pathagudem (1.70)	Dhalegaon (0.39)
4	Krishna	2011-2012	T. Ramapuram (123)	Shimga (3.9)	T. Ramapuram (398.4)	Simoga (14.9)	Keesara (0.92)	Honnali (0.0)	Halia (4.1)	Maral (0.11)
5	Cauvery	2011-2012	Elunuthimsngalam (245.5)	Nellithurai (3.2)	Elunuthimangalam (1121)	Muthankeara(13)	Thevur (.88)	K.M. Vadi(0.00)	Thoppur (1.65)	Kudigi (0.1)
6	West Flowing Rivers	2011-2012	Mankara (26)	Haladi (3.9)	Mankara (70)	Haladi (4.3)	Kuzhithural (2.5)	Santeguli (0.0)	Pudur (4.46)	Aversha (0.00)
7	Tapi	2011-2012	Gopalkheda (128.17)	Burahnpur (25.6)	Gopalkheda (142.2)	Burhanpur (0.12)	Burhanpur (95.5)	Sarangkheda (0.08)	Burahnpur (0.26)	Sarangkheda (0.08)
8	Narmada	2011-2012	Chandwada (93.7)	Chhidgaon (3.5)	Chandwad (293)	Handia (11.7)	Dhulsar (0.14)	Sandia (0.05)	Hoshangabad (0.42)	Chandwada (0.1)
9	Mahi,Sabarmati & other Basins	2011-2012	Pingalwada (152.1)	Kamalpur (12.0)	Luwara (1161)	Kamalpur (12.0)	Chitrasani (0.73)	Gadat (0.05)	Luwara (1.2)	Gadat (0.06)

Table 6.5.4: 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	2011-2012	Basantpur(18.0)	Sundargarh (1.2)	Andhiyar Khore (76.0)	Tikarapara (12.4)	Tikarpara (-)	Rajim (-)	Sundergarh (-)	Selebhata (-)
2	Brahmani	2011-2012	Kamalnga (10.6)	Panposh (1.0)	Kamalange (58.6)	Tilga (7.1)	Jaraikela (0.34)	Jenapur (0.21)	Tilga (0.41)	Panposh (0.36)
3	Godavari	2011-2012	Dhalegaon (29.5)	Konta (0.0)	Satrapur (54.2)	Jagdalpur (4.2)	Dhalegaon (1.00)	Perur (0.00)	P.G. Bridge (2.64)	Konta (0.35)
4	Krishna	2011-2012	T.Ramapuram (182)	Simoga (1.9)	T.Ramapuram (542)	Shimoga (3.0)	Takli (1.51)	Vijaywada (0.0)	Vijaywada (2.750)	Kerlodu (1.1)
5	Cauvery	2011-2012	Thoppur (69.8)	Nellethori (0.3)	Elunuthimangalam (258.3)	Muthankera (1.0)	Sevanur (4.9)	Menangudi (10.1)	T. Bekuppe (18.4)	Nellithurai (0.38)
6	West Flowing Rivers	2011-2012	Badlapur (3.4)	Kalampur (0.01)	Ambarampalayam (28.5)	Malakkara (0.12)	Kuzhithural (1.3)	Kuttyodi (0.01)	Pudur (5.34)	Mangaon (0.3)
7	Tapi	2011-2012	Gopalkheda (15.5)	Bushanpur (10)	Bashanpur (26.4)	Sarankheda (10)	Gopalkheda (0.19)	Sarangkheda (0.1)	Burahnpur (0.25)	Sarankheda (0.1)
8	Narmada	2011-2012	Dhulsar (9.9)	Hoshangabad (1.3)	Dhulsar (21.3)	Belkheri (5)	Dhulsar (2.73)	Mohgaon (0.01)	Pati (21.92)	Chandwada (0.12)
9	Mahi,Sabarmati & other Basins	2011-2012	Vautha (24.3)	Godat (6.1)	Luwara (133)	Derel Bridge (9.6)	Ganod (4.57)	Pingalwada (0.06)	Luwara (6.69)	Gadat (0.1)

Table 6.5.4: 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	2011-2012	Kurubhata (6.5)	Simga (2.8)	Simga (9.3)	Ghatora (6.8)	Jondhra	Kurubhata (0.2)	Simga (4.2)	Manendragaeh (1.0)
2	Brahmani	2011-2012	Jenapur (6.8)	Rsp Nala (2.8)	Gomlai (8.7)	Rsp Nala (6.9)	Jenapur (1.0)	Gomlai (0.2)	Nsandira (3.8)	Gomlai (1.6)
3	Godavari	2011-2012	Dhalegaon (6.8)	Bamni (0.0)	Bhatpally (11.5)	Saigaon (6.4)	P.G. Bridge (1.3)	Mancheual (0.1)	Bamni (45.0)	Saigaon (0.8)
4	Krishna	2011-2012	Yadgir (64)	Paleru Bridge (1.9)	Yadgir (84)	Paleeu Bridge (5.6)	Horalahalli (1.7)	Paleru Bridge(0.1)	Bawapuram (3.3)	T. Ramapuram (0.8)
5	Cauvery	2011-2012	Nellithurai (7.5)	T. Bekuppe (2)	Nallamaran (8.7)	T.Bekuppe (4.7)	T. Bekuppe (6.8)	Akkihebbal (0.1)	T.Bekuppe (14.5)	M.H. Halli (1.2)
6	West Flowing Rivers	2011-2012	Aversha (7.3)	Badlapur (4.3)	Perumannu (7.8)	Kumbidi (6.8)	Aversha (1.3)	Badlapur (0.1)	Ambarampaleyam (2.8)	Haladi (0.2)
7	Tapi	2011-2012	-	-	-	-	Sarangkheda (2.6)	Beeshanpur (0.6)	Burhanpur (4.3)	Gopalkheda (1.8)
8	Narmada	2011-2012	Handia (5.3)	Dindori (1.5)	Patan (8.1)	Kogaon (5.4)	Handia (0.9)	Banni (0.1)	Chandwada (3)	Dhulsai (1.2)
9	Mahi,Sabarmati & other Basins	2011-2012	Kamalpur (9.0)	Voutha(0)	Paderdibadi (12.3)	Luwarea (7.4)	Vautha (4.2)	Abu Road (0.2)	Voutha (38)	Mahuwa (0.8)

Table 6.5.4: 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	2011-2012	Salebhata (89)	Manendragaon (24)	Simga (334)	Baronda (48)	Ghatora (20)	Kucubhata (6)	Andhiyarkhode (46)	Rajim (20)
2	Brahmani	2011-2012	Rsp Nala (69)	Tilga (16))	Jaraikela (285)	Jenapur (101)	Gomlai (15)	Tilga (2)	Tilga (33)	Tolcher (16)
3	Godavari	2011-2012	Dhalegaon (159)	Pathagudem (20)	Bamni (300)	Kamnta (87)	Mancherial (29)	Bamni (3)	Mancherial polavarum (50)	Jagelapur (21)
4	Krishna	2011-2012	T.Rampuram (165)	Honalli (12)	T. Rampuram (389)	Hounali (48)	Kellodu (68)	Dameracherea (0.0)	T. Bowapuram (76)	Dameshvella (3.1)
5	Cauvery	2011-2012	Thopper (323)	Nellethori (12)	Elunuthimangalam (630)	Sakaleshpur (40)	Elunuthimangalam (47)	Thengumarhada (11)	Elunuthimangalam (75)	Thengumarhada (19)
6	West Flowing Rivers	2011-2012	Pudur (120)	Haladi (8)	Ambarempalayam (157)	Haladi (12)	Kuzhithural (36)	Badlapur (21)	Haladi (46)	Belne Bridge (24)
7	Tapi	2011-2012	Gopalkhda (116)	Sarangkheda (99)	Gopalkheda (129)	Sarangkheada(99)	Gopalkheda (54)	Burahnpur (21)	Goplkheda (55)	Buehanpur (48)
8	Narmada	2011-2012	Kogaon (136)	Chhidgaon (54)	Patau (273)	Bamni (107)	Chandwada (48)	Beikheeri (17)	Chandwada (74)	Barman (15)
9	Mahi,Sabarmati & other Basins	2011-2012	Ganod (169)	Luwara (77)	Luwara (716)	Durvesh (106)	Pingalwada (55)	Kamalpur (14)	Pingalwada (74)	Kamalpur (14)

Table 6.5.4: 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	2011-2012	Andhiyarkhode (0.6)	Baronda (0.1)	Andhiyarkhode (2.5)	Rajim (0.3)
2	Brahmani	2011-2012	Rsp Nala (0.4)	Tilga (0.1)	Rsp Nala (0.8)	Talcher (0.3)
3	Godavari	2011-2012	Mancherial (.9)	Bamni (0.1)	Nandgaon (2.4)	Jagdalpur (0.4)
4	Krishna	2011-2012	T. Rampuram (4.9)	Hounali (0.3)	T. Ramapuram (8.4)	Phulgaon (0.4)
5	Cauvery	2011-2012	Elunuthimangalam (3.6)	Thengumarhada (0.2)	Elunuthimangalam (14.9)	Arengaly (0.306)
6	West Flowing Rivers	2011-2012	Mankara (0.732)	Mangaon (0.2)	Mankara (1.404)	Burhanpur (2.3)
7	Tapi	2011-2012	Gopaikheda (3)	Burhanpur (0.6)	Gopalkheda (3.1)	Baraman (0.3)
8	Narmada	2011-2012	Chandwada (2.3)	Mandelshwar (0.2)	Chandwada (7.5)	Kamalpur (0.3)
9	Mahi,Sabarmati & other Basins	2011-2012	Pingalwada (3.3)	Kamalpur (0.3)	Luwara (14.2)	Mataji (0.9)

Sources:CWC, Integrated Hydrological Data Book (Non-Classified River Basin), 2015
Note: N.A - Not available

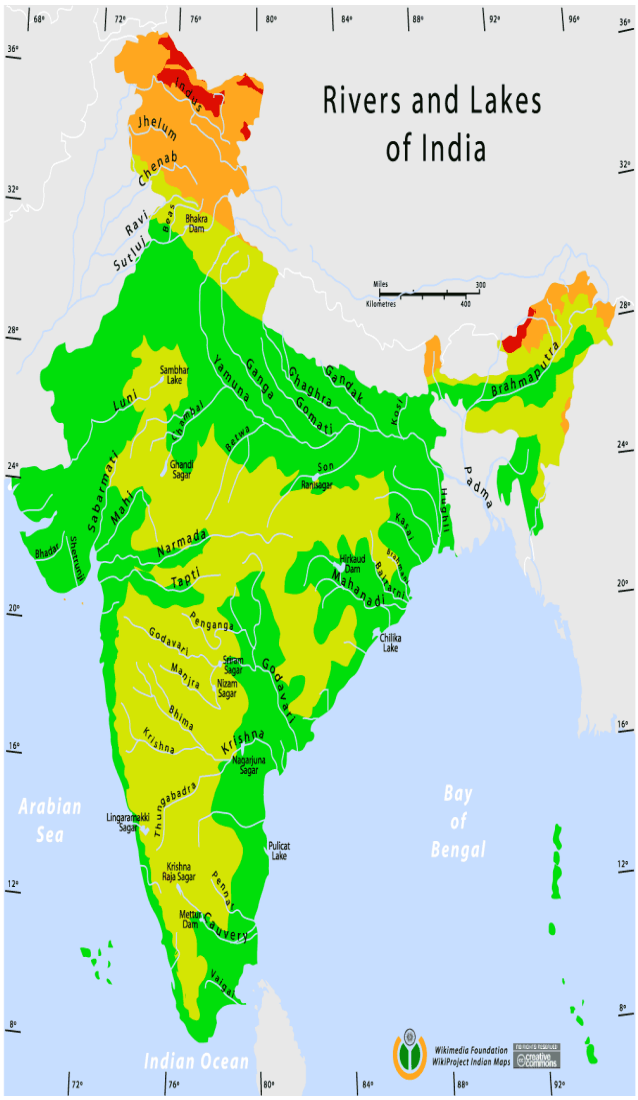


Table 6.5.5 : River-basin wise distribution of water quality monitoring stations

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(I),), 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

Table 6.5.7 : State wise river water quality

Sl.No.	State	Dissolved Oxygen (mg/l)			pH			Conductivity (µmhos/cm)		
		MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
1	2	3	4	5	6	7	8	9	10	11
1	Andhra Pradesh	0	11.7	6.6	2	9.6	7.8	76	14920	641
2	Assam	0	18	7.2	5.8	8.1	7.2	43	868	193
3	Bihar	2.6	9.4	8.4	7.1	8.6	8	162	476	329
4	Chhattisgarh	0.8	8.5	7.3	7	8.8	7.7	85.5	755	258
5	Daman Diu	-	-	-	7.2	8.1	7.6	202	348	277
6	Delhi	0	10.5	2.6	7.1	8.3	7.7	230	1590	767
7	Goa	3.6	8.1	6.5	6.6	8	7.2	8.2	1370	118
8	Gujarat	0	12.8	6.1	6.8	8.9	8	138	55300	2627
9	Haryana	0.42	10.6	7.3	4.5	8.7	7.6	150	3640	665
10	Himachal Pradesh	2.2	13.3	8.8	7	8.7	7.8	53	1495	324
11	Jammu & Kashmir	1.8	9.8	7.5	6.7	8.8	7.6	163	548	247
12	Jharkhand	5.1	8.9	7.6	6	7.8	7	-	-	-
13	Karnataka	0.7	14	7.1	6	8.9	7.9	20	2400	482
14	Kerala	0	8	6.2	5.4	8.2	6.6	24	44000	923
15	Madhya Pradesh	0	16	7.1	6.8	10	7.8	104	9340	734
16	Maharashtra	0	9.9	5.8	5.8	8.9	7.6	44	55830	651
17	Manipur	3.8	9.6	7.2	6.5	8	7.4	141	735	404
18	Meghalaya	1.4	10	6.8	2.9	7.4	6.2	123	950	294
19	Mizoram	4.3	8.7	6.8	7.5	8.3	7.9	70	220	148
20	Nagaland	2.4	9.2	6.2	4.7	8.7	7.8	62	400	160
21	Odisha	3.4	9.7	7.7	6.7	8.5	7.8	17.4	48400	1384
22	Puducherry	6.6	7.6	7	6.7	8. 4	7.6	398	715	593
23	Punjab	1.2	8.9	6.2	6.5	7. 9	7.4	162	1600	575
24	Rajasthan	3.2	7.8	5.7	7.2	8.7	8.1	250	880	453
25	Sikkim	8	12.5	10.8	6	7.2	6.6	210	290	255
26	Tamilnadu	0.6	9.3	6.9	5.7	8.8	7.4	42	28700	556
27	Tripura	4.2	6.9	5.8	7.1	8.1	7.6	110	180	141
28	Uttar Pradesh	0	20.6	6.7	7	9.5	7.9	122	8010	610
29	Uttarakhand	5.6	10.2	8.5	6.5	8.4	7.3	40	398	154
30	West Bengal	2.5	15.2	6.7	6.8	8.7	7.9	60	68700	1244

cont..

Table 6.5.7 : State wise river water quality

(concluded)

Sl.No.	State	BOD (mg/l)			Total Coliform (MPN/100ml)			Fecal Coliform (MPN/100ml)		
		MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
1	2	12	13	14	15	16	17	18	19	20
1	Andhra Pradesh	0.1	50	2.7	3	28000	1888	0	800	44
2	Assam	0.3	32	1.9	1	240000	3816	0	24000	653
3	Bihar	1.7	2.9	2.3	700	90000	11707	300	50000	4823
4	Chhattisgarh	0.2	3.4	1.6	4	1100	110	0	0	0
5	Daman Diu	-	-	-	-	-	-	-	-	-
6	Delhi	1	70	19.9	19000	103000000	12024579	500	10900000	1256411
7	Goa	0.7	4.7	2	4	5400	511	2	1300	168
8	Gujarat	0.1	50	4.4	0	2100000	31885	0	460000	12567
9	Haryana	1	590	18.8	112000	6600000	804484	180	760000	76726
10	Himachal Pradesh	0.1	7.6	0.7	2	4400000	127730	0	430000	6349
11	Jammu & Kashmir	0.1	40	2.4	-	-	-	-	-	-
12	Jharkhand	0.4	10.5	2.9	750	2400	1516	110	930	287
13	Karnataka	0.1	7	1.7	1	160000	4791	0	90000	2031
14	Kerala	0.1	11	1.1	0	56000	2318	0	44000	1236
15	Madhya Pradesh	0.2	50	4.4	0	2400	349	0	280	7
16	Maharashtra	1.2	50	7.6	0	1800	439	0	1600	100
17	Manipur	-	-	-	5	415	101	-	-	-
18	Meghalaya	1	7.7	3.3	31	2200	552	23	1700	402
19	Mizoram	0.3	1.7	0.9	3	15	5	-	-	-
20	Nagaland	0.4	2.8	1.1	-	-	-	-	-	-
21	Odisha	0.4	6.4	1.9	630	1600000	18088	230	160000	6293
22	Puducherry	0	1	0.3	-	-		-	-	-
23	Punjab	0	50	9.9	35	2500000	81441	0	500000	13787
24	Rajasthan	0.1	6.2	1.7	4	210	32	3	14	4
25	Sikkim	2	3.8	2.8	80	350	238	40	220	118
26	Tamilnadu	0.1	23	1.7	21	5400	574	13	3500	375
27	Tripura	0.5	4	2.3	180	620	483	17	560	356
28	Uttar Pradesh	1	364	9.2	160	140000000	1808500	20	1790000	90302
29	Uttarakhand	0.9	7.6	1.8	0	10100000	559977	1	380000	27016
30	West Bengal	0	6.8	2.3	540	1400000	139135	280	850000	62013

Source: Central Pollution Control

Note : BOD : Bio chemical Oxygen demand

(µmhos/cm) : Micromhos per centimetre; MPN: Most Probable Number

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	Bangalore	4130288	4130288	375.0	25.0	400.0	300.0	75.0	290.0	Y	Y	V. Valley,Ksc Valley
3	Bhopal	1062771	1062771	189.3	--	189.3	94.6	50.0	87.0	Y	Y	Agriculture
4	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 Farm
6	Coimbatore	1100746	816321	60.0	--	60.0	45.0	75.0	--	--	--	Nayal river, Irrigation
7	Delhi	8419084	8419084	1270.0	--	1270.0	1016.0	80.0	981.0	Y	Y	Agriculture, Yamuna River
8	Hyderabad	4344437	4098734	348.3	25.0	373.3	299.0	80.1	115.0	Y	--	River, Irrigation
9	Indore	1109056	1091674	145.0	--	145.0	116.0	80.0	14.0	Y	--	Khan River, Irrigation
10	Jaipur	1518235	1458483	220.0	--	220.0	165.0	75.0	27.0	Y	Y	Agriculture
11	Kanpur	2029889	1874409	200.0	--	200.0	150.0	75.0	41.0	Y	Y	Ganga, Sewage Farm
12	Kochi	1140605	670009	75.0	--	75.0	45.0	60.0	--	--	--	Cochin Back waters
13	Lucknow	1669204	1619115	106.0	--	106.0	80.0	75.5	--	--	--	Gomati River
14	Ludhiana	1042740	1042740	94.4	--	94.4	47.0	49.8	--	--	--	Agriculture
15	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	Agriculture
18	Patna	1099647	917243	219.0	--	219.0	164.0	74.9	105.0	Y	N	River, Fisheries
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 Litre 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	Ambagarh 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, 2014

* Only in some locations

6.7 Navigable Inland Waterways

6.7.1 A stretch of water, not part of the sea, over which craft of a carrying capacity not less than 50 tonnes can navigate when normally loaded is termed a navigable inland waterway. This term covers both navigable rivers and lakes (natural water-courses, whether or not they have been improved for navigation purposes) and canals (waterways constructed primarily for the purpose of navigation).

6.7.2 India is endowed with a variety of navigable waterways comprising river systems, canals, back waters, creeks, and tidal inlets. However, navigation by mechanized crafts is possible only over a limited length. The Inland Water Transport (IWT) is functionally important in regions covered by the Brahmputra and the Ganges in the North East and Eastern parts of the country, Kerala, Goa and in the deltas of the rivers of Krishna and Godavari.

6.7.3 Length of waterways along with its navigable length is an indicator of inland water potential of a state. Table 6.7.1 gives a snapshot of the navigable waterways in the states.

Table 6.7.1 : Navigable waterways in India 2013-14

(Km.)

Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length		Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4		1	2	3	4
1	**ANDHRA PRADESH**				5	**GUJARAT**		
	Godavari	1530	171			Narmada	161	50
	Krishna	1400	157			Tapti	140	15
	Others **	649	476			Ambica	136	20
	Total	**3579**	**804**			Auranga	75	4
						Puma	141	13
2	**ASSAM**							
	Brahmaputra	2800	891			**Total**	**653**	**102**
	Borak	900	152					
	Subansiri	468	111		6	**KARNATAKA**		
	Dhansiri	135	25			Sharavathi	80	27
	Manash	375	104			Tungabhadra	375	375
	Aai	.	64			Malaprabha	230	230
	Beki	85	55			Ghataprabha	160	160
	Jiabhoroli	90	60			Krishna	325	125
	Puthimari	..	64			Cauvery	270	34
	Disang	25	25			Kabini	117	30
	Kopili	50	50			Gurupur	80	20
	Dikhow	92	40			Gangolli	48	20
	Katakhal/Dhaleswari	150	120			Bheema	860	125
	Soani	.	48			Udyavara	37	14
	Mahura	.	32			Netravathi	96	26
	Buridihing	120	80			Kali	184	29
	Chiri	.	42			**Total**	**2862**	**1215**
	Jiri	.	64					
	Total	**5290**	**2027**		7	**KERALA**		
						Manjeswar	16	3.2
3	**BIHAR**					Uppala	50	-
	Damodar	…	---			Shiriya	67	4.8
	Ganga	510	510			Mogral	34	-
	Gandak	323	300			Chandragiri	105	12.8
	Koshi	236	160			Chittari	25	-
	Ghaghra	100	100			Nileswar	46	11.2
	Sone	226	31			Kariangoda	64	24
	Mahananda	140	--			Kavvai	31	9.6
	Burhi Gandak	400	--			Peruvamba	51	16
	Punpun	200	--			Ramapuram	19	6.4
	Phalgu Harihar	300	--			Kuppan	82	24
	Kiul	100	--			Valapattanam	110	44.8
	Kari Koshi	150	--			Anjara Kandy	48	27.2
	Chandan	100	--			Teiciherry	28	21.6
	Karmnasha	144	--			Mahe	54	24
	Others	860	290			Kuthiadi	74	9.6
	Total	**3789**	**1391**			Korapuzha	40	24.8
4	**GOA**					Kallai	22	9.6
	Mandovi	78	66			Chaliyar	169	68.4
	Zuari	68	68			Kadalundy	130	43.2
	Mapusa	27	27			Tirur	48	9.6
	Chapora	34	32			Bharathappujha	209	40
	Tiracol	29	23			Keecheri	51	-
	Sal	20	15			Puzhakkal	29	-
	Others	17	17			Karivannur	48	24
	Total	**273**	**248**			Chalakkudy	130	16
							1780	**474.8**

Table 6.7.1 : Navigable waterways in India 2013-14 .....Contd.

(Km.)

Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length		Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4		1	2	3	4
	Kerala	**1780**	**474.8**					
	Periyar	244	72		9	**ORISSA**		
	Muvattei Puzha	121	25.6			Mahanadi	493	199
	Meenachil	78	41.6			Brahmani	541	277
	Manimala	90	54.4			Baitarani	344	32
	Pamba	176	73.6			Subarnarekha	--	50
	Achan coil	128	32			Budha Balanga	--	35
	Pallickal	42	2			Dhamara	--	20
	Kallada	121	40			Salandi	--	17
	Ithikkara	56	16			Panchputra	--	21
	Ayroor	17	1			Pernei	--	45
	Vamanapuram	88	11.2			Hatel	--	30
	Mamom	27	1			Bansagadal	--	32
	Karamana	68	-			Hansua	--	37
	Neyyar	56	**-**			Tirkota	--	18
	Total	**3092**	**845.2**			Jamboo	--	6
						Gobari	--	16
8	**MAHARASHTRA**					Ramchandi	--	16
						Kharansi	--	14
	Dande River	2	1			Batigharia	--	14
	Pangere River	2	1			Birupa	--	110
	Girye River	3	1			Genguti	--	45
	Kajali River	35	5			Luna	--	37
	Kalbadevi River	10	2			Devi	--	20
	Are River	6	1			Pradhi	--	15
	Jog River	10	5			Kadha	--	30
	Kelshi River	10	3			Kusavadra	--	25
	Savitri River (Bankot to	45	40			Daya	--	9
	Kal River	6	4			Rajua	--	7
	Vaitarna River	24	9			Makara	--	11
	Ulhas River	32.5	28			Ohers **	--	367
	Mahim River (Bay)	1.5	1			**Total $**	**1378**	**1555**
	Amba River	23	20					
	Patalganga	11	6.5		10	**TAMIL NADU**		
	Kundalika River	16	16			Ananths Victoria Martha	27	12
	Mandad River (Rajpuri	14	10			North Buckingam Canal	58	.
	Mhasla River (Turmad	9	5			Central Buckingam Can	7	.
	Vashisti River (Dabhol	45	38			South Buckingam Canal	105	.
	Jagbudi River	20	20			**Total**	**197**	**12**
	Shastri River/Jaigad	45	40		11	**UTTAR PRADESH**		
	Rajapur River	30	30					
	Vagothan	38	22			Gomti	960	
	Gad River (Kalaval	13	7			Rapti	778	
	Terekhol River/Creek	28	28			Ghaghra	1116	
	Karli River (Malva)	23	13			Ganga	2345	425#
	Others	129	105			Sai	760	
	Total	**631**	**462**			Tons	485	
						Total	**6444**	

Table 6.7.1 : Navigable waterways in India 2013-14				Table 6.7.1: Navigable waterways in India 2013-14 ….Concluded.			
Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length	Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4	1	2	3	4
12	**WEST BENGAL**			13	**NAGALAND*** **		
	Hooghly	580	580		Doyans	185	105
	Mahananda	206	58		Tizu/Zungki	287	90
	Ajoy	174	174		Dhansiri/Chathe	170	75
	Jalangi	232	232		Dikhu	120	52
	Dwarka	129	129		Tapi-Yangnyn	95	18
	Bakreswar	102	102		Tsurang/Disai	60	15
	Damodar	437	437		Others	20	20
	Dwarekeswar	103	103		**Total**	**937**	**375**
	Silabati	135	135	14	**MIZORAM**		
	Kumari	308	308		R.TlawNg (Dhaleswari)	185	81
	Ichamati	232	232		R.Kolodyne (Chhimtuipo	138	80
	Others @	2103	2103		Khawtthlang Tuipui	128	63
	Total	**4741**	**4593**		R. Tuichawrg	174	73
					Tul River	138	51
					Others	24	24
					Total	**787**	**372**

Source : IWT Directorate of States & IWAI. Transport Research Wing, Ministry of Surface Transport

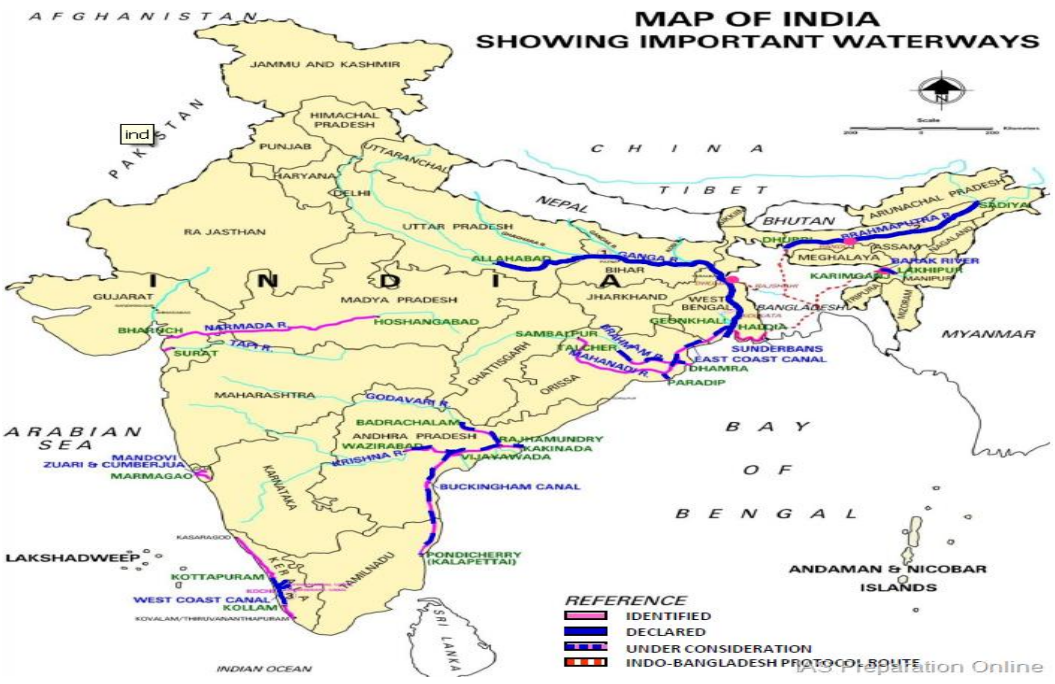
* Relates to 2012-13 ** Including Ca *** Related to 2007-08

@ 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.



CHAPTER SEVEN

HUMAN SETTLEMENTS

7.1 Population and Poverty

7.1.1 The components of environment include the natural environment comprising the environmental media of air, water and land/soil, as well as the biota found in these media. The man-made environment is represented by human settlements which consist of physical elements, namely, shelter and infrastructure; and services to these elements which provide the material support. Rapid population growth and economic development in country are degrading the environment through the urbanization and industrialization, expansion and intensification of agriculture, and the destruction of natural habitats. The existence or the absence of 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 was lower than that of male till 1980 and has shown a reverse trend thereafter. Infant Mortality Rate refers to the number of deaths of children in the age 0-1 year per thousand live births. Infant mortality rate has been declining steadily in India since 1958. Details of these are given in Table 7.1.3. However, infant mortality rate in high is rural India compared to the urban sector which is evident from Table 7.1.3.

7.1.4 Reducing poverty and fostering human development are fundamental pre requisites for achieving sustainable development. Poverty is an indicative of a situation where a person fails to maintain a living standard adequate for comfortable living. In India, Planning Commission is the nodal agency in the Government of India for estimation of poverty. It estimates the incidence of poverty at the national and as well as state level separately. The table 7.1.4 gives the state-wise percentage of population below poverty line (according to Tendulkar Methodology). During 2011-12, nearly 25.7% of the population in rural India and almost 13.7% of those in urban areas were observed to be living below poverty line as per the estimates of Planning Commission.

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	271,09,616	264,41,410	337,24,581	327,83,427	385,27,413	376,82,594	424,42,146	421,38,631
2	Arunachal Pradesh	3,39,322	2,92,517	4,65,004	3,99,554	5,79,941	5,18,027	7,13,912	6,69,815
3	Assam	94,44,037	85,97,211	116,57,989	107,56,333	137,77,037	128,78,491	159,39,443	152,66,133
4	Bihar	359,30,560	339,84,174	338,38,238	306,92,316	432,43,795	397,54,714	542,78,157	498,21,295
5	Chhattisgarh++		..	88,72,620	87,42,308	104,74,218	103,59,585	128,32,895	127,12,303
6	Goa	5,10,152	4,97,597	5,94,790	5,75,003	6,87,248	6,60,420	7,39,140	7,19,405
7	Gujarat	175,52,640	165,33,159	213,55,209	199,54,373	263,85,577	242,85,440	314,91,260	289,48,432
8	Haryana	69,09,679	60,12,440	88,27,474	76,36,174	113,63,953	97,80,611	134,94,734	118,56,728
9	Himachal Pradesh	21,69,931	21,10,887	26,17,467	25,53,410	30,87,940	29,89,960	34,81,873	33,82,729
10	Jammu & Kashmir+	31,64,660	28,22,729	41,42,082	36,94,969	53,60,926	47,82,774	66,40,662	59,00,640
11	Jharkhand++	..	..	113,63,853	104,80,058	138,85,037	130,60,792	169,30,315	160,57,819
12	Karnataka	189,22,627	182,13,087	229,51,917	220,25,284	268,98,918	259,51,644	309,66,657	301,28,640
13	Kerala	125,27,767	129,25,913	142,88,995	148,09,523	154,68,614	163,72,760	160,27,412	173,78,649
14	Madhya Pradesh	268,86,305	252,92,539	253,94,673	231,71,569	314,43,652	289,04,371	376,12,306	350,14,503
15	Maharashtra	324,14,432	303,68,386	408,25,618	381,11,569	504,00,596	464,78,031	582,43,056	541,31,277
16	Manipur[1]	7,21,006	6,99,947	9,38,359	8,98,790	11,61,952	11,31,944	14,38,586	14,17,208
17	Meghalaya	6,83,710	6,52,109	9,07,687	8,67,091	11,76,087	11,42,735	14,91,832	14,75,057
18	Mizoram	2,57,239	2,36,518	3,58,978	3,30,778	4,59,109	4,29,464	5,55,339	5,41,867
19	Nagaland	4,15,910	3,59,020	6,41,282	5,68,264	10,47,141	9,42,895	10,24,649	9,53,853
20	Odisha	133,09,786	130,60,485	160,64,146	155,95,590	186,60,570	181,44,090	212,12,136	207,62,082
21	Punjab	89,37,210	78,51,705	107,78,034	95,03,935	129,85,045	113,73,954	146,39,465	131,03,873
22	Rajasthan	178,54,154	164,07,708	230,42,780	209,63,210	294,20,011	270,87,177	355,50,997	329,97,440
23	Sikkim	1,72,440	1,43,945	2,16,427	1,90,030	2,88,484	2,52,367	3,23,070	2,87,507
24	Tamil Nadu	244,87,624	239,20,453	282,98,975	275,59,971	314,00,909	310,04,770	361,37,975	360,09,055
25	Tripura	10,54,846	9,98,212	14,17,930	13,39,275	16,42,225	15,56,978	18,74,376	17,99,541
26	Uttarakhand++	..	..	36,74,540	34,38,943	43,25,924	41,63,425	51,37,773	49,48,519
27	Uttar Pradesh	588,19,535	520,42,977	703,62,417	616,36,387	875,65,369	786,32,552	1044,80,510	953,31,831
28	West Bengal	285,60,901	260,19,746	355,10,633	325,67,332	414,65,985	387,10,212	468,09,027	444,67,088
	Union Territories								
1	A&N Islands	1,07,261	81,480	1,54,369	1,26,292	1,92,972	1,63,180	2,02,871	1,77,710
2	Chandigarh	2,55,278	1,96,332	3,58,614	2,83,401	5,06,938	3,93,697	5,80,663	4,74,787
3	D&N Haveli	52,515	51,161	70,953	67,524	1,21,666	98,824	1,93,760	1,49,949
4	Daman & Diu	38,298	40,683	51,595	49,991	92,512	65,692	1,50,301	92,946
5	Delhi	34,40,081	27,80,325	51,55,512	42,65,132	76,07,234	62,43,273	89,87,326	78,00,615
6	Lakshadweep	20,377	19,872	26,618	25,089	31,131	29,519	33,123	31,350
7	Puducherry	3,04,561	2,99,910	4,08,081	3,99,704	4,86,961	4,87,384	6,12,511	6,35,442
	All India[+ & 1]	**3533,74,460**	**3299,54,637**	**4393,58,440**	**4070,62,599**	**5322,23,090**	**4965,14,346**	**6232,70,258**	**5875,84,719**

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 respectively, 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.

Table 7.1.2 : Life Expectancy at birth-India

(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
32	2007-11	68.2	64.9	66.5
33	2008-12	68.8	65.4	67.0
34	2009-13	69.3	65.8	67.5

Source : Office of the Registrar General, Government of India

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*	73	70	77	45	72
7	1999	71	70	75	44	70
8	2000	69	67	74	44	68
9	2001	68	64	72	42	66
10	2002**	65	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
21	2013	42	39	44	27	40

Source : Office of the Registrar General, India, Sample Registration System-2013

* : Excludes Jammu and Kashmir due to non-receipt of returns.

* * : Excludes Nagaland (Rural) due to part-receipt of returns.

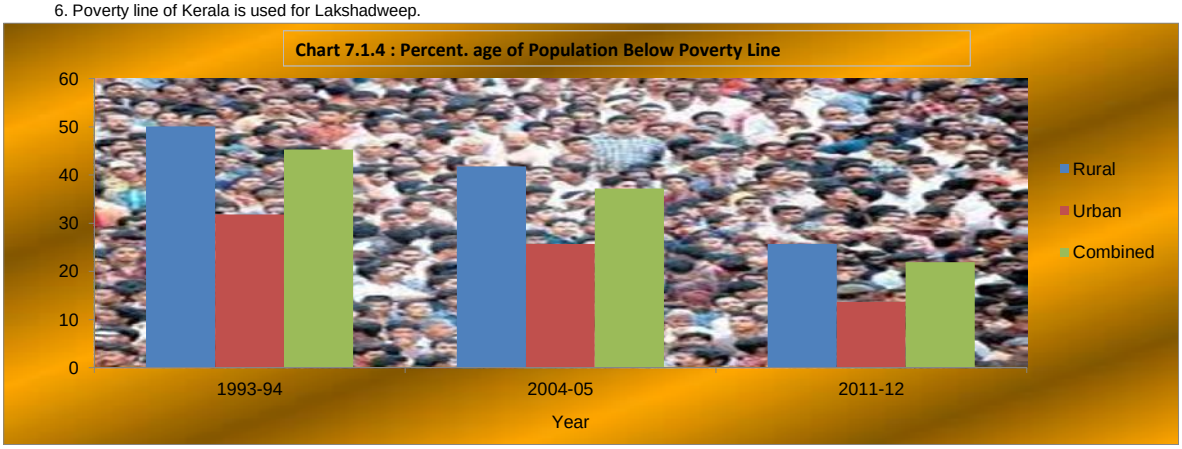
Table 7.1.4 : State-wise percentage of population below the poverty line -Rural, Urban & Combined (1993-74, 2004-05 and 2011-12)

(% of Population)

Sl. No.	States/ Union Territories	1993-94			2004-05			2011-12		
		Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
1	2	7	4	5	9	9	9	12	10	11
	States									
1	Andhra Pradesh	48.10	35.20	44.60	32.30	23.40	29.90	10.96	5.81	9.20
2	Arunachal Pradesh	60.00	22.60	54.50	33.60	23.50	31.10	38.93	20.33	34.67
3	Assam	54.90	27.70	51.80	36.40	21.80	34.40	33.89	20.49	31.98
4	Bihar	62.30	44.70	60.50	55.70	43.70	54.40	34.06	31.23	33.74
5	Chattisgarh	55.90	28.10	50.90	55.10	28.40	49.40	44.61	24.75	39.93
6	Delhi	16.20	15.70	15.70	15.60	12.90	13.10	12.92	9.84	9.91
7	Goa	25.50	14.60	20.80	28.10	22.20	25.00	6.81	4.09	5.09
8	Gujarat	43.10	28.00	37.80	39.10	20.10	31.80	21.54	10.14	16.63
9	Haryana	40.00	24.20	35.90	24.80	22.40	24.10	11.64	10.28	11.16
10	Himachal Pradesh	36.70	13.60	34.60	25.00	4.60	22.90	8.48	4.33	8.06
11	Jammu & Kashmir	32.50	6.90	26.30	14.10	10.40	13.20	11.54	7.20	10.35
12	Jharkhand	65.90	41.80	60.70	51.60	23.80	45.30	40.84	24.83	36.96
13	Karnataka	56.60	34.20	49.50	37.50	25.90	33.40	24.53	15.25	20.91
14	Kerala	33.90	23.90	31.30	20.20	18.40	19.70	9.14	4.97	7.05
15	Madhya Pradesh	49.00	31.80	44.60	53.60	35.10	48.60	35.74	21.00	31.65
16	Maharashtra	59.30	30.30	47.80	47.90	25.60	38.10	24.22	9.12	17.35
17	Manipur	64.40	67.20	65.10	39.30	34.50	38.00	38.80	32.59	36.89
18	Meghalaya	38.00	23.00	35.20	14.00	24.70	16.10	12.53	9.26	11.87
19	Mizoram	16.60	6.30	11.80	23.00	7.90	15.30	35.43	6.36	20.40
20	Nagaland	20.10	21.80	20.40	10.00	4.30	9.00	19.93	16.48	18.88
21	Odisha	63.00	34.50	59.10	60.80	37.60	57.20	35.69	17.29	32.59
22	Punjab	20.30	27.20	22.40	22.10	18.70	20.90	7.66	9.24	8.26
23	Rajasthan	40.80	29.90	38.30	35.80	29.70	34.40	16.05	10.69	14.71
24	Sikkim	33.00	20.40	31.80	31.80	25.90	31.10	9.85	3.66	8.19
25	Tamil Nadu	51.00	33.70	44.60	37.50	19.70	28.90	15.83	6.54	11.28
26	Tripura	34.20	25.40	32.90	44.50	22.50	40.60	16.53	7.42	14.05
27	Uttarkhand	36.70	18.70	32.00	35.10	26.50	32.73	11.62	10.48	11.26
28	Uttar Pradesh	50.90	38.30	48.40	42.70	34.10	40.90	30.40	26.06	29.43
29	West Bengal	42.50	31.20	39.40	38.20	24.40	34.30	22.52	14.66	19.98
30	Puducherry	28.10	32.40	30.90	22.90	9.90	14.10	17.06	6.30	6.69
31	Andaman & Nicobar Islands							1.57	0.00	1.00
32	Chandigarh							1.64	22.31	21.81
33	Dadar & Nagar Haveli							62.59	15.38	39.31
34	Daman & Diu							0.00	12.62	9.86
35	Lakshadweep							0.00	3.44	2.77
	All India	**50.10**	**31.8**	**45.30**	**41.80**	**25.70**	**37.20**	**25.70**	**13.70**	**21.92**

Source : Planning Commission (Tendulkar Methodology)

Note: 1. Population as on 1st March 2012 has been used for estimating number of persons below poverty line. (2011 Census population extrapolated)
2. Poverty line of Tamil Nadu is used for Andaman and Nicobar Island.
3. Urban poverty line of Punjab is used for both rural and urban areas of Chandigarh.
4. Poverty line of Maharasthra is used for Dadra & Nagar Haveli.
5. Poverty line of Goa is used for Daman & Diu
6. Poverty line of Kerala is used for Lakshadweep.



7.2 Housing and basic facilities

7.2.1 Agenda 21, as mentioned in chapter 1, that resulted from Rio Earth Summit of 1992 recognised that people were at the core of sustainable development. For hundred's of people world wide, poor living conditions in urban & rural area are destroying lives health and social and moral values. Access to safe healthy shelter is essential to a persons physical, social, psychological and economic well being.

7.2.2 In India, Census of India, RGI under take a house listing and housing census in 2011 as a first phase of census of India-2011. One of the objectives of Census of India 2011 was to identify each building/census house and also to ascertain the quality of the census house, amenities accessible to it and assets available to the households living in those census houses. As is evident from Table 7.2.1 the census houses increased to 33 crore. The average size of the households however decreased to 4.9. Urban-Rural breakup of population with number of households distribution of households by this number of dwelling units is presented in Table 7.2.2 and 7.2.3. Table 7.2.4 gives the number of houseless household & the houseless population in census year.

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	6652,87,849	1197,72,545	121,782,109**	5.6	1.0	5.5
	Urban	1576,80,171	289,05,949	298,97,491	5.5	1.0	5.3
	Rural	5076,07,678	908,66,596	918,84,618	5.6	1.0	5.5
2	1991+						
	Total	8385,83,988	1520,09,467	159,425,666**	5.5	1.0	5.3
	Urban	2157,71,612	404,18,141	435,18,317	5.3	0.9	5.0
	Rural	6228,12,376	1115,91,326	1159,07,349	5.6	1.0	5.4
3	2001++						
	Total	10286,10,328	1935,79,954	202,973,364#	5.3	1.0	5.1
	Urban	2861,19,689	558,32,570	585,14,738	5.1	1.0	4.9
	Rural	7424,90,639	1377,47,384	1444,58,626	5.4	1.0	5.1
4	2011^						
	Total	12108,54,977	2495,01,663	3308,35,767	4.9	0.7	3.7
	Urban	3771,06,125	808,88,766	1101,39,853	4.7	0.8	3.4
	Rural	8337,48,852	1686,12,897	2206,95,914	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 schedule.

\# 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.

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	1197,72,545	6652,87,849	3439,30,423	3213,57,426	1217,82,109	1137,35,542	80,46,567
		Institutional	2,47,457	37,90,700	31,16,289	6,74,411			
	Urban	Total	289,05,949	1576,80,171	838,76,403	738,03,768	298,97,491	276,04,947	22,92,544
		Institutional	1,43,015	23,77,559	19,56,711	4,20,848			
	Rural	Total	908,66,596	5076,07,678	2600,54,020	2475,53,658	918,84,618	861,30,595	57,54,023
		Institutional	1,04,442	14,13,141	11,59,578	2,53,563			
2		1991+							
	Total	Total	1520,09,467	8385,83,988	4352,16,358	4033,67,630	1594,25,666	1470,13,766	124,11,900
		Institutional	2,44,881	42,52,976	33,51,584	9,01,392			
	Urban	Total	404,18,141	2157,71,612	1139,36,953	1018,34,659	435,18,317	390,73,337	44,44,980
		Institutional	1,40,702	24,06,841	18,93,949	5,12,892			
	Rural	Total	1115,91,326	6228,12,376	3212,79,405	3015,32,971	1159,07,349	1079,40,429	79,66,920
		Institutional	1,04,179	18,46,135	14,57,635	3,88,500			
3		2001++							
	Total	Total	1935,79,954	10286,10,328	5321,56,772	4964,53,556	2029,73,364	1871,62,172	158,11,192
		Institutional	4,60,717	78,02,866	54,60,238	23,42,628			
	Urban	Total	558,32,570	2861,19,689	1505,54,098	1355,65,591	585,14,738	520,62,718	64,52,020
		Institutional	2,08,470	37,58,714	27,17,220	10,41,494			
	Rural	Total	1377,47,384	7424,90,639	3816,02,674	3608,87,965	1444,58,626	1350,99,454	93,59,172
		Institutional	2,52,247	40,44,152	27,43,018	13,01,134			
4		2011^							
	Total	Total	2466,92,667	12101,93,422	6231,21,843	5874,47,730	2714,13,517	2467,40,228	246,73,289
		Institutional							
	Urban	Total	788,65,937	3771,05,760	1954,89,200	1816,16,925	899,59,567	788,65,937	110,93,630
		Institutional							
	Rural	Total	1678,26,730	8330,87,662	4276,32,643	4058,30,805	1814,53,950	1678,74,291	135,79,659
		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 Rooms	No exclusive room	Six Rooms & above
1	2	3	4	5	6	7	8	9
1981*								
Total	1186,14,803	530,46,175	339,48,809	144,96,724	74,82,461	68,52,624	7,69,506	20,18,504
Percentage	100.00	44.70	28.60	12.20	6.30	5.80	0.65	1.70
Urban	285,41,877	130,72,617	79,47,026	34,84,741	18,04,721	16,26,979	1,49,001	4,56,792
Percentage	100.00	45.80	27.80	12.30	6.30	5.70	0.52	1.60
Rural	900,72,926	399,73,558	260,01,783	110,11,983	56,77,740	52,25,645	6,20,505	15,61,712
Percentage	100.00	44.40	28.90	12.20	6.30	5.80	0.69	1.73
1991+								
Total	1510,32,898	611,54,743	461,80,064	209,10,465	107,91,101	106,08,294	43,538	13,44,693
Percentage	100.00	40.50	30.60	13.80	7.20	7.00	0.03	0.89
Urban	394,93,450	156,20,078	119,92,915	58,52,191	30,70,829	27,51,947	16,578	1,88,912
Percentage	100.00	39.50	30.40	14.80	7.80	7.00	0.04	0.48
Rural	1115,39,448	455,34,665	341,87,149	150,58,274	77,20,272	78,56,347	26,960	11,55,781
Percentage	100.00	40.80	30.70	13.50	6.90	7.00	0.02	1.04
2001								
Total	1919,63,935	738,56,117	575,71,314	275,41,899	143,61,957	126,60,232	59,72,416	-
Percentage	100.00	38.47	29.99	14.35	7.48	6.60	3.11	
Urban	536,92,376	188,52,794	158,57,448	91,76,931	46,56,850	39,00,405	12,47,948	-
Percentage	100.00	35.11	29.53	17.09	8.67	7.26	2.32	
Rural	1382,71,559	550,03,323	417,13,866	183,64,968	97,05,107	87,59,827	47,24,468	-
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

* : Excluding 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.

** : Six rooms & above

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	6,29,929	23,42,954	13,76,512	9,66,442
	Urban	2,09,520	6,18,843	4,06,154	2,12,689
	Rural	4,20,409	17,24,111	9,70,358	7,53,753
2	**1991+**				
	Total	5,22,445	20,07,489	11,80,368	8,27,121
	Urban	2,16,917	7,25,592	4,71,077	2,54,515
	Rural	3,05,528	12,81,897	7,09,291	5,72,606
3	**2001**				
	Total	4,47,585	19,43,766	11,36,496	8,07,270
	Urban	1,87,810	7,78,599	5,02,344	2,76,255
	Rural	2,59,775	11,65,167	6,34,152	5,31,015
4	**2011**				
	Total	4,49,787	17,73,040	10,46,871	7,26,169
	Urban	2,56,896	9,38,348	6,02,421	3,35,927
	Rural	1,92,891	8,34,692	4,44,450	3,90,242

Source: Primary census Abstract for total population and houseless population, 2011,Office of the Registrar General of India

* : Excluding Assam

\+ : Excludes Jammu & Kashmir

7.3 Water and Sanitation

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 diarrhoea, 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 detailed 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	Treated	Untreated	With Toilet of Any Type*	Without Toilet of Any Type*
1	2	3	4	5	6	7
2011						
Total	246740228	1074,26,831	788,80,843	285,45,988	1157,37,458	1309,72,879
Percentage	100	43.5	32.0	11.6	46.9	53.1
Rural	167874291	517,24,820	299,76,500	217,48,320	515,75,339	1162,98,952
Percentage	100	30.8	17.9	13.0	30.7	69.3
Urban	78865937	557,02,011	489,04,343	67,97,668	641,62,119	147,03,818
Percentage	100.0	70.6	62.0	8.6	81.4	18.6

Source : Office of the Registrar General of India (Census 2011)

* Within the Premises

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 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 table 7.3.3

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 32.49% of the sewage generation in class I cities and 8.67% of the sewage generation in Class II towns. The data on this is depicted in tables 7.3.4 a, 7.3.4 b&7.3.4 c .

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	1,14,845	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	1,01,275	1,04,104	1,27,719	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	1,39,112	1,66,053	1,76,765	1,83,856	2,45,772	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	1,03,194	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		**8,46,303**	**10,27,015**	**10,79,887**	**11,14,200**	**13,98,861**	**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 Source		
		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	210,24,534	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	2,61,614	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	63,67,295	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	189,40,629	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 #	2,35,061	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	56,22,850	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 #	33,40,538	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	3,22,813	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	121,81,718	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	47,17,954	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	14,76,581	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	20,15,088	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	61,81,607	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	131,79,911	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	77,16,370	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	149,67,597	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	238,30,580	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	5,54,713	38.8	24.7	14.1	7.6	2.7	4.9	5.9	0.3	7.4	13.9	22.8	3.1	15.5	47.3	37.2
23	Meghalaya	5,38,299	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	2,21,077	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	3,99,965	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	96,61,085	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 #	3,01,276	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	54,09,699	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	125,81,303	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	1,28,131	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	184,93,003	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	8,42,781	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	329,24,266	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	19,97,068	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	200,67,299	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	**2466,92,667**	**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	2	3	4	5
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 population), 15,644 Millions Litre 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 to 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 Hyderabad, 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	1,07,200	12.90	-
2	Andhra Pradesh	47	201,43,050	1760.60	654.00
3	Assam	5	14,17,820	380.70	-
4	Bihar	23	57,83,554	1009.70	135.50
5	Chandigarh	1	9,94,820	429.76	164.79
6	Chhattisgarh	7	25,15,100	350.00	69.00
7	Delhi	1	148,58,800	3800.00	2330.00
8	Goa	1	1,22,330	9.79	-
9	Gujarat	28	146,78,240	1680.92	782.50
10	Haryana	20	54,94,110	626.69	312.00
11	Himachal Pradesh	1	1,63,490	28.94	35.63
12	Jammu & Kashmir	2	19,10,060	213.93	-
13	Jharkhand	14	49,64,171	830.47	-
14	Karnataka	33	151,02,373	1790.40	43.44
15	Kerala	8	37,78,516	575.17	-
16	Madhya Pradesh	25	107,95,000	1248.72	186.10
17	Maharashtra	50	402,55,170	9986.29	4225.25
18	Manipur	1	2,49,870	26.74	-
19	Meghalaya	1	1,86,030	20.84	-
20	Mizoram	1	2,82,550	31.65	-
21	Nagaland	1	1,71,810	19.24	-
22	Odisha	12	33,35,930	660.73	53.00
23	Puducherry	2	5,04,130	56.46	-
24	Punjab	19	63,29,860	1545.30	411.00
25	Rajasthan	24	96,11,490	1382.37	54.00
26	Tamilnadu	42	168,52,940	1077.21	333.42
27	Tripura	1	2,14,327	24.00	-
28	Uttar Pradesh	61	257,62,280	3506.02	1240.13
29	Uttarakhand	6	12,49,380	176.97	18.00
30	West Bengal	60	198,18,471	2345.21	505.92
	Total	**498**	**2276,52,872**	**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

(-) : Indicates that no information is received same data online

7.4 Fuel and Lighting

7.4.1 The primary source of energy for cooking and lighting is an indicator of conditions of living as well as within household air pollution. The Tables 7.4.1 (a) & (b) and 7.4.2(a),(b) & (c) present the sources of energy for cooking and lighting in India. As for as the main source of lighting is concerned 67% households use electricity which shows on increase of 11 points over 2001. The rural-urban gap has reduced by 7 percentage points from 44% in 2001 to 37%.

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	Fire wood and chips	L.P.G.	Gobar gas	Dung-cake	Charcoal	Kerosene	Electricity	Others	With no cooking arrangement	all*		
Andhra Pradesh	2	675	289	0	2	1	2	0	2	27	1000	151556	3925
Arunachal Pradesh	3	654	314	0	1	0	9	1	0	18	1000	1807	1066
Assam	1	810	172	4	0	0	3	0	1	9	1000	50592	2607
Bihar	6	564	59	0	208	0	5	0	157	1	1000	162107	3310
Chhattisgarh	9	932	15	1	31	0	2	1	3	6	1000	39514	1440
Delhi	0	23	922	0	0	0	0	0	0	55	1000	2387	63
Goa	0	169	662	6	0	0	164	0	0	0	1000	1610	159
Gujarat	0	797	139	6	9	0	35	1	0	12	1000	69060	1712
Haryana	0	417	267	0	244	0	12	2	56	3	1000	35153	1423
Himachal Pradesh	1	727	252	0	1	0	10	2	0	8	1000	13237	1657
Jammu & Kashmir	0	678	265	0	21	0	22	8	3	4	1000	14417	2032
Jharkhand	143	777	29	0	29	0	3	0	2	16	1000	44869	1757
Karnataka	0	805	147	7	0	0	20	0	0	21	1000	81325	2048
Kerala	1	663	308	5	0	0	1	2	0	20	1000	56925	2608
Madhya Pradesh	2	808	62	7	106	0	5	0	0	8	1000	105234	2735
Maharashtra	0	621	231	5	2	0	10	0	92	38	1000	134674	4031
Manipur	0	635	346	0	1	4	2	0	0	12	1000	3329	1376
Meghalaya	0	910	55	0	0	0	10	11	0	15	1000	4138	856
Mizoram	0	602	391	0	0	0	7	0	0	0	1000	1090	640
Nagaland	0	466	534	0	0	0	0	0	0	0	1000	1448	672
Odisha	9	870	39	2	18	1	2	2	51	6	1000	76142	2974
Punjab	0	305	305	7	303	0	27	2	33	19	1000	34161	1552
Rajasthan	0	893	89	0	6	0	7	0	4	1	1000	94456	2579
Sikkim	1	404	560	4	0	0	6	0	0	26	1000	1038	608
Tamil Nadu	0	583	372	0	0	0	25	2	0	18	1000	101853	3319
Tripura	0	925	63	2	0	0	5	0	0	5	1000	7204	1312
Uttar Pradesh	2	561	67	0	334	0	1	0	28	6	1000	263726	5915
Uttarakhand	0	698	288	0	1	0	9	0	0	3	1000	15685	1048
West Bengal	65	629	66	0	53	0	5	0	175	6	1000	149793	3566
A&N Islands	0	411	382	0	0	0	189	1	0	17	1000	533	278
Chandigarh	0	3	752	0	15	0	229	0	0	0	1000	193	64
Dadar & N. Haveli	0	683	37	0	0	0	114	0	0	166	1000	404	96
Daman & Diu	0	130	238	0	0	0	542	0	0	90	1000	415	64
Lakshadweep	0	793	37	0	0	0	26	80	0	65	1000	56	63
Puducherry	0	306	592	0	3	0	40	0	0	59	1000	1175	128
All India	**11**	**673**	**150**	**2**	**96**	**0**	**9**	**1**	**46**	**13**	**1000**	**1721307**	**59683**

Source : NSS Report No. 567: Energy Sources of Indian Households for Cooking and Lighting in India, 2011-12 (NSS 68 th Round) (P-A-37 to A-57)

* all including n.r. cases

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	Fire wood and chips	L.P.G.	Gobar gas	Dung-cake	Charcoal	Kerosene	Electricity	Charcoal & others	With no cooking arrangement	All		
Andhra Pradesh	1	101	773	0	0	1	27	6	0	91	1000	75569	2971
Arunachal Pradesh	0	122	841	0	0	0	12	25	0	0	1000	486	608
Assam	1	168	710	0	1	0	57	0	23	40	1000	7287	832
Bihar	40	249	605	0	55	6	5	2	25	13	1000	17948	1270
Chhattisgarh	113	347	398	1	33	1	27	10	9	59	1000	11874	734
Delhi	2	6	856	0	0	0	17	3	46	71	1000	29486	882
Goa	0	33	903	0	0	0	26	0	0	38	1000	1710	288
Gujarat	9	159	620	0	3	0	105	0	57	47	1000	57668	1717
Haryana	0	60	865	0	31	1	14	1	3	25	1000	17793	1166
Himachal Pradesh	0	56	718	0	5	2	74	13	0	132	1000	2269	383
Jammu & Kashmir	1	98	783	0	3	4	39	37	0	28	1000	4708	1355
Jharkhand	311	56	539	0	5	0	12	9	0	68	1000	13323	980
Karnataka	0	148	640	1	0	0	68	3	0	139	1000	52095	2048
Kerala	0	363	554	0	0	0	6	4	1	72	1000	21916	1854
Madhya Pradesh	8	257	652	0	18	0	36	2	0	27	1000	36909	1981
Maharashtra	2	57	745	0	0	0	101	2	13	80	1000	117361	4013
Manipur	1	285	647	0	1	54	8	2	0	2	1000	1289	1184
Meghalaya	0	141	640	0	3	31	57	80	0	48	1000	1114	404
Mizoram	0	58	936	0	0	1	5	0	0	0	1000	923	896
Nagaland	0	135	863	0	0	0	3	0	0	0	1000	866	352
Odisha	38	365	435	0	2	3	48	14	10	85	1000	15242	1052
Punjab	1	67	754	1	32	0	100	4	2	38	1000	22670	1566
Rajasthan	5	187	716	0	2	0	20	0	0	70	1000	31248	1552
Sikkim	0	3	826	0	0	0	22	0	0	149	1000	315	160
Tamil Nadu	0	112	709	0	0	0	85	2	0	92	1000	87098	3327
Tripura	0	281	668	0	0	0	38	0	0	13	1000	1548	544
Uttar Pradesh	6	210	668	0	75	1	10	4	3	23	1000	80002	3099
Uttarakhand	0	161	788	0	5	0	16	0	0	31	1000	5648	734
West Bengal	135	107	565	0	6	0	87	2	13	84	1000	60705	2746
A&N Island	0	22	713	0	0	0	215	0	5	46	1000	355	288
Chandigarh	0	48	756	0	0	0	136	0	0	61	1000	2152	248
Dadar & N. Haveli	0	54	731	0	0	0	211	0	0	3	1000	359	94
Daman & Diu	0	67	757	0	0	0	65	0	0	110	1000	154	64
Lakshadweep	0	263	453	0	0	0	163	55	0	67	1000	51	128
Puducherry	0	81	762	0	0	0	30	0	0	126	1000	2182	448
All India	**21**	**140**	**684**	**0**	**13**	**1**	**57**	**3**	**11**	**69**	**1000**	**782319**	**41968**

Source : NSS Report No. 567: Energy Sources of Indian Households for Cooking and Lighting in India, 2011-12 (NSS 68 th Round) (P-A-37 to A-57)

* all including n.r. cases

Table :7.4.2(a) Distribution of households by source of lighting (India)											
Sl. No.	India/ State/ Union Territory	Percentage of households having									
		Total No. of Households		Electricity		Kerosene		Any other sources		No lighting	
		2011	2001	2011	2001	2011	2001	2011	2001	2011	2001
1	2	3	4	5	6	7	8	9	10	11	12
1	A & N Islands	93376	73062	86.1	76.8	12.9	21.7	0.6	0.9	0.5	0.6
2	Andhra Pradesh	21024534	16849857	92.2	67.2	6.9	32.1	0.6	0.4	0.4	0.3
3	Arunachal Pradesh	261614	212615	65.7	54.7	18.5	31.4	5.3	5.6	10.5	8.3
4	Assam	6367295	4935358	37.0	24.9	61.8	74.7	1.0	0.3	0.2	0.1
5	Bihar	18940629	13982590	16.4	10.3	82.4	89.3	1.2	0.4	0.1	0.0
6	Chandigarh	235061	201878	98.4	96.8	1.2	2.8	0.3	0.2	0.2	0.2
7	Chhattisgarh	5622850	4148518	75.3	53.1	23.2	46.0	1.2	0.5	0.3	0.4
8	Dadra & Nagar Haveli	73063	43973	95.2	86.0	4.4	12.9	0.0	0.3	0.3	0.8
9	Daman & Diu	60381	34342	99.1	97.8	0.8	1.8	0.1	0.1	0.1	0.3
10	Goa	322813	279216	96.9	93.6	2.4	5.7	0.4	0.3	0.4	0.4
11	Gujarat	12181718	9643989	90.4	80.4	8.1	18.1	0.5	0.6	1.0	0.9
12	Haryana	4717954	3529642	90.5	82.9	8.1	16.2	1.0	0.5	0.5	0.4
13	Himachal Pradesh	1476581	1240633	96.8	94.8	2.8	4.6	0.3	0.4	0.1	0.2
14	Jammu & Kashmir	2015088	1551768	85.1	80.6	9.7	14.8	3.2	4.2	2.0	0.5
15	Jharkhand	6181607	4862590	45.8	24.3	53.1	75.3	1.0	0.4	0.1	0.1
16	Karnataka	13179911	10232133	90.6	78.5	8.6	20.8	0.4	0.3	0.4	0.3
17	Kerala	7716370	6595206	94.4	70.2	5.2	29.1	0.4	0.6	0.0	0.0
18	Lakshadweep	10703	9240	99.7	99.7	0.2	0.2	0.1	0.1	0.0	0.0
19	Madhya Pradesh	14967597	10919653	67.1	70.0	32.1	29.5	0.6	0.3	0.2	0.2
20	Maharashtra	23830580	19063149	83.9	77.5	14.5	21.5	0.7	0.5	0.9	0.5
21	Manipur	554713	397656	69.3	60.0	24.3	38.0	5.7	1.0	0.6	0.9
22	Meghalaya	538299	420246	60.9	42.7	37.0	55.9	1.3	0.7	0.8	0.7
23	Mizoram	221077	160966	84.2	69.6	13.5	27.8	1.9	1.3	0.3	0.4
24	Nagaland	399965	332050	81.6	63.6	15.6	31.6	1.6	2.0	1.1	2.8
25	NCT of Delhi	3340538	2554149	99.1	92.9	0.7	6.2	0.2	0.7	0.1	0.2
26	Odisha	9661085	7870127	43.0	26.9	55.3	72.1	0.6	0.5	1.1	0.5
27	Puducherry	301276	208655	97.7	87.8	2.1	11.8	0.1	0.2	0.2	0.1
28	Punjab	5409699	4265156	96.6	91.9	2.2	6.7	0.6	0.5	0.7	0.9
29	Rajasthan	12581303	9342294	67.0	54.7	30.9	44.1	1.2	0.7	0.8	0.5
30	Sikkim	128131	104738	92.5	77.8	6.6	21.6	0.4	0.3	0.5	0.4
31	Tamil Nadu	18493003	14173626	93.4	78.2	5.9	21.1	0.4	0.4	0.4	0.4
32	Tripura	842781	662023	68.4	41.8	29.1	57.5	2.1	0.4	0.3	0.2
33	Uttar Pradesh	32924266	25760601	36.8	31.9	61.9	67.4	1.1	0.5	0.2	0.1
34	Uttarakhand	1997068	1586321	87.0	60.3	11.1	37.3	1.6	2.1	0.3	0.3
35	West Bengal	20067299	15715915	54.5	37.5	43.5	61.9	1.5	0.5	0.5	0.2
	INDIA	**246740228**	**191963935**	**67.3**	**55.8**	**31.4**	**43.3**	**0.8**	**0.5**	**0.5**	**0.3**

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	Percentage of households having									
		Total No. of Households		Electricity		Kerosene		Any other sources		No lighting	
		2011	2001	2011	2001	2011	2001	2011	2001	2011	2001
1	2	3	4	5	6	7	8	9	10	11	12
1	A & N Islands	59030	49653	79.4	68.1	19.3	29.9	0.8	1.2	0.6	0.8
2	Andhra Pradesh	14246309	12676218	89.7	59.7	9.2	39.7	0.6	0.4	0.5	0.3
3	Arunachal Pradesh	195723	164501	55.5	44.5	23.6	37.9	7.0	7.1	14.0	10.5
4	Assam	5374553	4220173	28.4	16.5	70.4	83.1	1.1	0.3	0.2	0.1
5	Bihar	16926958	12660007	10.4	5.1	88.4	94.5	1.2	0.4	0.1	0.0
6	Chandigarh	6785	21302	97.3	97.4	2.4	2.1	0.2	0.3	0.1	0.2
7	Chhattisgarh	4384112	3359078	70.0	46.1	28.2	52.9	1.5	0.6	0.3	0.4
8	Dadra & Nagar Haveli	35408	32783	91.7	82.6	7.9	16.0	0.1	0.3	0.6	1.0
9	Daman & Diu	12750	22091	98.3	97.5	1.5	2.0	0.1	0.2	0.2	0.4
10	Goa	124674	140755	95.6	92.4	3.4	6.9	0.3	0.3	0.6	0.4
11	Gujarat	6765403	5885961	85.0	72.1	12.8	26.2	0.8	0.7	1.4	0.1
12	Haryana	2966053	2454463	87.2	78.5	11.3	20.6	1.0	0.5	0.5	0.4
13	Himachal Pradesh	1310538	1097520	96.6	94.5	3.0	4.9	0.3	0.4	0.1	0.2
14	Jammu & Kashmir	1497920	1161357	80.7	74.8	12.6	19.2	4.1	5.4	2.6	0.6
15	Jharkhand	4685965	3802412	32.3	10.0	66.4	89.6	1.2	0.3	0.0	0.0
16	Karnataka	7864196	6675173	86.7	72.2	12.3	27.2	0.5	0.3	0.5	0.3
17	Kerala	4095674	4942550	92.1	65.5	7.4	33.8	0.4	0.7	0.0	0.0
18	Lakshadweep	2523	5351	99.8	99.7	0.2	0.1	0.0	0.1	0.0	0.0
19	Madhya Pradesh	11122365	8124795	58.3	62.3	40.9	37.2	0.6	0.3	0.2	0.2
20	Maharashtra	13016652	10993623	73.8	65.2	23.9	33.6	1.0	0.7	1.3	0.6
21	Manipur	383313	296354	63.5	52.5	30.2	45.1	5.6	1.2	0.7	1.1
22	Meghalaya	422197	329678	51.6	30.3	45.9	68.2	1.6	0.8	0.9	0.8
23	Mizoram	104874	79362	68.8	44.1	26.9	52.8	3.9	2.3	0.5	0.7
24	Nagaland	284911	265334	75.2	56.9	21.1	37.5	2.2	2.4	1.5	3.2
25	NCT of Delhi	79115	169528	97.8	85.5	1.4	13.0	0.6	0.9	0.2	0.6
26	Odisha	8144012	6782879	35.6	19.4	62.8	79.8	0.6	0.5	1.1	0.4
27	Puducherry	95133	72199	95.8	81.0	3.6	18.6	0.2	0.2	0.5	0.1
28	Punjab	3315632	2775462	95.5	89.5	2.9	8.9	0.7	0.5	0.9	1.1
29	Rajasthan	9490363	7156703	58.3	44.0	39.3	54.7	1.5	0.8	1.0	0.5
30	Sikkim	92370	91723	90.2	75.0	8.7	24.3	0.5	0.3	0.6	0.4
31	Tamil Nadu	9563899	8274790	90.8	71.2	8.3	28.2	0.3	0.3	0.6	0.4
32	Tripura	607779	539680	59.8	31.8	37.7	67.6	2.5	0.4	0.4	0.2
33	Uttar Pradesh	25475071	20590074	23.8	19.8	75.0	79.5	1.1	0.6	0.1	0.1
34	Uttarakhand	1404845	1196157	83.1	50.3	14.5	46.7	2.1	2.7	0.3	0.3
35	West Bengal	13717186	11161870	40.3	20.3	57.8	79.2	1.5	0.5	0.4	0.1
	INDIA	**167874294**	**138271559**	**55.3**	**43.5**	**43.2**	**55.6**	**1.0**	**0.6**	**0.5**	**0.3**

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	Percentage of households having									
		Total No. of Households		Electricity		Kerosene		Any other sources		No lighting	
		2011	2001	2011	2001	2011	2001	2011	2001	2011	2001
1	2	3	4	5	6	7	8	9	10	11	12
1	A & N Islands	34346	23409	97.7	95.2	1.9	4.3	0.1	0.2	0.2	0.2
2	Andhra Pradesh	6778225	4173639	97.3	90.0	2.0	9.2	0.5	0.5	0.2	0.3
3	Arunachal Pradesh	65891	48114	96.0	89.4	3.2	9.4	0.4	0.5	0.4	0.7
4	Assam	992742	715185	84.1	74.3	15.2	25.0	0.5	0.6	0.3	0.2
5	Bihar	2013671	1322583	66.7	59.3	32.2	39.9	0.8	0.7	0.2	0.2
6	Chandigarh	228276	180576	98.4	96.7	1.1	2.9	0.2	0.2	0.2	0.2
7	Chhattisgarh	1238738	789440	93.7	82.9	5.7	16.5	0.3	0.3	0.2	0.3
8	Dadra & Nagar Haveli	37655	11190	98.5	95.8	1.4	3.8	0.0	0.3	0.1	0.0
9	Daman & Diu	47631	12251	99.3	98.3	0.6	1.3	0.1	0.1	0.1	0.3
10	Goa	198139	138461	97.7	94.7	1.8	4.6	0.3	0.3	0.3	0.4
11	Gujarat	5416315	3758028	97.2	93.4	2.1	5.5	0.2	0.5	0.5	0.7
12	Haryana	1751901	1075179	96.2	92.9	2.7	6.1	0.7	0.5	0.4	0.4
13	Himachal Pradesh	166043	143113	98.1	97.4	1.6	2.2	0.2	0.3	0.1	0.1
14	Jammu & Kashmir	517168	390411	98.0	97.9	1.2	1.6	0.6	0.4	0.2	0.1
15	Jharkhand	1495642	1060178	88.0	75.6	11.4	23.8	0.5	0.5	0.1	0.1
16	Karnataka	5315715	3556960	96.4	90.5	3.1	8.8	0.3	0.4	0.2	0.3
17	Kerala	3620696	1652656	97.0	84.3	2.8	15.1	0.2	0.5	0.0	0.0
18	Lakshadweep	8180	3889	99.7	99.7	0.2	0.3	0.1	0.0	0.0	0.0
19	Madhya Pradesh	3845232	2794858	92.7	92.3	6.6	7.1	0.4	0.3	0.2	0.2
20	Maharashtra	10813928	8069526	96.2	94.3	3.1	5.1	0.3	0.3	0.4	0.3
21	Manipur	171400	101302	82.4	82.0	11.2	17.3	5.9	0.5	0.5	0.3
22	Meghalaya	116102	90568	94.9	88.1	4.4	10.9	0.3	0.5	0.3	0.5
23	Mizoram	116203	81604	98.1	94.4	1.5	5.2	0.3	0.2	0.1	0.2
24	Nagaland	115054	66716	97.4	90.3	2.1	8.3	0.3	0.5	0.2	0.9
25	NCT of Delhi	3261423	2384621	99.1	93.4	0.6	5.7	0.2	0.7	0.1	0.2
26	Odisha	1517073	1087248	83.1	74.1	15.3	24.3	0.4	0.7	1.2	1.0
27	Puducherry	206143	136456	98.5	91.4	1.3	8.2	0.1	0.2	0.1	0.1
28	Punjab	2094067	1489694	98.3	96.5	1.0	2.6	0.3	0.4	0.3	0.5
29	Rajasthan	3090940	2185591	93.9	89.6	5.2	9.6	0.5	0.4	0.5	0.4
30	Sikkim	35761	13015	98.7	97.1	0.9	2.8	0.1	0.1	0.3	0.0
31	Tamil Nadu	8929104	5898836	96.1	88.0	3.4	11.1	0.2	0.4	0.3	0.4
32	Tripura	235002	122343	91.6	86.4	7.0	13.0	1.2	0.4	0.2	0.2
33	Uttar Pradesh	7449195	5170527	81.4	79.9	17.2	19.3	0.9	0.5	0.4	0.3
34	Uttarakhand	592223	390164	96.5	90.9	2.9	8.4	0.4	0.4	0.3	0.3
35	West Bengal	6350113	4554045	85.1	79.6	12.7	19.5	1.6	0.6	6.0	0.3
	INDIA	**78865937**	**53692376**	**92.7**	**87.6**	**6.5**	**11.6**	**0.5**	**0.5**	**0.3**	**0.4**

Source : Office of the Registrar General

7.5 SLUM POPULATION

7.5.1 As per UN Habitat, a slum is characterized by lack of durable housing, insufficient living area, lack of access to clean water, inadequate sanitation and insecure tenure. Under, Section -3 of the Slum Area Improvement and Clearance Act, 1956, slums have been defined as mainly those residential areas where dwellings are in any respect unfit for human habitation by reasons of dilapidation, overcrowding, faulty arrangements and designs of such buildings, narrowness or faulty arrangement of streets, lack of ventilation, light, sanitation facilities or any combination of these factors which are detrimental to safety, health and morals.

7.5.2 In India, according to the census 2001, 1743 cities/towns reported slums. Total slum population was around 42 million which accounted for 23.1% of the population of cities/towns reporting slums. However, as per the Census 2011 total number of towns reported slums has increased to 2613. Only 4 States/UTs in India- Manipur, Daman & Diu, Dadra & Nagar Haveli, Lakshadweep were classified "Not Reporting Slums". The details of slums may be seen in table 7.5.1 and Table 7.5.2.

Table 7.5.1 : Number of statutory and slum reported towns with type wise slum population

Sl. No.	State/UT's	Towns		Type wise slum population			
		Statutory towns	Slum reported towns	Total Population	Notified slums	Recognised slums	Identified slums
1	2	3	4	5	6	7	8
1	A & N Islands	1	1	14172	0	0	14172
2	Arunachal Pradesh	26	5	15562	0	0	15562
3	Andhra Pradesh	125	125	10186934	8338154	877172	971608
4	Assam	88	31	197266	9163	70979	117124
5	Bihar	139	88	1237682	0	0	1237682
6	Chandigarh	1	1	95135	95135	0	0
7	Chhattisgarh	168	94	1898931	713654	764851	420426
8	Delhi*	3	22	1785390	738915	0	1046475
9	Goa	14	3	26247	6107	0	20140
10	Gujarat	195	103	1680095	0	0	1680095
11	Haryana	80	75	1662305	14912	0	1647393
12	Himachal Pradesh	56	22	61312	60201	0	1111
13	Jammu & Kashmir	86	40	662062	162909	136649	362504
14	Jharkhand	40	31	372999	64399	59432	249168
15	Karnataka	220	206	3291434	2271990	445899	573545
16	Kerala	59	19	202048	186835	8215	6998
17	Madhya Pradesh	364	303	5688993	1900942	2530637	1257414
18	Maharashtra	256	189	11848423	3709309	3485783	4653331
19	Meghalaya	10	6	57418	34699	8006	14713
20	Manipur	28	0	0	0	0	0
21	Mizoram	23	1	78561	0	78561	0
22	Nagaland	19	11	82324	0	48249	34075
23	Odisha	107	76	1560303	0	812737	747566
24	Puducherry	6	6	144573	70092	73928	553
25	Punjab	143	73	1460518	787696	193305	479517
26	Rajasthan	185	107	2068000	0	0	2068000
27	Sikkim	8	7	31378	31378	0	0
28	Tamil Nadu	721	507	5798459	2541345	1978441	1278673
29	Tripura	16	15	139780	0	124036	15744
30	Uttar Pradesh*	648	293	6239965	562548	4678326	999091
31	Uttarakhand	74	31	487741	185832	52278	249631
32	Daman &Diu	2	0	0	0	0	0
33	Dadra & Nagar Haveli	1	0	0	0	0	0
34	West Bengal	129	122	6418594	48918	3703852	2665824
35	Lakshadweep	0	0	0	0	0	0
INDIA		**4041**	**2613**	**65494604**	**22535133**	**20131336**	**22828135**

Source :Slum Population -Census of India, 2011

Note : Himachal Pradesh, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Daman & Diu, Dadra & Nagar Haveli and Lakshadweep have not reported any slums in 2001

* Delhi and Uttar Pradesh includes 19 and 1 census town.

Table 7.5.2 : State-wise households by type of drainage connectivity for waste water outlet in India-2011					
Sl. No.	States/UT's	Total number of households	Waste water outlet connected to		
			Closed drainage	Open Drainage	No Drainage
1	2	3	4	5	6
1	Andhra Pradesh	2421268	1046362	1073653	301253
2	Arunachal Pradesh	4005	167	1342	2496
3	Assam	48122	5816	18197	24109
4	Bihar	194065	37351	76664	80050
5	Chhattisgarh	395297	40181	224370	130746
6	Goa	4846	2980	1155	711
7	Gujarat	360291	182157	78861	99273
8	Haryana	325997	125103	169676	31218
9	Himachal Pradesh	14240	8249	4497	1494
10	Jammu & Kashmir	96990	26103	52575	18312
11	Jharkhand	79200	11437	32909	34854
12	Karnataka	728277	253874	357117	117286
13	Kerala	54849	17411	16842	20596
14	Madhya Pradesh	1086692	225749	620412	240531
15	Maharashtra	2449530	1407141	853050	189339
16	Meghalaya	10936	2140	6733	2063
17	Mizoram	16240	3866	9964	2410
18	Nagaland	15268	765	12208	2295
19	Odisha	350306	32821	128589	188896
20	Punjab	296482	147782	115160	33540
21	Rajasthan	383134	101944	216983	64207
22	Sikkim	8612	3043	5149	420
23	Tamil Nadu	1451690	610503	421360	419827
24	Tripura	33830	1315	14665	17850
25	Uttar Pradesh	992728	213616	702274	76838
26	Uttarakhand	89398	26661	57555	5182
27	West Bengal	1393319	347827	609599	435893
28	A & N Islands	3053	313	2506	234
29	Chandigarh	22080	3441	12545	6094
30	Delhi	383609	186803	174837	21969
31	Puducherry	35070	7324	18656	9090
	India	**13749424**	**5080245**	**6090103**	**2579076**

Source: Census of India 2011, Slum Houses, Household Amenities and Assets.

Note : This appendix excludes institutional households.

Table 7.5.3: State-Wise slum households by availability of latrine facility in India-2011.

Sl.No	States/Uts	Total number of households	Number of households having latrine facility within the premises	Number of households not having latrine facility within the premises	No latrine with in premises Alternative source	
					Public latrine	Open
1	2	3	4	5	6	7
1	Andhra Pradesh	2421268	1993862	427406	69498	357908
2	Arunachal Pradesh	4005	3351	654	113	541
3	Assam	48122	41593	6529	1468	5061
4	Bihar	194065	104494	89571	7118	82453
5	Chhattisgarh	395297	192393	202904	38278	164626
6	Goa	4846	2953	1893	1537	356
7	Gujarat	360291	232075	128216	51636	76580
8	Haryana	325997	260675	65322	8878	56444
9	Himachal Pradesh	14240	12169	2071	727	1344
10	Jammu & Kashmir	96990	85539	11451	2630	8821
11	Jharkhand	79200	41731	37469	4297	33172
12	Karnataka	728277	461029	267248	85387	181861
13	Kerala	54849	51123	3726	1895	1831
14	Madhya Pradesh	1086692	683061	403631	59725	343906
15	Maharashtra	2449530	1019634	1429896	1191026	238870
16	Meghalaya	10936	10141	795	392	403
17	Mizoram	16240	16120	120	41	79
18	Nagaland	15268	14240	1028	830	198
19	Odisha	350306	168666	181640	12315	169325
20	Punjab	296482	262906	33576	2488	31088
21	Rajasthan	383134	274306	108828	8219	100609
22	Sikkim	8612	7840	772	544	228
23	Tamil Nadu	1451690	885619	566071	231050	335021
24	Tripura	33830	32259	1571	891	680
25	Uttar Pradesh	992728	769145	223583	37311	186272
26	Uttarakhand	89398	81977	7421	2000	5421
27	West Bengal	1393319	1149877	243442	88733	154709
28	A & N Islands	3053	2017	1036	610	426
29	Chandigarh	22080	869	21211	16921	4290
30	Delhi	383609	192171	191438	143589	47849
31	Puducherry	35070	22014	13056	4322	8734
	India	**13749424**	**9075849**	**4673575**	**2074469**	**2599106**

Source: Census of India 2011, Slum Houses, Household Amenities and Assets.
Note : This appendix excludes institutional households.

Table 7.5.4 : State-wise slum households classified by source and location of drinking water by them in India-2011

Sl. No.	States/Uts	Number of households (Hhs) by source of drinking water						
		Total number of households	Tap		Hand pump & tube well, borehole	Well		All others
			Treated source	Un treated source		Covered	Uncovered	
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	2421268	1883817	150341	261637	10417	47244	67812
2	Arunachal Pradesh	4005	444	1494	1861	12	38	156
3	Assam	48122	12410	1074	25490	1521	4677	2950
4	Bihar	194065	22760	7509	152564	1515	5252	4465
5	Chhattisgarh	395297	168218	72374	127204	3891	19432	4178
6	Goa	4846	4538	189	6	17	18	78
7	Gujarat	360291	261793	42761	37413	1478	708	16138
8	Haryana	325997	208355	30227	72908	1558	932	12017
9	Himachal Pradesh	14240	13174	218	503	86	37	222
10	Jammu & Kashmir	96990	61904	26350	5080	567	139	2950
11	Jharkhand	79200	17134	4631	39013	2531	14319	1572
12	Karnataka	728277	491339	117819	75900	4903	15130	23186
13	Kerala	54849	29185	2601	1273	7742	13619	429
14	Madhya Pradesh	1086692	525635	135668	325874	12871	51128	35516
15	Maharashtra	2449530	2121907	90313	153705	11617	22251	49737
16	Meghalaya	10936	6717	543	215	637	483	2341
17	Mizoram	16240	9189	1707	377	460	289	4218
18	Nagaland	15268	626	4859	2331	1383	2304	3765
19	Odisha	350306	122649	19897	137272	15335	46841	8312
20	Punjab	296482	179047	27849	85062	377	258	3889
21	Rajasthan	383134	291176	26933	41139	2059	2461	19366
22	Sikkim	8612	6170	1808	6	24	-	604
23	Tamil Nadu	1451690	974400	196122	193264	12137	28245	47522
24	Tripura	33830	16372	3555	12527	203	732	441
25	Uttar Pradesh	992728	383273	67573	518549	3602	3772	15959
26	Uttarakhand	89398	61001	4944	22357	132	51	913
27	West Bengal	1393319	776557	103869	452838	8305	28696	23054
28	A & N Islands	3053	2923	16	3	-	94	17
29	Chandigarh	22080	16019	4544	1121	81	7	308
30	Delhi	383609	281081	42153	44138	474	247	15516
31	Puducherry	35070	31959	2487	406	12	136	70
India		**13749424**	**8981772**	**1192428**	**2792036**	**105947**	**309540**	**367701**

Source: Census of India 2011, Slum Houses, Household Amenities and Assets.
Note : This appendix excludes institutional households.

Table 7.5.5 : State-wise Number of Towns/Cities Reporting Slums, percentage of Slum Population to the Total Urban Population and SC/ST Slum Population to Total Slum Population-2011

Sl. No	State/UT's	Number of Cities/towns reporting slums	Total Urban population of State/UT	Slum population	% of slum population to total urban populatio	Slum Population		% of Slum Population	
						Scheduled Caste	Scheduled Tribe	Scheduled Caste	Scheduled Tribe
1	Jammu & Kashmir	40	3433242	662062	19.28	11136	10797	1.68	1.63
2	Himachal Pradesh	22	688552	61312	8.90	16062	488	26.20	0.80
3	Punjab	73	10399146	1460518	14.04	581984	NST	39.85	0.00
4	Chandigarh	1	1026459	95135	9.27	29230	NST	30.72	0.00
5	Uttarakhand	31	3049338	487741	15.99	91953	2321	18.85	0.48
6	Haryana	75	8842103	1662305	18.80	497042	NST	29.90	0.00
7	Delhi	22	16368899	1785390	10.91	482870	NST	27.05	0.00
8	Rajasthan	107	17048085	2068000	12.13	582562	100675	28.17	4.87
9	Uttar Pradesh	293	44495063	6239965	14.02	1373211	19186	22.01	0.31
10	Bihar	88	11758016	1237682	10.53	260442	16630	21.04	1.34
11	Sikkim	7	153578	31378	20.43	1658	8745	5.28	27.87
12	Arunachal Pradesh	5	317369	15562	4.90	NSC	4631	0.00	29.76
13	Nagaland	11	570966	82324	14.42	NSC	64253	0.00	78.05
14	Manipur	0	834154	0	0.00	0	0	0.00	0.00
15	Mizoram	1	571771	78561	13.74	69	73552	0.09	93.62
16	Tripura	15	961453	139780	14.54	40291	3337	28.82	2.39
17	Meghalaya	6	595450	57418	9.64	1589	40752	2.77	70.97
18	Assam	31	4398542	197266	4.48	42358	3702	21.47	1.88
19	West Bengal	122	29093002	6418594	22.06	1060811	106373	16.53	1.66
20	Jharkhand	31	7933061	372999	4.70	58164	66680	15.59	17.88
21	Odisha	76	7003656	1560303	22.28	321167	199836	20.58	12.81
22	Chhattisgarh	94	5937237	1898931	31.98	338098	174050	17.80	9.17
23	Madhya Pradesh	303	20069405	5688993	28.35	1251713	356481	22.00	6.27
24	Gujarat	103	25745083	1680095	6.53	186577	125538	11.11	7.47
25	Daman & Diu	0	182851	0	0.00	0	0	0.00	0.00
26	D&N Haveli	0	160595	0	0.00	0	0	0.00	0.00
27	Maharashtra	189	50818259	11848423	23.32	1863882	364254	15.73	3.07
28	Andhra Pradesh	125	28219075	10186934	36.10	1428212	270556	14.02	2.66
29	Karnataka	206	23625962	3291434	13.93	922589	172129	28.03	5.23
30	Goa	3	906814	26247	2.89	651	112	2.48	0.43
31	Lakshadweep	0	50332	0	0.00	0	0	0.00	0.00
32	Kerala	19	15934926	202048	1.27	21923	411	10.85	0.20
33	Tamil Nadu	507	34917440	5798459	16.61	1853315	30996	31.96	0.53
34	Puducherry	6	852753	144573	16.95	34521	NST	23.88	0.00
35	A&N Islands	1	143488	14172	9.88	NSC	48	0.00	0.34
India		**2613**	**377106125**	**65494604**	**17.37**	**13354080**	**2216533**	**20.39**	**3.38**

Source: Registrar General of India, Census of India 2011

Note: Manipur, Dama & Diu, Dadra & Nagar Haveli and Lakshdweep have not reported any slum in 2011 Census.

NSC : No Scheduled Caste/ NST: No Scheduled Tribes

Table7.5.6 : Total Urban Population, Slum Population and percentage of Slum Population in Million plus cities and percentage of Slum Population of SC/ST to Total Slum Population-2011

Sl. No	Million plus cities (M. Corp.)	State	Total Urban Population	Slum Population	% of Slum Population	Slum Population		% of SC/ST Slum Population to Total Slum Population	
						Scheduled Caste	Scheduled Tribe	Scheduled Caste	Scheduled Tribe
1	2	3	4	5	6	7	8	9	10
1	Greater Mumbai	Maharashtra	12442373	5206473	41.84	410300	66370	7.88	1.27
2	DMC	Delhi	11034555	1617239	14.66	420204	NST	25.98	NST
3	Bangalore BBMP	Karnataka	8495492	712801	8.39	265900	16449	37.30	2.31
4	Hyderabad ,GHMC	Andhra Pradesh	6993262	2287014	32.70	226208	49859	9.89	2.18
5	Ahmadabad	Gujarat	5633927	250681	4.45	47218	5817	18.84	2.32
6	Chennai	Tamil Nadu	4646732	1342337	28.89	394081	2995	29.36	0.22
7	Surat	Gujarat	4501610	467434	10.38	18802	41390	4.02	8.85
8	Kolkata	West Bengal	4496694	1409721	31.35	78337	3981	5.56	0.28
9	Pune	Maharasthra	3124458	690545	22.10	192442	9256	27.87	1.34
10	Jaipur	Rajasthan	3046163	323400	10.62	78606	15679	24.31	4.85
11	Lucknow	Uttar Pradesh	2817105	364941	12.95	58214	2585	15.95	0.71
12	Kanpur	Uttar Pradesh	2768057	425008	15.35	116166	741	27.33	0.17
13	Nagpur	Maharashtra	2405665	859487	35.73	209217	99646	24.34	11.59
14	Indore	Madhya Pradesh	1994397	590257	29.60	142868	17825	24.20	3.02
15	Thane	Maharasthra	1841488	326798	17.75	35988	13156	11.01	4.03
16	Bhopal	Madhya Pradesh	1798218	479699	26.68	96950	17919	20.21	3.74
17	Vadodara	Gujarat	1752371	84804	4.84	6386	7443	7.53	8.78
18	Visakhapatnam	Andhra Pradesh	1728128	770971	44.61	81953	9321	10.63	1.21
19	Pimpri Chinchwad	Maharasthra	1727692	129099	7.47	65946	2289	51.08	1.77
20	Patna	Bihar	1684297	77034	4.57	18979	112	24.64	0.15
21	Ghaziabad	Uttar Pradesh	1648643	333962	20.26	57854	840	17.32	0.25
22	Ludhiana	Punjab	1618879	244163	15.08	59567	NST	24.40	NST
23	Agra	Uttar Pradesh	1585704	533554	33.65	175582	4031	32.91	0.76
24	Nashik	Maharasthra	1486053	189721	12.77	61662	24843	32.50	13.09
25	Faridabad	Hariyana	1414050	215053	15.21	58055	NST	27.00	NST
26	Rajkot	Gujarat	1323363	189360	14.31	36880	3138	19.48	1.66
27	Meerut	Uttar Pradesh	1305429	544859	41.74	130045	2366	23.87	0.43
28	Kalyan-Dombivli	Maharasthra	1247327	98157	7.87	28486	1951	29.02	1.99
29	Vasai-Virar City	Maharasthra	1222390	35691	2.92	1888	1907	5.29	5.34
30	Srinagar	Jammu & Kashmir	1206419	343125	28.44	4	957	0.00	0.28
31	Varanasi	Uttar Pradesh	1198491	302025	25.20	37023	1995	12.26	0.66
32	Aurangabad	Maharasthra	1175116	221001	18.81	66077	2668	29.90	1.21
33	Allahabad	Uttar Pradesh	1168385	91689	7.85	25001	235	27.27	0.26
34	Dhanbad	Jharkhand	1162472	14275	1.23	4077	414	28.56	2.90
35	Amritsar	Punjab	1159227	329797	28.45	127432	NST	38.64	NST
36	Vijaywada	Andhra Pradesh	1143232	451231	39.47	59195	9994	13.12	2.21
37	Navi Mumbai	Maharasthra	1120547	207645	18.53	37196	4577	17.91	2.20
38	Jabalpur	Madhya Pradesh	1081677	483626	44.71	99299	23168	20.53	4.79
39	Haora	West Bengal	1077075	83509	7.75	3631	307	4.35	0.37
40	Ranchi	Jharkhand	1073427	74287	6.92	6817	28605	9.18	38.51
41	Jhodhpur	Rajasthan	1056191	254096	24.06	71417	14511	28.11	5.71
42	Gwalior	Madhya Pradesh	1054420	309793	29.38	78106	5918	25.21	1.91
43	Coimbatore	Tamil Nadu	1050721	129181	12.29	55474	33	42.94	0.03
44	Rajpur	Chhattisgarh	1027264	406571	39.58	71440	19314	17.57	4.75
45	Madurai	Tamil Nadu	1017865	278153	27.33	32420	1839	11.66	0.66
46	Kota	Rajasthan	1001694	319309	31.88	83864	15667	26.26	4.91
			116558745	**25099576**	**21.53**	**4433257**	**552111**	**17.66**	**2.20**

Source: Registrar General of India, Census of India 2011

NST: No Scheduled Tribe

7.6 Solid and Hazardous Waste

7.6.1 Hazardous waste has been defined as any waste, which by reason of any of its physical, chemical, reactive, toxic, flammable, explosive or corrosive characteristics causes danger or is likely to cause danger to health or environment, whether alone or when in contact with other wastes or substances. (AS per Rule 3 of the Hazardous Wastes (Management, Handling and Transboundry Movement)Rules, 2008). Regulatory Quantities of Hazardous Waste are given 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 The State wise quantity of hazardous waste generation in India in 2008 can be assessed from the table 7.6.2

7.6.3 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.

7.6.4 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 are given in Table 7.6.3, 7.6.4 and 7.6.5.

7.6.5 The criteria fallow for direct waste of hazardous waste into secured landfill in given in Table 7.6.6.

Table 7.6.2 : State-wise status of hazardous waste generation -2008

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 Bengal	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)	Population (as per 2011 census)	Waste Quantity (Tonnes Per Day)	Waste generation rate (Kcal/day)
1	Agartala	189998	63	77	0.40	250417	114	0.456
2	Agra	1275135	140	654	0.51	1754705	1021	0.852
3	Ahemdabad	3520085	191	1302	0.37	5963967	2518	0.422
4	Aizwal	228280	117	57	0.25	300873	86	0.285
5	Allahabad	975393	71	509	0.52	1373658	815	0.593
6	Amritsar	966862	77	438	0.45	1323163	679	0.514
7	Asansol	745439	127	207	0.44	1406792	706	0.502
8	Bangalore	4301326	226	1669	0.39	7514506	3344	0.445
9	Bhopal	1437354	286	574	0.40	1922192	877	0.456
10	Bhubaneswar	648032	135	234	0.36	867534	356	0.411
11	Chandigarh	808515	114	326	0.40	1065623	486	0.456
12	Chennai	4343645	174	3036	0.62	8646399	6118	0.708
13	Coimbatore	930882	107	530	0.57	1925781	1253	0.65
14	Daman	35770	7	15	0.42	47145	23	0.479
15	Dehradun	426674	67	131	0.31	698887	247	0.54
16	Delhi'	10306452	1483	5922	0.57	16972505	11040	0.65
17	Dhanbad	199258	24	77	0.39	1404101	625	0.445
18	Faridabad	1055938	216	448	0.42	1391726	667	0.479
19	Gandhinagar	195985	57	44	0.22	258308	65	0.251
20	Gangtok	29354	15	13	0.44	38689	19	0.502
21	Greater Mumbai	11978450	437	5320	0.45	21660521	11124	0.514
22	Guwahati	809895	218	166	0.20	1079190	246	0.228
23	Hyderabad	3843585	169	2187	0.57	7568003	4923	0.65
24	Impal	221492	34	43	0.19	329808	72	0.217
25	Indore	1474968	130	557	0.38	1999298	867	0.434
26	Itanagar	35022	22	12	0.34	46159	18	0.388
27	Jabalpur	932484	134	216	0.23	1447164	380	0.262
28	Jaipur	2322575	518	904	0.39	3061154	1362	0.445
29	Jammu	369659	102	215	0.58	806831	534	0.662
30	Jamshedpur	1104713	64	338	0.31	1456012	515	0.354
31	Kanpur	2551337	267	1100	0.43	3579101	1756	0.491
32	Kavarati	10119	4	3	0.30	13337	5	0.342
33	Kochi	595575	98	400	0.67	1787171	1366	0.765
34	Kohima	77030	30	13	0.17	101526	20	0.194
35	Kolkata	4572876	187	2653	0.58	17405109	11520	0.662
36	Lucknow	2185927	310	475	0.22	2959581	743	0.251
37	Ludhiana	1398467	159	735	0.53	1843180	1115	0.605
38	Madurai	928868	52	275	0.30	1585679	543	0.342
39	Meerut	1068772	142	490	0.46	1531142	804	0.525
40	Nagpur	2052066	218	504	0.25	2806681	801	0.285
41	Nashik	1077236	269	200	0.19	1518766	329	0.217
42	Panjim	69066	69	32	0.54	131374	81	0.616
43	Patna	1366444	107	511	0.37	2237932	945	0.422
44	Pondicherry	220865	19	130	0.59	666854	449	0.673
45	Port Blair	99984	18	76	0.76	131779	114	0.867
46	Pune	2538473	244	1175	0.46	4959518	2602	0.525
47	Raipur	605747	56	184	0.30	443362	153	0.346
48	Rajkot	967476	105	207	0.21	1321974	317	0.24
49	Ranchi	847093	224	208	0.25	1138086	325	0.285
50	Shillong	132867	10	45	0.34	352779	137	0.388
51	Silvassa	50463	17	16	0.32	28855	11	0.365
52	Simla	142555	20	39	0.27	191077	59	0.308
53	Srinagar	989440	341	428	0.48	1302461	713	0.548
54	Surat	2433835	112	1000	0.41	3705707	1734	0.468
55	Tiruvananantapuram	744983	142	171	0.23			
	Thirvchirapalli					435101	537	1.234
56	Vadodara	1306227	240	357	0.27	1965197	606	0.308
57	Varanasi	1091918	80	425	0.39	1586821	706	0.445
58	Vijaywada	851282	58	374	0.44	1370085	688	0.502
59	Vishakhapatnam	982904	110	584	0.59	1773946	1194	0.673

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 7.6.4 : 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 survey 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	Ahmedabad	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 7.6.6: 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

Tot. Dis. : Total Dissolved Tot. kj : Total Kilo joule

ABBREVIATIONS

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

Appendix II

Concepts and Definitions of the Terms Used

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

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

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

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

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

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

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

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

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

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

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

Flush system latrine:
The type of latrine which is connected to an under ground

sewerage system, from which human excreta and wastes are flushed out by water.

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

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

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

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

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

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

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

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

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

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

The above definition was elaborated as follows:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Urban Agglomeration:
(i) A city or a town with a continuous outgrowth, the outgrowth being outside the statutory limits but falling within the boundaries of the adjoining villages ; or
(ii) Two or more adjoining towns with their outgrowths, if any, as in (i) above ; or
(iii) A city and one or more adjoining towns with or without outgrowths all of which form a continuous spread.

Vulnerable:
The species believed likely to move into the endangered category in the near future if the casual factors continue operating. Included are species of which most or all the populations are decreasing because of overexploitation, extensive destruction of habitat or other environmental disturbance; species with populations that have been seriously depleted and whose ultimate security is not yet assured; and species with populations that are still abundant but are under threat from serious adverse factors throughout their range.