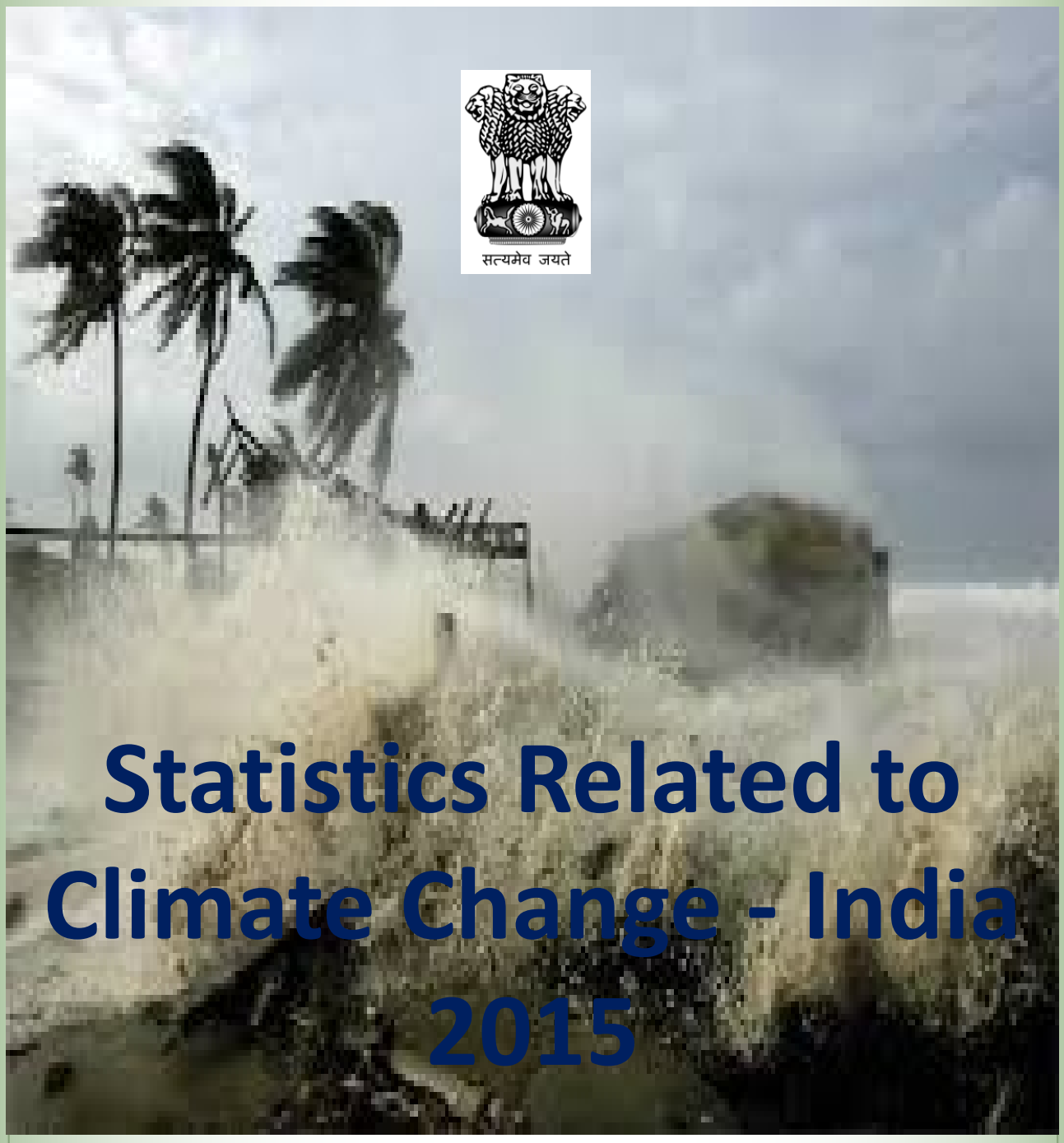

Statistics Related to Climate Change - India 2015

Government of India
Ministry of Statistics and Programme Implementation
Central Statistics Office
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सत्यमेव जयते

एक कदम स्वच्छता की ओर

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Preface

India is faced with the challenge for sustaining rapid economic growth while addressing the threat posed by Climate Change. Climate change is net result of several factors and many sectors of the economy are climate sensitive. Therefore, it is essential to have assessments of impacts of climate change to various sectors of the economy directly or indirectly to enable devising approaches, strategies and action plans to respond to the changes. Obviously such assessments require compilation and dissemination of related statistics.

Realizing the importance and need for such an effort, the Central Statistics Office(CSO) of Ministry of Statistics and Programme Implementation constituted an Expert Committee in 2009 to develop a framework for 'Statistics Related to Climate Change.' The framework developed by the Expert Committee was given a final shape after consultations with some key Ministries and discussions in a National Seminar organized by CSO in 2013 which was attended by Academicians, Researchers, State/UT Governments, Data Producing Ministries and Data Users. Accordingly, CSO decided to bring out regular biannual publication on "Statistics related to Climate Change-India. The first publication was brought out in November 2013.

This issue is second edition in the series. The publication consists of three distinct parts viz. causal factors behind climate change; impact factors of climate change; and mitigation and adaptation. The Publication is expected to serve the needs of Environment planners and policy makers as well as other government and non-government organizations and research institutions working in the field.

The data given in the Publication is based on the information provided by the Union Government Ministries/Departments/organizations from published records and websites of various agencies. This edition of the Publication presents a compilation of latest data available from the source agencies.

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

I wish to place on record appreciation for the team of officers of Social Statistics Division comprising Smt. Sudha Midha, Additional Director General, Shri Krishna Kumar, Deputy Director General, Shri James Mathew, Director, Shri Rakesh Kumar Maurya, Director, Ms. Avneet Kaur, Assistant Director, Shri Rajesh Kumar Panwar, Senior Statistical Officer and Ms. Kulpreet Sokhi, Junior Statistical Officer who made commendable efforts in bringing out preparing this publication in its present form.

I hope the publication will benefit all those who are involved in the field of policy, planning, management, administration, and research in the areas related to environment and climate change.We welcome suggestions/comments for further improvement of the Publication from users. Suggestions may be sent to ddg.ssd-mospi@nic.in.

(Ashish Kumar)
27/11/15

November 2015
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SECTION- I

Introduction to Statistics Related to Climate Change India: Concepts and Framework

1.1 Introduction

1.1.1 Climate Change

The Earth's climate has always changed and evolved. Some of these changes have been due to natural causes but others can be attributed to human activities such as deforestation, atmospheric emissions from industry and transport, which have led to gases and aerosols being stored in the atmosphere. These gases are known as greenhouse gases (GHGs) because they trap heat and raise air temperatures near the ground, acting like a greenhouse on the surface of the planet. Recent research indicates that the climate system is influenced by human activity and has led to warming of climate system since 1950. Intergovernmental Panel on Climate Change (IPCC) synthesis report comprising of key findings was published by IPCC in October, 2014. The Synthesis report of the Fifth Assessment Report has indicated that

– Human influence on the climate system is clear, and recent anthropogenic emissions of GHG are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.

– Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen. Oceanic uptake of carbon dioxide (CO^2) resulted in acidification of oceans Warming of 0.85^0 C increased during 1882-2012 and sea level rose by 0.19 m during 1901-2010.

– Continued emission of greenhouse gases will cause further warming and long lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.

– Multi-model results show that limiting total human-induced warming to less than 2°C relative to the period 1861-1880 with a probability of more than 66% would require cumulative CO2 emissions from all anthropogenic sources since 1870 to remain below about 2900 GtCO2 (with a range of 2550-3150 $GtCO_2$ depending on non-CO_2 drivers). About 1900 $GtCO_2$ had already been emitted by 2011.

– Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.

– Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of GHG are stopped. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases.

– Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change. Substantial emissions reductions over the next few decades can reduce climate risks in the 21st century and beyond, increase prospects for effective adaptation, reduce the costs and challenges of mitigation in the longer term, and contribute to climate-resilient pathways for sustainable development.

– Effective decision making to limit climate change and its effects can be informed by a wide range of analytical approaches for evaluating expected risks and benefits, recognizing the importance of governance, ethical dimensions, equity, value judgments, economic assessments and diverse perceptions and responses to risk and uncertainty.

– Without additional mitigation efforts beyond those in place today, and even with adaptation, warming by the end of the 21st century will lead to high to very high risk of severe, widespread, and irreversible impacts globally (high confidence). Mitigation involves some level of co-benefits and of risks due to adverse side-effects, but these risks do not involve the same possibility of severe, widespread, and irreversible impacts as risks from climate change, increasing the benefits from near-term mitigation efforts.

– Adaptation can reduce the risks of climate change impacts, but there are limits to its effectiveness, especially with greater magnitudes and rates of climate change. Taking a longer-term perspective, in the context of sustainable development, increases the likelihood that more immediate adaptation actions will also enhance future options and preparedness.

– There are multiple mitigation pathways that are likely to limit warming to below 2°C relative to pre-industrial levels. These pathways would require substantial emissions reductions over the next few decades and near zero emissions of CO_2 and other long-lived GHGs by the end of the century. Implementing such reductions poses substantial technological, economic, social, and institutional challenges, which increase with delays in additional mitigation and if key technologies are not available. Limiting warming to lower or higher levels involves similar challenges, but on different timescales.

– Many adaptation and mitigation options can help address climate change, but no single option is sufficient by itself. Effective implementation depends on policies and cooperation at all scales, and can be enhanced through integrated responses that link adaptation and mitigation with other societal objectives.

- Global mean sea-level rise will continue during the 21st century, very likely at a faster rate than observed from 1971 to 2010. Sea level rise will not be uniform across regions.

By the end of the 21st century, it is very likely that sea level will rise in more than about 95% of the ocean area. About 70% of the coastlines worldwide are projected to experience a sea-level change within ± 20% of the global mean.

1.1.2 Background- Statistics related to Climate Change

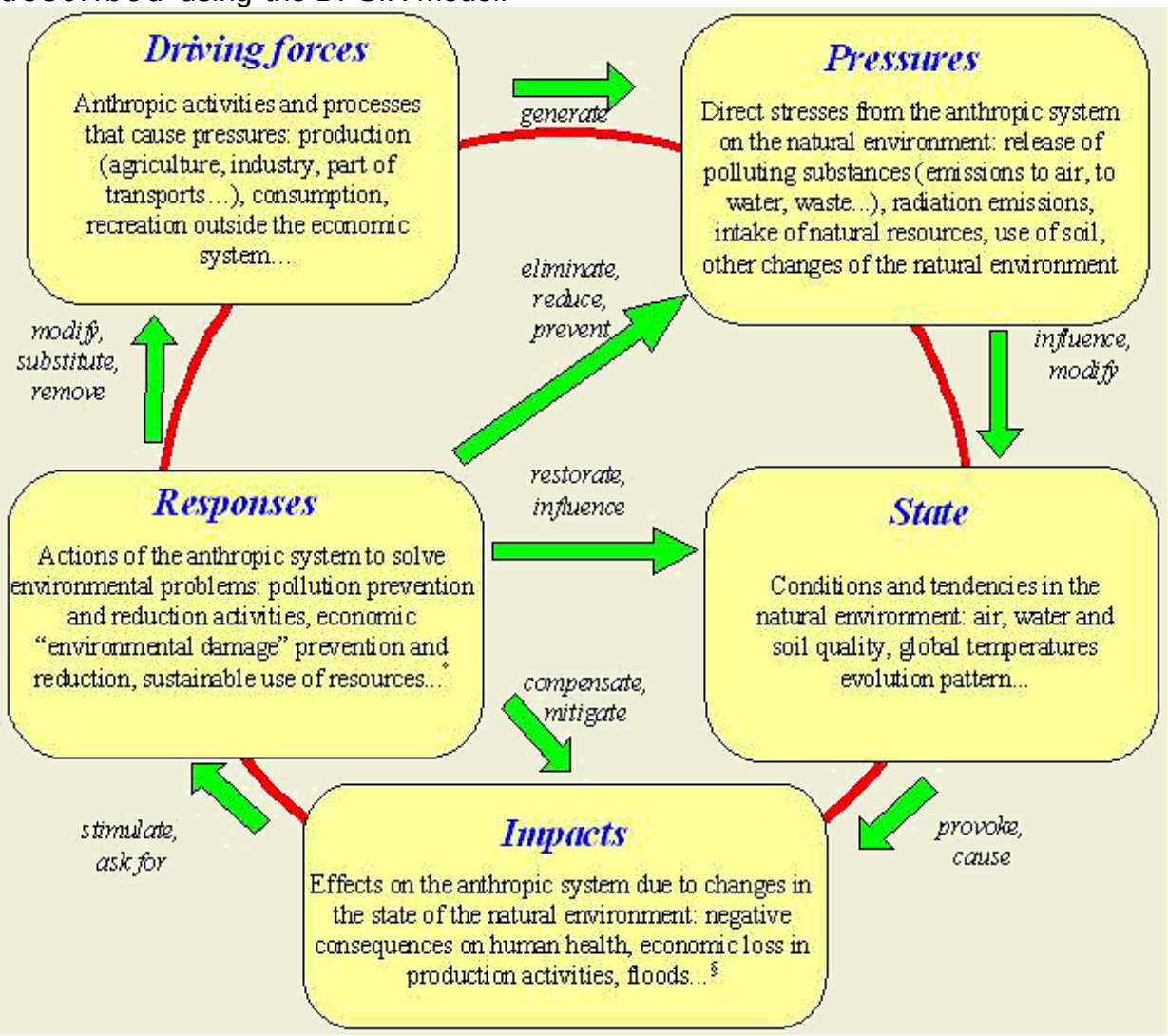
Awareness on the impact of climate change has been increasing since 1960 when a group of people gathered together protesting against a polluting industry in Great Britain. The thinkers and social scientists have recognized the impacts of climate change since then and a movement to save the earth and the precious life on it gained momentum. The Stockholm Conference in the year 1972 was the first international recognition and manifestation of the urgency to address climate change as it affects both the developed and developing countries, though, the degree of impact could vary. The atmosphere is a global public good and it is commonly shared by all living beings in the earth's ecosystem. The awareness on the degradation of the environment and its impact on the climate system and the natural resources have gained momentum after the efforts of the United Nations, especially after the Stockholm Conference held during June, 1972. The Stockholm conference recognized the concept of 'Sustainable Development' and the impact of development and industrialization on the environmental quality of a nation. This conference led to the formation of the United Nations Environment Programme (UNEP).

United Nations Statistics Division (UNSD) recognized the subject of Climate Change as one of its priorities in the Environment Statistics. Climate Change comes under the ambit of the UN framework Convention on Climate Change (UNFCCC) wherein different countries are required to report their Green House Gases (GHGs) emission to the UN. There is also Inter Governmental Panel on Climate Change (IPCC) which reports to UNFCCC. With the financial assistance from UNEP, the UNSD brought out a framework for the collection of data on environment and related variables in 1984, called 'Framework for the Development of Environment Statistics' (FDES). 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. In 1995, UNSD brought out a list of environmental indictors which evolved through the studies undertaken by them in the participating countries and in collaboration with the Inter-Governmental Working Group on Advancement of Environment Statistics. The FDES, however, covers most of the environmental indicators which are also related with climate change. It is therefore difficult to segregate climate change as a separate subject outside the domain of environment statistics. However it is important is to examine the availability of statistics for climate change indicators either under the system of environmental statistics per se or through special mechanisms addressing climate change issues. There is need to identify parameters defining necessary climate change data-needs, availability of credible data and identification of data-gaps

for assessing causes and effects of climate change and provide a framework for their levels of relevance and international harmonization in the Indian context.

1.1.3. Climate change assessment

A common way to assess and manage environmental problems is the so-called Driving forces-Pressure-State-Impact-Response framework (DPSIR). Driving forces are the socio- economic forces driving human activities, which increase or mitigate pressures on the environment. Pressures are the stresses that human activities generate on the environment. Impacts are the effects of environmental degradation on society, the economy and ecosystems. Responses refer to the responses of society to the environmental situation. This framework is very helpful to organize information on the state of the environment, both for researchers, policy makers and the general public. Specific indicators can be compiled for each part of the DPSIR framework. Climate change and its relations with the economy can be described using the DPSIR model.



1.1.4. Driving forces of climate change

Basic economic developments are the main drivers behind human induced climate change. Increased production of goods and services, changes in the production structure, increased transportation, a higher demand for all kinds of consumer goods, etc., contribute to a higher pressure on the atmosphere thereby increasing the greenhouse gas concentration. Particularly important is, of course, the ever increasing demand for energy. At present the world's economy runs on fossil fuels. The combustion of coal, oil and natural gas and derived products provide energy to nearly all economic activities. The emission of Carbon Dioxide (CO_2) is a residual product of burning these fossil fuels. Also changes in land use pattern, deforestation and land clearings are important driving forces leading to a rise in Carbon Dioxide emissions.

1.1.5. Pressure on the environment

Driving forces lead to human activities such as transportation or food production, i.e. result in meeting a need. These human activities exert 'pressures' on the environment, as a result of production or consumption processes, which can be divided into three main types: (i) excessive use of environmental resources, (ii) changes in land use, and (iii) emissions (of chemicals, waste, radiation, noise) to air, water and soil. Emissions include direct emissions to air, water and soil, indirect emissions to air, water and soil, Production of waste, Production of noise, Radiation Vibration, Hazards.

Greenhouse Gases (GHGs)

Greenhouse Gases (GHGs) are gases in the atmosphere that absorb and emit radiation within the thermal infrared range. Earth's most abundant GHGs are water vapor, Carbon Dioxide, atmospheric Methane, Nitrous Oxide (NO), Ozone (O_3) and Chloro-Fluro-Carbons (CFCs). Greenhouse effect is a process by which radioactive energy leaving a planetary surface is absorbed by some atmospheric gases called greenhouse gases. The ability of the atmosphere to capture and recycle energy emitted/reflected by earth's surface is the defining characteristic of the greenhouse effect. Global warming is believed to be the result of the strengthening of greenhouse effect mostly due to human produced increases of greenhouse gases in the atmosphere. The pressures related to climate change being considered are the greenhouse gas emissions caused by economic activities. CO_2 is by far the most important greenhouse gas, and originates mainly from the combustion of fossil fuels and biomass. However, other greenhouse gasses like methane, Nitrous Oxide and halocarbons also contribute to climate change. Methane is mainly produced by domesticated animals such as dairy cows, pigs etc, rice growing, gas flaring and mining activities. Nitrous Oxide mainly originates from agricultural land management, animal manure management, combustion of fossil fuels, and the production of fertilizers and nitric acid.

1.1.6. State of the environment

The present state of the environment with regard to climate change is reflected in the condition of the atmosphere and hydrologic system of the earth. This state can be described using the so-called Essential Climate Variables (ECV's). Within the atmospheric domain these are air temperature, air pressure, precipitation rates, surface radiation, and also the concentration of the different GHGs. In the oceanic domain these are sea surface temperatures, sea level, sea ice, ocean current etc. In the terrestrial domain these are river discharge, ground water levels, lake water levels, land cover (including vegetation type), glaciers, etc.

Global Climate Observing System (GCOS) Essential Climate Variables
The 50 GCOS Essential Climate Variables (ECVs) (2010) are required to support the work of the UNFCCC and the IPCC. All ECVs are technically and economically feasible for systematic observation. It is these variables for which international exchange is required for both current and historical observations. Additional variables required for research purposes are not included in this table. It is emphasized that the ordering within the table is simply for convenience and is not an indicator of relative priority.

Domain	GCOS Essential Climate Variables
Atmospheric (over land, sea and ice)	**Surface:**[1] Air temperature, Wind speed and direction, Water vapour, Pressure, Precipitation, Surface radiation budget. **Upper-air:**[2] Temperature, Wind speed and direction, Water vapour, Cloud properties, Earth radiation budget (including solar irradiance). **Composition:** Carbon dioxide, Methane, and other long-lived greenhouse gases[3], Ozone and Aerosol, supported by their precursors[4].
Oceanic	**Surface:**[5] Sea-surface temperature, Sea-surface salinity, Sea level, Sea state, Sea ice, Surface current, Ocean colour, Carbon dioxide partial pressure, Ocean acidity, Phytoplankton. **Sub-surface:** Temperature, Salinity, Current, Nutrients, Carbon dioxide partial pressure, Ocean acidity, Oxygen, Tracers.

Terrestrial	River discharge, Water use, Groundwater, Lakes, Snow cover, Glaciers and ice caps, Ice sheets, Permafrost, Albedo, Land cover (including vegetation type), Fraction of absorbed photosynthetically active radiation (FAPAR), Leaf area index (LAI), Above-ground biomass, Soil carbon, Fire disturbance, Soil moisture.

[1] Including measurements at standardized, but globally varying heights in close proximity to the surface.
[2] Up to the stratopause.
[3] Including nitrous oxide (N_2O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF_6), and perfluorocarbons (PFCs).
[4] In particular nitrogen dioxide (NO_2), sulphur dioxide (SO_2), formaldehyde (HCHO) and carbon monoxide (CO).
[5] Including measurements within the surface mixed layer, usually within the upper 15m.

1.1.7. The impact of climate change on the economy

Climate change has the potential to create a wide range of economic impacts. In all likelihood all sectors of the economy will be affected. Some impacts will gradually affect economic processes, such as the effect of increasing temperature on energy demand, whereas others may come as extreme events, such as sudden floods or forest fires. Impacts may be either negative or positive. For example, agriculture may become more productive or tourism may flourish in areas experiencing higher or lower temperatures. However, in a global level, the negative impacts will generally outweigh the economic benefits. Beside industry specific impacts, the economy as a whole may be at risk in certain areas due to an increase in sea level and an increase in runoff by rivers. Coastal zones usually contain large human populations and a high concentration of economic activities. Flooding and extreme storm events may seriously disrupt economic activities and cause loss of produced capital. The same is true for areas adjacent to major river systems which may be subject to flooding when precipitation and overland flow increases.

Assessing the impact of climate change faces a fundamental challenge of complexity. The set of mechanisms through which climate may influence economic outcomes, positive or negative is extremely large and difficult to investigate. For example, a decrease in agricultural output or value added products may be induced by climate change. However, climate change is only one driver among many that will shape agriculture in future decades. Other factors, such as technological developments, socio-economic factors or other environmental issues could have a similar large impact.

1.1.8. Initiatives of Central Statistics Office

The Central Statistics Office (CSO) under National Statistical Organizatio (NSO) constituted a Steering Committee on Environment Statistics in 1996 to examine the indicators identified by UNSD and recommend a set of parameters which are relevant in Indian context and applicable to our needs and requirements. The Committee recommended for the adoption of five broad categories of the UNSD Framework for Development of Environment Statistics (FDES), 1984 viz., bio-diversity, atmosphere, land/soil, water and human settlements. Accordingly, CSO decided to bring out an Annual publication by title 'Compendium of Environment Statistics' covering all the parameters as identified by the said Committee. So far CSO has brought out fifteen issues and the latest one, is for year 2014 covers the data available up to 2014.

The liberalization of the Indian economy in the early 1990s and the unprecedented growth have brought our country in the centre stage of climate change discussions worldwide. The growth in the energy sector and the use of fossil fuels for the development needs have resulted increased emission of Carbon Dioxide and other GHGs in absolute terms. The findings of IPCC indicate that there was 0.4^0C change in the surface temperature in India during the last century and a recession in the Himalayan glaciers. The formation of Prime Minister's Council of National Action Plan on Climate Change (NAPCC) is an outcome of all these related events which happened in the past decade.

The 16th Conference of Central and State Statistical Organizations (COCSSO) held at Shimla during 4-5 December, 2008 felt that India's official statistics on Climate change is insufficient to address the challenges posed by the country and a more elaborate and a meaningful database to be built to ascertain the impact of climate change. Hence COCSSO recommended that

> *'for collection of statistics, to capture climate change effectively, an Expert Committee should be set up in the Ministry of Statistics and Programme Implementation with members drawn from concerned Ministries, State Departments, research Organizations and outside experts to identify the parameters that affect environment'.*

Keeping this in view, CSO organised a two days seminar on 'Climate Change – Data Availability and Requirements' at Institute of Social and Economic Change (ISEC), Bangalore during April, 2009. Researchers, academicians, technocrats and officials from Ministries who deal with environment and climate were invited and their views and research findings were gathered to prepare a status paper on the subject matter

As an outcome of the seminar, CSO constituted an Expert Committee on the Development of Database on Climate Change on 20th July, 2009 under the

Chairmanship of Dr. K. S. Rao, Professor, Dept. of Botany, Delhi University with the following terms of reference:

(i) To identify indicators/parameters for which statistical data need to be collected. Such data may be utilized to capture causes and effects of climate change and to monitor adaptability and mitigation measures

(ii) To suggest the data source agencies for the collection of above data

(iii) To decide the relevant geographical unit/ climatic unit for which data may be collected and periodicity of such data collection

(iv) To review the data contained in the CSO's publication 'Compendium of Environment Statistics' and suggest modification, if any, in existing tables to meet the users requirement at national and international level.

The Expert Committee took up the task of finding out minimum set of indicators which are relevant and could be used for building up a database for the Climate Change in India has submitted its Draft Report in June 2010. The Report included a Framework for Climate change Statistics and recommended:-

(1) The Annual publication entitled 'Compendium of Environment Statistics' should be continued in the present form without any modification in terms of its contents, parameters or its time-period as it is in conformity with the FDES.

(2) The data source agencies identified in the report will supply the necessary data in the specified format to the CSO as per periodicity indicated.

(3) Climate change is an ongoing phenomenon and needs historical information to identify changes if any, in the long run. So, time series data need to be compiled starting from 1990 or depending upon the availability of data.

(4) Various ministries and departments are collecting data as per their requirements and maintaining with them in aggregate and disaggregate levels. CSO may publish the data in the aggregate form with state as the basic unit.

(5) The periodicity of the data as indicated in the report may be followed.

(6) The data on Mitigation and Adaptation activities may be obtained from the nodal ministries so that the same could be used for analyzing the extent and reach of the activities undertaken by them. The analysis would help to identify the strengths and weaknesses of the missions.

(7) CSO should initiate concerted efforts to capture data for some of the indicators which are not available at present, by approaching the concerned organizations.

(8) CSO should be the nodal agency to coordinate with the data source agencies.

(9) CSO should bring out a new publication on Climate Change Statistics covering only the data related to the subject.

The Draft Report was sent to Ministry of Environment and Forests for comments. The comments received from MOEF were examined and the Report of the Expert Committee was accepted by the Ministry in December 2010. The Report was uploaded in the Ministry's website for comments from public. As recommended by the Expert Committee it was decided by CSO to bring out a new publication on climate change Statistics.

With the purpose of betterment and enrichment of the proposed framework CSO organised a Two day National Seminar on 'Identification and Prioritization of Statistical Indicators on Climate Change' at Centre for Economic and Social Change (CESS) Hyderabad in February 2013. The Seminar was attended by academicians, researchers, DES officers and data users. The Framework and the report of the Expert Committee was discussed in detail during the Seminar. As per the recommendations of the Seminar certain modifications were incorporated. The Framework after incorporating the suggestions and recommendations evolved from the National Seminar has been used for the present publication.

1.1.9. First Publication of 'Statistics Related to Climate Change-India

The first publication titled 'Statistics Related to Climate Change-India-2013' was published in the Ministry's website in November 2013. It was decided by DG, CSO that the next publication on the Series be issued after 2 years.

1.2 Factors Effecting Climate Change

1.2.1 Definition of Climate Change

The Inter-Governmental Panel on Climate Change (IPCC) was established by United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear view on the current state of Climate Change and its potential environmental and socio-economic consequences. IPCC defines climate change as '*a change in the state of the climate that can be identified (e.g., using statistical tests) by changes in the mean and/or variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as a result of human activity'*.

The definition provided by UNFCCC is slightly different, as it emphasizes on '*a change that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods*'.

The UNSD has not, however, formulated any internationally agreed definition

of climate change for statistical purposes.

1.2.2. Defining Environment

Understanding the causes and consequences of climate change, and design of mitigation and adaptation strategies to deal with global warming require knowledge in physical science (*Any of several branches of science, such as physics, chemistry, and astronomy, that study the nature and properties of energy and nonliving matter*), natural science (*It refers to a naturalistic approach to the study of the universe*) and social science (*Any of various disciplines that study human society and social relationships, including sociology, psychology, anthropology, economics, political science, and history*). Different disciplines in these sciences use different approaches for collecting / generating data, analysis of data and development of indicators. Climate change and Global warming have been gaining importance at national and international level. Any substantial change in the climatic system of the earth which extends for a substantial period of time can be termed as 'Climate Change'. A substantial increase in the earth's surface temperature due to Climate Change could be termed as global warming. Carbon Dioxide, Methane and water vapour are the natural greenhouse gases which form a cover over the earth's surface and reflect back the heat emitted by earth earlier absorbed by the earth from Sun. However, before going to the subject of Climate Change, it will be important to understand the terms environment and atmosphere where the phenomenon of climate change occurs.

1.2.3. Environment

It literally means "Surroundings" and may be defined as sum total of all external conditions and influences that affect living organisms. It comprises the following (i) Atmosphere (ii) Hydrosphere (iii) Lithosphere and (iv) Biosphere. The term 'atmosphere' is explained in subsequent para. **Hydrosphere** forms that part of environment which contains water in the form of sea, oceans, rivers, lakes, ponds etc. It covers almost 75% of the earth's surface. **Lithosphere** is the solid component of the earth consisting of soil, rocks, mountains etc. The uppermost part of the earth's crust contains weathered rocks as well as organic matter and is called soil. This is also the storehouse of minerals and metallic ores. **Biosphere** is that part of the lithosphere, hydrosphere and atmosphere where living organisms interact with these parts and thus live together. A number of natural cyclic process like oxygen, water, nitrogen etc. are taking place in the environment to keep a balance of different materials present in the environment.

1.2.4. Atmosphere

To better understand the intricacies of the phenomenon of climate change and the global warming, one needs to know the structure and composition of the atmosphere surrounded by the planet earth. Earth's atmosphere could be defined as the gaseous mass surrounded and retained by the earth through its gravitational force. Earth's atmosphere is a cover of gases that extend to a height of about 1600 km above the surface of the earth and protect the life on earth from

harmful radiation of cosmic rays from the Sun. The atmosphere is divided into five layers, which are

(a) Troposphere
(b) Stratosphere or ozonosphere
(c) Mesosphere
(d) Thermosphere and
(e) Exosphere

1.2.4.1.1.Troposphere: It is the lowest layer on the earth's surface, which is otherwise called the boundary layer, having about 70 to 80% of the total mass present in the atmosphere. The height of the layer varies from 7 to 20 km above sea level depending on the latitude and season. The weather occurs in this layer. The air at the bottom of the layer will be warm and gets colder when the height increases. This layer contains about 79% nitrogen, 21% oxygen and only a small concentration of other gases such as argon, Carbon Dioxide etc. Dust particles and water vapour are the other major components in this layer, of which water vapor helps to form clouds. The sunlight warms the earth during day time and the heat is radiated from earth to the atmosphere. The warm air tends to rise in the atmosphere. The top portion of the layer is colder.

1.2.4.2.Stratosphere: The second layer in the atmosphere is known as the stratosphere, which starts a 20 km and extends up to 50 km from the earth's surface. There is a variation of about 8 to 16 km in the bottom of the layer due to the variation in latitude and seasons. The bottom portion of this layer is cooler and temperature increases with the increase in height. This layer plays a vital role in keeping the life on earth as the ozone is abundantly available here. Ozone absorbs the Ultra-Violet (UV) radiations from Sun. Increasing doses of UV radiations may cause skin cancer, eye cataracts, damage to the immune system in animals and human beings and have an adverse impact on the plant growth. Ozone is scattered between 19 to 30 km in the upper layer of stratosphere. The Ozone is formed when the highly energetic solar radiation strikes the molecules of oxygen and splits it into two atoms apart and the freed atoms conjoin with the oxygen through the process of photolysis, which is a process whereby sunlight causes the chemical bonds in a molecule to break. Ozone is also naturally broken down by sunlight and by a chemical reaction with various compounds containing nitrogen, hydrogen and chlorine. In a pristine atmosphere, there is a balance between the amount of ozone generated and destroyed. The air is quite stable in the stratosphere. Air is thin and dry and no water vapour present in this region. Due to lack of vertical convection, the materials got into this region stays longer periods. The Ozone depleting substances like CFCs could stay here and react with ozone, resulting in depletion in the amount of ozone.

1.2.4.3.Mesosphere: It is the third layer in the atmosphere which starts at 50 km from the earth's surface and goes up to 85 km. The bottom portion of the mesosphere is hotter and the temperature gets colder when height increases. The upper layer of the mesosphere is the coldest with -90^0C. The air is so thin in this

region that the atoms and molecules of gases hardly ever run into each other.

1.2.4.4.Thermosphere: The fourth layer in the atmosphere is thermosphere. It starts from 85 km to 500 km and extends up to 1000 km. This layer is very hot at about 500^0C when the sun is active. A good amount of sun's X-ray and UV radiations were absorbed in this area, making this region very hot. The temperature in the upper layer varies from 500^0C to 2000^0C or higher depending on the sun's activity. A most common definition says that the space begins with thermosphere at an altitude of 100 km as the air is too thin in this region. The space shuttles and space stations are orbiting around the earth in this region only.

1.2.4.5.Exosphere: It is the fifth layer having a very thin layer of air containing atoms and molecules only. These particles escape into the space from this region only.

1.2.5 .Some Terminologies and Definitions

Precipitation

Precipitation refers to the quantity of water falling to the earth at a specific period of time. The water could be in any form like rain, snow, hail, sleet or mist.

Natural Carbon Sinks

Natural Carbon Sinks are the reservoirs which absorb the carbon and store it for indefinite period. Forests, oceans, soils and atmosphere are better examples of carbon sinks. The plants and other organisms that use photosynthesis to remove carbon from atmosphere by incorporating it into biomass are also carbon sinks.

Carbon Sequestration

This term refers to describing processes that remove carbon from atmosphere.

Biomass

In ecology, Biomass is defined as the mass of living biological organisms in a given area or ecosystem at a given time. This is a renewable energy source and is biological material derived from living or recently living organism such as wood, waste, hydrogen (gas) and alcohol fuels.

Carbon Stock

The quantity of carbon contained in a reservoir or a system which has the capacity to accumulate or release carbon. The forest biomass refers to the amount of carbon stored in the forest ecosystem, mainly in living biomass and soil, but to a lesser extent in dead wood and litter.

Anthropogenic Emission

These are the emissions of greenhouse gases resulting from human activities.

1.2.6. Factors Influencing Climate Change

Climate is a vibrant phenomenon and undergoes continuous changes over centuries. There are natural forces like photosynthesis of the plants, eruption of volcanoes, emission of methane from agricultural activities, vapor emissions etc. The important factors, which are responsible for climate change and are causally contributed by human civilization on earth, are listed below:

- Greenhouse Gases
- Deforestation
- Land-use Change
- Energy Usage
- Vehicular Usage

Greenhouse Gases

Human civilization and industrialization have amplified the emissions of 'Greenhouse Gases', which are considered to be one of the main causal factors accelerating climate change in the post industrialization era. GHGs constitute

- Carbon Dioxide (CO_2),
- Methane (CH_4),
- Nitrous Oxide (N_2O),
- Hydrofluorocarbons (HFCs)
- Perflurocarbons (PFCs)
- Sulpurhexafluoride (SF_6)

In addition to this, water vapor, which absorbs the heat radiations from Sun and trap such radiations in the atmosphere making the earth warmer, is considered important. Emissions of GHGs beyond certain limits make earth's atmosphere hotter and induce climate change. The extent of GHGs in the atmosphere increased phenomenally from 280ppm[1] (1750) to 379ppm in 2005 (IPCC-AR4[2]). The available global data on CO_2 since 1970 indicates that the annual emissions have grown at about 80% from 21 to 38 gigatons, which represents 77% of the total anthropogenic emissions. The global increases in CO_2 concentrations are primarily due to

- Fossil Fuel Use
- Land-use and Land-use Change
- Agricultural activities
- Industrial Development
- Forestry

CO_2 is the most important anthropogenic GHG as it constitutes about 70% of the total emissions. CO_2 originates from burning of fossil fuel (56.6%),

deforestation and decay of biomass (17.3%), agriculture etc. The largest growth in GHG emissions between 1970 and 2004 has come from energy supply, transport and industry while deforestation, agriculture and residential/commercial buildings are only minor contributing factors.

India's share of CO_2 in the total emissions in the world is very insignificant in per-capita terms. The per-capita emission of an Indian citizen is 1.2 tons of Carbon dioxide whereas his counterpart in USA contributing 20.6 tons as per UNDP Human Development Report 2007/2008. The per-capita emissions of UK and Japan are 8 and of USA 17 times higher than that of India. India's contribution to the world total is only 4.6% when compared to USA's contribution of 20.9% followed by 17.3% of China.

The energy sector is the major producer of CO_2. 58.6 %* of our energy needs are met from coal , which is abundant, locally available and cheap when compared to alternative fuels. As per Central Electricity Authority CO_2 Baseline Database for the Indian Power Sector, CO_2 emissions in the power sector are continuously increasing in all parts of the country.

The global atmospheric concentration of Methane has increased from pre-industrial value of about 715ppb (Particles per Billion) to 1774ppb in 2005 (The Intergovernmental Panel on Climate Change 4 th Annual Report (IPCC-AR4). Methane is generated due to the following activities :

- Agriculture
- Energy Sources like biomass burning, coal mining and handling and flaring of natural gas systems
- Waste disposal
- Land-use
- Land-use Change
- Forestry
- Shifting Cultivation practice

In India, the Methane emissions in the year 1994 were 18,583 Gg, (Giga gram)out of which 78% came from agriculture, 16% from energy sources and 6% from waste disposal. The rest is contributed by other activities mentioned above.

Global Nitrous Oxide concentration increased from about 270ppb (1750) to 319ppb (2005). Many halocarbons including hydro-fluro-carbons have also increased from a near-zero level to significant levels primarily due to human activities.

Deforestation

There is considerable reduction in the forest cover due to encroachment and land use change and economic development activities like construction of roads, canals and power stations. Forests are the major source of carbon sequestration and the womb of the biodiversity, which acts as the main artery of any environment and ecosystem. National Action Plan on Climate Change (NAPCC) estimates that

77 to 68% of the forest areas in the country are likely to experience shift in forest types by the end of the 21st century, which needs our immediate attention.

Land-use Change

Land-use change is another major predicament to be viewed seriously. As per the data available, after the enactment of Forest Conservation Act, 1980, a huge portion of forestland is diverted for non-forest use. The reported figure for the year 1981 is 1331 ha whereas the cumulative figure till 2004 is 9,54,839 Ha. A relative growth in the land-use change is also visible in urban and rural areas due to urbanization and industrialization. Fragmentation of forests and habitats are another major reason for loss of biodiversity. There are no data which gives any indication of loss of biodiversity and loss of biomass due to this land use change.

Energy Usage

After the liberalization and globalization, India is on a high growth path and envisages about 7-8% GDP growth rate per annum. The energy generation has grown manifold due to the ever increasing demand for energy since 1992. Coal, Gas and Diesel being the major sources of power in India, the emissions of GHGs are also on the rise. The GHG emission level estimation, however, depends on utilization of installed capacity.

In addition to this, the unorganized sector is also engaged in power generation through low capacity diesel generator sets and coal-fired generators. Data on such activities are not available and extent of pollution caused by such units are still beyond our reach.

Vehicular Usage

The number of vehicles registered in India is on the increase over the last 7 years at an average annual cumulative rate of 10%(data from 2004 to 2011). It indicates the increases in the use of fossil fuel and thereby an increases in GHG emissions. Data reveals that there has been consistent growth in vehicular registration, however no indication on the emission load is available. The emission load depends on the types of vehicle. In India, we have standard and non-standard vehicular emissions, which also vary from place to place depending on regulatory mechanisms in use by the civic and local authorities in different areas. Some metropolitan cities have standards in consonance with the European Emission standards, but the data are **not captured** according to the types of vehicles and their average usage per annum.

1.2.7. Visible/Perceivable Impacts of Climate Change

The resilience of the ecosystems is likely to be disturbed in the future due to abrupt climatic change which could appear in the form of floods, drought, wildfires, ocean acidification etc., inducing further loss of biodiversity and the earth's latent capacity for mitigation and regeneration. The rise in temperature, change in

precipitation patterns, sea level rise, melting of snow cover and mountain glaciers, coastal erosion and occurrence of health hazards and disaster events are perceived as the visible impacts of climate change. The following are the main dimensions/impacts of climate change and some of these are explained in brief in the sub- sections which follow.

- Temperature
- Rainfall (Precipitation)
- Mountain Glaciers
- Sea Level Rise
- Health
- Agriculture
- Coastal Erosion
- Biodiversity Loss
- Storm/Storm Events
- Soil Moisture Availability
- Sea Surface Temperature

Temperature

The temperature increase is wide spread across the globe and is greater at higher northern latitudes. It is estimated that there is a 100-year linear trend of 0.74^0C increase. It is observed since 1961 that the average temperature of the global ocean has been taking up over 80% of the heat being added to the climate system. Warming of the climate system induces increase in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.

In India, an increase in the linear trend of about 0.4^0C in the surface air temperature has been observed in the past century. A warming trend is visible along the west coast, central India, interior peninsula and the North-Eastern India, but some cooling trends are also visible in the North-West India and parts of South-India. (NAPCC, 2008). To analyze the comparative change in the Indian peninsula, both sea level temperature and land surface temperature are required to be recorded on long term basis at different climatic zones of the country.

India Meteorological Department (IMD) is the nodal agency to provide the data on temperature. The time series data on mean temperature of major cities in India are available with this department.

Rainfall (Precipitation)

Indian monsoon rains are the backbone of Indian economy as most of our agricultural activities, rivers and replenishment of ground water sources have a direct dependence on monsoon rains. Monsoon rains are a manifestation of the complex interactions between land, ocean and atmosphere. Rainfall data are collected by the India Meteorological Department (IMD) in respect of the meteorological subdivisions of the country on day-to-day basis. A significantly long

series of rainfall data are therefore available to analyze patterns of change in distribution, intensity and duration of rainfall. The All-India rainfall data do not show any significant trend in monsoon rains, however, there are some regional variations. A trend of about 10 to 12% (of the normal) increase in monsoon rains were reported along the west coast, northern Andhra Pradesh and north-western India during the last century. A decreasing trend of about 6 to 8% is observed over the last 100 years over eastern Madhya Pradesh, North-Eastern India and some parts of Gujarat and Kerala (NAPCC, 2008).

Mountain Glaciers

The ice and snow deposits on the Himalayan ranges are lifelines of northern India in many ways. These deposits provide a perennial supply of water though many rivers, which cater to the livelihood, drinking water, and water for industrial purposes. Any recession in the snow cover in the Himalayas is going to affect the life in the Northern parts of India where half of India's population resides. The available data on snowfall in Himalayan ranges show a recession in some parts of the Himalayan ranges. The river systems of the Brahmaputra, the Ganges and the Indus draws water directly from melting of the Himalayas. National Remote Sensing Agency (NRSA) and Snow and Avalanche Studies Establishment (SASE) are responsible for collection and supply of data on **cryosphere** (*the component of earth's system comprising frozen water like snow, permafrost and glaciers*).

Sea Level Rise

IPCC has estimated a sea level rise of 1 to 2 mm per year globally. Due to sea level rise, the fresh water sources near the coastal areas will suffer from salt intrusion and inundation of coastal areas where the density of population and their dependence on sea for livelihood activities are high.

Health

There is a high incidence of occurrence of vector borne diseases like Malaria, Kala-azar, Japanese Encephalitis, filaria, Chikungunia etc., in the immediate past. It is observed that changes in climatic patterns may alter the distribution of vector species and increase its spread in new areas. An increase in temperature and relative humidity may enlarge the transmission windows. Effluent emissions to water bodies and salination of rivers through sea level rise may increase the incidence of water borne diseases. Deaths due to heat wave are reported from several parts of the country from time to time, particularly during the summer.

Central Bureau of Health Intelligence (CBHI) under Ministry of Health and Family Welfare compiles data on cases/death due to communicable diseases. However, the reasons for variations should be traced in linkage with the climate change over time, so that the impact of climate change could be ascertained on disease patterns.

Agriculture

India is a predominantly agriculture-oriented economy, as 52% of the population directly depends on agriculture either as farmers or agricultural laborers,

and their concentration is higher at 76% in the villages. Variation in climate will have a direct impact on the majority of the livelihood of the people. Food production in India is sensitive to climate change like variations in temperature and monsoon rainfall. Rise in temperature has a direct impact on the Rabi crop and every 1^0C rise will reduce wheat production by 4 to 5 Million Tons. Every small change in temperature and rainfall has significant effect on the quality and quantity of fruits, vegetables, tea, coffee, basmati rice and aromatic and medicinal plants. It is predicted that a loss of 10 to 40% in production may occur by 2100 due to climate change (NAPCC).

Coastal Erosion

Population in coastal regions are vulnerable to natural disasters like cyclones, floods, droughts, soil and land erosion leading to irreparable loss or damage to sown areas in arid and semi-arid zones caused by climate change. About 40 million hectares of land is flood-prone, including river-deltas on three sides of the country stretching over 6000 km of coastal belt, affecting about 30 million people on an average each year. National Institute of Disaster r Management and CSO are responsible for the collection and compilation of hazard and disaster data respectively. State governments would also start compiling data on disasters at district levels. All these inputs are to be integrated to assess climate change impacts.

Biodiversity Loss

India is one of the species-rich countries in the world and about 6% of the world's biodiversity is reported from India. The existence of biodiversity helps to keep a balance between the environment and earth through its ecosystem services. A comparison of data on 'Number and status of plant species in India' published in 2001 and 2007 does not give any indication to the extent of change which happened in the last few years due to rapid economic growth, urbanization and land-use change. The existing data do not provide any insight into the loss of biodiversity in the country. The NAPCC also emphasizes on the need for 'creation of biodiversity registers (at national, district and local levels) for documenting genetic diversity and the associated traditional knowledge. Some interesting findings here are the reduction in the number of known species in India of 'Fern & Fernallics' from 1200 to 1135 during the reference period (2001-2007).

Zoological Survey of India, Botanical Survey of India, Forest Survey of India and the State Forest Department are responsible for collection and supply of data related to biodiversity.

Storm/Storm Events

The 'Storm Event' is a rainfall event that produces more than 0.1 inch of precipitation and that, which is separated from the previous storm event by at least 72 hours of dry weather.

Soil Moisture Availability

'Soil moisture' is the ability of the soil to hold water. Soil moisture

impacts the distribution and growth of vegetation, soil aeration, soil microbial activity, soil erosion, concentration of toxic substance, the movement of nutrients within the soil and to the roots.

Sea Surface Temperature

Sea surface temperature is the temperature of the water close to the surface of the sea, which is measured by drawing water from one metre below the surface of the sea.

1.2.8. Mitigation and Adaptation

There are two options available to address the problems which may arise out of pollutions caused to the air, water or soil. The term 'mitigation' involves actions that reduce the likelihood of the event or process. In other words, Mitigation refers to measures for reduction of emissions of GHGs that cause climate change like switching from fossil fuel based power generation to alternative sources of renewable energy like solar, wind, nuclear etc. 'Adaptation' involves actions that reduce the impact of the event or process without changing the likelihood that it will occur. The process may include relocating the communities living close to the sea level or switching to crops that can withstand higher temperature etc

Under the ambit of NAPCC, 8 Missions have been initiated to implement theprogrammes related to mitigation and adaptation. The missions are:

- National Solar Mission
- National Mission for Enhanced Energy Efficiency in Industry
- National Mission on Sustainable Habitat
- National Water Mission
- National Mission for Sustaining the Himalayan Ecosystem
- National Mission for a 'Green India'
- National Mission for Sustainable Agriculture
- National Mission on Strategic Knowledge for Climate Change

These eight Missions form the core of National Action Plan representing multi-pronged long term and integrated strategy for achieving the goals in the context of climate change. For institutionalizing the National Mission, nodal ministries have been identified for each of the missions.

1.3 Framework of Database for Climate Change

The Expert Committee on the Development of Database on Climate Change under the Chairmanship of Dr. K.S.Rao took up the task of finding out minimum set of indicators which are relevant and could be used for building up a database for the Climate Change in India. The Committee focused on a basic minimum number of indicators which have a direct bearing on climate change as it would not be possible to manage huge data if collected at micro level. The

report of NAPCC formed the basis for identifying the indicators for the Climate change and the Mitigation and Adaptation activities undertaken by the Government.

1.3.1. Classification of Data

The availability and periodicity of data could be classified into three categories as per their source, generation and variability. These are:

(a) Data generated as a routine activity of the organization: An example of such data pertains to the temperature and rain fall data gathered by IMD. These data are captured on a day-to-day basis.

(b) Data based on estimates: the second category is based on the annual/bi-annual estimates prepared by the respective organizations. The forest data published by Forest Survey of India is an example of generation of such data.

(c) Data based on studies: The third category of data generation is based on studies conducted by the organizations at specific intervals. The estimation of GHGs is an example of such an activity. The data on GHGs are available in the public domain for the year 1994, which formed part of the First National Communication (NATCOM-I) by the Government to the UNFCCC. *The data for the year 2004 are under compilation and it will be available in the public domain as part of NATCOM-II which is expected to be communicated in the year 2011*. There are 56 various organizations working for the estimation under MOEF, which is the nodal ministry for this purpose.

The Committee considered the data availability with the respective departments and its periodicity of generation at the source level. It was decided that CSO may also maintain the same periodicity and the way in which the data are generated and supplied by the respective departments. However, efforts will be made to maintain a time series data since 1990 till the latest year of the data availability. The Committee decided to include all the relevant indicators irrespective of their data availability.

With respect to the institutional mechanism, the Committee recommended that CSO should take a lead role and act as the nodal agency for collection of the data from the source agencies and compilation of the same. It should act as the single window to provide all the relevant data in respect of the indicators identified by the Committee. The Committee also recommended that CSO should bring out a new publication on Climate Change covering only the data related to the subject.

1.3.2. Framework of Database

The framework as accepted finally by the Committee is given below. The framework describes the details of indicators of Climate Change along with data items, geographical unit for collection of data, periodicity, possible sources and meta-data linkages. The Committee also recommended that the data for those variables which are included in the framework, but not available presently need to be collected.

The Framework for Statistics related to Climate Change

I. Indicators for Causal Factors behind Climate Change

Indicator	Variables Needed	Geo-graphical Unit	Periodicity	Possible Source	Metadata links
Greenhouse Gases	Emission of (1) CO2 (2) N2O (3) Methane (4) HFCs (5) PFCs (6) SF6	National level State-wise depending upon the availability of data	Yearly/ Monthly	(a)Central Pollution Control Board, M/o. Environment & Forests (b) NATCOM (Source wise data) (c) Central Electricity Authority	www.cpcb.nic.in www.cea.nic.in
Ambient air pollutants	(1) Sulphur Dioxide (2)Carbon Monoxide (3)Nitrogen Dioxide (4) SPM (5) RSPM	City wise	Yearly	(a) Central Pollution Control Board (b) State Pollution Control Boards	www.cpcb.nic.in

Indicator	Variables Needed	Geo-graphical Unit	Periodicity	Possible Source	Metadata links
Solid Waste	(1)Municipal Solid Waste Generation by type- a. Biodegradable b. Non-biodegradable (2)Municipal Solid Waste Generation by source	National/ State level	Yearly	Central Pollution Control Board	www.cpcb.nic.in ENVIS Centre, Mumbai.
Ozone	Ozone Depleting substance (1) Choloro-Fluro-Carbons (CFC) (2)Compounds of Halogen (Halons) (3) Carbon Tetrachloride (CTC)	National level	Yearly	Ozone Cell, MOEF	www.moef.nic.in
Forest Cover/Area	Extent of (1) Forest Area/Cover	National Level/ State-wise/Region	Biannual	Forest Survey of India, Ministry of Environment	www.fsi.org.in

Indicator	Variables Needed	Geo-graphical Unit	Periodicity	Possible Source	Metadata links
	(2)Tree Cover (3)Mangroves	level		& Forests	
Forest Produce including logging data(Timber, firewood, bamboo)	Different types of forest produce Production data	National/State level	Biannual	Indian Council of Forestry Research and Education (ICFRE), Forest Survey of India, State Forest Departments	www.icfre.gov.in www.fsi.org.in
Biomass	(1)Above ground (2)Below ground (3)Litter (4)Deadwood (5)Soil organic carbon	National/State Level	Biannual	Forest Survey of India, Ministry of Environment & Forests	www.fsi.org.in
Land Use	(1) Land Use Change (2) Land use based on agro climatic	National /State Level	Annual	Ministry of Agriculture	www.moa.gov.in

Indicator	Variables Needed	Geo-graphical Unit	Periodicity	Possible Source	Metadata links
	zones				
Water	(1)Glacial retreat (2)Surface water (3)Ground water (4)water quality (5)water use	National Level/ State Level/ Riverbasin wise/ Groundwater quality station wise	Annual	(a)Geological Survey of India (b) Central Water Commission (c) Central Ground Water Board (d) National Remote Sensing Agency, Hyderabad. (e) Central and State Pollution Control Boards (water quality)	www.portal.gsi.gov.in www.cwc.nic.in *www.cgwb.gov.in* www.cpcb.nic.in
Transport (Road, Rail, Aviation, Inland water Transport)	No. of vehicles (1) Existing (2) Newly Registered Both fuel usage basis (LPG, CNG, Petrol, Diesel)	State-wise	Annual	Ministry of Road transport & Highways	www.morth.nic.in

Indicator	Variables Needed	Geo-graphical Unit	Periodicity	Possible Source	Metadata links
Energy	Energy production through (1) Hydro (2) Coal (3) Diesel (4) Gas (5) Nuclear renewable Energy (6) Wind (7) Solar (8) Biomass (9) Firewood (10) Cowdung cakes (11) Others Energy usage sector wise 1) Kerosene 2) Electricity 3) LPG 4) CNG	National/State level	Annual	(a)Central Electricity Authority (b) Ministry of Petroleum and Natural Gas (c) O/o Coal Controller (d) M/o. Non Conventional Energy Sources (e) M/o. New Renewable Energy (f) Department of Atomic Energy (g) NSSO	www.cea.nic.in www.dae.gov.in

II. Indicators for observed and assessed impact of Climate Change

Indicator	***Variables Needed***	***Geo-graphical Unit***	***Periodicity***	***Possible Source***	***Metadata links***
Ocean Level &Temperature	(1)Sea surface temperature (2) Sea level Rise (3)Coastal inundation (4) Coral reef	Region-wise	Annual	(a) National Institute of Oceanography (b) Ministry of Earth Sciences (c) Department of Science & Technology (DST) (d) National Institute of Ocean Management, Chennai. (e) Envis centre, Cuddalore	www.nio.org www.dod.nic.in www.dst.gov.in
Temperature /Precipitation	(1)Rain Fall (avg) (2) Snowfall (3) Temperature Max/Min/Avg (4) Relative Humidity	State-wise	Month-wise/ season-wise	(a)Indian Meteorological Department, Ministry of Earth Sciences (b) National Remote Sensing Agency (National Remote Sensing Centre)	www.imd.nic.in www.nrsc.gov.in

Indicator	***Variables Needed***	***Geo-graphical Unit***	***Periodicity***	***Possible Source***	***Metadata links***
				(c)Agro meteorological departments, M/o Agriculture of States	
Glacier/landslides	(1) Glacier Advancement /retraction (2)Land slide hazards	National Level/ State level	Annual	Geological Survey of India (GSI)	www.portal.gsi.gov.in
Biodiversity	(1) Total Species (2) Endangered (3) Threatened (4) Rare (5) Endemic (6) Invasive (7) Extinct	Habitat-wise	Annual	(a) Botanical Survey of India (b) Zoological Survey of India	www.bsi.gov.in www.zsi.gov.in
Health	(1) Recurring Endemic Diseases (2) Newly Reported	(a)Season-wise (b) State-wise	Annual	(a) Ministry of Health & FW (b)National Crime Records Bureau, Ministry of	www.cbhidghs.nic.in www.ndmindia.nic.in

Indicator	***Variables Needed***	***Geo-graphical Unit***	***Periodicity***	***Possible Source***	***Metadata links***
	Endemic diseases			Home Affairs	
Soil and Land degradation	(1)Soil Degradation Soil fertility Soil type Soil erosion (2) Degraded Land	National/State Level	Annual	(a) All India Soil and Land Use Survey, Ministry of Agriculture (b) National Remote Sensing Agency (NRSA) (c)National Bureau of Soil Survey and Land Use Planning (d)Indian Council of Agricultural Research (ICAR) (e)Indian Institute of remote sensing (IIRS), Dehradun	www.moa.nic.in www.icar.org.in www.nbsslup.in www.nrsc.gov.in www.iirs.gov.in
Agriculture	(1)Yield loss of major crops/ biomass loss due to (a)drought	National/State Level	Annual	Indian Council of Agricultural Research (ICAR)	www.icar.org.in

Indicator	***Variables Needed***	***Geo-graphical Unit***	***Periodicity***	***Possible Source***	***Metadata links***
	(moderate /severe) (b)cyclone (c) floods (d)heat waves (e)flowering (f)early vegetative (g)early maturity (h)early harvesting				
Extreme Events	Accidents/Disasters (Natural/Man made) Deaths due to Extreme events- Heat, Cold, Drought, cyclone, etc	National /State	Annual	Ministry of Home Affairs, National Disaster Management Authority, National Institute of Disaster Management (NIDM)	www.mha.nic.in www.ndmindia.nic.in

III. Indicators for Climate Change – Mitigation & Adaptation

Indicator	*Variables Needed*	*Geo-graphical Unit*	*Periodicity*	*Possible Source*	*Metadata links*
Solar Energy	(1) Solar Cells (2) Solar Lanterns (3) Solar Water Heater (4) Solar Electricity Generation Plants and Capacity	National /State level	Annual	M/o. New & Renewable Energy	www.mnes.nic.in
Energy Use	(1) Use of fuel like Condensed Natural Gas(CNG),Liquidified Petroleum Gas (LPG) (2) Industries adopted fuel efficient technologies (3) Use of Compact Fluorescent Light (CFL)	National/ State level	Annual	(a) Ministry of Commerce and Industry (b) Ministry of Transport	www.dipp.nic.in www.morth.nic.in
Dry-land Agriculture	(1) Crop Varieties for drought prone areas (2) Varieties of pest-resistant crops (3) Organic	National/ State level	Annual	Indian Council of Agricultural Research	www.icar.org.in

Indicator	*Variables Needed*	*Geo-graphical Unit*	*Periodicity*	*Possible Source*	*Metadata links*
	farming and production b)area				
Afforestation	Forest Cover/Area	National/ State level	Annual	Forest Survey of India	www.fsi.org.in

1.4. India's intended nationally determined contribution: working towards climate justice

1.4.1 India's Policy and Views

ॐ द्यौः शान्तिरन्तरिक्षं शान्तिः

पृथिवी शान्तिरापः शान्तिरोषधयः शान्तिः ।

"Om dyauh śāntir antariksam śāntih prithvi śāntih āpah śāntih osadhayah śāntih"

-- Yajur Veda 36.17

{{Unto Heaven be Peace, Unto the Sky and the Earth be Peace, Peace be unto the Water, Unto the Herbs and Trees be Peace}}

India has a long history and tradition of harmonious co-existence between man and nature. Human beings here have regarded fauna and flora as part of their family. This is part of our heritage and manifest in our lifestyle and traditional practices. We represent a culture that calls our planet Mother Earth. As our ancient text says; "Keep pure! For the Earth is our mother! And we are her children!" The ancient Indian practice of Yoga, for example, is a system that is aimed at balancing contentment and worldly desires, that helps pursue a path of moderation and a sustainable lifestyle. Environmental sustainability, which involves both intra-generational and inter-generational equity, has been the approach of Indians for very long. Much before the climate change debate began, Mahatma Gandhi, regarded as the father of our nation had said that we should act as *'trustees'* and use natural resources wisely as it is our

moral responsibility to ensure that we bequeath to the future generations a healthy planet.

The desire to improve one's lot has been the primary driving force behind human progress. While a few fortunate fellow beings have moved far ahead in this journey of progress, there are many in the world who have been left behind. Nations that are now striving to fulfill this 'right to grow' of their teeming millions cannot be made to feel guilty of their development agenda as they attempt to fulfill this legitimate aspiration. Just because economic development of many countries in the past has come at the cost of environment, it should not be presumed that a reconciliation of the two is not possible

It is possible for people to live in harmony with nature by harnessing its potential for the benefit of mankind without undue exploitation leading to irretrievable damage and consequences that block the progress of others. There is a need to evolve a set of precepts, a kind of commandments, especially for the youth of the world, that help in developing a unified global perspective to economic growth so that the disparity in the thinking of the 'developed' and 'developing' countries could be bridged. The removal of such barriers of thought and the creation of a regime where facilitative technology transfer replaces an exploitative market driven mechanism could pave the way for a common understanding of universal progress. If climate change is a calamity that mankind must adapt to while taking mitigation action withal, it should not be used as a commercial opportunity. It is time that a mechanism is set up which will turn technology and innovation into an effective instrument for global public good, not just private returns

The challenge of climate change calls for extraordinary vision, leadership, compassion and wisdom. Human ingenuity and intellect will also play an important role in addressing this challenge. The cumulative accumulation of greenhouse gases (GHGs) historically since industrial revolution has resulted in the current problem of global warming. This is further compounded by the tepid and inadequate response of the developed countries even after the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) and delineation of obligations and responsibilities. As a result, an ‘emission’ ambition gap has been created calling for enhanced global actions to address it. India, even though not a part of the problem, has been an active and constructive participant in the search for solutions. Even now, when the per capita emissions of many developed countries vary between 7 to15 metric tonnes, the per capita emissions in India were only about 1.56 metric tonnes in 2010. This is because Indians believe in nature friendly lifestyle and practices rather than its exploitation. By enhancing their efforts in keeping with historical responsibility, the developed and resource rich countries could reduce the burden of their action from being borne by developing countries that carry the additional responsibility of finding resources to meet their development needs and strive to improve their Human Development Index (HDI).

With the responsibility of ensuring a reasonable HDI for the country and the economic progress of its vast population, India has attempted to follow a path 'cleaner' than the one followed by many countries in the past. Today these countries may be in the forefront of development, even providing a model of growth to other developing countries. However, if India compares the emission intensity of its GDP (Gross Domestic Product) in PPP (Purchasing Power Parity) terms at present with those countries at a similar level of development, it is seen that their emissions then were far more than India's at present. This is as much on account of India being open and innovative in embracing new technology and a cleaner way of doing things, as it is from the inherent principles of sustainability ingrained in its thought process.

If the world indeed is concerned about its new investments to be climate friendly, it must consider the opportunity provided by a country like India where economic growth could be achieved with minimum levels of emissions by employing new technologies and finance for achieving low carbon growth. Developed countries can certainly bring down their emission intensity by moderating their consumption, and substantially utilize their investments by employing them for development activities in countries housing a vast majority of people barely living at subsistence level. The ratio of emission avoided per dollar invested and economic growth attained would be relatively more favourable in case of investments made in India.

Mahatma Gandhi had once said, "One must care about the world one will not see". Indeed, humanity has progressed when it has collectively risen to its obligation to the world and responsibility to the future.

1.4.2 The 2015 Agreement

India is committed to engaging actively in multilateral negotiations under the UNFCCC in a positive, creative and forward-looking manner. Our objective is to establish an effective, cooperative and equitable global architecture based on climate justice and the principles of Equity and Common But Differentiated Responsibilities and Respective Capabilities, under the UNFCCC. Such an approach should be anchored in the vision inspired by Mahatma Gandhi's famous exhortation; *"Earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed"*. We must promote sustainable production processes and also sustainable lifestyles across the globe. Habit and attitude are as much a part of the solution as Technology and Finance. It must be understood that poverty is a big polluter; so is the extravagant way of life and a profligate pattern of consumerism a grave threat to environment.

As we put together the new global compact for enhanced actions, it is critical to ensure that it is comprehensive, balanced, equitable, and pragmatic. It should address all the

elements including Adaptation, Mitigation, Finance, Technology Transfer, Capacity Building and Transparency of Action and Support. At the same time, the genuine requirements of developing countries like India for an equitable carbon and development space to achieve sustainable development and eradication of poverty needs to be safeguarded. Achievement of these goals requires adherence to the principles and provisions of the UNFCCC. As the Prime Minister of India, while addressing the United Nations on 25th September 2015, has said; "We all believe that international partnership must be at the centre of our efforts, whether it is development or combating climate change. And, the principle of common but differentiated responsibilities is the bedrock of our collective enterprise. When we speak only of climate change, there is a perception of our desire to secure the comforts of our lifestyle. When we speak of climate justice, we demonstrate our sensitivity and resolve to secure the future of the poor from the perils of natural disasters".

India's contribution takes into account its commitment to conservation of nature as well as the imperatives of meeting the competing demand of resources for addressing the challenges of poverty eradication, food security and nutrition, universal access to education and health, gender equality and women empowerment, water and sanitation, energy, employment, sustainable urbanisation and new human settlements and the means of implementation for enhanced action for achieving among others, the sustainable development goals for its 1.2 billion people.

1.4.3 National circumstances

Climate change is a major challenge for developing countries like India that face large scale climate variability and are exposed to enhanced risks from climate change. Few countries in the world are as vulnerable to the effects of climate change as India is with its vast population that is dependent on the growth of its agrarian economy, its expansive coastal areas and the Himalayan region and islands. It also entails tradeoffs with economic growth and social development in the shortrun that needs to be factored in the policy matrix, where eradication of poverty is one of the foremost priorities.India accounts for 2.4% of the world surface area, but supports around 17.5% of the world population. It houses the largest proportion of global poor (30%), around 24% of the global population without access to electricity (304 million), about 30% of the global population relying on solid biomass for cooking and 92 million without access to safe drinking water. The average annual energy consumption in India in 2011 was only 0.6 tonnes of oil equivalent (toe) per capita as compared to global average of 1.88 toe per capita.

It may also be noted that no country in the world has been able to achieve a Human Development Index of 0.9 or more without an annual energy availability of at least 4 toe per capita. With a HDI of 0.586 and global rank of 135, India has a lot to do to provide a dignified life to its population and meet their rightful aspirations.

India is a developing country with a per capita GDP (nominal) of around USD 1408 per annum. However, this doesn't reflect the wide disparities amongst its people and regions.

Around 363 million people (30% of the population) live in poverty, about 1.77 million people are houseless and 4.9% of the population (aged 15 years and above) are unemployed. The per capita electricity consumption stands low at 917 kWh, which is barely one third of the world's average consumption.

A recent national socio-economic census indicates that economic and social deprivations are much higher in terms of availability of proper houses, access to education, lifeline availability of energy, and stable sources of income. This is more so in rural India where 48% of the households lack basic socio economic services and were categorized as deprived. India also has the largest cattle and buffalo population in the world of about 300 million, which faces multiple challenges including diseases, inadequate supply of fodder etc. as a result of changing climate.

Given the development agenda in a democratic polity, the infrastructure deficit represented by different indicators, the pressures of urbanization and industrialization and the imperative of sustainable growth, India faces a formidable and complex challenge in working for economic progress towards a secure future for its citizens

. The following projected key macro indicators are a reflection of India's future needs as the economy grows in the coming years:

Indicator	India in 2014	India in 2030
Population (billion) [a]	1.2	1.5
Urban population (million)[b]	377 (2011)	609
GDP at 2011-12 prices (in trillion)[c]	INR 106.44 (USD 1.69)	INR 397.35 (USD 6.31)
Per capita GDP in USD (nominal)[c]	1408	4205
Electricity demand (TWh)[c]	776(2012)	2499

Source: a: Population Foundation of India; b: UN World Urbanization Prospects, 2014; c: Government of India.

Almost all the macroeconomic models predict that anticipated needs in the future will be large. Rapid urbanization in the country will be one of the most dominant trends in the coming years. It is expected that about 40% of the population in 2030 would be urban as against 30% currently. As population expands and incomes grow, this shift will likely be realized alongside demographic changes that will exponentially increase the demand for urban amenities like housing, energy, transport, water, waste disposal. It is estimated that more than half of India of 2030 is yet to be built. In a way, India's development process is doubly challenging. It not only has to complete the current unfinished development agenda, it has to strategise for future pressures that may increase the magnitude of this development gap. India realises that economic growth and development have to be guided by the key concerns of sustainability, because none of us have the luxury, any longer, of ignoring the economic as well as the environmental threat that a fast-deteriorating ecosystem poses to our fragile planet. India believes that development and environment are not adversaries but can go hand in hand, if environmental sensibilities can be imbibed. Equitable, inclusive and sustainable development would be the key to a new model of growth that India is committed to pursue, which can be fostered and facilitated by a collaborative approach among the Developing and the Developed countries.

1.4.4. Policy framework

India's environment policy is anchored in the Constitution of India, Article 48-A of the Constitution states that "The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country".

The Indian development process is guided by the aspiration of making India prosperous and progress on the path of "Development without Destruction".

The broad policy framework on environment and climate change is laid down by the National Environment Policy (NEP) 2006, which promotes sustainable development along with respect for ecological constraints and the imperatives of social justice. The current development paradigm reiterates the focus on sustainable growth and aims to exploit the co-benefits of addressing climate change along with promoting economic growth. The National Action Plan on Climate Change (NAPCC) provides a sharper focus on required interventions. Currently, NAPCC is implemented through eight National Missions, outlining priorities for mitigation and adaptation to combat climate change. The broad policy initiatives of the government are supplemented by actions of the State Governments, Non-governmental Organizations (NGOs), initiatives of the private sector and other stakeholders. 32 States and Union Territories have put in

place the State Action Plan on Climate Change (SAPCC) attempting to mainstream climate change concerns in their planning process.

Many other national strategies and policies supplement the above efforts. The Energy Conservation Act has been enacted to encourage efficient use of energy and its conservation. The National Policy for Farmers focuses on sustainable development of agriculture. The National Electricity Policy (NEP) underscores the focus on universalizing access to electricity and promoting renewable sources of energy, as does the Integrated EnergyPolicy (IEP).

Policies to promote actions that address climate concerns also include fiscal instruments like coal cess, cuts in subsidies, increase in taxes on petrol and diesel, market mechanisms including Perform Achieve and Trade (PAT), Renewable Energy Certificates (REC) and a regulatory regime of Renewable Purchase Obligation (RPO). The institutional arrangement for offtake of renewable power will be further strengthened.

1.4.5 India's progress in combating climate change

In recognition of the growing problem of Climate Change, India declared a voluntary goal of reducing the emissions intensity of its GDP by 20–25%, over 2005 levels, by 2020, despite having no binding mitigation obligations as per the Convention. A slew of policy measures were launched to achieve this goal. As a result, the emission intensity of our GDP has decreased by 12% between 2005 and 2010. It is a matter of satisfaction that United Nations Environment Programme (UNEP) in its Emission Gap Report 2014 has recognized India as one of the countries on course to achieving its voluntary goal.

India has a definite plan of action for clean energy, energy efficiency in various sectors of industries, steps to achieve lower emission intensity in the automobile and transport sector, a major thrust to non-fossil based electricity generation and a building sector based on energy conservation.

India's on-going mitigation and adaptation strategies and actions are detailed in the following sections, along with the expected direction of activities in the near future.

1.4.6. Mitigation strategies

14.6.1 Clean and efficient energy system

Energy is a vital input for production and growth. Considering universal energy access and energy security as one of the fundamental development goals for the country, Government of India (GoI) has undertaken a two pronged approach to cater to the energy demand of its citizens while ensuring minimum growth in carbon emissions.

On the generation side, the Government is promoting greater use of renewables in the energy mix mainly through solar and wind power and shifting towards supercritical technologies for coal based power plants. On the demand side, efforts are being made to efficiently use energy through various innovative policy measures under the overall ambit of Energy Conservation Act.

The energy intensity of the economy has decreased from 18.16 goe (grams of oil equivalent) per Rupee of GDP in 2005 to 15.02 goe per Rupee GDP in 2012, a decline of over 2.5% per annum.

1.4.6.2 Promotion of Clean Energy

India is running one of the largest renewable capacity expansion programs in the world.

Between 2002 and 2015, the share of renewable grid capacity has increased over 6 times, from 2% (3.9 GW) to around 13% (36 GW). This momentum of a tenfold increase in the previous decade is to be significantly scaled up with the aim to achieve 175 GW renewable energy capacity in the next few years. India has also decided to anchor a global solar alliance, InSPA (International Agency for Solar Policy & Application), of all countries located between the Tropic of Cancer and the Tropic of Capricorn.

1) Wind energy has been the predominant contributor to the renewable energy growth in India accounting for 23.76 GW (65.2%) of the renewable installed capacity, making India the 5th largest wind power producer in the world. With a potential of more than 100 GW, the aim is to achieve a target of 60 GW of wind power installed capacity by 2022.

2) Solar power in India is poised to grow significantly with Solar Mission as a major initiative of the Government of India. Solar power installed capacity has increased from only 3.7 MW in 2005 to about 4060 MW in 2015, with a CAGR of more than 100% over the decade. The ambitious solar expansion programme seeks to enhance the capacity to 100 GW by 2022, which is expected to be scaled up further thereafter. A scheme for development of 25 Solar Parks, Ultra Mega Solar Power Projects, canal top solar projects and one hundred thousand solar pumps for farmers is at different stages of implementation. Government of India is also promoting solarization of all the 55,000 petrol pumps across the country out of which about 3,135 petrol pumps have already been solarized.

3) Biomass energy constitutes about 18% of total primary energy use in the country and more than 70% of the country’s population depends on it. However, it is currently used in an inefficient manner with high levels of indoor pollution. A number of

programmes have been initiated for promotion of cleaner and more efficient use, including biomass based electricity generation. It is envisaged to increase biomass installed capacity to 10 GW by 2022 from current capacity of 4.4 GW.

4) Hydropower contributes about 46.1 GW to current portfolio of installed capacity, of which 4.1 GW is small hydro (upto 25 MW) and 41.99 GW is large hydro (more than 25 MW). Special programmes to promote small and mini hydel projects, new and efficient designs of water mills have been introduced for electrification of remote villages. With a vast potential of more than 100 GW, a number of policy initiatives and actions are being undertaken to aggressively pursue development of country's vast hydro potential.

5) India is promoting Nuclear Power as a safe, environmentally benign and economically viable source to meet the increasing electricity needs of the country. With a 2.2% share in current installed capacity, total installed capacity of nuclear power in operation is 5780 MW. Additionally six reactors with an installed capacity of 4300 MW are at different stages of commissioning and construction. Efforts are being made to achieve 63 GW installed capacity by the year 2032, if supply of fuel is ensured.

6) Clean Coal policies: Coal based power as of now accounts for about 60.8% (167.2 GW) of India's installed capacity. In order to secure reliable, adequate and affordable supply of electricity, coal will continue to dominate power generation in future. Government of India has already taken several initiatives to improve the efficiency of coal based power plants and to reduce its carbon footprint. All new, large coal-based generating stations have been mandated to use the highly efficient supercritical technology. Renovation and Modernisation (R&M) and Life Extension (LE) of existing old power stations is being undertaken in a phased manner. About 144 old thermal stations have been assigned mandatory targets for improving energy efficiency. Coal beneficiation has been made mandatory. Introduction of ultra-supercritical technology, as and when commercially available is part of future policy. Besides, stringent emission standards being contemplated for thermal plants would significantly reduce emissions.

7) National Smart Grid Mission has been launched to bring efficiency in power supply network and facilitate reduction in losses and outages. Green Energy Corridor projects worth INR (Indian National Rupee) 380 billion (USD 6 billion) are also being rolled out to ensure evacuation of renewable energy.

The Government's goal of Electricity for All is sought to be achieved by the above programs that would require huge investments, infusion of new technology, availability of nuclear fuel and international support.

1.4.6.3 Enhancing Energy Efficiency

With the goal of reducing energy intensity of the Indian economy, Ministry of Power through Bureau of Energy Efficiency (BEE) has initiated a number of energy efficiency initiatives. The National Mission for Enhanced Energy Efficiency (NMEEE) aims to strengthen the market for energy efficiency by creating a conducive regulatory and policy regime. It seeks to upscale the efforts to unlock the market for energy efficiency and help achieve total avoided capacity addition of 19,598 MW and fuel savings of around 23 million tonnes per year at its full implementation stage. The programmes under this mission have resulted in an avoided generation capacity addition of about 10,000 MW between 2005 and 2012 with government targeting to save 10% of current energy consumption by the year 2018-19. Demand Side Management programmes have been launched to replace existing low-efficiency appliances:

1) During the last decade, there has been rapid transformation of efficient lighting in India. The sales of Compact fluorescent lamps (CFLs) have risen to about 37% of the total lighting requirements in 2014 from 7.8% in 2005. India has also launched an ambitious plan to replace all incandescent lamps with Light-emitting diode (LED) bulbs in the next few years leading to energy savings of upto 100 billion kilowatt hours (kWh) annually.

2) Standards and Labeling Programme launched by the Government of India enables consumers to make informed decision by providing information about the energy consumption of an appliance. Currently, 21 equipment and appliances are labeled. The programme has contributed to an increase of 25% to 30% in the energy efficiency of an average refrigerator or air-conditioner in 2014 compared to those sold in 2007. Super-Efficient Fan (that uses half as much energy as the average fan) programme has been launched. Further, two sets of Corporate Average Fuel Consumption standards for cars have been notified, with one coming into force in 2017 and the second set in 2022.

3) Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE), a risk sharing mechanism to provide financial institutions with a partial coverage of risk involved in extending loans for energy efficiency projects, and Venture Capital Fund for Energy Efficiency (VCFEE), a trust fund to provide “last mile” equity capital to energy efficiency companies, have been established.

4) The Energy Conservation Building Code (ECBC) sets minimum energy standards for new commercial buildings. Eight states have already adopted and notified the ECBC, and over 300 new commercial buildings have become compliant. The Code would be made more stringent to promote construction of even more (Near-Zero)

energy-efficient buildings. “Design Guidelines for Energy Efficient Multi-storey Residential buildings” have also been launched.

5) In order to both recognize energy-efficient buildings, as well as to stimulate their large scale replication, India has developed its own building- energy rating system GRIHA (Green Rating for Integrated Habitat Assessment), based on 34 criteria like site planning, conservation and efficient utilization of resources etc. A number of buildings including Commonwealth Games Village have been rated using GRIHA system. Indira Paryavaran Bhawan, the headquarters of Central Government’s Ministry of Environment, Forest & Climate Change is a model building of Government of India and has received LEED India Platinum and a 5 Star GRIHA rating. It is a ‘Net Zero Energy’ building with 100% onsite power generation.

14.4.6.4 Enhancing energy efficiency in industries

Infrastructure sectors, viz. electricity, coal and cement have seen a growth rate of 4.5% in the year 2013-14. The recent initiatives like Make in India, Digital India, creating National Industrial Corridors, streamlining environment and forest approvals, labour reforms and undertaking other measures for the ease of doing business have also fuelled the spurt in their growth rates. Amidst all this, policies to enable industries reduce their energy consumption play a critical role as an instrument for sustainable environment through various interventions like:

1) Perform, Achieve and Trade (PAT), as a market based energy efficiency trading mechanism, at present covers 478 plants (designated consumers) in eight energy-intensive industrial sectors accounting for one-third of total energy consumption in the country. The mandated decrease in the specific energy consumption under PAT programme has led to a decline of 4 to 5% in their specific energy consumption in 2015 as compared to that in 2012. Energy Saving Certificates (ESCerts) are issued to consumers who over-achieve the target. The scheme is to be widened and deepened to include additional sectors like railways, electricity distribution and refineries in the next cycle and would cover more than half the commercial energy consumed in India.

2) Zero Effect, Zero Defect (ZED): The Make in India campaign with ZED is a policy initiative to rate Medium & Small Industries on quality control and certification for energy efficiency, enhanced resources efficiency, pollution control, use of renewable energy, waste management etc. using ZED Maturity Assessment Model. The scheme launched in 2015, envisages coverage of about 1 million medium and small enterprises.

1.4.6.5 Developing climate resilient urban centers

Government of India in recent times has launched a number of schemes for transformation And rejuvenation of urban areas including Smart Cities Mission, Atal

Mission for Rejuvenation and Urban Transformation (AMRUT) and National Heritage City Development and Augmentation Yojana (HRIDAY):

1) Under the Smart Cities Mission, 100 smart cities are planned with the objective to develop new generation cities, which will provide core infrastructure and a decent quality of life to its citizens by building a clean and sustainable environment. Smart solutions like recycling and reuse of waste, use of renewables, protection of sensitive natural environment will be incorporated to make these cities climate resilient.

2) Atal Mission for Rejuvenation and Urban Transformation (AMRUT), a new urban renewal mission has been launched by Government of India for 500 cities with focus on ensuring basic infrastructure services such as water supply, sewerage, storm water drains, transport and development of green spaces and parks by adopting climate resilient and energy efficient policies and regulations.

1.4.6.7 Promoting waste to wealth conversion

India recognizes the dual benefits that can arise from efficient waste disposal leading to enhanced environmental benefits along with conversion to energy. Incentives are being granted to cities to take up waste to energy conversion projects.

1) The Waste to Energy capacity is sought to be enhanced. Government is also encouraging conversion of waste to compost by linking it with sale of fertilizers and providing market development assistance.

2) Government has invested significantly in Solid Waste Management (SWM) projects over the years and has provided INR 25 billion (USD 397 million) as grant in aid to states and Urban Local Bodies specifically for SWM through public-private partnerships.

3) Similarly, initiatives on waste water management would cover an additional population of 41 million and enhance recycling and reuse of treated water. There are about 816 Sewage Treatment Plants (522 operational and rest at different stages of construction and planning) having a combined capacity of 23,277 million of liters per day across 28 States and Union Territories.

4) Government of India has recently launched a one-of-its kind ‘Swachh Bharat Mission’ (Clean India Mission) with the objective of making the country clean and litter free with scientific solid waste management in about 4041 towns covering a population of 306 million. It aims to construct 10.4 million individual household toilets and 0.5 million Community and Public Toilets.

1.4.6.8 Safe, smart and sustainable green transportation network

In the endeavor towards a low carbon economy, India is focusing on low carbon infrastructure and public transport systems like Dedicated Freight Corridors and energy efficient railways to reduce their environmental impact.

1) Indian Railways handles 3 million tonnes of freight and 23 million passengers daily and is the world's third largest network. The endeavor is to increase the share of Railways in total land transportation from 36% to 45 %, thereby decreasing the load on less efficient diesel operated road traffic.

2) Dedicated Freight Corridors (DFCs) have been introduced across the country. In the first phase, two corridors viz. 1520 km Mumbai-Delhi (Western Dedicated Freight Corridor) and 1856 km Ludhiana-Dankuni (Eastern Dedicated Freight Corridor) are being constructed. The project is expected to reduce emissions by about 457 million ton CO2 over a 30 year period. With a number of energy efficiency measures undertaken,

Indian Railways has achieved 19.7% improvement in Specific Fuel Consumption for Freight Service Locomotives and 21.2% improvement for Coaching Service Locomotives during the last 10 years. Indian Railways is also installing solar power on its land and roof tops of coaches.

3) Recognizing its fuel efficiency, environmental friendliness and cost effectiveness, the Government is promoting growth of Coastal Shipping and Inland Water Transport. To enhance the inland waterways transport, Government has announced the implementation of Jal Marg Vikas for capacity augmentation of National Water Way -1. It is also proposed to establish integrated Waterways transportation grid with a view to connecting all existing and proposed National waterways with road, rail and ports connectivity. Another initiative in this direction is the Sagarmala Project with the objective to augment port-led development and promote efficient transportation of goods. Bharatmala Project which envisions constructing about 5,000 km of road network all along the coastal areas will further provide connectivity to these ports.

4) The vision of Urban Transport policies is to focus on moving 'people' rather than 'vehicles', in which Mass Rapid Transit System (MRTS) would play an important role.

5) Around 236 km of metro rail have been made operational in the country. Further, about 550 km are under construction and 600 km under consideration for different cities across the country including Ahmedabad, Pune, and Lucknow. Delhi Metro, which has become India's first MRTS project to earn carbon credits, has the potential to reduce about 0.57 million tonnes of CO2e annually. Delhi Metro has also initiated installation of 9 solar power generation facilities and plans to increase their number.

6) The mass-transit and urban transport projects initiated under the National Urban Renewal Mission also have positive climate change impacts in the long-run. About 39 urban transport and mass rapid transport projects have been approved and about 19 projects have been completed so far.

7) Solar powered toll plazas have been envisaged as a mandatory requirement for toll collection across the country.

8) India has recently formulated Green Highways (Plantation & Maintenance) Policy to develop 140,000 km long “tree-line” with plantation along both sides of national highways. 1% of total civil cost of projects is to be set aside to implement the policy.

9) With a view to facilitating international commuting by highways, Government of India has approved signing of the Bangladesh, Bhutan, India and Nepal (BBIN) Motor Vehicle Agreement to promote safe, economical efficient and environmentally sound road transport in the sub-region and support regional integration.

10) Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India (FAME India) is a scheme formulated as part of the National Electric Mobility Mission Plan 2020 (NEMMP) to promote faster adoption and manufacturing of hybrid and electric vehicles in the country by providing incentives.

11) Under the Vehicle Fuel Efficiency Program, Government of India in 2014 finalized country's first passenger vehicle fuel-efficiency standards. They will take effect beginning in April 2016, and set the efficiency targets for new cars. The standards will keep 50 million tons of CO2 out of the atmosphere. India aims to improve fuel standards by switching from Bharat Stage IV (BS IV) fuels to Bharat Stage V (BS V)/ Bharat Stage VI (BS VI) across the country in the near future.

12) National Policy on Biofuels has adopted an aspirational target of 20% blending of biofuels, both for bio-diesel and bio-ethanol. The government also launched the National Bio-diesel Mission identifying Jatropha curcas as the most suitable tree-borne oilseed for bio-diesel production. With the intention of further promoting biofuels, India has begun consultations on allowing 5% blending of biofuels in diesel that would be consumed by bulk users such as the railways and defence establishments.

14.4.6.9 Planned afforestation

India is one of the few countries where forest and tree cover has increased in recent years transforming country’s forests into a net sink owing to national policies aimed at conservation and sustainable management of forests. As per the latest assessment, forests and tree cover has increased from 23.4% in 2005 to 24% of the

geographical area in2013. Government of India's long term goal is to bring 33% of its geographical area under forest cover eventually.

1) With its focus on sustainable forest management, afforestation and regulating diversion of forest land for non-forest purpose, India has been successful in improving carbon stock in its forest by about 5%, from 6,621.5 million tons in 2005 to 6,941 million tonnes in 2013.

2) Initiatives like Green India Mission (GIM) aim to further increase the forest/tree cover to the extent of 5 million hectares (mha) and improve quality of forest/tree cover on another 5 mha of forest/non-forest lands along with providing livelihood support. It is expected to enhance carbon sequestration by about 100 million tonnes CO2 equivalent annually.

3) These efforts have been further augmented by policies like National Agro-forestry Policy (NAP), REDD-Plus policy, Joint Forest Management; National Afforestation Programme and proposed devolution of about USD 6 billion under Compensatory Afforestation to states.

1.4.6.10 Abatement of pollution

India has recently launched many programmes and schemes to address the problem of pollution:

1) Continuous Emission Monitoring System (CEMS) mandates the highly polluting industries to install 24X7 real time monitoring of emission and effluent discharge points.

2) Common Effluent Treatment Plants (CETPs) are being set up to treat the effluent emanating from the clusters of compatible small - scale industries.

3) The Fly Ash Utilisation Policy makes it mandatory to use only fly ash/ fly ash based products in construction of buildings, roads and reclamation / compaction of land within a radius of 100 km from a coal or lignite based thermal power plant, thus displacing the cement use. It also mandates utilisation of Fly Ash for backfilling or stowing of the mines.

4) Standards related to effluent discharge have been modified for over 2000 industries focusing on reducing quantity of waste water generation, conservation of water, promote Zero Liquid Discharge (ZLD) and use of treated effluent for irrigation.

5) In 2014, a National Air Quality Index (AQI) was launched for Indian cities. AQI is based on six pollutants and is notified every day serving as public information tool to disseminate information on air quality in qualitative terms.

6) Amendment of Municipal Solid Waste Management (Management and Handling) Rules is underway which will emphasize on proper segregation of waste at source; enhance waste processing and implementation of scientific landfills. Similarly, Bio-Medical Waste (Management & Handling) Rules, Plastic Waste Management Rules, e-waste (Management) Rules and Hazardous and Other Wastes (Management and Transboundary Movement) Rules are being amended for a more scientific, technology driven, regulated and participative environment management.

1.4.6.11 Citizens and Private Sector Contribution to Combating Climate Change

Citizens of India are an integral part of country's strategies to combat climate change. TheConstitution of India vide Article 51-A lays down that it as a fundamental duty of every citizen to "protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures".

Policies like Swachh Bharat Mission (Clean India Mission), cleaning of our rivers, achieving energy efficiency are all examples of policies which are contingent upon full participations of India's citizens for their successful implementation.

In addition to being involved in Government initiatives related to climate change and resource efficiency, private sector has also embarked on a number of voluntary actions. It plays a key role in sustainable development efforts in the country, some of which are enumerated below:

1) Companies Act 2013 directs companies having a certain level of profits, to spend 2% of their annual profit on Corporate Social Responsibility (CSR) activities. Estimates indicate that a fair share of the available CSR funding of about INR 220 billion (USD 3.5 billion) annually will be invested in environment initiatives from this window.

2) The Indian industry has also participated in voluntary carbon disclosure programmes whereby they report their carbon management strategy and GHG emissions. Latest Report by Carbon Disclosure Project, India indicates a reduction of 165 million metric tonnes of CO2 equivalent by Indian industries. "India GHG Programme" is another voluntary programme to support development of India-specific emission factors and for corporates to measure their carbon footprints.

3) Indian industry has undertaken many initiatives to reduce their water consumption. A study of 100 companies over a 5 year period covering 12 sectors indicate that the Indian companies on an average have been reducing their specific

water consumption by 2.8 to 3 % per year. A few companies have achieved ‘water positive’ status.

4) Smart Power for Environmentally-sound Economic Development (SPEED) is a program that aims at electrification of rural areas based on a decentralized renewable energy system.

5) India currently has about 2.68 billion sq. ft. of registered green building space across 3,000 projects (second largest in the world), of which 600 are certified and fully functional.

6) GreenCo Rating System is first of its kind in the world which assesses companies on their environmental performance across 10 different parameters to help them develop a roadmap to improve further.

7) New Ventures India (NVI) is an initiative to support cleantech entrepreneurs in developing their business plans and access finance and markets.

8) The Small and medium-sized enterprises (SME) Cluster Programs for Energy Efficiency covers more than 150 clusters all over the country and has resulted in substantial energy saving, quality improvement and improved competitiveness. Another initiative by SIDBI (Small Industry Development Bank of India) in 500 SMEs spread over 40 industrial clusters is expected to save annually 30,000 tonnes of GHG emissions.

1.4.7 Adaptation Strategies

The adverse impacts of climate change on the developmental prospects of the country are amplified enormously by the existence of widespread poverty and dependence of a large proportion of the population on climate sensitive sectors for livelihood. Hence for India adaptation is inevitable and an imperative for the development process. It is of immediate importance and requires action now.

Vulnerabilities in India differ among states, among regions and among different groups of people within the same region due to substantial variations in topography, climatic conditions, ecosystems as well as diversity in its social structures, economic conditions and needs of different communities.

A range of actions have been introduced to address it. Out of the eight National Missions on Climate Change five mission focus on adaptation in sectors like agriculture, water,Himalayan ecosystems, forestry, Capacity building and Knowledge management. Climate plans at the sub national level also focus significantly on adaptation.

Besides these targeted programmes, India has also implemented a series of schemes which strengthen adaptive capacities of the vulnerable communities. India’s

expenditure on programmes with critical adaptation components has increased from 1.45% of GDP in 2000-01 to 2.82% during 2009-10. Expenditure on human capabilities and livelihoods viz. poverty alleviation, health improvement and disease control and risk management, constitutes more than 80% of the total expenditure on adaptation in India.

India's adaptation policies in some of the crucial sectors are outlined below:

1.4.7.1 Agriculture

Agriculture is the source of livelihood for nearly two-thirds of the population in India. It is predominantly rainfed covering about 60% of the country's net sown area and accounts for 40% of the total food production. Droughts and floods are frequent and the sector is already facing high degree of climate variability. The performance of agriculture sector has a direct bearing on food supplies and food security. India is projected to become the most populated country by 2030 and will need to produce an additional 100 million tonnes of food grains to feed the large population. In the agriculture sector, the need for comprehensive risk management and insurance is further enhanced due to these reasons.

Keeping in view the above challenges, Government of India is implementing policies/missions targeting various threats facing agriculture. Some of the important ones are

National Food Security Mission, Mission for Integrated Development of Horticulture,National Mission for Sustainable Agriculture, Paramparagat Krishi Vikas Yojana to promote organic farming practices, Pradhan Mantri Krishi Sinchayee Yojana to promote efficient irrigation practices and National Mission on Agricultural Extension &Technology.

1) The National Mission on Sustainable Agriculture (NMSA) aims at enhancing food security and protection of resources such as land, water, biodiversity and genetics. The mission focuses on new technologies and practices in cultivation, genotypes of crops that have enhanced CO2 fixation potential, which are less water consuming and more climate resilient. India has developed 580 district level (covering many states) contingency plans based on early warning systems and other weather forecasting systems.

2) Government of India adopted a mega project called the National Initiative on Climate Resilient Agriculture (NICRA). Its four main modules include Natural Resource Management, improving crop production, livestock and fisheries and institutional interventions.

3) A Scheme has been launched to provide in mission mode Soil Health Card to every farmer. Additionally, 100 mobile soil-testing laboratories have been setup across the country.

4) National Agroforestry Policy (NAP) of India aims at encouraging and expanding tree plantation in complementarity and integrated manner with crops and livestock. It will help protect and stabilize ecosystems, and promote resilient cropping and farming systems to minimize the risk during extreme climatic events. It will also complement achieving the target of increasing forest/ tree cover.

1.4.7.2 Water

India identifies water as the most critical component of life support system. The total catchment area is 252.8 million hectare (mha), covering more than 75% of the total area of the country. The adaptation strategies for the water sector focus on enhancing efficient use of water, ensuring access and tackling the adverse impact of Climate Change. The trans-boundary and regional issues also need to be factored in.

1) The main objective of India's National Water Mission (NWM) is "conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management". One of the key goals of the mission is to enhance water use efficiency by 20%.

2) Groundwater is the major component of the total available water resources. Rapid expansion of groundwater use in India in the last three decades has resulted in a steep decline in the groundwater table in vast areas of the country. Rainwater harvesting, which offers a promising solution to replenish and recharge the groundwater is a significant component of Watershed Development Programme, taken up under different schemes of the central and state governments. Several municipal authorities, including Delhi have amended their existing building bye-laws, making it compulsory for every large house or hotel (200 yards or more in area) to undertake rainwater harvesting.

3) Neeranchal is a recent programme by Government to give additional impetus to watershed development in the country.

4) Another important initiative relating to rivers is the National Mission for Clean Ganga which seeks to rejuvenate the river along its length of more than 2,500 km through multifarious activities such as pollution inventorization, assessment and surveillance and laying of sewage networks, treatment plants etc.

5) The total flood prone area in the country is about 45.64 million ha. Existing flood management mechanisms involve both Central and State Government.

6) Government of India has also set up the National River Conservation Directorate for conservation of rivers, lakes and wetlands in the country and improving the water quality which covers stretches of 40 rivers in 190 towns spread over 20 States.

1.4.7.3 Health

Climate change will increase health related stress from extreme weather-related disasters such as wider spread of vector-borne diseases as malaria and dengue and increasing frequency of heat and cold waves.

India is now formulating a 'Health Mission' under the ambit of NAPCC to evolve strategies for mitigating, containing and managing the adverse impact of Climate Change on health. The mission aims at analysing epidemiological data, identify vulnerable population and regions, build knowledge base and expertise, increase awareness and community participation.

Apart from the overall public heath infrastructure at the national and sub national levels, the Government of India has launched programmes like Integrated Disease Surveillance Programme (IDSP), National Vector Borne Disease Control Programme (NVBDCP) to deal with vector borne diseases like malaria, dengue etc. As part of this programme India aims to eliminate malaria by 2030.

1.4.7.4 Coastal Regions & Islands

India has a long coastline of 7517 km including island territories, and encompasses total 73 districts in the 9 maritime states and 2 Union Territories. The coastal districts house 14.2% of India's total population. India has been identified as one of the countries which are most vulnerable to the impact of accelerated sea level rise due to global warming:

1) India has demarcated vulnerable areas on the coasts and declared them as Coastal Regulation Zone (CRZ) with restrictions imposed on setting up and expansion of industries, operations and processes in these areas.

2) India is also implementing programmes for Integrated Coastal Zone Management (ICZM). The vision of the project is to build national capacity for implementation of comprehensive coastal management through ecological management, conservation and protection of critical habitats, coastal geomorphology and geology of coastal and marine areas, coastal engineering, socio-economic aspects, policy and legal issues and other related fields in the area of coastal governance.

3) Mapping and demarcation of coastal hazard lines for development of emergency response plans is being carried out in all the coastal states and union territories.

4) Another initiative to protect coastal livelihood is ‘Mangroves for the Future (MFF)’ coordinated by International Union for Conservation of Nature (IUCN) in India.

5) Similar to Small Island Developing States, the 1,238 Indian islands are vulnerable to loss of coastal wetlands including mangroves and salt water intrusion in fresh water aquifers. With changing climate, islands are highly susceptible to frequent and more intense tropical cyclones and associated storm surge, droughts, tsunamis and volcanic eruptions, which will have adverse impact on economy of these islands and health of their inhabitants.

6) The Government notified the Island Protection Zone (IPZ) in 2011 with the objective of ensuring livelihood security to the local communities, conserving and protecting coastal stretches, and promoting development in a sustainable manner. The IPZ focuses on disaster risk reduction through bioshields with local vegetation (mangroves) and other soft protection measures, and the conservation of beaches and sand dunes.

1.4.7.5 Disaster Management

The Indian subcontinent is among the world's most disaster prone areas. Almost 85% of India’s area is vulnerable to one or multiple hazard. 23 States and Union Territories covering 45.64 million hectares of land are subject to floods, and are prone to flood disasters. India's annual average flood damage during the period 1996-2005 was INR 47.45 billion (USD 753.2 Million).

India has been able to establish a holistic disaster risk reduction and response apparatus at national, state and district levels with the aim of reducing existing levels of vulnerability, prevention, and mitigation of disasters and also to provide appropriate response, rehabilitation and reconstruction. Strategies include early warnings and communications, construction and sustainable maintenance of multi-purpose cyclone shelter, improved access and evacuation, enhanced capacity and capability of local communities to respond to disaster and strengthening disaster risk mitigation capacity at central, state and local levels. The link between Adaptation, Disaster Risk Reduction and Loss and Damage is important. It has been witnessed that the occurrence of flash floods, extreme weather events, droughts etc. has increased in frequency and become more unpredictable. The Sendai Framework for Disaster Risk Reduction has laid down a road map for required response. There is an urgent need for finance to undertake activities for early warning system, disaster risk reduction, loss and damage and Capacity building at all levels. The indigenous locally appropriate knowledge and technology may also be used for the purpose.

In order to achieve these goals, India has set up Disaster Relief Funds at all levels and launched the National Disaster Relief Fund, which is financed through the levy of a cess.

1.4.7.6 Protecting Biodiversity & Himalayan Ecosystem

Biodiversity: India, a mega diverse country with only 2.4% of the world's land areas, harbours 7-8% of all recorded species, and 4 out of 34 global biodiversity hotspots. In order to protect the biodiversity from changing climate, India has developed a biogeographic classification for conservation planning, and has mapped biodiversity rich areas in the country. The protected area network has increased from 427 (3.34% of total geographical area) in 1988 to 690 (5.07% of total geographical area) in 2014.

Himalayan Ecosystem: The Himalayas form the most important concentration of snow covered region outside the polar region. It is highly sensitive to global warming. The detailed glacier inventory of Indian Himalayas indicates presence of 9579 glaciers in the Himalayas, some of which form the perennial source of major rivers.

The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) addresses important issues concerning Himalayan Glaciers and the associated hydrological consequences, biodiversity and wildlife conservation and protection, traditional knowledge societies and their livelihood and planning for sustaining of the Himalayan Ecosystem. Government has also launched National Mission on Himalayan Studies to complement NMSHE with the objective of building a body of scientific and traditional knowledge along with demonstrating replicable solutions to the problems in thematic areas including natural resource management, capacity building, long-term ecological monitoring etc.

1.4.7.7 Rural Livelihoods Security

The rural areas are highly prone to stress and pressures from natural resource exploitation. In this context, schemes for rural development and livelihood programmes are very relevant. The Mahatma Gandhi National Rural Employment Guarantee Scheme in India (MGNREGS), with a budgetary annual allocation of about INR 347 billion (USD 5.5 billion) in 2015-16, aims at enhancing livelihood in the rural areas. A vast majority of works under this programme aim at strengthening natural resource base of the rural economy and are linked to land, soil, and water.

Another important programme of the Government is the National Rural Livelihoods Mission which has the objective to cover 70 million rural poor households, across 600,000 villages in the country through self-managed self help groups and federated institutions to support the rural communities in strengthening their livelihood.

1.4.8 Adaptation Actions Under State Action Plans On Climate Change

All the 29 states and 7 Union Territories in India are preparing a State level action plan to deal with the challenges of climate change incorporating local needs and priorities. SAPCCs are envisioned to encompass the vision of the NAPCC and aligned with the 8 National Missions. SAPCCs describe in detail the impact of climate and vulnerability assessment, adaptation, mitigation options and financing and capacity building needs to implement the identified interventions. Key sectors covered by SAPCCs include agriculture, water, habitat, forestry, health and disaster management among others.

1.4.9 Knowledge Management & Capacity Building

India attaches great significance to knowledge creation and capacity building for climate change.

1. A network of 127 institutions called “INCCA” (Indian Network on Climate Change Assessment) has been set up to share knowledge and work in a collaborative manner on climate change issues.

2. The Department of Science & Technology has also initiated creation of Climate Change Centers at the state level especially in the Himalayan region. All the state governments have established links with local research institutions to ensure a continuous updating of their SAPCCs.

3. As a move towards competency based system, Government of India has also implemented National Training Policy, through which each Ministry and Department earmarks about 2.5% of its salary budget for training. A part of this budget is used for training in climate change and sustainable development issues as well.

4. Government has recently launched “Skill India” with the target to provide skill training in various sectors including sustainable development to about 400 million people by 2022.

1.4.10 India’s Climate Change Finance Instruments

Maximum share of India's current climate finance comes from budgetary sources, as most of the resources for adaptation and mitigation are built into the ongoing sectoral programmes. The availability of funds for such purposes is largely guided by the overall resources and requirement of different sectors.

At the same time India is not relying solely on budgetary resources and is experimenting with a careful mix of market mechanisms together with fiscal instruments and regulatory interventions to mobilize finance for climate change.

1.4.11 National Funds

To augment the availability of assured targeted resources, Government of India has set up two dedicated funds at the national level for mobilizing financing for mitigation and adaptation respectively.

1) Cess on Coal: India imposed a cess on coal in 2010 @ INR 50 (USD 0.8) per tonne of coal. Recently it has been quadrupled to INR 200 (USD 3.2) per tonne of coal. The coal cess translates into a carbon tax equivalent, using the emission factor for coal, of around USD 2 per tonne. This forms the corpus for the National Clean Environment Fund, used for financing clean energy, technologies, and projects related to it. The total collection of INR 170.84 billion (USD 2.7 billion) till 2014-15 is being used for 46 clean energy projects worth INR 165.11 billion (USD 2.6 billion).

2) India has set up a National Adaptation Fund with an initial allocation of INR 3,500 million (USD 55.6 million) to combat the adaptation needs in sectors like agriculture, water, forestry etc. in addition to sectoral spending by the respective ministries.

1.4.12 Other Fiscal Instruments and Incentives for Low Carbon Growth

Some of the other fiscal measures incentivizing green actions in India are as follows:

1) With a series of steps taken recently, India has cut subsidies and increased taxes on fossil fuels (petrol and diesel) turning a carbon subsidy regime into one of carbon taxation. Further, in its effort to rationalize and target subsidies, India has launched 'Direct Benefit Transfer Scheme' for cooking gas, where subsidy will be transferred directly into the bank accounts of the targeted beneficiaries. In fact, over the past one year India has almost cut its petroleum subsidy by about 26%.

2) Recent actions have led to an implicit carbon tax (USD 140 for petrol and USD 64 for diesel in absolute terms. This is substantially above what is now considered a reasonable initial tax on CO2 emissions of USD 25- USD 35 per tonne. Estimates suggest that these measures will help India achieve a net reduction of 11 million tonnes of CO2 emissions in less than a year.

3) Tax Free Infrastructure Bonds of INR 50 billion (USD 794 million) are being introduced for funding of renewable energy projects during the year 2015-16.

4) Finance Commission (FC) Incentive for creation of carbon sink: Another important initiative has been the 14th FC recommendation on incentives for forestry sector. The devolution of funds to states from the federal pool would be based on a formula that attaches 7.5 % weight to the area under forest. According to the estimations based on 14thFC data, this initiative has effectively given afforestation a

massive boost by conditioning about USD 6.9 billion of transfers to the states based on their forest cover, which is projected to increase up to USD 12 billion by 2019-20. Implicitly, India is going to transfer to states roughly about USD 174 per hectare of forest per year which compares very favorably with other afforested countries.

1.4.13 External Cooperation: A Critical Enabler

Over the years, the carbon intensity of the Indian economy has decreased, in large part, due to the adoption of new and innovative technologies which address climate mitigation and climate adaptation. The development, adoption and dissemination of these technologies has been an ongoing process which has led to, inter-alia, increased energy efficiency and an increasing share of renewables in the electricity grid. This has been facilitated by several bilateral and multilateral collaborative efforts both in the public and private sector.

At the same time, climate friendly technologies, adapted and deployed in India are also being utilized in other countries, particularly in developing countries, through bilateral cooperation. This development and transfer of technologies, both into the Indian market and from India into other markets, will continue to sustain future decreases in the carbon intensity of the Indian economy and increases in the share of renewables in the electricity-mix.

1.4.14 India's INDC

Keeping in view its development agenda, particularly the eradication of poverty coupled with its commitment to following the low carbon path to progress and being sanguine about the unencumbered availability of clean technologies and financial resource from around the world, India hereby communicates its Intended Nationally Determined Contribution (INDC) in response to COP decisions 1/CP.19 and 1/CP.20 for the period 2021 to 2030:

To put forward and further propagate a healthy and **sustainable way of living** based on traditions and **values of conservation and moderation**.

1. To adopt a climate friendly and a cleaner path than the one followed hitherto by others at corresponding level of economic development.

2. To reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level.

3. To achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance including from Green Climate Fund (GCF).

4. To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030.

5. To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.

6. To mobilize domestic and new & additional funds from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.

7. To build capacities, create domestic framework and international architecture for quick diffusion of cutting edge climate technology in India and for joint collaborative R&D for such future technologies.

To achieve the above contributions, India is determined to continue with its on-going interventions, enhance the existing policies as detailed in previous sections and launch new initiatives in the following priority areas:

1) Introducing new, more efficient and cleaner technologies in thermal power generation.

2) Promoting renewable energy generation and increasing the share of alternative fuels in overall fuel mix.

3) Reducing emissions from transportation sector.

4) Promoting energy efficiency in the economy, notably in industry, transportation, buildings and appliances.

5) Reducing emissions from waste.

6) Developing climate resilient infrastructure.

7) Full implementation of Green India Mission and other programmes of afforestation.

8) Planning and implementation of actions to enhance climate resilience and reduce vulnerability to climate change.

India has also revisited the National Missions under the NAPCC in the light of new scientific information and technological advances and identified new missions or programs on wind energy, health, waste to energy, and coastal areas. It is also redesigning the National Water Mission and National Mission on Sustainable Agriculture.

It is clarified that India's INDC do not bind it to any sector specific mitigation obligation or action, including in agriculture sector. India's goal is to reduce overall emission intensity and improve energy efficiency of its economy over time and at the same time protecting the vulnerable sectors of economy and segments of our society.

The successful implementation of INDC is contingent upon an ambitious global agreement including additional means of implementation to be provided by developed country parties, technology transfer and capacity building following Article 3.1 and 4.7 of the Convention.

1.4.15 Climate Change Finance Requirement

Finance is a critical enabler of climate change action. However, an overall assessment and quantification of finance requirements for adaptation and mitigation for a country with so much diversity and demand is a difficult task given the rapid pace of changing technologies and innovation. Estimates by various studies vary in projecting precise requirements but converge on the enormity of funds that would be needed.

Preliminary estimates indicate that India would need around USD 206 billion (at 2014-15 prices) between 2015 and 2030 for implementing adaptation actions in agriculture, forestry, fisheries infrastructure, water resources and ecosystems. Apart from this there will be additional investments needed for strengthening resilience and disaster management. An Asian Development Bank Study on assessing the costs of climate change adaptation in South Asia indicates that approximate adaptation cost for India in energy sector alone would roughly be about USD 7.7 billion in 2030s. The report also projects the economic damage and losses in India from climate change to be around 1.8% of its GDP annually by 2050.

Mitigation requirements are even more enormous. Estimates by NITI Aayog (National Institution for Transforming India) indicate that the mitigation activities for moderate low carbon development would cost around USD 834 billion till 2030 at 2011 prices.

India's climate actions have so far been largely financed from domestic resources. A substantial scaling up of the climate action plans would require greater resources. A detailed and full scale assessment of international climate finance needs will be finalized at a later stage and would depend on the gap between actual cost of implementation of India's plans and what can be made available from domestic sources. While this would evolve over time, a preliminary estimate suggests that at least USD 2.5 trillion (at 2014-15 prices) will be required for meeting India's climate change actions between now and 2030.

1.4.16 Requirement for Technology Transfer & Support

In the rapidly and ever evolving realm of technology development, it is difficult to project future requirement of technologies. Transfer and grounding of technologies and their knowhow would be key to enhancing adaptation and mitigation measures in developing countries. It also calls for meaningful and adequate financing for the required cutting edgetechnologies. It is in this context that India has advocated global collaboration in Research & Development (R&D), particularly in clean technologies and enabling their transfer, free of Intellectual Property Rights (IPR) costs, to developing countries. IPR costs can also be borne from the GCF through a separate window.

It is also to be appreciated that every country has different requirements of technology and different capabilities of handling technologies depending on trained and skilled manpower, supporting infrastructure, intellectual environment etc. Knowledge creation, eco-system design for innovation and development, and technology deployment would be a continuous requirement in this process.

In its pursuit of low carbon growth, India would be focusing on technologies that need to be moved from lab to field and those that require targeted global research along with those that are still in the realm of imagination. One of the important areas of global collaborative research should be clean coal and fossil fuel, energy management and storage systems for renewable energy. Given the current stage of dependence of many economies on coal, such an effort is an urgent necessity. A preliminary and illustrative list of some of the technologies (which will evolve over time) is at Annexure A.

1.4.17 Capacity Building Needs

India's efforts will require proper training and upgrading of skills across sectors. While no firm assessments have been made, it is evident that substantial resources will be required to implement capacity building programmes both nationally and across the states to address climate change challenges. It is expected that the international mechanism will support such initiatives including formation of Thematic Knowledge Networks, further expand activities under Global Technology Watch Group, establishing more intensive state centric knowledge and awareness creating activities and training of professionals in different aspects of renewable energy and supporting research and development institutions for pre-competitive research.

Though a firm projection is difficult, rough estimates indicate that around 2.5% of Government's salary budget would be required for capacity building initiatives, while some part of it would need to be financed internationally.

1.4.18 Consideration On Fairness And Ambition

India's INDC is based on the 1992 convention. In terms of the provision on Article 3.1 and 4.7, this submission by India represents the utmost ambitious action in the current state of development. Both in terms of cumulative global emissions (only 3%) and per capita emission (1.56 tCO2e in 2010), India's contribution to the problem of climate change is limited but its actions are fair and ambitious.

The recent decisions of the Government represent a quantum jump in our aspirations in climate change actions starting with the manifold scaling up of our renewable energy targets to the programme on Smart Cities, cleaning of rivers and Swachh Bharat Mission (Clean India Mission). The initiatives have demonstrated unparalleled vision and strong political initiatives of the Government. It is expected that developed countries will re-examine their pre 2020 actions in the light of substantial action taken by developing countries like India to ensure that the ambition gap is substantially bridged.

Through this INDC, India has shown its commitment to combat climate change and these actions are indeed important contributions to the global effort. However, our efforts to avoid emissions during our development process are also tied to the availability and level of international financing and technology transfer since India still faces complex developmental challenges. The critical issue for developing nations is the gap between their equitable share of the global carbon space and the actual share of carbon space that will be accessible to them. The transfer of appropriate technologies and provision of adequate finance will have to be a determined contribution of the developed countries, which will further enable the developing countries to accomplish and even enhance their efforts. It is expected that developed countries would recognize that without means of implementation and adequate resources, the global vision is but a vacant dream. Addressing the United Nations Summit for the adoption of Post-2015 Development Agenda in September 2015, the Prime Minister of India, Shri Narendra Modi said; "We should forge a global public partnership to harness technology, innovation and finance to put affordable clean and renewable energy within the reach of all. Equally, we must look for changes in our lifestyles that would make us less dependent on energy and more sustainable in our consumption. It is equally critical to launch a global education programme that prepares our next generation to protect and conserve Nature. I hope that the Developed World will fulfil its financing commitments for development and climate change, without in any way putting both under the same head".

India's INDC is fair and ambitious considering the fact that India is attempting to

work towards low carbon emission pathway while endeavoring to meet all the developmental challenges the country faces today. Through this submission, India intends to reduce the emissions intensity of its GDP by 33 to 35 % by 2030 from 2005 level. This commitment is further echoed in India's actions in climate change adaptation with setting up its own 'National Adaptation Fund'.

The current policy framework also includes a favorable environment for a rapid increase in renewable energy, move towards low carbon sustainable development pathway and adapting to the impacts of climate change. It represents the highest possible efforts as evident from the multiple initiatives of the Government of India.

Accordingly, India's development plans will continue to lay a balanced emphasis on economic development and environment.

India reserves the right to make additional submissions on Intended Nationally Determined Contribution (INDC) as and when required.

1.4.19 Recent Initiatives of the Government of India

Under the leadership and vision of Hon'ble Prime Minister Shri Narendra Modi, Government of India has taken a number of measures to promote sustainable development and address the threat of climate change at national and sub-national level.

The first step was revisiting the National Missions under the National Action Plan on Climate Change (NAPCC). Government is proposing to set up new missions on Wind Energy, Health, Waste to Energy, Coastal Areas and redesigning the National Water Mission & National Mission on Sustainable Agriculture. Other initiatives include:

14.19.1 Mitigation Strategies

- Green Generation for Clean & Energy Secure India: more than 5 times increase in Renewable Capacity from 35 GW (upto March 2015) to 175 GW by 2022.
- National Solar Mission scaled up five-fold from 20 GW to 100 GW by 2022. Kochi Airport is the World's first airport to fully run on solar power.
- Solar powered toll plazas envisaged for all toll collection booths across the country.
- National Smart Grid Mission launched for efficient transmission & distribution network.
- Green Energy Corridor projects being rolled out to ensure evacuation from renewable energy plants.
- Nationwide Campaign for Energy Conservation launched with the target to save

10% of current energy consumption by the year 2018-19.

- Launched Smart Cities Mission to develop new generation cities by building a clean and sustainable environment.
- National Heritage City Development and Augmentation Yojana (HRIDAY) launched to bring together urban planning, economic growth and heritage conservation in an inclusive manner.
- Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is a new urban renewal mission for 500 cities across India.
- Launched one-of-its kind 'Swachh Bharat Mission' (Clean India Mission) to make country clean and litter free by 2019.
- Zero Effect, Zero Defect (ZED) with Make in India campaign to enhance energy& resource efficiency, pollution control, use of renewable energy, waste management etc.
- Formulated Green Highways (Plantation & Maintenance) Policy to develop 140,000 km long "tree-line" along both sides of national highways.
- Faster Adoption and Manufacturing of Hybrid & Electric Vehicles (FAME India) to promote faster adoption and manufacturing of hybrid and electric vehicles.
- Country's first passenger vehicle fuel-efficiency standards finalized.
- Policies to increase production of energy efficient 3 phase locomotives and switchover to 100% of these locos from 2016-17 onwards.
- Policy directive issued to use 5% bio-diesel in traction fuel in diesel locomotives.
- National Air Quality Index launched with One Number, One Color and One Description to give the status of air pollution in a particular city.

1.4.19.2 Adaptation Strategies

- Launched Soil Health Card Scheme. Additionally, 100 mobile soil-testing laboratories setup across the country.
- Paramparagat Krishi Vikas Yojana launched to promote organic farming practices.
- The Pradhan Mantri Krishi Sinchayee Yojana launched to promote efficient irrigation practices.
- Neeranchal is a new programme to give additional impetus to watershed development in the country.
- Launched National Mission for Clean Ganga (Namami Gange) which seeks to rejuvenate the river.
- National Bureau of Water Use Efficiency (NBWUE) proposed for promotion, regulation and control efficient use of water.

- ‘Give It Up’ Campaign launched to encourage citizens to give up subsidy on cooking gas to meet the needs of the truly needy citizens, thereby promote shift away from inefficient use of biomass in rural areas.

1.4.19.3 Climate Finance Policies

- Setting up of INR 3,500 million (USD 55.6 million) National Adaptation Fund.
- Reduction in subsidies on fossil fuels including diesel, kerosene and domestic LPG.
- Coal cess quadrupled from INR 50 to INR 200 per tonne to help finance clean energy projects and Ganga rejuvenation.
- Introduction of Tax Free Infrastructure Bonds for funding of renewable energy projects.

Annexure A

Illustrative list of some of the Technologies (Mitigation perspective)

Clean Coal Technologies (CCT)

- Pulverized Combustion Ultra Super Critical (PC USC)
- Pressurised Circulating Fluidised Bed Combustion, Super Critical, Combine Cycle (PCFBC SC CC)
- Integrated Gasifier Combined Cycle (IGCC)
- Solid Oxide Fuel Cell (SOFC), Integrated Gasifier Fuel Cell (IGFC)
- Underground Coal gasification (UCG)

Nuclear Power

- Pressurized water reactor, Integral pressurized water reactor, Advanced Heavy Water Reactor (AHWR)
- Fast breeder reactor (FBR)
- Accelerated-driven systems in advanced nuclear fuel cycles

Renewable Energy

- Yeast /enzyme based conversion to high quality hydrocarbon fuels
- Conversion of pre-treated biomass to fuels and chemicals
- Gasification technologies like fluidised bed, plasma induced etc. for power generation

Wind Energy technologies:

- Development of smaller and efficient turbines
- Wind turbines for low wind regime
- Designs of offshore wind power plants

Solar PV technologies:

- Based on p-type silicon wafers and n-type silicon wafers
- Hetero junction with Thin Interfacial (HIT) Module, Back Contact
- Crystalline silicon photovoltaic cells of > 24 % cell efficiency o High efficiency Concentrating PV (CPV)

Non-silicon based solar PV technologies

- Composite cylinders for on-board hydrogen storage

Advanced biomass gasification technologies

- Low temperature Polymer Electrolyte Membrane Fuel Cell (PEMFC) for stationary power generation and for vehicular applications
- Energy storage technologies for bulk storage and Renewable Energy integration, frequency regulation, utility Transmission & Distribution applications and for community scale projects.

Section – II

Indicators for causal factors behind climate change.

2.1 Greenhouse Gases

Greenhouse Gases are gases in the atmosphere that absorb and emit radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. Greenhouse Gases greatly affect the temperature of the Earth; without them, the Earth's surface would be about 33°C (59 °F) colder than at present. The natural greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide and ozone. Some amounts of GHGs are absorbed by the natural systems such as oceans and plant biomass, which are also referred to as sinks of GHGs. However, when plants are cut down and allowed to decay or are burnt; the GHGs absorbed by them from the atmosphere are released back into the atmosphere. The buildup of GHGs in the atmosphere is therefore the net emission from sources and removal by sinks. Since the time of Industrial revolution in the mid-18th century large scale burning of fossil fuels, land use change and forestry activities have considerably enhanced the concentration of greenhouses gases in the atmosphere. Additionally synthetic greenhouse gases like CFCs, HCFCs and SF6 are also accumulating in the atmosphere.

Increase in the concentration of greenhouse gases in the atmosphere is considered as one of the main causal factors of climate change. As concentrations of greenhouse gases rise, the average surface temperature of the Earth increases over time. The Earth's rising temperature produces a change in weather patterns and sea levels.

The framework for statistics related to climate change has identified the following variables/indicators for reporting the greenhouse gases.

1. Emission of Greenhouse Gases

(i) Carbon dioxide
(ii) Nitrous Oxide
(iii) Methane
(iv) Hydro fluorocarbons(HFCs)
(v) Per fluorocarbons (PFCs)
(vi) Sulfur Hexafluoride(SF6)

2. Ambient air pollutants

(i) Sulfur Dioxide
(ii)Carbon Monoxide
(iii)Nitrogen Dioxide
(iv) SPM
(v) RSPM

Data tables included in the Report:

The following data tables are included in the Report.

2.1 Greenhouse Gases

2.1.1 Emissions Data for Selected Countries (2008)
2.1.2 Energy-related Cumulative CO_2 Emissions
2.1.3 Summary of greenhouse gas emissions in Gg (thousand tonnes) from India in 1994 by sources and sinks
2.1.4 India's initial national greenhouse gas inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol for the base year 1994.
2.1.5 Greenhouse gas emission by source and removal by sinks from India in 2007 (thousand metric tonnes)
2.1.6 A comparison of emissions by sector between 1994 and 2007 in million tons of CO_2 equivalent
2.1.7 Technological Status of Indian Cement Industry as of Dec, 2007
2.1.8 Livestock population estimates – India (1951-2007)
2.1.9 Methane emission from rice cultivation 2007
2.1.10 State wise status of ambient air quality in India during 2013
2.1.11 State wise level of SO_2, NO_2 and RSPM in industrial area under National Ambient air quality Monitoring Programme (NAMP) during 2008.
2.1.12 Ambient Air Quality in major cities
2.1.13 Production of Ozone depleting substance (ODS) in India
2.1.14 Total consumption of Ozone depleting substances

<u>Data sources</u>

Planning Commission interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth. The Expert Group was chaired by Dr Kirit Parikh. The Report is available in the website of Planning Commission.
NATCOM-I-India. India's Initial National Communication to the United Nations Framework Convention on Climate Change-2004. The Report is available in the website of ministry of Environment and Forests.
Indian Network of Climate Change Assessment (INCCA) Report: India's Greenhouse Gas Emissions 2007. The Report is available in the website of ministry of Environment and Forests.
Central Pollution Control Board (CPCB) has established the National Ambient Air Quality Monitoring network. The Report is available in CPCB website.
Ozone Cell, Ministry of Environment and Forests. The Cell provide data on Ozone depleting substances.

Table 2.1.1 : Emissions data for selected countries (2008)

Region/ Country	Population (Million)	GDP (Billion USD)*	GDP ppp (Billion USD)*	Energy Consumed (MTOE)	CO_2 Emission (MT CO_2)	Percapita Energy Cons.(Kg OE)	Energy Intensity (Kg OE/ $GDPppp)	Kg CO_2/ $GDPppp	Per capita Electricity Cons (Kwh)	Per Capita CO_2 emission (tonnes)
World	6609	39493	61428	12029.0	28962	1.82	0.20	0.47	2752	4.38
China	1327	2623	10156	1970.0	6071	1.48	0.19	0.60	2346	4.58
Brazil	192	808.95	1561	235.6	347	1.23	0.15	0.22	2154	1.80
India	**1123**	**771**	**4025**	**421.0**	**1146**	**0.53**	**0.10**	**0.28**	**543**	**1.18**
Japan	128	5205	3620	513.5	1236	4.02	0.14	0.34	8475	9.68
S. Africa	48	178	517	134.3	346	2.82	0.26	0.67	5013	7.27
Thailand	64	173	548	104.0	226	1.63	0.19	0.41	2157	3.54
Turkey	74	372	821	100.0	265	1.35	0.12	0.32	2210	3.59
UK	61	1766	1833	211.0	523	3.48	0.12	0.29	6142	8.60
USA	302	11468	11468	2340.0	5769	7.75	0.20	0.50	13616	19.10
France	64	1506	1738	264.0	369	4.15	0.15	0.21	7573	5.81
Germany	82	2065	2315	331.0	798	4.03	0.14	0.34	7185	9.71
Russia	142	130	1651	786.0	1593	5.54	0.48	0.97	6443	11.24

MTOE: Metric Tons of Oil Equivalent; MT CO_2: million tons CO_2: OE - Oil Equivalent: Kwh : Kilo watt hour.

* US Dollar at year 2000 level.: PPP: Purchasing Power Parity.

Source: International Energy Agency 2009 (As reported in page 8 Planning Commission interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth)

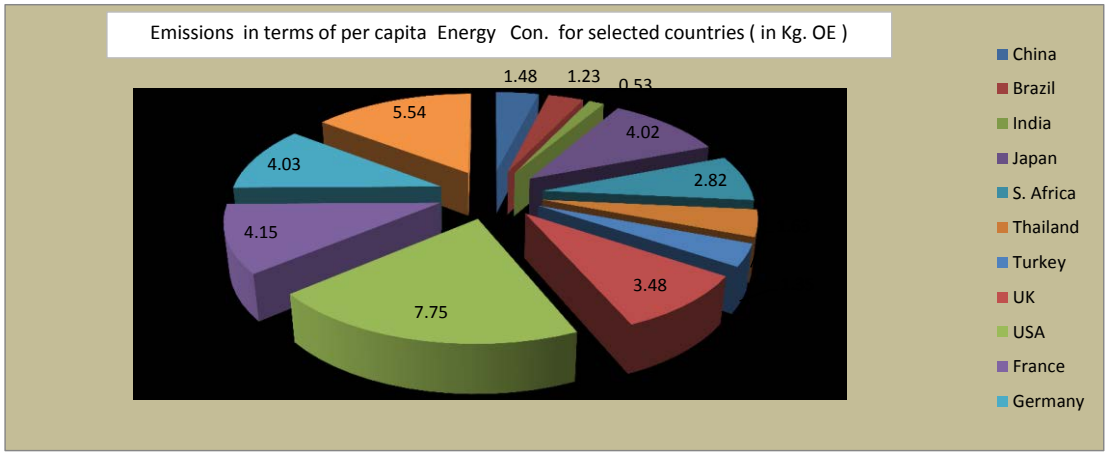


Table 2.1.2: Energy-related Cumulative CO_2 Emissions				
Country/Region	**1990 - 2006 (MT CO_2)**	**1850-2006 (MT CO_2)**	**1990-2006(Percent)**	**1850-2006(Percent)**
World	400834	1150702	100.0	100.0
India	**15977**	**27433**	**4.0**	**2.4**
China	61360	99204	15.3	8.6
Brazil	4925	9457	1.2	0.8
USA	92641	333747	23.1	29.0
Europe	55377	252148	13.8	21.9
MT: Million tonnes				
Source: As reported in page 8, Planning Commission interim Report of the Expert Group on Low Carbon Strategies for Inclusive Growth				

Table 2.1.3 (a) :Summary of greenhouse gas emissions in Giga grams (thousand tonnes) from India in 1994 by sources and sinks					
Greenhouse gas source and sink categories	**CO_2 emissions**	**CO_2 Removals**	**CH_4 emissions**	**N_2O emissions**	**CO_2 eqivalant emissions**
All energy	679470		2896	11.4	743.82
Industrial Processess	99878		2	9	102.71
Agriculture			14175	151	379.723
Land use, land-use change and forestry	37675	23533	6.5	0.04	14.292
Waste			1003	7	23.233
Total National emission ('000 Ton per year)	**817023**	**23533**	**18083**	**178**	**1228.54**
Co_2 - Carbon Dioxide: CH_4- Methane: N_2O: Nitrous Oxide.					
Source: NATCOM-I,2004					

Table 2.1.3(b) :Summary of greenhouse gas emissions in Giga grams (thousand tonnes) from India in 2007 by sources and sinks					
Greenhouse gas source and sink categories	**CO_2 emissions**	**CO_2 Removals**	**CH_4 emissions**	**N_2O emissions**	**CO_2 eqivalant emissions**
All energy	992836.30		4266.05	56.88	1100056.86
Industrial Processess	405862.90		14.77	20.56	412546.53
Agriculture			13767.80	146.07	334405.50
Land use, land-use change and forestry	98330.00	275358.00			-177028.00
Waste			2515.58	15.80	57725.18
Total National emission ('000 Ton per year)	1497029.20	275358.00	20564.20	239.31	1727706.10
Source: India :Greenhouse Gas emission 2007, Ministry of Environment, Forest and Climate Change.					

Table 2.1.4: India's initial national greenhouse gas inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol for the base year 1994.

GHG source and sink categories (Gg per year)	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	CO_2 Eq. emissions *
Total (Net) National Emission	**817023**	**23533**	**18083**	**178**	**1228540**
1. All Energy	**679470**	**0**	**2896**	**11.4**	**743820**
Fuel combustion					
Energy and transformation industries	353518			4.9	355037
Industry	149806			2.8	150674
Transport	79880		9	0.7	80286
Commercial/institutional	20509			0.2	20571
Residential	43794			0.4	43918
All other sectors	31963			0.4	32087
Biomass burnt for energy			1636	2	34976
Fugitive Fuel Emission					
Oil and natural gas system			601		12621
Coal mining			650		13650
2. Industrial Processes	**99878**		**2**	**9**	**102710**
Cement production	30767				
Lime production	1901				
Lime stone and dolomite use	5751				
Soda ash use	273				
Ammonia production	14395				
Carbide production	302				
Iron and steel production	44445				
Ferro alloys production	1295				
Aluminium production	749				
3. Agriculture			**14175**	**151**	**344485**
Enteric Fermentation			8972		188412
Manure Management			946	1	20176
Rice Cultivation			4090		85890
Agricultural crop residue			167	4	4747
Emission from Soils				146	45260
4. Land use, Land-use change and Forestry	**37675**	**23533**	**6.5**	**0.04**	**14292**
Changes in forest and other woody biomass stock		14252			-14252
Forest and grassland conversion	17987				17987
Trace gases from biomass burning			6.5	0.04	150
Uptake from abandonment of managed lands		9281			-9281
Emissions and removals from soils	19688				19688
5. Other sources as appropriate and to the extent possible					
5a. Waste			**1003**	**7**	**26606**
Municipal solid waste disposal			582		12222
Domestic waste water			359		7539
Industrial waste water			62		1302
Human sewage				7	2170
5b. Emissions from Bunker fuels	**3373**				**3373**
Aviation	2880				2880
Navigation	493				493

* Converted by using Global warming potential (GWP) indexed multipliers of 21 and 310 for converting CH_4 and N_2O respectively to CO_2 equivalents.

Source: NATCOM-I , India

Table 2.1.5: Greenhouse gas emission by source and removal by sinks from India in 2007 (thousand metric tons)					
	CO_2 emission	CO_2 removals	CH_4	N_2O	CO_2 equivalent
Grand Total	**1497029.20**	**275358.00**	**20564.20**	**239.31**	**1727706.10**
Energy	**992836.30**		**4266.05**	**56.88**	**1100056.89**
Electricity generation	715829.80		8.14	10.66	719305.34
Other energy industries	33787.50		1.72	0.07	33845.32
Transport	138858.00		23.47	8.67	142038.57
Road Transport	121211.00		23.00	6.00	123554.00
Railways	6109.00		0.34	2.35	6844.64
Aviation	10122.00		0.10	0.28	10210.90
Navigation	1416.00		0.13	0.04	1431.13
Residential	69427.00		2721.94	36.29	137838.49
Commercial/Institutional	1657.00		0.18	0.04	1673.18
Agriculture/Fisheries	33277.00		1.20	1.15	33658.70
Fugitive emissions			1509.40		31697.30
INDUSTRY	**405862.90**		**14.77**	**20.56**	**412546.53**
Minerals	**130783.95**		**0.32**	**0.46**	**130933.27**
Cement Production	129920.00				129920.00
Glass & Cermic Production	277.82		0.32	0.46	427.14
Other uses of soda ash	586.12				586.12
Chemicals	**27888.86**		**11.14**	**17.33**	**33496.42**
Ammonia production	10056.43				10056.43
Nitric acid production				16.05	4975.50
Carbide production	119.58				119.58
Titanium dioxide production	88.04				88.04
Methanol Production	266.18		0.91		285.37
Ethylene Production	7072.52		9.43		7270.64
EDC & VCM production	198.91				198.91
Ethylene Oxide production	93.64		0.19		97.71
Acrylonitile production	37.84		0.01		37.98
Carbon Black production	1155.52		0.03		1156.07
Caprolactum				1.08	336.22
Other chemical	8800.21		0.56	0.20	8873.97
Metals	**122371.43**		**0.95**	**1.11**	**122736.91**
Iron & Steel Production	116958.37		0.85	1.09	117315.63
Ferroalloys production	2460.70		0.08		2462.29
Aluminium Production	2728.87		0.01	0.00	2729.91
Lead Production	84.13		0.00	0.01	86.38
Zinc production	76.11		0.00	0.01	77.99
Copper	63.25		0.01	0.00	64.70
Other Industries	**123969.17**		**2.37**	**1.65**	**124530.44**
Pulp and paper	5222.50		0.05	0.08	5248.35
food processing	27625.53		1.12	0.22	27717.25
Textile and leather	1861.11		0.03	0.02	1867.94
Mining and quarrying	1460.26		0.06	0.01	1464.62
Non-specific industries	87799.77		1.11	1.32	88232.28
Non energy product use	**849.49**				**849.49**
Lubricant	776.75				776.75
Paraffin wax	72.75				72.75
AGRICULTURE			**13767.80**	**146.07**	**334405.50**
Enteric fermentation			10099.80		212095.80
Livestock Manure management			115.00	0.07	2436.70
Rice cultivation			3327.00		69867.00
Soils				140.00	42400.00
Burning of crop residue			226.00	6.00	6606.00
LULUCF	**98330.00**	**275358.00**			**-177028.00**

	CO_2 emission	CO_2 removals	CH_4	N_2O	CO_2 equivalent
Forestland		67800.00			-67800.00
Cropland		207520.00			-207520.00
Grassland	10490.00				10490.00
Settlement		38.00			-38.00
Wetland NE NE	NE				NE
Other land	NO				NO
Fuel wood use in forests	87840.00				87840.00
Waste			**2515.58**	**15.80**	**57725.18**
Municipal Solid waste			604.51		12694.71
Domestic waste water			861.07	15.80	22980.47
Industrial waste water			1050.00		22050.00
Bunkers*	**3454.00**		**0.03**	**0.10**	**3484.45**
Aviation Bunkers	3326.00		0.02	0.09	3355.31
Marine bunkers	128.00		0.01	0.003	129.14
Note: LULUCF: Land Use, Land Use Change & Forestry					
*Not included in the national totals					
NE: Not estimated; NO: Not occurring					
Source: INCCA- India: Greenhouse Gas Emission 2007					

Table 2.1.6: A comparison of emissions by sector between 1994 and 2007 in million tons of CO_2 equivalent

	1994	2007	CAGR (compounded annual growth rate in %)
Electricity	355.03 (28.4%)	719.30 (37.8%)	5.6
Transport	80.28 (6.4%)	142.04 (7.5%)	4.5
Residential	78.89 (6.3%)	137.84 (7.2%)	4.4
Other Energy	78.93 (6.3%)	100.87 (5.3%)	1.9
Cement	60.87 (4.9%)	129.92 (6.8%)	6.0
Iron & Steel	90.53 (7.2%)	117.32 (6.2%)	2.0
Other Industry	125.41 (10.0%)	165.31 (8.7%)	2.2
Agriculture	344.48 (27.5%)	334.41 (17.6%)	-0.2
Waste	23.23 (1.9%)	57.73 (3.0%)	7.3
Total without LULUCF	1251.95	1904.73	3.3
LULUCF	14.29	-177.03	
Total with LULUCF	1228.54	1727.71	2.9

Note: Figure in brackets indicate percentage emissions from each sector with respect to total GHG emissions without LULUCF in 1994 and 2007 respectively

Source: INCCA- India: Greenhouse Gas Emission 2007.

Table 2.1.7: Technological Status of Indian Cement Industry as of December 2007						
	Mini-Vertical Shaft Kiln	**Mini-Rotary kiln**	**Wet Process**	**Semi-Dry**	**Dry**	**Grinding Units**
No of Plants	193	17	26	4	107	29
Total Capacity (million tones)	1.51	3.11	5.71	1.80	146.56	20.30
Percent of total cement capacity	0.84	1.73	3.18	1.00	81.87	11.34
Average kiln Capacity [TPD]	30 -75	200-800	150-900	600-1300	2400-10,000	*600-2500
Fuel consumption (Kcal/kg. Clinker)	850-1000	900-1000	1200-1400	900-1000	670- 775	Nil (except for captive power plants)
Power Consumption (Kwh/tonne of cement)	110-125	110-125	115-130	110-125	85-92	*35-45
*Grinding capacity						
Source: INCCA (Indian Network for Climate Change Assessment) Greenhouse Gas Emission 2007.						

Table 2.1.8: Livestock population -1951 -2012													
All India census estimates (in Million Numbers)													
Species	**1951**	**1956**	**1961**	**1966**	**1972**	**1977**	**1982**	**1987**	**1992**	**1997**	**2003**	**2007**	**2012**
Cattle	155.30	158.70	175.60	176.20	178.30	180.00	192.45	199.69	204.58	198.88	185.18	199.08	190.90
Adult female cattle*	54.40	47.30	51.00	51.80	53.40	54.60	59.21	62.07	64.36	64.43	64.51	72.95	76.68
Buffaloes	43.40	44.90	51.20	53.00	57.40	62.00	69.78	75.97	84.21	89.92	97.92	105.34	108.70
Adult female buffaloes**	21.00	21.70	24.30	25.40	28.60	31.30	32.50	39.13	43.81	46.77	50.97	54.47	56.59
Total cattle & buffaloes	198.70	203.60	226.80	229.20	235.70	242.00	262.36	275.82	289.00	288.80	283.10	304.42	299.98
Sheep	39.10	39.30	40.20	42.40	40.00	41.00	48.76	45.70	50.78	57.49	61.47	71.56	65.10
Goats	47.20	55.40	60.90	64.60	67.50	75.60	95.25	110.21	115.28	122.72	124.36	140.54	135.20
Horses & ponies	4.50	1.50	1.30	1.10	0.90	0.90	0.90	0.80	0.82	0.83	0.75	0.61	0.62
Camels	0.60	0.80	0.90	1.00	1.10	1.10	1.08	1.00	1.03	0.91	0.63	0.52	0.40
Pigs	4.40	4.90	5.20	5.00	6.90	7.60	10.07	10.63	12.79	13.29	13.52	11.13	10.30
Mules	0.06	0.04	0.05	0.08	0.08	0.09	0.13	0.17	0.19	0.22	0.18	0.14	0.20
Donkeys	1.30	1.10	1.10	1.10	1.00	1.00	1.02	0.96	0.97	0.88	0.65	0.44	0.31
Yaks	NC	NC	0.02	0.03	0.04	0.13	0.13	0.04	0.06	0.06	0.06	0.08	0.08
Total Livestock	292.80	306.60	335.40	344.10	353.60	369.00	419.59	445.29	470.86	485.39	485.00	529.70	512.06
Poultry	73.50	94.80	114.20	115.40	138.50	159.20	207.74	275.32	307.07	347.61	489.01	648.88	729.21
Dogs	NC	NC	NC	NC	NC	NC	18.54	17.92	21.77	25.48	29.03	19.09	11.67
Rabbits	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	0.48	0.42	0.59

Source: Livestock census, Directorate of Economics & Statistics and Animal Husbandary Statistics Division, Department of Animal Husbandary, Dairying & Fisheries , Ministry of Agriculture

* : Includes number of Exotic/Crossbreda nd Indigenous Cattle in both Rural and Urban areas over the age 2.5 years

**: Includes Buffaloes in both rural and urban areas over 3 years of age

NC : Not Collected

Table 2.1.9: Methane emission from rice cultivation 2007				
Ecosystem	**Water regime**	**Rice Area (thousand ha)**	**Emission Coeff 2007 (kg per ha)**	**Methane (thousand tonnes)**
Irrigated	CF	6427	162	1042
	SA	8517	66	562.1
	MA	8898	18	160.1
Rainfed	DP	3577	70	635
	FP	9640	190	679
Deep water	DW	1309	190	249
Upland		5234	0	0
Total				**3327**
Note: CF - Continuously flooded				
SA - Single Aeration				
MA - Multiple Aeration				
DP - Drought Prone				
FP - Flood Prone				
Source: INCCA- India: Greenhouse Gas Emission 2007				

TABLE 2.1.10 : State wise status of ambient air quality in India during 2013

Sl	State	SO_2 µg/m^3 (Annual)			NO_2 µg/m^3 (Annual)			PM10 (Annual)		
		Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.
1	Andhra Pradesh	2	75	7	5	131	18	8	538	75
2	Assam	3	31	7	8	29	15	12	450	124
3	Bihar	-	-	-	-	-	-	-	-	-
4	Chandigarh	3	18	10	8	60	23	40	373	118
5	Chhattisgarh	2	5	2	5	73	28	19	464	101
6	Delhi	2	40	4	21	199	66*	28	670	221
7	Dadar & Nagar Haveli	7	9	8	18	25	21	41	48	44
8	Daman	7	22	8	18	23	20	37	46	44
9	Goa	2	21	7	5	21	12	3	113	53
10	Gujarat	7	29	12	11	33	19	36	259	84
11	Haryana	5	22	11	5	45	24	53	306	178
12	Himachal Pradesh	0	30	2	2	240	14	6	526	91
13	Jammu & Kashmir	5	35	15	2	14	5	63	179	118
14	Jharkhand	12	42	22	29	125	41	54	291	151
15	Karnataka	2	32	9	5	76	18	10	440	82
16	Kerala	2	20	4	5	111	11	7	712	55
17	Madhya Pradesh	2	50	12	2	74	22	15	728	144
18	Maharashtra	1	122	16	1	138	31	1	582	101
19	Meghalaya	2	45	5	5	28	10	10	181	59
20	Mizoram	2	7	2	4	55	7	1	253	48
21	Manipur	-	-	-	-	-	-	-	-	-
22	Nagaland	2	2	2	5	25	5	21	252	93
23	Odisha	2	19	4	5	74	16	7	393	82
24	Punjab	4	22	10	8	48	25	50	748	153
25	Puducherry	2	9	6	5	28	14	24	68	43
26	Rajasthan	4	20	7	14	73	30	16	707	173
27	Sikkim	-	-	-	-	-	-	-	-	-
28	Tamil Nadu	2	56	12	5	118	22	3	414	69
29	Uttar Pradesh	2	121	10	2	203	27	12	704	182
30	Uttaranchal	2	30	23	5	31	26	24	966	142
31	West Bengal	2	66	10	5	240	65*	13	981	162

Source : Central Pollution Control Board,2013

NB.'-' data not received, Nationalair quality standard (NAAQS) of 50µg/m3 for SO_2, 40 µg/m3 for NO_2, and 60µg/m3 for PM_{10} for residential/industrial/other area & 20µg/m3 for SO_2, 30µg/m3 for NO_2, and 60µg/m3 for PM_{10} for ecologically sensitive area. Data of monitoring stations with monitoring days $\geq$ 50 has only been considered. The data furnished in the table is as available on date.

TABLE 2.1.11: State wise level of SO_2, NO_2 and RSPM in industrial area under national ambient air quality monitoring programme (NAMP) during 2008.

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

µg/m3: Micrograms per metre cube

Source : Central Pollution Control Board,2008

Table 2.1.12 : Ambient Air Quality in Major cities

(µg/m^3) :micrograms per metre cube

Sulphur dioxide (SO_2)

City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008(P)	2013
Ahmedabad	32.0	25.0	15.1	-	12.2	8.4	10	12.3	16	15.7	12.3	12.0
Bangalore	-	20.7	27.9	20.3	38.2	20.7	20	13.4	12	8.5	15.2	13.0
Chennai	21.7	8.1	15.9	12.6	11.9	12.5	17	19.9	15	12.2	9.5	14.0
Delhi	23.5	17.3	16.3	15.4	17.5	15.2	13	11.3	10	9.89	6.6	4.0
Hyderabad	17.2	16.8	16.4	11.8	14	12.4	10	7.27	6	5.63	5.5	5.0
Kolkata	35.7	21.3	0	34.3	44.5	17.4	18	11.4	17	9.33	7.7	11.0
Mumbai	31.1	18	25.1	11.5	14.9	12.1	16	9.07	8	6.67	8.7	3.0

Oxides of Nitrogen (NO_x)

City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008(P)	2013
Ahmedabad	18.8	14.8	20	-	33	28.6	39	31.8	25	24.3	20.0	17
Bangalore	-	28	20.4	25	27.1	40.2	23	25.5	35	51.8	40.8	26
Chennai	17.5	9	13	16.7	10.7	14.4	18	18.4	26	16.8	15.4	22
Delhi	47.2	39.7	34	33.9	35.7	39.9	37	37.3	42	46.1	56.7	66
Hyderabad	37.8	25	30.7	30.8	24.3	25.2	31	25.5	26	30.3	26.2	24
Kolkata	29.9	29.3	0	32	30.5	34.8	74	81.7	71	59.7	64.0	70
Mumbai	64.2	35.3	34.3	19.5	29.6	25.5	23	17.4	21	18.3	39.3	13

Suspended Particulate Matter (SPM)

City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008(P)
Ahmedabad	251	254	235	-	351	393	343	281	256	244	220
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

Respirable Suspended Particulate Matter (RSPM)

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

SPM : Suspended particulate matter (P) : Provisional

RSPM : Respirable suspended particulate matter

SO_2 : Sulphur dioxide Nox : Oxides of nitrogen

Source: Central Pollution Control Board

TABLE 2.1.13: Production of Ozone Depleting Substances (ODS) 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**	**58314.3**

Source : Ozone cell, Ministry of Environment and Forests

NA Not available

TABLE 2.1.14: Total consumption 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	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	15645.51	8029.435
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	4568.216
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**	**22181.51**	**12794.6**

Source : Ozone cell, Ministry of Environment and Forests

2.2 Waste Generation

Rising levels of greenhouse gases in the Earth's atmosphere are causing changes in our climate, and some of these changes can be traced to solid waste. The manufacture, distribution, and use of products-as well as management of the resulting waste-all result in greenhouse gas emissions. Waste prevention and recycling are real ways to help mitigate climate change.

Making smart choices about what we buy, how we use it, and how we dispose of it can make a big difference in the amount of waste we produce and the greenhouse gas emissions associated with our consumption. The manufacture, distribution and use of the goods and food we rely on in our daily lives—as well as management of the resulting waste—all require energy. This energy mostly comes from fossil fuels, which are the largest global source of heat-trapping green house gas emmissions.

What Is the Link Between Solid Waste and Climate Change?
Waste prevention and recycling-jointly referred to as waste reduction-help us better manage the solid waste we generate. But preventing waste and recycling also are potent strategies for reducing greenhouse gases. Together they:

Reduce emissions from energy consumption. Recycling saves energy. That's because making goods from recycled materials typically requires less energy than making goods from virgin materials. And waste prevention is even more effective. Less energy is needed to extract, transport, and process raw materials and to manufacture products when people reuse things or when products are made with less material. When energy demand decreases, fewer fossil fuels are burned and less carbon dioxide is emitted to the atmosphere.

Reduce emissions from incinerators. Diverting certain materials from incinerators through waste prevention and recycling reduces greenhouse gas emissions to the atmosphere.

Reduce methane emissions from landfills. Waste prevention and recycling (including composting) divert organic wastes from landfills, reducing the methane released when these materials decompose.

Increase storage of carbon in trees. Forests take large amounts of carbon dioxide out of the atmosphere and store it in wood, in a process called carbon sequestration. Waste prevention and recycling of paper products can leave more trees standing in the forest, continuing to absorb carbon dioxide from the atmosphere.

The framework for statistics related to climate change has identified Municipal Solid Waste Generation data as a variable/indicator as causal factor of climate change.

The following Tables are included in the Report.

2.2 Waste Generation

2.2.1	Quantities and waste generation rates in 59 Cities
2.2.2	Waste characterisation in 59 Cities
2.2.3	State-wise status of hazardous waste generation
2.2.4	Municipal solid waste generation in Metro Cities / State Capitals
2.2.5	State- wise municipal solid waste generation in India
2.2.6	State wise municipal solid waste generation and treatment data (as on 31st July 2012)
2.2.7	Status of sewage generation and treatment capacity in metropolitan cities
2.2.8	State wise sewage generation of class-I Cities
2.2.9	State wise sewage generation of class-II Towns

Data Sources.

CPCB Report: Status of Municipal Waste Management. The Report is available in the Website of CPCB.
CPCB Hazardous Waste Management Division Report 'National Inventory of Hazardous Wastes Generating Industries & Hazardous Waste Management in India.' February 2009. The Report is available in the CPCB website.
CPCB Report : Status of Sewage Generation – India (2005). The Report is available in the CPCB website.
CPCB: Status of water supply, Waste water generation and treatment – Class-I & II towns. (2009). The Report is available in the CPCB website.

TABLE 2.2.1: Quantities and waste generation rates in 59 Cities					
Sl. No.	Name of city	Population (as per 2001 census)	Area (Sq. Km)	Waste Quantity (Tonne per Day)	Waste generation rate (Kg per capita per day)
1	Agartala	189998	63	77	0.40
2	Agra	1275135	140	654	0.51
3	Ahemdabad	3520085	191	1302	0.37
4	Aizwal	228280	117	57	0.25
5	Allahabad	975393	71	509	0.52
6	Amritsar	966862	77	438	0.45
7	Asansol	745439	127	207	0.44
8	Bangalore	4301326	226	1669	0.39
9	Bhopal	1437354	286	574	0.40
10	Bhubaneswar	648032	135	234	0.36
11	Chandigarh	808515	114	326	0.40
12	Chennai	4343645	174	3036	0.62
13	Coimbatore	930882	107	530	0.57
14	Daman	35770	7	15	0.42
15	Dehradun	426674	67	131	0.31
16	Delhi	10306452	1483	5922	0.57
17	Dhanbad	199258	24	77	0.39
18	Faridabad	1055938	216	448	0.42
19	Gandhinagar	195985	57	44	0.22
20	Gangtok	29354	15	13	0.44
21	Greater Mumbai	11978450	437	5320	0.45
22	Guwahati	809895	218	166	0.20
23	Hyderabad	3843585	169	2187	0.57
24	Impal	221492	34	43	0.19
25	Indore	1474968	130	557	0.38
26	Itanagar	35022	22	12	0.34
27	Jabalpur	932484	134	216	0.23
28	Jaipur	2322575	518	904	0.39
29	Jammu	369659	102	215	0.58
30	Jamshedpur	1104713	64	338	0.31
31	Kanpur	2551337	267	1100	0.43

32	Kavarati	10119	4	3	0.30
33	Kochi	595575	98	400	0.67
34	Kohima	77030	30	13	0.17
35	Kolkata	4572876	187	2653	0.58
36	Lucknow	2185927	310	475	0.22
37	Ludhiana	1398467	159	735	0.53
38	Madurai	928868	52	275	0.30
39	Meerut	1068772	142	490	0.46
40	Nagpur	2052066	218	504	0.25
41	Nashik	1077236	269	200	0.19
42	Panjim	69066	69	32	0.54
43	Patna	1366444	107	511	0.37
44	Puducherry	220865	19	130	0.59
45	Port Blair	99984	18	76	0.76
46	Pune	2538473	244	1175	0.46
47	Raipur	605747	56	184	0.30
48	Rajkot	967476	105	207	0.21
49	Ranchi	847093	224	208	0.25
50	Shilong	132867	10	45	0.34
51	Silvassa	50463	17	16	0.32
52	Shimla	142555	20	39	0.27
53	Srinagar	989440	341	428	0.48
54	Surat	2433835	112	1000	0.41
55	Thiruvananthapuram	744983	142	171	0.23
56	Vadodara	1306227	240	357	0.27
57	Varanasi	1091918	80	425	0.39
58	Vijaywada	851282	58	374	0.44
59	Vishakhapatnam	982904	110	584	0.59

Source :Central Pollution Control Board (CPCB)

CPCB with the assistance of NEERI conducted survey of solid waste management in 59 cities (35 metro cities and 24 State capital -2004-05)

Table 2.2.2 : Waste characterisation in 59 Cities						
Sr. No.	Name of City	Compostables (%)	Recyclables (%)	C/N Ratio#	HCV* (Kcal/Kg)	Moisture(%)
1	Agartala	58.57	13.68	30.02	2427	60
2	Agra	46.38	15.79	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	30.87	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	Puducherry	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	Shimla	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	Thiruvananthapuram	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 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 2.2.3 : State-wise status of hazardous waste generation						
Sl. NO.	STATE/UT	Year	Quantity of Hazardous Waste Generation (Metric Tons Per Annum)			
			Landfillable	Incinerable	Recyclable	Total
1	2	3	4	5	6	7
1	Andhra Pradesh	2010	235291	18661	386873	640825
2	Assam	2011	3835	269	14386	18490
3	Bihar	2010	3612	8	725	4345
4	Chhattisgarh	2013	8504	4772	41659	54935
5	Delhi	2008	3338	1740	203	5281
6	Gujarat	2008	1107130	108622	577037	1792789
7	Goa	2009	12955	30579	12964	56498
8	Haryana	2010	14862	6745	7952	29559
9	Himachal Pradesh	2013	12021	205	22295	34521
10	Jammu & Kashmir	2008	9946	141	6867	16954
11	Jharkhand	2008	23135	9813	204236	237184
12	Karnataka	2015	65362	65725	119802	250889
13	Kerala	2009-10	46295	184	16750	63229
14	Madhya Pradesh	2013-14	77752	15404	211431	304587
15	Maharashtra	2014	603091	298547	728152	1629790
16	Manipur	2008	0	115	137	252
17	Meghalaya	2013-14	8	0	106	114
18	Mizoram	2010	31	186	Nil	217
19	Nagaland	2013-14	60	0	11	71
20	Odisha	2010-11	81076	13201	28041	122318
21	Punjab	2013-14	24895	3089	39068	67052
22	Rajasthan	2013	557140	45548	182504	785192
23	Tripura	2010	4	21	255	280
24	Tamil Nadu	2011	240939	17976	138347	397262
	Telangana	2010	179457	24164	242294	445915
25	Uttar Pradesh	2014	34341	18954	84377	137672
26	Uttarakhand	2012	5278	4824	45525	55627
27	West Bangal	2011	44389	5629	146516	196534
	Union Territory					0
28	Daman, Diu, Dadra & NH	2008	17219	421	56350	73990
29	Puducherry	2011	133	25	35093	35251
30	Chandigarh	2009	3942	0	5794	9736
Total			**3416041**	**695568**	**3355750**	**7467359**

Source: Central Pollution Control Board, Hazardous Waste Management Division Delhi

Table 2.2.4 : Municipal solid waste generation in Metro Cities / State Capitals				
S. No.	Name of City	* Municipal Solid Waste (Tonnes per day)		
		1999-2000 (a)	2004-2005 (b)	2010-11 (c)
1	Agartala	-	77	102
2	Agra	-	654	520
3	Ahmedabad	1683	1302	2300
4	Aizwal	-	57	107
5	Allahabad	-	509	350
6	Amritsar	-	438	550
7	Asansol	-	207	210
8	Bangalore	2000	1669	3700
9	Bhopal	546	574	350
10	Bhubaneswar	-	234	400
11	Chandigar	-	326	264
12	Cheennai	3124	3036	4500
13	Coimbatore	350	530	700
14	Daman	-	15	25
15	Dehradun	-	131	220
16	Delhi	4000	5922	6800
17	Dhanbad	-	77	150
18	Faridabad	-	448	700
19	Gandhinagar	-	44	97
20	Gangtok	-	13	26
21	Guwahati	-	166	204
22	Hyderabad	1566	2187	4200
23	Imphal	-	43	120
24	Indore	350	557	720
25	Itanagar	-	12	102
26	Jabalpur	-	216	400
27	Jaipur	580	904	310
28	Jammu	-	215	300
29	Jamshedpur	-	338	28
30	Kanpur	1200	1100	1600
31	Kavaratti	-	3	2
32	Kochi	347	400	150
33	Kohima	-	13	45
34	Kolkata	3692	2653	3670
35	Lucknow	1010	475	1200
36	Ludhiana	400	735	850
37	Madurai	370	275	450
38	Meerut	-	490	52
39	Mumbai	5355	5320	6500
40	Nagpur	443	504	650
41	Nashik	-	200	350
42	Panjim	-	35	25
43	Patna	330	511	220

S. No.	Name of City	* Municipal Solid Waste (Tonnes per day)		
		1999-2000	2004-2005	2010-11
44	Puducherry	-	130	250
45	Port Blair	-	76	45
46	Pune	700	1175	1300
47	Raipur	-	184	224
48	Rajkot	-	207	230
49	Ranchi	-	208	140
50	Shillong	-	45	97
51	Shimla	-	39	50
52	Silvassa	-	16	35
53	Srinagar	-	428	550
54	Surat	900	1000	1200
55	Thiruvananthapuram	-	171	250
56	Vadodara	400	357	600
57	Varanasi	412	425	450
58	Vijayawada	-	374	600
59	Vishakhapatnam	300	584	334
	Total MSW	**30058**	**39034**	**50574**

Source: STATUS REPORT ON MUNICIPAL SOLID WASTE MANAGEMENT, CPCB

* Municipal Solid Waste Study conducted by CPCB through;

a) EPTRI (1999-2000) Environment protection training & Research Institute

b) NEERI-Nagpur (2004-2005) c) CIPET during 2010-11

Table 2.2.5: State- wise municipal solid waste generation in India					
Sl. NO.	STATE/UT	Municipal solid waste Metric Tons/day 1999-2000			Municipal solid waste Metric Tons/day (2009-12)
		Class-I cities	Class-II Towns	Total	
1	2	3	4	5	6
1	Andaman & Nicobar	-	-	-	50.0
2	Andhra Pradesh	3943	433	4376	11500.0
3	Arunachal Pradesh	-	-	-	93.8
4	Assam	196	89	285	1146.3
5	Bihar	1479	340	1819	1670.0
6	Chandigarh	200	-	200	380.0
7	Chhattisgarh	-	-	-	1167.0
8	Daman, Diu, Dadra	-	-	-	41.0
9	Delhi	4000	-	4000	7384.0
10	Goa	-	-	-	193.0
11	Gujarat	-	-	-	7378.8
12	Haryana	3805	427	4232	536.9
13	Himachal Pradesh	623	102	725	304.3
14	Jammu & Kashmir	35	-	35	1792.0
15	Jharkhand	-	-	-	1710.0
16	Karnataka	3118	160	3278	6500.0
17	Kerala	1220	78	1298	8338.0
18	Lasshadweep	-	-	-	21.0
19	Maharashtra	8589	510	9099	19.2
20	Manipur	40	-	40	112.9
21	Meghalaya	35	-	35	284.6
22	Mizoram	46	-	46	4742.0
23	Madhya Pradesh	2286	398	2684	4500.0
24	Nagaland	-	-	-	187.6
25	Odisha	646	9	655	2239.2
26	Puducherry	60	9	69	380.0
27	Punjab	1001	265	1266	2793.5
28	Rajasthan	1768	198	1966	5037.3
29	Sikkim	-	-	-	40.0
30	Tamil Nadu	5021	382	5403	12504.0
31	Tripura	33	-	33	360.0
32	Uttar Pradesh	5515	445	5960	11.6
33	Uttarakhand	-	-	-	752.0
34	West Bangal	4475	146	4621	12557.0
	Total	**48134**	**3991**	**52125**	**96726.9**
Class I Cities: Populaton > 1,00,000 (393 in number) ; Class II cities: 50,000 - 99,999 (401 in number)					
Source: Status report on municipal solid waste management, CPCB					
a) EPTRI		b) As reported by SPCBs/PCCs (during 2009-12)			

Table 2.2.6 :State wise municipal solid waste generation and treatment data (as on 06.02.2015)

S.No	State	Quantity Generated (TPD)	Collected (TPD)	Treated (TPD)
1	Andaman & Nicobar	70	70	5
2	Andhra Pradesh	11500	10656	9418
3	Arunachal Pradesh	110	82	74
4	Assam	650	350	100
5	Bihar	1670	-	-
6	Chandigarh	340	330	250
7	Chhattisgarh	1896	1704	168
8	Daman Diu & Dadra	85	85	Nil
9	Delhi	8390	7000	4150
10	Goa	183	182	182
11	Gujarat	9227	9227	1354
12	Haryana	3490	3440	570
13	Himachal Pradesh	300	240	150
14	Jammu & Kashmir	1792	1322	320
15	Jharkhand	3570	3570	65
16	Karnataka	8784	7602	2000
17	Kerala	1576	776	470
18	Lakshadweep	21	-	-
19	Madhya Pradesh	2079	4298	802
20	Maharashtra	26,820	14,900	4700
21	Manipur	176	125	-
22	Meghalaya	268	199	98
23	Mizoram	552	276	Nil
24	Nagaland	270	186	18
25	Odisha	2460	2107	30
26	Puducherry	495	495	Nil
27	Punjab	3900	3853	32
28	Rajasthan	5037	2491	490
29	Sikkim	49	49	0.3
30	Tamil Nadu	14532	14234	1607
31	Tripura	407	407	Nil
32	Uttar Pradesh	19180	19180	5197
33	Uttrakhand	1013	1013	Nil
34	West Bengal	8674	7196	1415
	TOTAL	**143449**	**117644**	**32871**

Source: CPCB

TPD : Tonnes per day | NA : Not available

Table 2.2.7 : Status of sewage generation and treatment capacity in metropolitan cities				
Sr. No.	**State /UT**	**Sewage generation (in MLD)**	**Sewage Treatment Capacity (in MLD)**	**Percent of treatment capacity**
1	Hyderabad	426.21	593	100
2	Vishakhapatnam	134.99	-	-
3	Vijayawada	128.39	-	-
4	Patna	279.14	105	37
5	Delhi	3800	2330	61
6	Ahmedabad	472	488	96
7	Surat	432	202	46
8	Rajkot	108.8	44.5	40
9	Vadodara	180	206	100
10	Bangalore	771.75	-	-
11	Indore	204	78	38
12	Bhopal	334.75	22	6
13	Jabalpur	143.34	-	-
14	Mumbai	2671	2130	80
15	Pune	474	305	64
16	Nagpur	380	100	26
17	Nasik	227.84	107.5	47
18	Ludhiana	235.2	311	100
19	Amritsar	192	-	-
20	Jaipur	451.71	54	11
21	Chennai	158	264	100
22	Kanpur	417.35	171	41
23	Lucknow	363.81	42	11
24	Agra	260.36	88	33
25	Kolkata	705.86	172	24
26	Faridabad	164	65	39
27	Jamshedpur	199.43	-	-
28	Asansol	147	-	-
29	Coimbatore	120	-	-
30	Madurai	97.93	-	-
31	Meerut	177.05	-	-
32	Varanasi	230.17	102	44
33	Allahabad	176	60	34
34	Kochi	188.4	-	-
35	Dhandbad	192	-	-
	Total	**15644.48**	**8040**	**51**
Source: Status of sewage treatment in India (CUPS/61/2005-06) Central Pollution Control Board				

Table 2.2.8 : 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	107200	12.9	-
2	Andhra Pradesh	47	20143050	1760.6	654
3	Assam	5	1417820	380.7	-
4	Bihar	23	5783554	1009.7	135.5
5	Chandigarh	1	994820	429.76	164.79
6	Chhattisgarh	7	2515100	350	69
7	Delhi	1	14858800	3800	2330
8	Goa	1	122330	9.79	-
9	Gujarat	28	14678240	1680.92	782.5
10	Haryana	20	5494110	626.69	312
11	Himachal Pradesh	1	163490	28.94	35.63
12	Jammu & Kashmir	2	1910060	213.93	-
13	Jharkhand	14	4964171	830.47	-
14	Karnataka	33	15102373	1790.4	43.44
15	Kerala	8	3778516	575.17	-
16	Madhya Pradesh	25	10795000	1248.72	186.1
17	Maharashtra	50	40255170	9986.29	4225.25
18	Manipur	1	249870	26.74	-
19	Meghalaya	1	186030	20.84	-
20	Mizoram	1	282550	31.65	-
21	Nagaland	1	171810	19.24	-
22	Odisha	12	3335930	660.73	53
23	Puducherry	2	504130	56.46	-
24	Punjab	19	6329860	1545.3	411
25	Rajasthan	24	9611490	1382.37	54
26	Tamilnadu	42	16852940	1077.21	333.42
27	Tripura	1	214327	24	-
28	Uttar Pradesh	61	25762280	3506.016	1240.13
29	Uttarakhand	6	1249380	176.97	18
30	West Bengal	60	19818471	2345.21	505.92
	Total	**498**	**227652872**	**35558.12**	**11553.68**

Source: Central Pollution Control Board.

Status of Water Supply, Wastewater Generation and Treatment in Class-I Cities & Class-II Towns of India

(CUPS/70/ 2009-10) MLD : Million liter per day

Table 2.2.9 : 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: Central Pollution Control Board.					

2.3 Forest cover/Area, Forest Produce and Biomass

Forest ecosystems provide environmental services that benefit, directly or indirectly, all human communities, including watershed protection, regional climatic regulation, fiber, food, drinking water, air purification, carbon storage, recreation, and pharmaceuticals. Forests harbor an estimated two thirds of all terrestrial species, and a fascinating array of ecological processes. The ecological stability, resistance, resilience, and adaptive capacities of forests depend strongly on their biodiversity. The diversity of genes, species, and ecosystems confers on forests the ability to withstand external pressures, and the capacity to 'bounce back' to their pre-disturbance state or adapt to changing conditions.

Forests present a significant global carbon stock. As per UNFCC report, global forest vegetation stores 283 Gt of carbon in its biomass, 38 Gt in dead wood and 317 Gt in soils (top 30 cm) and litter. The total carbon content of forest ecosystems has been estimated at 638 Gt for 2005, which is more than the amount of carbon in the entire atmosphere. This standing carbon is combined with a gross terrestrial uptake of carbon, which was estimated at 2.4 Gt a year, a good deal of which is sequestration by forests. Forests also have a potentially significant role to play in climate change adaptation planning through maintaining ecosystem services and providing livelihood options.

Deforestation, and especially the destruction of rainforests, is a hugely significant contributor to climate change. Forest loss and other changes to the use of land account contribute to man-made CO2 emissions Conversion of Forest land for agricultural or other purposes reduce the carbon stock.

The framework for statistics related to climate change identified the following variables/indicators to be included in the Report.

1. **Forest Cover/Area**
   Extent of (i) Forest Area/Cover (ii) Tree Cover
   (iii) Mangroves at National Level/ State- wise/Region level

2. **Forest Produce**
   Different types of forest produce - Production data National/State Level

3. **Biomass**
   (i) Above ground (ii) Below ground (iii) Litter (iv) Deadwood
   (v) Soil organic carbon at National/State Level

The following Tables are included in the report.

2.3 Forests

2.3.1 State/UT wise forest area (1987-2013)
2.3.2 State/UT wise forest cover (1987-2013)
2.3.3 State wise tree cover estimates
2.3.4 State wise list of mangrove areas
2.3.5 State/UT wise mangrove cover assessment (Sq Km)
2.3.6 Physiographic zone wise tree cover estimate
2.3.7 Physiographic zone wise growing stock
2.3.8 State/UT wise forest cover in hill districts -2011 (Sq Km)
2.3.9 State/UT wise forest cover in tribal districts - 2011
2.3.10 Diversion of forest land for non-forest use since the enforcement of Forest

Conservation Act,1980

2.3.11 India's major bio-geographic habitats

2.3.12 State wise Carbon Stock in different forest carbon pools

2.3.13 Forest type and density wise carbon stock in different carbon pools

Data sources

Ministry of Environment and Forests is the main source of Forest related Statistics in India. Forest Survey of India (FSI), Forest Research Institute, and Indian Council of Forestry Research and Education *(*ICFRE are the suppliers of all forest related data.

Table 2.3.1 : State/UT wise Forest Area (1987-2013)

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

Table 2.3.2 : State/UT wise Forest Cover (1987-2013)															
Sl. No.	State/UT	Total Forest Cover in Sq.Km													
		1987 #	1989 #	1991 #	1993 #	1995 #	1997	1999	2001	2003	2005**	2007	2009***	2011	2013
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Andhra Pradesh	49573	47290	47290	47256	47112	43290	44229	44637	44419	45231	45102	46670	46389	46116
2	Arunachal Pradesh	64132	69002	68757	68661	68621	68602	68847	68045	68019	67472	67353	67484	67410	67321
3	Assam	25160	24832	24751	24508	24061	23824	23688	27714	27826	27758	27692	27692	27673	27671
4	Bihar	28482	26668	26668	26587	26561	4832	4830	5720	5558	6807	6804	6804	6845	7291
5	Chhattisgarh						56435	56693	56448	55998	55929	55870	55678	55674	55621
6	Delhi	15	22	22	22	26	26	88	111	170	177	177	177	176	180
7	Goa	1240	1255	1255	1250	1247	1252	1251	2095	2156	2156	2151	2212	2219	2219
8	Gujarat	11991	11921	11907	12044	12320	12578	12965	15152	14946	14604	14620	14620	14619	14653
9	Haryana	513	513	513	513	603	604	964	1754	1517	1604	1594	1594	1608	1586
10	Himachal Pradesh	12480	12480	12480	12502	12501	12521	13082	14360	14353	14666	14668	14668	14679	14683
11	Jammu & Kashmir	20905	20499	20499	20443	20433	20440	20441	21237	21267	22689	22686	22537	22539	22538
12	Jharkhand						21692	21644	22637	22716	22722	22894	2894	22977	23473
13	Karnataka	32268	32104	32199	32343	32382	32403	32467	36991	36449	36200	36190	36190	36194	36132
14	Kerala	10292	10292	10292	10336	10336	10334	10323	15560	15577	17284	17324	17324	17300	17922
15	Madhya Pradesh	130099	135541	135541	135396	135164	74760	75137	77265	76429	77739	77700	77700	77700	77522
16	Maharashtra	45616	44044	44044	43859	43843	46143	46672	47482	46865	50661	50650	50650	50646	50632
17	Manipur	17475	17685	17685	17621	17558	17418	17384	16926	17219	16952	17280	17280	17090	16990
18	Meghalaya	16466	15645	15875	15769	15714	15657	15633	15584	16839	17205	17321	17321	17275	17288
19	Mizoram	19084	18170	18853	18697	18576	18775	18338	17494	18430	18600	19240	19183	19117	19054
20	Nagaland	14394	14399	14321	14348	14291	14221	14164	13345	13609	13665	13464	13464	13318	13044
21	Odisha	53253	47227	47205	47145	47107	46941	47033	48838	48366	48755	48855	48855	48903	50347
22	Punjab	943	1338	1343	1343	1342	1387	1412	2432	1580	1660	1664	1664	1764	1772
23	Rajasthan	12758	12884	12889	13099	13280	13353	13871	16367	15826	16012	16036	16036	16087	16086
24	Sikkim	2756	3041	3041	3119	3127	3129	3118	3193	3262	3357	3357	3359	3359	3358
25	Tamil Nadu	17472	16992	16992	17005	17045	17064	17078	21482	22643	23314	23338	23551	23625	23844
26	Tripura	5953	5535	5535	5538	5538	5546	5745	7065	8093	8173	8073	7985	7977	7866
27	Uttar Pradesh	31226	33627	33609	33961	33986	10751	10756	13746	14118	14346	14341	14341	14338	14349
28	Uttarakhand						23243	23260	23938	24465	24493	24495	24495	24496	24508
29	West Bengal	8432	8015	8015	8186	8276	8349	8362	10693	12343	12970	12994	12994	12995	16805
30	A & N Islands	7601	7622	7622	7624	7615	7613	7606	6930	6964	6663	6662	6662	6724	6711
31	Chandigarh	2	5	5	5	7	7	7	9	15	17	17	17	17	17
32	Dadra and Nagar Haveli	238	206	206	206	204	204	202	219	225	216	211	211	211	213
33	Daman & Diu	*	*	*	*	3	3		6	8	6	6	6	6	9
34	Lakshadweep	0	0	0	0	0	0	0	27	23	26	26	26	27	27
35	Puducherry	0	0	0	0	0	0	0	36	40	42	44	50	50	50
Total		**640819**	**638804**	**639364**	**639386**	**638879**	**633397**	**637293**	**675538**	**678333**	**690171**	**690899**	**692394**	**692027**	**697898**
Percent of	**Geographical Area**	**19.49**	**19.43**	**19.45**	**19.45**	**19.43**	**19.27**	**19.39**	**20.55**	**20.64**	**20.99**	**21.02**	**21.06**	**21.05**	**21.23**
Source: M/o Environment, Forest and Climate Change															
# Revised estimate as provided by State Forest Report 1997 by incorporating interpretational corrections															
* Included in Goa : ** Revised estimate as provided by State Forest Report 2009 by incorporating interpretational changes due to refinement of methodology															
*** Revised estimate as provided by State Forest Report 2011 by incorporating interpretational changes															

Note: The forest cover includes all lands which have a tree canopy density of more than ten percent when projected vertically on the horizontal ground, withn a minimum areal extent of one hectare. The forest cover reported by FSI does not make any distinction between the origin of tree crops (wheter natural or man made) or tree species; and encompasses all type of lands irrespective of their ownership, land use and legal status. A land may be recoreded as forest area and udner management of forest department but may not have any discernible forest cover. On the other hand, all wooded lands or plantations, delineated as forest cover from satelite data may not be legally recorded as forest area as there could be private plantaions or institutional wood lots.

Table 2.3.3: State wise tree cover estimates (2001-2013)							
Sl. No.	State/UT	Total Tree Cover in Sq.Km					
		2001	2003	2005	2009	2011	2013
1	2	3	4	5	6	7	8
1	Andhra Pradesh	9011	12120	7640	7191	7152	7187
2	Arunachal Pradesh	478	363	446	592	549	660
3	Assam	1942	935	1484	1590	1564	1582
4	Bihar	3693	1620	2522	2495	2369	2164
5	Chhattisgarh	3535	6723	4492	4027	3866	3463
6	Delhi	40	98	107	123	120	118
7	Goa	62	136	268	286	286	334
8	Gujarat	4036	10586	7621	8390	7837	8358
9	Haryana	1526	1415	1565	1409	1395	1282
10	Himachal Pradesh	397	491	709	638	623	697
11	Jammu & Kashmir	2217	3826	5633	6764	6550	7664
12	Jharkhand	2694	5012	3080	3032	2914	2629
13	Karnataka	7446	5371	5467	5683	5733	5920
14	Kerala	1146	1903	2632	2801	2755	3146
15	Madhya Pradesh	5751	7250	6267	6871	7090	7087
16	Maharashtra	8269	9320	8978	9466	9079	9142
17	Manipur	95	136	142	197	193	224
18	Meghalaya	140	352	405	542	578	668
19	Mizoram	95	130	122	172	190	223
20	Nagaland	70	217	238	300	322	372
21	Odisha	4364	6381	4598	4435	4301	4013
22	Punjab	1634	1608	1823	1699	1699	1499
23	Rajasthan	5286	8638	8379	8274	8272	7860
24	Sikkim	14	22	27	20	25	31
25	Tamil Nadu	6054	4991	5621	4968	4718	4866
26	Tripura	68	116	134	171	184	213
27	Uttar Pradesh	7545	7715	8203	7381	7382	6895
28	Uttarakhand	448	571	658	665	642	703
29	West Bengal	3264	1731	2269	2458	2335	2144
30	A & N Islands	83	33	53	44	39	41
31	Chandigarh	2	8	9	11	10	10
32	Dadra and Nagar Haveli	27	35	28	27	29	29
33	Daman & Diu	4	6	9	9	9	9
34	Lakshadweep	0	2	4	4	5	5
35	Puducherry	35	35	42	34	31	29
Total		**81472**	**99896**	**91663**	**92769**	**90844**	**91267**
Percent of Geographical Area		**2.48**	**3.04**	**2.79**	**2.82**	**2.76**	**2.78**
Source: M/o Environment, Forests and Climate Change							

Table 2.3.4 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 and Climate Change		

Table 2.3.5: State/UT wise Mangrove Cover Assessment (Sq Km)

Sl No.	State/UT	Year													
		1987	1989	1991	1993	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013
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	353	352	352
2	Goa	0	3	3	3	3	5	5	5	16	16	17	17	22	22
3	Gujarat	427	412	397	419	689	901	1031	911	916	991	1046	1046	1058	1103
4	Karnataka	0	0	0	0	2	3	3	2	3	3	3	3	3	3
5	Maharashtra	140	114	113	155	155	124	108	118	158	186	186	186	186	186
6	Odisha	199	192	195	195	195	211	215	219	203	217	221	221	222	213
7	Tamil Nadu	23	47	47	21	21	21	21	23	35	36	39	39	39	39
8	West Bengal	2076	2109	2119	2119	2119	2123	2125	2081	2120	2136	2152	2152	2155	2097
9	Andaman & Nicobar	686	973	971	966	966	966	966	789	658	635	615	615	617	604
10	Puducherry	0	0	0	0	0	0	0	1	1	1	1	1	1	1.63
11	Kerala	0	0	0	0	0	0	0	0	8	5	5	5	6	6
12	Daman & Diu	0	0	0	0	0	0	0	0	1	1	1	1	1.56	1
Total		**4046**	**4255**	**4244**	**4256**	**4533**	**4737**	**4871**	**4482**	**4448**	**4581**	**4639**	**4639**	**4663**	**4628**

Source: India State of Forest Reports, Forest Survey of India

Table 2.3.6 :Physiographic Zone Wise Tree Cover Estimate								
Sl. No.	Physiographic Zone	Geographic Area (Km^2)	Year					
			2009		2011		2013	
			Area (Km^2)	% of Geog. Area	Area (Km^2)	% of Geog. Area	Area (Km^2)	% of Geog. Area
1	2	3	4	5	6	7	8	9
1	Western Himalayas	329255	8091	2.46	7859	2.39	9035	2.74
2	Eastern Himalayas	74618	324	0.43	356	0.48	448	0.60
3	North East	133990	2243	1.67	2275	1.70	2655	1.98
4	Northern Plains	295780	9473	3.20	9366	3.17	8609	2.91
5	Eastern Plains	223339	5444	2.44	5168	2.31	4722	2.11
6	Western Plains	319098	7497	2.35	7038	2.21	6245	1.96
7	Central Highlands	373675	9150	2.45	9886	2.65	10127	2.71
8	North Deccan	355988	7559	2.12	7007	1.97	6762	1.90
9	East Deccan	336289	11157	3.32	10718	3.19	9644	2.87
10	South Deccan	292416	8002	2.74	8012	2.74	8244	2.82
11	Western Ghats	72381	3847	5.31	4083	5.64	4189	5.79
12	Eastern Ghats	191698	4051	2.11	4420	2.31	4194	2.19
13	West Coast	121242	9427	7.78	8863	7.31	10391	8.57
14	East Coast	167494	6504	3.88	5791	3.46	6001	3.58
Total		**3287263**	**92769**	**2.82**	**90844**	**2.76**	**91266**	**2.78**
Source : India State of Forest Report, Forest Survey of India								

Table 2.3.7 : Physiographic zone wise growing stock -2013						
Sl. No.	Physiographic Zone	Area of Phy.Zone (Km^2)	Recorded Forest Area (Km^2)	Growing Stock (volume in million Cum)		
				In Forest	In Tree Outside Forest	Total
1	2	3	4	5	6	7
1	W. Himalayas	329255	91119	1008.240	185.499	1193.739
2	E. Himalayas	74614	47965	438.406	82.521	520.927
3	North East Ranges	133990	78957	280.782	87.485	368.267
4	Northern Plains	295780	14608	152.283	94.886	247.169
5	Eastern Plains	223339	32183	212.176	88.793	300.969
6	Western Plains	319098	16421	9.670	63.641	73.311
7	Central Highlands	373675	80352	104.270	99.980	204.250
8	North Deccan	355988	86819	289.840	84.016	373.856
9	East Deccan	336289	128636	636.084	208.836	844.920
10	South Deccan	292416	49451	202.255	113.319	315.574
11	Western Ghats	72381	31012	352.895	100.652	453.547
12	Eastern Ghats	191698	74418	262.280	63.401	325.681
13	West Coast	121242	22040	128.244	136.698	264.942
14	East Coast	167494	17839	95.938	74.897	170.835
Total		**3287259**	**771820**	**4173.363**	**1484.624**	**5657.990**

Source :India State of Forest Report, 2013

Table 2.3.8 : State/UT wise forest cover in hill districts - 2013

(Sq Km)

Sl. No.	Name of State/UT	Number of Hill Districts	Geographic Area in Hill Districts	Forest Cover				
				Very Dense Forest	Moderately Dense Forest	Open Forest	Total	Percent of Geographical Area
1	2	3	4	5	6	7	8	9
1	Arunachal Pradesh	13	83743	20828	31414	15079	67321	80.39
2	Assam	3	19153	741	5696	6587	13024	68.00
3	Himachal Pradesh	12	55673	3224	6381	5078	14683	26.37
4	Jammu & Kashmir	(a) 14	101388	2814	6288	6951	16053	15.83
		(b) *	120848	1326	2472	2687	6485	5.37
5	Karnataka	6	48046	1492	14920	6728	23140	48.16
6	Kerala	10	29572	1178	7159	5760	14097	47.67
7	Maharashtra	7	69905	318	7234	7966	15518	22.20
8	Manipur	9	22327	728	6094	10168	16990	76.10
9	Meghalaya	7	22429	449	9689	7150	17288	77.08
10	Mizoram	8	21081	138	5900	13016	19054	90.38
11	Nagaland	8	16579	1298	4736	7010	13044	78.68
12	Sikkim	4	7096	500	2161	697	3358	47.32
13	Tamil Nadu	5	22789	944	3387	2197	6528	28.65
14	Tripura	4	10486	109	4641	3116	7866	75.01
15	Uttaranchal	13	53483	4785	14111	5612	24508	45.82
16	West Bengal	1	3149	724	650	1004	2378	75.52
Total		**124**	**707747**	**41596**	**132933**	**106806**	**281335**	**39.75**

Source:India State of Forest Report, 2013

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

Table 2.3.9 : State/UT wise forest cover in tribal districts - 2013

Sl. No.	State/UT	Number of Tribal Districts	Geographic Area	Forest Cover				
				Very Dense Forest	Moderately Dense Forest	Open Forest	Total	Percent of Geographical Area
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	8	87090	239	16465	8359	25063	28.78
2	Arunachal Pradesh	13	83743	20828	31414	15079	67321	80.39
3	Assam	16	50137	648	4570	6730	11948	23.83
4	Chhattisgarh	9	92656	3605	24437	11975	40017	43.19
5	Gujarat	8	48409	322	2937	3512	6771	13.99
6	Himachal Pradesh	3	26764	950	1067	1218	3235	12.09
7	Jharkhand	8	44413	1705	6006	6590	14301	32.20
8	Karnataka	5	26597	1248	7642	4249	13139	49.40
9	Kerala	9	27228	1147	6846	5414	13407	49.24
10	Madhya Pradesh	18	139448	5631	20235	16362	42228	30.28
11	Maharashtra	12	144233	7261	11775	11665	30701	21.29
12	Manipur	9	22327	728	6094	10168	16990	76.10
13	Meghalaya	7	22429	449	9689	7150	17288	77.08
14	Mizoram	8	21081	138	5900	13016	19054	90.38
15	Nagaland	8	16579	1298	4736	7010	13044	78.68
16	Odisha	12	86124	5249	14356	14237	33842	39.29
17	Rajasthan	5	38218	0	2442	3897	6339	16.59
18	Sikkim	4	7096	500	2161	697	3358	47.32
19	Tamil Nadu	6	30720	715	2359	3693	6767	22.03
20	Tripura	4	10486	109	4641	3116	7866	75.01
21	Uttar Pradesh	1	7680	409	475	427	1311	17.07
22	West Bengal	11	69403	2957	3709	7880	14546	20.96
23	Andaman & Nicobar	2	8249	3754	2413	544	6711	81.36
24	Dadra & Nagar Haveli	1	491	0	114	99	213	43.38
25	Daman & Diu	1	72	0	1	3	4	5.56
26	Lakshadweep	1	32	0	17	10	27	84.38
Total		**189**	**1111705**	**59890**	**192501**	**163100**	**415491**	**37.37**

Source:India State of Forest Report 2013

Table 2.3.10 : Diversion of forest land for non-forest use since the enformcement of forest conservation act,1980

(Area in ha.)

Sl. No.	Year	Forest Area Diverted	Cummulative Area Diverted
1	1980	0	0
2	1981	1331.70	1331.70
3	1982	3674.32	5006.02
4	1983	5100.51	10106.53
5	1984	9348.90	19455.43
6	1985	7676.83	27132.26
7	1986	9310.45	36442.71
8	1987	25925.97	62368.68
9	1988	4868.71	67237.39
10	1989	66768.09	134005.48
11	1990	127361.79	261367.27
12	1991	5065.35	266432.62
13	1992	21756.77	288189.39
14	1993	16182.51	304371.90
15	1994	59962.02	364333.92
16	1995	51428.98	415762.90
17	1996	32862.55	448625.45
18	1997	24738.43	473363.88
19	1998	18425.21	491789.09
20	1999	45784.41	537573.50
21	2000	22386.43	559959.93
22	2001	267897.61	827857.54
23	2002	51172.31	879029.85
24	2003	42729.68	921759.53
25	2004	33079.50	954839.03

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

Table 2.3.11: India's major biogeographic zones				
No.	**Name**	**Biotic Province**	**Total Area (sq.km)**	**%**
1	Trans Himalaya		174225	
		Ladakh	98618	3.3
		Tibetan Plateau	75607	2.3
2	Himalaya		210385	
		North-Western	69033	2.1
		Western	52596	1.6
		Central	6575	0.2
		Eastern	82182	2.5
3	Desert		213672	
		Kachchh	36160	1.1
		Thar	177512	5.4
4	Semi-Arid		545686	
		Central India	121629	3.7
		Gujarat-Rajputana	424057	12.9
5	Western Ghats		131491	
		Malabar coast	65745	2.0
		Western Ghat Mountains	65745	2.0
6	Deccan Peninsula		1377363	
		Deccan South Plateau	341875	10.4
		Deccan Central Plateau	410908	12.5
		Eastern Plateau	207098	6.3
		Chhota Nagpur	177512	5.4
		Central Highlands	239970	7.3
7	Gangetic Plain		355024	
		Upper Gangetic	207098	6.3
		Lower Gangetic	147927	4.5
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			**3287263**	
Source: Wildlife Institute of India (Rodgers et al. 2002)/Zoological Survey of India				

Table 2.3.12 : State wise Carbon Stock in different forest carbon pools 2011							
							'(000 tonnes)
State	**Area in Km.**	**AGB***	**BGB****	**Dead wood**	**Litter**	**SOC*****	**Total**
Andhra Pradesh	44,372	1,57,184	60,967	732	4,851	1,74,299	3,98,033
Arunachal Pradesh	67,777	2,34,110	52,489	3,753	16,080	6,56,444	9,62,876
Assam	27,645	44,543	10,240	1,050	5,411	1,07,680	1,68,924
Bihar	5,579	16,431	6,173	109	417	23,861	46,992
Chhattisgarh	55,863	2,03,701	67,632	2,407	6,435	2,72,032	5,52,207
Delhi	176	199	45	2	9	564	818
Goa	2,164	4,118	1,097	91	311	11,160	16,776
Gujarat	14,715	34,842	12,598	313	982	64,769	1,13,504
Haryana	1,587	3,946	1,356	21	74	7,285	12,681
Himachal pradesh	14,369	63,436	16,718	525	2,367	78,178	1,61,224
Jammu & Kashmir	21,273	96,096	26,259	745	3,106	1,15,505	2,41,711
Jharkhand	22,591	82,419	31,876	423	1,230	97,987	2,13,935
Karnataka	35,251	1,16,562	33,784	1,420	17,056	2,70,612	4,39,433
Kerala	15,595	59,650	15,207	862	6,027	1,17,794	1,99,539
Madhya Pradesh	76,013	2,60,335	99,435	1,535	6,990	3,14,233	6,82,529
Maharashtra	47,476	1,41,161	48,813	1,878	8,681	2,78,009	4,78,542
Manipur	17,086	26,125	8,545	503	3,828	99,152	1,38,154
Meghalaya	16,988	23,191	6,333	789	4,924	1,13,861	1,49,098
Mizoram	18,684	15,851	3,273	656	2,743	75,405	97,928
Nagaland	13,719	16,578	4,273	586	2,547	1,05,894	1,29,878
Odisha	48,374	1,47,088	48,749	1,845	7,541	2,17,860	4,23,082
Punjab	1,558	4,365	1,613	24	58	7,782	13,842
Rajasthan	15,850	32,717	12,806	202	641	42,750	89,115
Sikkim	3,262	10,512	3,012	156	456	25,595	39,731
Tamilnadu	23,044	73,105	24,488	795	4,695	1,08,400	2,11,483
Tripura	8,155	14,142	2,909	515	1,595	39,756	58,917
Uttar Pradesh	14,127	41,682	12,620	388	1,566	57,358	1,13,614
Uttaranchal	24,442	1,06,354	27,499	1,255	5,655	1,44,927	2,85,689
West Bengal	12,413	36,558	11,585	288	1,762	69,564	1,19,757
Andaman & Nicobar	6,629	33,031	10,021	1,321	3,044	52,848	1,00,265
Chandigarh	15	44	15	0	1	78	139
Dadra & Nagar Haveli	221	523	124	13	44	918	1,623
Daman & Diu	9	3	1	0	1	28	33
Lakshdweep	25	50	0	1	4	91	146
Puducherry	41	89	19	1	7	243	358
Total	**6,77,088**	**21,00,739**	**6,62,573**	**25,201**	**1,21,137**	**37,52,924**	**66,62,574**
*AGB- Above Ground Biomass							
**BGB- Below Ground Biomass							
***SOC- Soil Organic Carbon							
Source - Carbon Stock in India's Forests, Forest Survey of India, 2011							

Table 2.3.13 : Forest type and density wise carbon stock in different carbon pools 2011

('000 tonnes)

Forest Type Stratum	Density	Area in Sq. Km.	AGB	BGB	Dead wood	Litter	SOC	Total
Tropical Wet Evergreen Forests –North East	VDF	883	4,353	1,506	106	239	10,038	16,242
	MDF	3,343	9,175	2,731	122	1,062	24,357	37,447
	OF	1,763	3,211	1,277	35	504	11,747	16,774
Tropical Wet Evergreen Forests – Western Ghats	VDF	3,596	25,412	8,790	1,474	2,582	34,381	72,640
	MDF	9,239	43,067	14,898	324	3,240	78,072	1,39,601
	OF	1,747	2,082	720	46	396	14,240	17,485
Tropical Semi Evergreen Forests	VDF	11,743	68,983	14,188	1,600	3,198	1,57,270	2,45,240
	MDF	38,328	1,15,260	23,707	1,402	9,311	3,30,093	4,79,773
	OF	32,416	30,078	6,186	650	5,812	1,40,071	1,82,797
Tropical Semi Evergreen Forests – Eastern Deccan	VDF	4	15	3	1	15	33	67
	MDF	186	754	155	7	320	952	2,187
	OF	201	511	105	5	287	697	1,605
Tropical Semi Evergreen Forests – Western Ghats	VDF	1,501	7,789	1,602	615	1,228	16,016	27,250
	MDF	10,214	35,286	7,258	359	7,443	69,901	1,20,246
	OF	3,902	4,716	970	103	2,670	20,930	29,390
Tropical Moist Deciduous Forests	VDF	10,521	39,096	8,041	1,232	2,888	80,244	1,31,501
	MDF	78,237	1,99,186	40,968	6,448	25,853	4,73,833	7,46,288
	OF	51,430	60,728	12,491	2,056	9,435	2,50,881	3,35,591
Littoral & Swamp Forests	VDF	1,190	8,997	3,112	3	151	9,848	22,111
	MDF	1,969	8,456	2,925	4	134	11,351	22,870
	OF	1,708	2,386	825	4	67	5,624	8,907
Tropical Dry Deciduous Forests	VDF	13,434	83,200	32,669	615	7,888	79,040	2,03,413
	MDF	1,30,339	7,71,107	3,02,783	1,922	7,836	6,92,382	17,76,030
	OF	1,27,519	1,63,454	64,182	1,677	5,249	3,81,376	6,15,938
Tropical Thorn Forests	VDF	103	142	56	4	22	302	526
	MDF	3,079	4,067	1,597	76	445	11,480	17,666
	OF	8,568	4,270	1,677	107	650	17,565	24,269
Tropical	VDF	1,524	5,362	2,105	139	239	14,097	21,941
	MDF	8,535	21,552	8,463	312	2,049	69,380	1,01,756
	OF	10,084	16,465	6,465	202	1,805	69,816	94,753
Subtropical Pine Forests	VDF	1,116	5,620	1,419	133	164	10,175	17,511
	MDF	10,235	32,462	8,194	375	1,322	64,629	1,06,981
	OF	7,030	13,837	3,493	141	676	36,412	54,559
Montane & Moist Temperate Forests 12	VDF	4,782	30,649	7,736	652	1,537	43,803	84,376
	MDF	16,603	83,972	21,197	608	4,056	1,22,207	2,32,040
	OF	11,559	28,666	7,236	232	2,243	64,338	1,02,715
Sub Alpine & Dry Temperate Forests	VDF	2,012	15,907	4,313	241	415	20,077	40,952
	MDF	9,249	42,414	11,499	338	1,030	60,809	1,16,091
	OF	7,040	23,162	6,280	141	504	31,004	61,091
Alpine Scrub	VDF	1,615	13,187	3,575	193	204	13,961	31,120
	MDF	1,312	3,991	1,082	48	139	10,204	15,464
	OF	1,194	2,700	732	24	98	4,745	8,299
Plantation/TOF	VDF	545	1,723	354	3	121	5,170	7,372
	MDF	11,781	35,025	7,197	421	2,835	91,035	1,36,513
	OF	23,712	28,264	5,811	0	2,774	98,339	1,35,188
Total		**6,77,088**	**21,00,739**	**6,62,573**	**25,201**	**1,21,137**	**37,52,924**	**66,62,574**

*AGB- Above Ground Biomass	VDF: Very Dense Forest
**BGB- Below Ground Biomass	MDF : Moderatly Dense Forest
***SOC- Soil Organic Carbon	OF : Other Forests

Source - Carbon Stock in India's Forests, Forest Survey of India, 2011

2.4 Land Use

Land-use change is related to climate change as both a causal factor and a major way in which the effects of climate change are expressed. As a causal factor, land use influences the flux of mass and energy, and as land-cover patterns change, these fluxes are altered. Projected climate alterations will produce changes in land-cover patterns at a variety of temporal and spatial scales, although human uses of the land are expected to override many effects. A review of the literature dealing with the relationship between land-use change and climate change clearly shows that (1) in recent centuries land-use change has had much greater effects on ecological variables than has climate change; (2) the vast majority of land-use changes have little to do with climate change or even climate; and (3) humans will change land use, and especially land management, to adjust to climate change and these adaptations will have some ecological effects. Therefore, an understanding of the non climatic causes of land-use change (e.g., socioeconomics and politics) are necessary to manage ecological functions effectively on regional and global scales.

Plants absorb carbon dioxide (CO_2) from the atmosphere as they grow, and they store some of the carbon throughout their lifetime. Soils can also store CO_2, depending on how the soil is managed. This storage of carbon in plants and soils is called biological carbon sequestration. Because biological sequestration takes CO_2 out of the atmosphere, it is also called a greenhouse gas "sink." Emissions or sequestration of CO_2 can occur as land uses change. For example, CO_2 is exchanged between the atmosphere and the plants and soils on land as former cropland is converted into grassland, as new areas are cultivated and become cropland, or as forests grow. In addition, using biological feedstock (such as energy crops or wood) for purposes such as electricity generation, input to processes that create liquid fuels, or building materials can lead to emissions or sequestration.

Thus changes in the land use has an impact on the greenhouse gases emission and thus to climate change. The framework for statistics related to climate change identified land use change as an indicator to be included in the Report.

The following are tables included.

2.4 Land Use

2.4.1 Agricultural land by use in India (1950-51 to 2012-13)
2.4.2 State wise land use classification and irrigated area (1996-97 to 2012-13)
2.4.3 Selected categories of land use in India
2.4.4 Common Property Resources land(CPR) (in hectares) per household by type of land and percentages of CPR land to total geographical area and to total non-residential geographical area in different climatic zones
2.4.5 Net area irrigated from different sources and gross irrigated area - All India
2.4.6 Growth of urban agglomerations & towns by size class/category during 1901-2011

Data Sources.

'Report State of Indian Agriculture 2011-12' , by Directorate of Economics and Statistics, Department of Agriculture and Cooperation, under Ministry of Agriculture . Report available in the Ministry's Website.

NSS Report No. 452 ; Common Property Resources in India, Jan-June 1998, NSS 54th Round.

National Building Organisation (Housing data tables) Ministry of Housing & Urban Poverty Alleviation, Government of India.

Table 2.4.1: Agricultural Land by Use in India (1990-91 to 2012-13)

(Million Hectares)

S.No.	Classification	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00
I	**Geographical Area for Land Utilisation Statistics**	328.73	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)**	304.86	305.00	304.85	304.88	304.82	304.87	304.62	304.66	305.00	305.01
	1. Forest	67.80	67.86	67.98	68.27	68.60	68.81	69.13	69.24	69.21	69.16
	(%)	22.24	22.25	22.30	22.39	22.51	22.57	22.69	22.73	22.69	22.67
	2. Not available for Cultivation (A+B)	40.46	40.73	40.89	40.90	41.01	41.36	40.51	40.59	40.86	41.12
	(A) Area under non-agricultural uses	21.08	21.46	21.77	22.21	22.55	22.36	22.55	23.13	23.34	23.59
	%	6.91	7.04	7.14	7.28	7.40	7.33	7.40	7.59	7.65	7.73
	(B) Barren & Un-culturable Land	19.38	19.27	19.12	18.69	18.46	19.00	17.96	17.46	17.52	17.53
	%	6.36	6.32	6.27	6.13	6.06	6.23	5.90	5.73	5.74	5.75
	3. Other uncultivated land excluding fallow land (A+B+C)	30.21	30.06	29.46	29.06	29.02	28.64	28.55	28.51	28.45	28.30
	(A) Permanent Pasture & other Grazing Land	11.40	11.30	11.10	10.96	11.03	11.06	10.88	10.84	10.89	10.84
	%	3.74	3.70	3.64	3.59	3.62	3.63	3.57	3.56	3.57	3.55
	(B) Land under miscellaneous tree crops & groves not included in Net Area Sown	3.81	3.76	3.78	3.70	3.73	3.48	3.65	3.73	3.67	3.72
	%	1.25	1.23	1.24	1.21	1.22	1.14	1.20	1.22	1.20	1.22
	(C) Culturable Waste land	15.00	15.00	14.58	14.40	14.26	14.10	14.02	13.94	13.89	13.74
	%	4.92	4.92	4.78	4.72	4.68	4.62	4.60	4.58	4.55	4.50
	4. Fallow Lands (A+B)	23.36	24.61	23.85	24.20	23.21	23.84	23.51	24.34	23.68	25.33
	(A) Fallow Lands other than Current Fallows	9.66	9.94	9.67	9.83	9.96	10.01	10.19	10.07	10.10	10.28
	%	3.17	3.26	3.17	3.22	3.27	3.28	3.35	3.31	3.31	3.37
	(B) Current Fallows	13.70	14.67	14.18	14.37	13.25	13.83	13.32	14.27	13.58	15.05
	%	4.49	4.81	4.65	4.71	4.35	4.54	4.37	4.68	4.45	4.93
	5. Net Area Sown (6-7)	143.00	141.64	142.61	142.43	142.91	142.20	142.93	141.96	142.75	141.07
	%	46.91	46.44	46.78	46.72	46.88	46.64	46.92	46.60	46.80	46.25
	6. Total Cropped Area (Gross Cropped Area)	185.74	182.24	185.61	186.60	188.00	187.47	189.50	190.00	191.64	188.40
	7. Area Sown more than once	42.74	40.60	43.00	44.17	45.09	45.27	46.57	48.04	48.89	47.33
	8. Cropping Intensity*	129.89	128.66	130.15	131.01	131.55	131.84	132.58	133.84	134.25	133.55
III	**Net Irrigated Area**	48.02	49.87	50.29	51.34	53.00	53.40	55.11	55.21	57.44	57.53
IV	**Gross Irrigated Area**	63.20	65.68	66.76	68.26	70.65	71.35	76.03	75.67	78.67	79.22

Source: Report State of Indian Agriculture, Department of Agriculture and Co-operation

Table 2.4.1: Agricultural Land by Use in India (1990-91 to 2012-13)

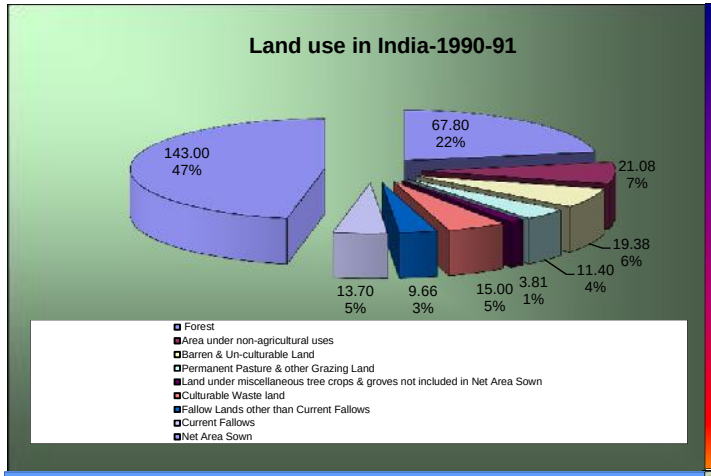
(Million Hectares)

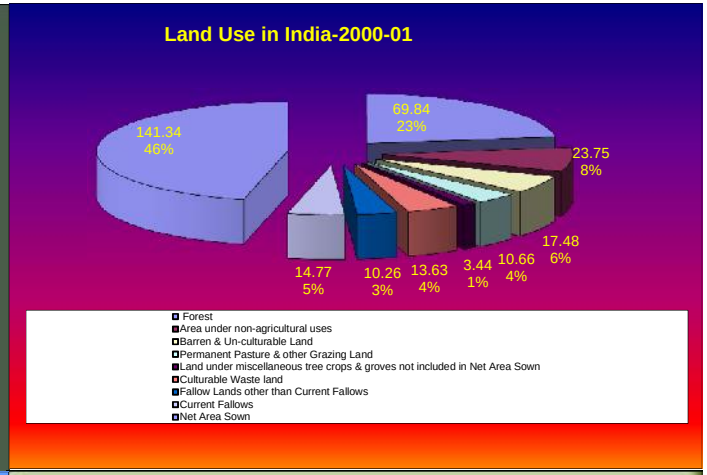
S.No.	Classification	2000-01	2001-02	2002-03#	2003-04	2004-05	2005-06	2006-07	2007-08 (P)	2008-09 (P)	2009-10 (P) &	2010-11 (P)	2011-12 (P)	2012-13 (P)
I	**Geographical Area for Land Utilisation Statistics**	328.73	328.73	328.73	328.73	328.73	328.73	328.73	328.73	328.73	328.73	328.73	328.73	328.73
II	**Reporting Area for Land Utilisation Statistics (1 to 5)**	305.18	305.12	305.34	305.56	305.58	305.43	305.65	305.67	305.84	305.84	305.90	305.81	305.94
	1. Forest	69.84	69.72	69.82	69.96	69.96	70.00	70.03	69.96	69.98	69.99	70.01	70.02	70.01
	(%)	22.88	22.85	22.87	22.90	22.89	22.92	22.91	22.89	22.88	22.88	22.89	22.90	22.88
	2. Not available for Cultivation (A+B)	41.23	41.32	41.63	41.97	42.22	42.31	42.72	42.90	43.06	43.34	43.57	43.52	43.74
	(A) Area under non-agricultural uses	23.75	23.91	24.11	24.51	24.75	24.98	25.43	25.88	26.21	26.16	26.39	26.29	26.45
	%	7.78	7.84	7.90	8.02	8.10	8.18	8.32	8.47	8.57	8.55	8.63	8.60	8.65
	(B) Barren & Un-culturable Land	17.48	17.41	17.52	17.46	17.47	17.33	17.29	17.02	16.85	17.18	17.18	17.23	17.28
	%	5.73	5.71	5.74	5.71	5.72	5.67	5.66	5.57	5.51	5.62	5.62	5.63	5.65
	3. Other uncultivated land excluding fallow land (A+B+C)	27.73	27.49	27.54	27.10	27.08	27.06	27.03	26.80	26.41	26.50	26.16	26.10	25.96
	(A) Permanent Pasture & other Grazing Land	10.66	10.52	10.45	10.48	10.45	10.44	10.41	10.36	10.34	10.34	10.30	10.30	10.24
	%	3.49	3.45	3.42	3.43	3.42	3.42	3.41	3.39	3.38	3.38	3.37	3.37	3.35
	(B) Land under miscellaneous tree crops & groves not included in Net Area Sown	3.44	3.45	3.44	3.38	3.36	3.40	3.35	3.40	3.34	3.21	3.21	3.16	3.16
	%	1.13	1.13	1.13	1.11	1.10	1.11	1.10	1.11	1.09	1.05	1.05	1.03	1.03
	(C) Culturable Waste land	13.63	13.52	13.65	13.24	13.27	13.22	13.27	13.04	12.73	12.95	12.65	12.64	12.56
	%	4.47	4.43	4.47	4.33	4.34	4.33	4.34	4.27	4.16	4.23	4.14	4.13	4.11
	4. Fallow Lands (A+B)	25.03	25.87	34.29	25.79	25.66	24.90	26.03	24.97	24.48	26.85	24.59	25.39	26.28
	(A) Fallow Lands other than Current Fallows	10.26	10.53	11.96	11.31	10.87	10.69	10.52	10.32	10.29	10.84	10.32	10.67	11.00
	%	3.36	3.45	3.92	3.70	3.56	3.50	3.44	3.38	3.36	3.54	3.37	3.49	3.60
	(B) Current Fallows	14.77	15.34	22.33	14.48	14.79	14.21	15.51	14.65	14.19	16.01	14.27	14.72	15.82
	%	4.84	5.03	7.31	4.74	4.84	4.65	5.07	4.79	4.64	5.23	4.66	4.81	5.17
	5. Net Area Sown (6-7)	141.34	140.70	131.94	140.70	140.65	141.16	139.82	141.01	141.90	139.17	141.56	140.80	139.93
	%	46.31	46.11	43.21	46.05	46.03	46.22	45.75	46.13	46.40	45.50	46.28	46.04	45.74
	6. Total Cropped Area (Gross Cropped Area)	185.34	188.28	173.89	189.66	191.11	192.74	192.38	195.22	195.31	188.99	197.32	195.25	194.40
	7. Area Sown more than once	44.00	47.58	41.95	48.96	50.46	51.58	52.56	54.21	53.41	49.82	55.76	54.44	54.47
	8. Cropping Intensity*	131.13	133.82	131.79	134.80	135.88	136.54	137.59	138.44	137.64	135.80	139.39	138.67	138.92
III	**Net Irrigated Area**	55.13	56.92	53.87	56.96	59.21	60.81	62.74	63.19	63.64	61.94	63.60	65.26	66.1
IV	**Gross Irrigated Area**	76.19	78.42	73.41	78.15	81.18	84.28	86.75	88.06	88.90	85.08	88.63	91.53	92.58

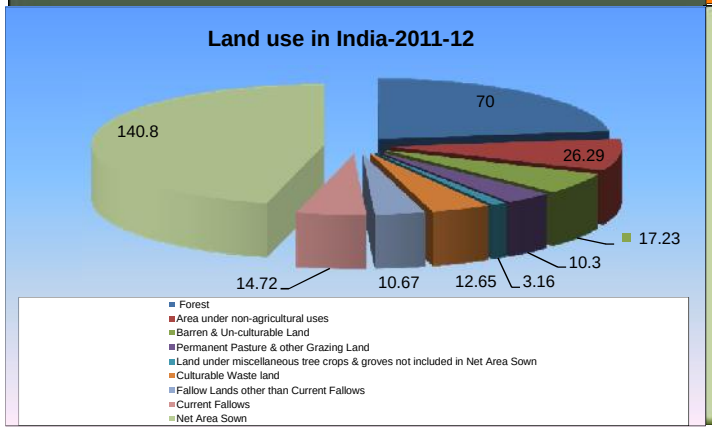
Source: Report State of Indian Agriculture, Department of Agriculture and Co-operation, Ministry of Agriculture & Farmers Welfares

& 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

* Cropping Intensity is percentage of the gross cropped area to the net area sown.


Land use in India-1990-91
143.00
47%
67.80
22%
21.08
7%
19.38
6%
11.40
4%
3.81
1%
15.00
5%
9.66
3%
13.70
5%
Forest
Area under non-agricultural uses
Barren & Un-culturable Land
Permanent Pasture & other Grazing Land
Land under miscellaneous tree crops & groves not included in Net Area Sown
Culturable Waste land
Fallow Lands other than Current Fallows
Current Fallows
Net Area Sown


Land Use in India-2000-01
141.34
46%
69.84
23%
23.75
8%
17.48
6%
10.66
4%
3.44
1%
13.63
4%
10.26
3%
14.77
5%
Forest
Area under non-agricultural uses
Barren & Un-culturable Land
Permanent Pasture & other Grazing Land
Land under miscellaneous tree crops & groves not included in Net Area Sown
Culturable Waste land
Fallow Lands other than Current Fallows
Current Fallows
Net Area Sown


Land use in India-2011-12
140.8
70
26.29
17.23
10.3
3.16
12.65
10.67
14.72
Forest
Area under non-agricultural uses
Barren & Un-culturable Land
Permanent Pasture & other Grazing Land
Land under miscellaneous tree crops & groves not included in Net Area Sown
Culturable Waste land
Fallow Lands other than Current Fallows
Current Fallows
Net Area Sown

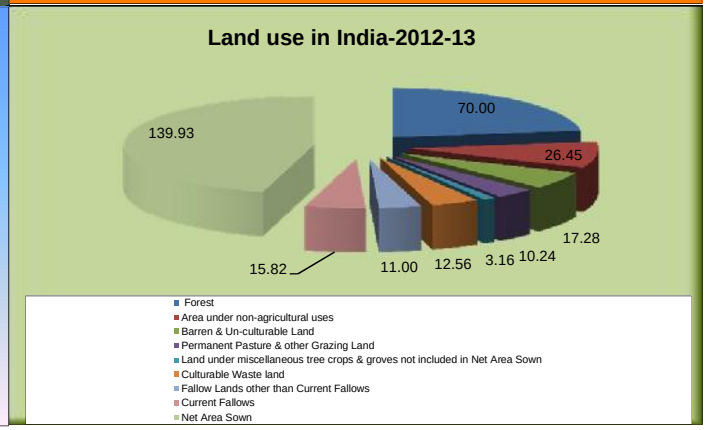

Land use in India-2012-13
139.93
70.00
26.45
17.28
10.24
3.16
12.56
11.00
15.82
Forest
Area under non-agricultural uses
Barren & Un-culturable Land
Permanent Pasture & other Grazing Land
Land under miscellaneous tree crops & groves not included in Net Area Sown
Culturable Waste land
Fallow Lands other than Current Fallows
Current Fallows
Net Area Sown

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2005-06

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cultivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity**	Agri.Land/Cultivable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and unculturable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27440	6199	2709	2084	4793	676	278	692	1646	1623	2434	4057	10745	13362	2617	124.4	15772	13179	11668	14261
2	Arunachal Pradesh	8374	5547	5154		32	32		46	28	74	64	23	87	200	267	67	133.4	361	223	5186	5324
3	Assam	7844	7850	1933	1081	1453	2533	160	209	77	445	66	99	164	2774	3731	957	134.5	3224	2873	4626	4977
4	Bihar	9416	9360	622	1646	436	2082	17	239	46	303	133	648	781	5572	7405	1832	132.9	6639	6220	2721	3139
5	Chhattisgarh	13519	13790	6353	678	314	992	855	2	339	1196	235	250	485	4764	5746	982	120.6	5590	5014	8200	8776
6	Delhi	148	147	1	74	14	88	0	1	10	11	8	12	19	28	44	16	159.2	58	39	90	108
7	Goa	370	361	125	37		37	1	1	53	55		7	7	137	170	34	124.5	197	144	164	217
8	Gujarat	19602	18868	1854	1145	2607	3753	850	4	1977	2831	11	568	579	9852	11304	1453	114.7	12412	10420	6457	8449
9	Haryana	4421	4372	44	423	95	518	25	12	31	68	6	169	175	3566	6504	2938	182.4	3784	3735	587	636
10	Himachal Pradesh	5567	4544	1099	453	673	1126	1515	62	128	1706	17	56	73	541	940	399	173.9	804	597	3740	3948
11	Jammu & Kashmir	22224	3781	2023	293	289	582	125	71	141	338	12	73	85	752	1090	338	144.9	1050	826	2731	2955
12	Jharkhand	7972	7970	2333	792	573	1366	88	113	274	476	783	1244	2027	1769	2116	347	119.6	4184	3013	3786	4957
13	Karnataka	19179	19050	3072	1349	788	2137	936	292	419	1647	452	1233	1684	10509	13027	2517	124.0	12905	11742	6145	7308
14	Kerala	3886	3886	1082	455	26	481	0	10	66	76	45	70	115	2132	2986	853	140.0	2323	2203	1563	1684
15	Madhya Pradesh	30825	30756	8692	1946	1442	3389	1339	19	1161	2519	595	591	1185	14971	19608	4637	131.0	17337	15562	13419	15194
16	Maharashtra	30771	30758	5212	1407	1720	3127	1252	249	914	2415	1204	1327	2531	17473	22556	5083	129.1	21167	18800	9591	11958
17	Manipur	2233	1950	1693*	26	1	27	1	6	1	8	0	0	0	223	223		100.0	230	223	1721	1728
18	Meghalaya	2243	2227	942	90	137	227		158	453	611	169	66	235	212	258	46	121.9	1058	278	1169	1949
19	Mizoram	2108	1951	1594	125	9	134	5	10	5	21	82	24	106	97	97		100.0	218	121	1733	1831
20	Nagaland	1658	1582	863	75		75		120	56	177	76	82	158	309	387	78	125.2	644	391	938	1191
21	Odisha	15571	15571	5813	999	843	1842	443	482	392	1317	434	426	860	5739	8716	2977	151.9	7473	6165	8098	9406
22	Punjab	5036	5033	308	429	21	451	4	4	9	17	0	13	14	4243	8085	3842	190.6	4270	4256	763	777
23	Rajasthan	34224	34266	2675	1823	2439	4262	1708	21	4590	6319	2264	1910	4174	16836	21699	4863	128.9	22739	18746	11527	15520
24	Sikkim	710	728	319	143	107	250	4	5	2	12	30	5	35	112	123	11	109.8	155	117	573	611
25	Tamil Nadu	13006	13027	2111	2139	503	2642	110	274	369	753	1518	759	2277	5244	6033	789	115.0	8164	6003	4863	7024
26	Tripura	1049	1049	606	131	3	134		27	1	28	1	1	2	280	299	19	106.6	310	281	740	768
27	Uttarakhand	5348	5670	3465	152	312	464	229	249	386	864	68	42	110	767	1266	499	165.1	1512	808	4158	4862
28	Uttar Pradesh	24093	24201	1688	2649	530	3178	64	344	454	862	574	1217	1791	16683	25105	8422	150.5	19272	17900	4930	6301
29	West Bengal	8875	8683	1175	1728	25	1753	6	63	43	111	30	319	349	5295	9533	4238	180.0	5749	5614	2934	3069
30	A & N Islands	825	740	717	1		1		2	1	3	2	1	3	16	46	30	285.4	22	17	718	723
31	Chandigarh	11	7	0	5		5		0		0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli	49	49	20	4	0	4	1		0	1	1	1	1	23	28	5	121.0	24	24	25	25
33	Daman & Diu	11	3												3	3	0	103.3	3	3	0	0
34	Lakshadweep	3	3												3	3	0	100.4	3	3	0	0
35	Puducherry	48	49		18	0	18		1	4	5	3	2	5	21	36	16	175.7	31	23	18	26
	Total	328726	305269	69785	25027	17476	42503	10415	3376	13123	26914	10504	13672	24176	141891	192796	50904	135.9	182566	155563	122703	149706

* : Provisional

** Cropping Intensity is percentage of the gross cropped area to the net area sown.

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

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2006-07

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cultivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity**	Agri.Land/Cultivable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and unculturable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27505	6210	2683	2098	4781	602	320	695	1618	1583	3166	4749	10147	12811	2664	126.3	15911	13313	11593	14191
2	Arunachal Pradesh	8374	5659	5154*	23	42	65	18	37	67	122	73	37	109	209	271	62	129.7	422	246	5237	5413
3	Assam	7844	7850	1954	1065	1447	2512	160	209	77	445	59	126	186	2753	3763	1010	136.7	3224	2879	4626	4971
4	Bihar	9416	9360	622	1647	436	2083	17	241	46	303	120	566	686	5665	7719	2054	136.3	6638	6232	2722	3128
5	Chhattisgarh	13519	13790	6355	683	313	996	857	1	350	1208	238	271	509	4722	5732	1010	121.4	5581	4993	8209	8797
6	Delhi	148	147	1	76	16	92	0	1	10	11	8	12	19	23	43	20	185.9	54	35	94	112
7	Goa	370	361	125	37		37	1	1	53	55		7	7	137	172	35	125.6	197	144	164	217
8	Gujarat	19602	18866	1833	1163	2595	3758	853	4	1976	2832	19	623	642	9801	11807	2007	120.5	12422	10424	6444	8443
9	Haryana	4421	4372	39	421	103	524	27	12	65	104	8	141	149	3556	6394	2838	179.8	3782	3697	590	675
10	Himachal Pradesh	5567	4545	1101	473	658	1131	1491	66	137	1694	15	64	78	541	944	403	174.5	821	604	3724	3941
11	Jammu & Kashmir	22224	3781*	2023*	293	289	582	128	72	146	345	16	74	89	742	1126	385	151.9	1048	815	2733	2966
12	Jharkhand	7972	7970	2239	758	564	1322	110	93	334	537	966	1402	2368	1504	1649	145	109.6	4299	2906	3671	5064
13	Karnataka	19179	19050	3072	1363	788	2151	934	292	416	1643	515	1565	2080	10105	12438	2333	123.1	12894	11670	6156	7380
14	Kerala	3886	3886	1082	449	26	475	0	9	90	100	47	82	129	2101	2918	816	138.8	2329	2183	1557	1703
15	Madhya Pradesh	30825	30756	8699	1992	1406	3397	1348	19	1177	2544	612	769	1381	14735	20113	5378	136.5	17312	15504	13444	15251
16	Maharashtra	30771	30758	5214	1412	1719	3131	1252	249	914	2415	1199	1325	2524	17475	22571	5096	129.2	21162	18800	9596	11958
17	Manipur	2233	2002	1742*	26	1	27	1	6	1	8	0	0	0	225	225		100.0	232	225	1770	1777
18	Meghalaya	2243	2227	942	91	137	228		158	450	608	169	68	237	213	246	33	115.7	1057	280	1170	1947
19	Mizoram	2108	2106	1594	125	9	134	5	69	5	79	166	41	208	91	91		100.0	373	133	1733	1973
20	Nagaland	1658	1595	863	75		75		120	57	177	76	82	158	322	406	84	125.9	657	405	938	1190
21	Odisha	15571	15571	5813	1298	840	2138	494	342	375	1211	229	526	755	5654	8960	3306	158.5	7126	6180	8445	9391
22	Punjab	5036	5033	298	477	27	504	2	4	4	10	1	35	36	4184	7861	3676	187.9	4229	4219	804	813
23	Rajasthan	34224	34265	2698	1835	2427	4262	1706	20	4611	6337	2265	1939	4204	16764	21534	4770	128.5	25600	18703	8665	15562
24	Sikkim	710	693	584*	11		11		8	3	11	4	5	9	77	123	46	159.5	98	82	595	610
25	Tamil Nadu	13006	13027	2106	2160	502	2662	110	268	354	733	1493	907	2400	5126	5843	717	114.0	8148	6033	4879	6994
26	Tripura	1049	1049	629	139		139	4	14	4	22	1	3	4	255	276	21	108.1	277	258	772	791
27	Uttar Pradesh	24093	24170	1657	2729	507	3236	64	373	440	877	542	1285	1827	16573	25415	8841	153.3	19213	17858	4958	6312
28	Uttarakhand	5348	5667	3465	161	312	472	220	269	367	856	64	44	108	765	1210	445	158.1	1509	809	4158	4858
29	West Bengal	8875	8684	1174	1733	21	1754	5	58	34	97	22	341	363	5296	9635	4339	181.9	5751	5637	2933	3047
30	A & N Islands	825	795	717	22	3	24	6	18	12	37	3	1	4	13	14	2	111.8	47	14	748	781
31	Chandigarh	11	7	0	5		5		0		0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli	49	49	20	4	0	4	1		0	1	1	2	3	21	29	8	136.0	24	23	25	25
33	Daman & Diu	11	3		0			0	0	0	0	0	0	0	2	2	0	100.0	3	2	0	0
34	Lakshadweep	3	3											3	3	0	3	100.7	3	0	0	
35	Puducherry	48	49		18	0	18		1	4	5	3	2	5	20	36	15	175.5	31	23	18	26
	Total	328726	305650	70025	25444	17287	42731	10418	3351	13274	27042	10516	15512	26028	139823	192381	52558	137.6	182476	155335	123174	150315

* : Provisional

** Cropping Intensity is percentage of the gross cropped area to the net area sown.

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

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2007-08

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cultivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity**	Agri.Land/Cultivable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and unculturable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27505	6210	2725	2059	4784	571	306	659	1535	1500	2719	4219	10756	13567	2811	126.1	15939	13475	11565	14030
2	Arunachal Pradesh	8374	5660	5154*	25	39	64	19	37	67	122	69	41	110	210	272	62	129.8	423	251	5237	5409
3	Assam	7844	7850	1853	1218	1408	2626	160	196	77	432	59	126	186	2753	3839	1086	139.4	3211	2879	4639	4971
4	Bihar	9416	9360	622	1653	432	2085	16	241	46	303	119	569	688	5662	7765	2102	137.1	6637	6231	2723	3129
5	Chhattisgarh	13519	13790	6350	687	312	999	857	1	344	1201	258	255	513	4727	5748	1020	121.6	5585	4982	8206	8808
6	Delhi	148	147	1	76	16	92	0	1	10	11		12	20	23	44	21	189.7	54	35	93	113
7	Goa	370	361	125	37		37	1	1	53	55		10	10	134	170	35	126.3	197	144	164	217
8	Gujarat	19602	18866	1834	1171	2552	3723	851	4	1960	2815	19	510	529	9966	12211	2246	122.5	12458	10476	6408	8391
9	Haryana	4421	4372	40	457	103	561	26	12	28	66	8	104	112	3594	6458	2864	179.7	3746	3698	626	674
10	Himachal Pradesh	5567	4550	1103	467	656	1123	1500	68	136	1704	18	60	78	542	954	412	176.0	824	602	3726	3947
11	Jammu & Kashmir	22224	3781*	2023*	302	289	592	126	66	147	339	26	67	93	734	1134	400	154.5	1040	801	2741	2980
12	Jharkhand	7972	7970	2239	754	564	1319	110	93	333	536	913	1428	2341	1536	1675	139	109.1	4302	2964	3668	5006
13	Karnataka	19179	19050	3072	1369	788	2157	930	290	415	1635	505	1262	1767	10419	12893	2474	123.7	12891	11681	6159	7369
14	Kerala	3886	3886	1082	463	26	488	0	6	93	99	45	83	128	2089	2761	672	132.2	2316	2172	1570	1714
15	Madhya Pradesh	30825	30756	8703	2012	1379	3392	1352	20	1170	2541	643	790	1433	14687	20416	5729	139.0	17310	15477	13446	15278
16	Maharashtra	30771	30758	5213	1428	1718	3146	1249	248	916	2413	1188	1327	2515	17473	22655	5183	129.7	21151	18799	9607	11959
17	Manipur	2233	2012	1742*	26	1	27	1	6	1	8	0	0	0	235	235		100.0	242	236	1770	1777
18	Meghalaya	2243	2227	944	91	136	227		160	434	594	161	67	227	235	283	48	120.4	1056	302	1171	1925
19	Mizoram	2108	2112	1594	125	9	134	5	67	5	77	166	45	211	96	96		100.0	379	141	1733	1971
20	Nagaland	1658	1618	863	74	4	78		111	64	175	87	100	186	316	400	84	126.6	677	415	940	1202
21	Odisha	15571	15571	5813	1298	840	2138	494	342	375	1211	229	556	785	5624	9016	3392	160.3	7126	6180	8445	9391
22	Punjab	5036	5033	287	483	24	507	3	3	3	10	1	41	42	4187	7870	3683	188.0	4236	4228	797	805
23	Rajasthan	34224	34270	2727	1847	2418	4264	1703	16	4573	6292	2167	1724	3891	17096	22208	5113	129.9	25576	18820	8694	15450
24	Sikkim	710	693	584*	11		11		8	3	11	4	5	9	77	118	41	152.7	98	82	595	610
25	Tamil Nadu	13006	13027	2106	2169	492	2661	110	261	347	718	1499	981	2479	5062	5815	753	114.9	8149	6043	4877	6984
26	Tripura	1049	1051	629	139		139	3	14	3	21	2	4	6	255	276	21	108.1	279	259	772	792
27	Uttar Pradesh	24093	24170	1658	2761	507	3268	65	374	440	879	540	1408	1948	16417	25320	8903	157.3	19179	17825	4991	6345
28	Uttarakhand	5348	5673	3484	217	224	441	199	384	302	885	72	36	108	755	1187	432	154.2	1549	791	4123	4882
29	West Bengal	8875	8684	1174	1762	22	1783	6	61	33	100	20	311	331	5296	9752	4456	184.1	5721	5607	2963	3078
30	A & N Islands	825	757	717	8	2	10	4	4	3	11	3	2	5	15	16	2	112.7	26	16	731	741
31	Chandigarh	11	7	0	5		5		0		0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli	49	49	20	4	0	4	1		0	1	2	2	4	20	27	7	132.9	24	23	25	26
33	Daman & Diu	11	3		0			0	0	0		0	0	0	2	2		100.0	3	2	0	0
34	Lakshadweep	3	3												3	3	0	100.7	3	3	0	0
35	Puducherry	48	49		18	0	18		1	4	6	2	3	5	20	35	15	174.6	30	22	18	26
	Total	328726	305667	69965	25881	17020	42901	10362	3400	13044	26806	10333	14646	24979	141016	195223	54207	138.4	182439	155662	123228	150005

* : Provisional

** Cropping Intensity is percentage of the gross cropped area to the net area sown.

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

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2008-09

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cultivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity**	Agri.Land/Culturable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and unculturable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27505	6210	2742	2056	4797	569	299	650	1517	1488	2624	4111	10868	13830	2962	127.3	15928	13492	11576	14013
2	Arunachal Pradesh	8374	5659	5154*	25	39	64	19	37	65	120	70	40	110	211	276	65	130.6	422	251	5237	5409
3	Assam	7844	7850	1853	1218	1408	2626	160	196	77	432	50	79	128	2810	3999	1188	142.3	3211	2889	4639	4961
4	Bihar	9416	9360	622	1670	432	2102	16	243	45	304	122	655	777	5554	7671	2117	138.1	6620	6209	2740	3150
5	Chhattisgarh	13519	13790	6349	696	308	1004	855	1	347	1203	258	265	523	4710	5683	973	120.7	5581	4975	8209	8814
6	Delhi	148	147	1	76	16	92	0	1	10	11		12	20	23	43	20	187.8	54	35	94	113
7	Goa	370	361	125	37		37	1	1	53	54		9	9	135	166	31	123.3	197	144	164	217
8	Gujarat	19602	19069	1834	1171	2552	3723	851	4	1960	2815	16	379	395	10302	11637	1335	113.0	12661	10681	6408	8388
9	Haryana	4421	4371	40	470	103	573	30	12	29	72	5	105	111	3576	6484	2908	181.3	3728	3681	644	691
10	Himachal Pradesh	5567	4550	1103	468	654	1122	1503	68	135	1706	20	59	79	539	946	407	175.4	822	599	3728	3951
11	Jammu & Kashmir	22224	3781*	2023*	297	288	585	128	67	150	346	23	65	88	739	1137	398	153.9	1044	803	2737	2978
12	Jharkhand	7972	7970	2239	764	569	1332	110	93	336	539	962	1394	2355	1504	1689	185	112.3	4289	2898	3681	5072
13	Karnataka	19179	19050	3072	1375	788	2163	923	290	413	1626	516	1500	2016	10174	12368	2195	121.6	12892	11673	6158	7376
14	Kerala	3886	3886	1082	475	25	500	0	6	96	102	46	68	114	2089	2695	606	129.0	2305	2157	1581	1730
15	Madhya Pradesh	30825	30756	8696	2050	1351	3401	1337	19	1160	2516	621	582	1202	14941	20657	5716	138.3	17322	15523	13434	15233
16	Maharashtra	30771	30758	5213	1433	1718	3151	1246	248	918	2411	1188	1372	2561	17422	22454	5032	128.9	21149	18795	9610	11964
17	Manipur	2233	2013	1742*	26	1	27	1	6	1	8	0	0	0	236	236		100.0	243	237	1770	1777
18	Meghalaya	2243	2227	948	91	134	226		160	393	553	157	59	215	284	337	53	118.7	1053	343	1174	1884
19	Mizoram	2108	2080	1594	124	9	133	5	17	5	27	171	60	231	95	95		100.0	348	155	1732	1925
20	Nagaland	1658	1621	863	95	3	98		121	60	181	89	73	163	316	402	86	127.2	659	389	961	1231
21	Odisha	15571	15571	5813	1298	840	2138	494	342	375	1211	229	576	805	5604	9071	3467	161.9	7126	6180	8445	9391
22	Punjab	5036	5033	295	492	24	516	7	5	3	15	0	37	37	4169	7912	3743	189.8	4215	4207	818	826
23	Rajasthan	34224	34270	2728	1970	2295	4265	1699	18	4336	6052	2108	1565	3673	17551	22771	5220	129.7	25578	19117	8692	15153
24	Sikkim	710	693	584*	11		11		8	3	11	4	5	9	77	118	40	152.3	98	82	595	610
25	Tamil Nadu	13006	13027	2106	2173	492	2665	110	259	333	702	1498	1013	2511	5043	5824	781	115.5	8146	6056	4880	6970
26	Tripura	1049	1049	629	139		139	3	14	4	21	2	3	4	256	263	8	103.1	278	258	771	791
27	Uttar Pradesh	24093	24170	1662	2779	499	3278	65	365	437	867	539	1263	1802	16562	25471	8909	158.3	19166	17825	5005	6345
28	Uttarakhand	5348	5673	3486	217	224	441	199	384	303	886	71	35	106	754	1193	439	153.8	1547	789	4126	4884
29	West Bengal	8875	8684	1174	1793	21	1814	7	55	32	94	22	287	309	5294	9802	4507	185.1	5689	5581	2995	3103
30	A & N Islands	825	759	717	9	2	11	5	4	3	11	3	3	6	14	16	2	113.6	27	17	733	742
31	Chandigarh	11	7	0	5		5		0		0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli	49	49	20	4	0	4	1		0	1	2	2	4	20	26	6	128.2	24	22	25	26
33	Daman & Diu	11	4		0		0	0	0	0	1	0	0	0	3	3		100.0	4	3	0	1
34	Lakshadweep	3	3		0		0								3	3*	0	105.1	3	3	0	0
35	Puducherry	48	49		18	0	18		1	4	6	2	3	5	19	33	14	170.6	30	22	18	26
	Total	328726	305823	69978	26210	16851	43061	10344	3343	12735	26423	10290	14192	24482	141899	195314	53414	137.6	182459	156092	123384	149752

* : Provisional

** Cropping Intensity is percentage of the gross cropped area to the net area sown.

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

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2009-10

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cultivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity**	Agri.Land/Cultivable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and unculturable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27505	6210	2765	2043	4808	566	295	647	1508	1627	3361	4987	9991	12560	2569	125.7	15921	13352	11584	14152
2	Arunachal Pradesh	8374	5661	5154*	26	38	64	18	38	64	120	70	40	110	212	276	64	130.2	424	252	5237	5409
3	Assam	7844	7850	1853	1218	1408	2626	160	196	77	432	50	79	128	2811	4099	1289	145.9	3211	2889	4639	4961
4	Bihar	9416	9360	622	1690	432	2121	16	244	45	305	122	858	980	5332	7296	1964	136.8	6601	6189	2759	3170
5	Chhattisgarh	13519	13790	6349	703	309	1012	859	1	351	1211	262	272	535	4683	5561	878	118.7	5570	4956	8220	8834
6	Delhi	148	147	1	76	16	93	0	1	10	11	8	12	20	22	46	23	204.3	53	34	94	113
7	Goa	370	361	125	37		37	1	1	53	54		12	12	132	160	29	121.8	197	144	164	217
8	Gujarat	19602	19069	1834	1171	2552	3723	851	4	1960	2815	16	379	395	10302	11085	783	107.6	12661	10681	6408	8388
9	Haryana	4421	4371	40	470	104	574	28	12	29	70	5	133	138	3550	6351	2801	178.9	3730	3684	641	688
10	Himachal Pradesh	5567	4510	1106	468	654	1132	1504	68	128	1700	22	60	82	538	941	407	174.7	817	599	3728	3951
11	Jammu & Kashmir	22224	3781*	2023*	306	274	580	120	63	149	333	26	84	110	735	1145	409	155.7	1058	819	2723	2962
12	Jharkhand	7972	7970	2239	764	569	1332	110	93	336	539	1045	1564	2609	1250	1399	149	111.9	4288	2814	3682	5156
13	Karnataka	19179	19050	3072	1386	788	2174	914	288	413	1615	484	1301	1785	10404	12873	2469	123.7	12891	11705	6159	7344
14	Kerala	3886	3886	1082	479	22	501	0	4	98	103	45	77	122	2079	2669	590	128.4	2303	2156	1583	1731
15	Madhya Pradesh	30825	30756	8689	2091	1341	3432	1338	24	1147	2508	608	547	1155	14972	21411	6440	143.0	17298	15519	13458	15237
16	Maharashtra	30771	30758	5215	1443	1729	3172	1242	250	917	2409	1189	1373	2562	17401	22612	5211	129.9	21130	18773	9628	11985
17	Manipur	2233	2011	1742*	26	1	27	1	6	1	8	0	0	0	234	234		100.0	240	234	1770	1777
18	Meghalaya	2243	2229	946	98	133	231		162	394	556	155	58	213	283	336	53	118.9	1052	341	1177	1888
19	Mizoram	2108	2101	1585	87	8	95	5	39	7	51	181	66	247	123	123		100.0	415	189	1686	1912
20	Nagaland	1658	1621	861	87	2	89		107	43	150	101	59	160	361	486	126	134.8	671	420	950	1201
21	Odisha	15571	15536	5814	1230	1076	2306	518	218	487	1223	573	859	1432	4761	5510	749	115.7	6898	5620	8638	9916
22	Punjab	5036	5033	295	503	25	528	4	5	3	11	4	37	40	4158	7875	3717	189.4	4206	4195	827	838
23	Rajasthan	34224	34270	2735	1976	2292	4268	1697	17	4475	6190	2048	2055	4103	16974	21745	4770	128.1	25569	19030	8701	15240
24	Sikkim	710	693	584*	11		11		8	3	11	4	5	9	77	144	67	186.0	98	82	595	610
25	Tamil Nadu	13006	13033	2127	2176	490	2666	110	253	326	689	1542	1117	2659	4892	5572	680	113.9	8131	6009	4903	7024
26	Tripura	1049	1049	629	141		141	2	14	4	20	2	2	4	256	267	11	104.4	277	258	772	792
27	Uttar Pradesh	24093	24170	1662	2801	494	3295	65	360	431	856	537	1232	1769	16589	25440	8851	153.4	19148	17821	5022	6350
28	Uttarakhand	5348	5672	3485	216	225	441	198	383	309	891	82	37	119	737	1166	430	158.4	1548	773	4124	4899
29	West Bengal	8875	8684	1174	1799	22	1820	6	55	31	92	20	323	342	5256	9530	4274	181.3	5684	5579	3000	3106
30	A & N Islands	825	757	717	7	2	9	4	4	3	11	3	3	6	15	17	2	112.4	28	17	730	740
31	Chandigarh	11	7	0	5		5		0		0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli	49	49	20	4	0	4	1		0	1	4	2	6	18	23	4	128.1	24	22	25	26
33	Daman & Diu	11	4		0		0	0	0	0	1	0	0	0	3	3		100.0	4	3	0	1
34	Lakshadweep	3	3		0		1								2	3	0	118.6	2	3	0	0
35	Puducherry	48	49		18	0	19		1	4	6	3	3	6	19	32	13	170.3	30	22	19	27
	Total	328726	305844	69990	26276	17047	43334	10340	3214	12945	26499	10838	16009	26847	139173	188992	49814	135.8	182179	155185	123650	150649

* : Provisional

** Cropping Intensity is percentage of the gross cropped area to the net area sown.

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

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2010-11

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cultivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity**	Agri.Land/Cultivable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and unculturable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27505	6230	2872	2026	4899	554	290	626	1471	1490	2229	3719	11186	14512	3326	129.7	15821	13415	11683	14089
2	Arunachal Pradesh	8374	5661	5154*	26	38	64	18	37	64	120	70	40	109	213	278	65	130.5	424	253	5237	5408
3	Assam	7844	7850	1853	1218	1408	2626	160	196	77	432	50	79	128	2811	4160	1349	148.0	3211	2889	4639	4961
4	Bihar	9416	9360	622	1700	432	2131	16	245	45	306	122	920	1042	5259	7194	1935	136.8	6591	6179	2769	3181
5	Chhattisgarh	13519	13790	6336	713	306	1019	855	1	355	1211	275	253	528	4697	5671	975	120.8	5580	4949	8210	8840
6	Delhi	148	147	1	76	16	93	0	1	10	11	8	12	20	22	44	22	200.9	53	34	94	113
7	Goa	370	361	125	37		37	1	1	53	54		13	13	131	160	29	122.1	197	144	164	217
8	Gujarat	19602	19069	1834	1171	2552	3723	851	4	1960	2815	16	379	395	10302	12247	1946	118.9	12661	10681	6408	8388
9	Haryana	4421	4370	39	522	102	624	27	11	27	65	3	122	125	3518	6505	2987	184.9	3681	3640	690	730
10	Himachal Pradesh*	5567	4559	1106	468	654	1132	1504	68	128	1700	22	60	82	538	955	410	177.3	817	599	3728	3951
11	Jammu & Kashmir	22224	3781*	2023*	301	277	578	119	66	135	321	26	101	127	732	1140	408	155.8	1061	833	2720	2948
12	Jharkhand	7972	7970	2239	764	569	1332	110	93	336	539	1045	1729	2774	1085	1249	164	115.1	4288	2814	3682	5156
13	Karnataka	19179	19050	3072	1430	787	2217	912	286	414	1613	426	1199	1626	10523	13062	2540	124.1	12849	11722	6201	7328
14	Kerala	3886	3886	1082	490	20	510	0	4	92	96	52	76	128	2072	2647	576	127.8	2295	2148	1591	1739
15	Madhya Pradesh	30825	30756	8697	2089	1335	3424	1328	28	1088	2444	568	503	1072	15119	22046	6926	145.8	17307	15623	13449	15133
16	Maharashtra	30771	30758	5216	1449	1731	3179	1242	250	919	2412	1179	1366	2545	17406	23175	6663	133.1	21121	18772	9637	11986
17	Manipur	2233	2125	1742*	26	1	27	1	6	1	8	0	0	0	348	348		100.0	355	348	1770	1777
18	Meghalaya	2243	2235	946	105	133	238		163	392	555	155	58	213	284	338	54	119.0	1052	342	1184	1894
19	Mizoram	2108	2099	1585	87	8	95	5	37	7	49	182	67	249	121	121	3	100.0	414	197	1686	1912
20	Nagaland	1658	1625	863	87	2	89		103	52	155	100	55	155	362	452	90	124.9	673	417	952	1208
21	Odisha	15571	15472	5814	1247	1032	2279	513	220	520	1253	567	877	1444	4682	5429	747	116.0	6866	5559	8606	9913
22	Punjab	5036	5033	294	508	25	533	4	4	4	12	4	33	37	4158	7883	3725	189.6	4202	4191	830	842
23	Rajasthan	34224	34270	2743	1889	2379	4268	1694	21	4233	5949	1726	1235	2962	18349	26002	7653	141.7	25565	19584	8705	14686
24	Sikkim	710	693	584*	11		11		8	3	11	4	5	9	77	152	74	195.7	98	82	595	610
25	Tamil Nadu	13006	13033	2125	2177	489	2666	110	252	331	693	1580	1015	2595	4954	5753	799	116.1	8132	5969	4901	7065
26	Tripura	1049	1049	629	141		141	2	14	4	20	2	2	4	256	350	94	136.9	277	258	772	792
27	Uttar Pradesh	24093	24170	1658	2835	486	3321	66	354	426	846	538	1215	1753	16593	25363*	8790	152.9	19126	17808	5045	6363
28	Uttarakhand	5348	5673	3485	218	225	442	199	386	310	894	84	43	128	723	1170	447	161.7	1547	766	4126	4906
29	West Bengal	8875	8684	1174	1823	17	1840	5	53	29	87	18	584	602	4991	8832	4572	177.3	5666	5565	3018	3119
30	A & N Islands	825	757	717	7	2	9	4	4	3	11	3	3	6	15	19	4	128.8	28	17	730	740
31	Chandigarh	11	7	0	5		5		0		0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli	49	49	20	4	0	4	1		0	1	4	2	6	17	22	3	124.8	24	3	0	1
33	Daman & Diu	11	4		0		0	0	0	0	1	0	0	0	3	3		100.0	4	3	0	1
34	Lakshadweep	3	3		0		1								2	3	0	130.4	2	3	0	0
35	Puducherry	48	49		19	0	19		1	5	6	2	3	6	19	31	13	169.3	30	22	19	27
Total		328726	305903	70009	26513	17051	43575	10301	3208	12650	26159	10324	14278	24602	141559	197323	57390	139.4	182018	155847	123871	150056

* : Provisional

** Cropping Intensity is percentage of the gross cropped area to the net area sown.

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

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2011-12

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cutivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity*	Agri.Land/Culti vable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and uncultu rable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27505	6230	2765	2043	4827	553	289	614	1455	1558	2273	3831	11161	13759	2569	123.3	15894	13352	11584	14152
2	Arunachal Pradesh	8374	5660	5154	26	38	64	18	37	64	119	69	39	108	215	281	67	131.0	424	254	5237	5407
3	Assam	7844	7850	1853	1212	1408	2620	160	196	78	434	52	81	132	2811	4174	1363	148.5	3217	2891	4633	4959
4	Bihar	9416	9360	622	1702	432	2134	16	245	45	306	121	781	902	5396	7647	2251	141.7	6588	6177	2772	3183
5	Chhattisgarh	13519	13790	6352	725	292	1017	863	1	352	1216	257	270	527	4677	5664	987	121.1	5557	4947	8233	8843
6	Delhi	148	147	1	76	17	93	0	1	10	11	8	12	20	22	39	17	175.1	53	34	94	113
7	Goa	370	361	125	37		37	1	1	53	54		12	12	132	164	32	124.2	197	144	164	217
8	Gujarat	19602	19069	1834	1171	2552	3723	851	4	1960	2815	16	379	395	10302	13093	2791	127.1	12661	10681	6408	8388
9	Haryana	4421	4371	39	500	106	606	28	9	27	64	21	128	149	3513	6489	2976	184.7	3698	3641	673	731
10	Himachal Pradesh	5567	4559	1106	349	783	1132	1504	68	128	1700	22	60	82	538	951	412	176.6	817	598	3742	3961
11	Jammu & Kashmir	22224	3781*	2023*	260	312	572	123	61	135	319	13	108	121	746	1161	415	155.6	1063	855	2718	2926
12	Jharkhand	7972	7970	2239	764	568	1332	110	93	336	539	1045	1729	2774	1085	1255	170	115.6	4288	2814	3682	5156
13	Karnataka	19179	19050	3072	1433	787	2220	908	285	413	1607	539	1672	2210	9941	12059	2118	121.3	12850	11613	6200	7437
14	Kerala	3886	3886	1082	531	0	531	0	3	95	99	58	77	135	2040	2662	622	130.5	2274	2117	1613	1769
15	Madhya Pradesh	30825	30756	8691	2119	1341	3460	1321	23	1066	2410	535	424	958	15237	22516	7280	147.8	17284	15660	13472	15096
16	Maharashtra*	30771	30758	5211	1451	1728	3179	1244	250	919	2413	1192	1378	2570	17386	21915	4529	126.1	21125	18764	9633	11994
17	Manipur	2233	2142	1742*	26	1	27	1	6	1	8	0	0	0	365	365		100.0	372	365	1770	1777
18	Meghalaya	2243	2241	946	107	132	239		164	391	555	155	60	215	285	339	54	118.9	1056	345	1185	1896
19	Mizoram	2108	2075	1585	87	8	95	5	41	7	53	183	61	244	97	97		100.0	389	158	1686	1916
20	Nagaland	1658	1644	863	93	2	95		92	67	159	98	49	147	379	474	95	125.0	686	429	958	1216
21	Odisha	15571	15367	5814	1234	1063	2297	508	200	536	1244	622	997	1619	4394	4964	571	113.0	6749	5391	8619	9977
22	Punjab	5036	5033	293	447	39	486	4	7	63	74	0	45	45	4134	7905	3771	191.2	4250	4179	783	854
23	Rajasthan	34224	34267	2747	1884	2387	4271	1694	21	4169	5884	1855	1477	3331	18034	24505	6471	135.9	25555	19511	8712	14756
24	Sikkim	710	693	584*	11		11		8	3	11	4	5	9	77	137	60	177.3	98	82	595	610
25	Tamil Nadu	13006	13033	2125	2181	488	2669	110	252	329	691	1594	967	2561	4986	5890	904	118.1	8129	5953	4904	7080
26	Tripura*	1049	1049	629	141		141	2	14	4	20	2	2	4	256	371	115	145.2	277	258	772	792
27	Uttar Pradesh	24093	24170	1656	2893	457	3350	66	350	420	836	533	1173	1705	16623	25809*	9186	155.3	19099	17796	5072	6375
28	Uttarakhand	5348	5673	3485	218	225	443	199	386	311	895	87	48	135	714	1132	418	158.5	1546	763	4126	4910
29	West Bengal	8875	8684	1174	1795	15	1810	4	52	31	86	18	399	417	5198	9353	4155	179.9	5697	5597	2987	3087
30	A & N Islands*	825	757	717	7	2	9	4	4	3	11	3	3	6	15	18	3	121.4	28	17	730	740
31	Chandigarh*	11	7	0	5		5		0		0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli*	49	49	20	4	0	4	1		0	1	4	2	6	17	22	4	125.0	24	20	25	29
33	Daman & Diu	11	4		0		0	0	0	0	0	0	0	0	3	3	0	104.7	4	3	0	1
34	Lakshdweep	3	3		1		1				0				2	3	1	130.4	2	2	1	1
35	Puducherry	48	49	0	18	0	18		1	5	6	2	4	6	18	27	9	151.6	30	22	19	27
Total		328726	305815	70015	26294	17227	43521	10296	3164	12636	26096	10666	14715	25381	140801	195246	54444	138.7	181983	155517	123832	150298

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

Table 2.4.2: State wise Land Use Classification and Irrigated Area- 2012-13

(Thousand Hectares)

Sl. No.	State/UT	Geographical Area	Reporting area for land utilisation statistics (col. 4+7+11+14+15)	Forest	Land not available for cutivation			Other uncultivated land excluding Fallow Land				Fallow Lands			Net Area Sown (col. 16-17)	Total Cropped Area (Gross Cropped Area)	Area Sown more than once	Cropping Intensity*	Agri.Land/Culti vable Land/Culturable Land (Col.9+10+14+15)	Cultivated Land(Col.13+15)	Uncultivable/Unculturable Land (Col.3-19)	Uncultivated Land (Col.3-20)
					Area put to non agricultural uses	Barren and uncultu rable land	Total (col. 5+ col. 6)	Permanent pastures & other grazing lands	Land under Miscellaneous Tree Crops & Groves not included in Net Area Sown	Culturable Waste Land	Total (col. 8+9+10)	Fallow Lands other than Current Fallows	Current Fallows	Total (col. 12+ col.13)								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.0	19	20	21	22
1	Andhra Pradesh	27507	27507	6227	2873	1959	4833	515	278	587	1380	1610	2337	3947	11117	13650	2533	122.8	15930	13454	11574	14050
2	Arunachal Pradesh	8374	5661	5154*	26	38	64	18	36	64	119	69	38	107	216	285	69	131.7	424	254	5237	5406
3	Assam	7844	7850	1853	1212	1408	2620	160	196	78	434	52	81	132	2811	4197	1386	149.3	3217	2891	4633	4959
4	Bihar	9416	9360	622	1708	432	2140	16	246	45	307	122	767	888	5402	7778	2375	144.0	6582	6169	2777	3190
5	Chhattisgarh	13519	13790	6352	734	290	1024	861	1	358	1220	265	257	522	4671	5691	1019	121.8	5552	4928	8238	8862
6	Delhi	148	147	1	76	16	92	0	1	10	11	8	12	20	22	49	27	220.2	53	34	94	113
7	Goa	370	361	125	37		37	1	1	53	55		12	12	132	163	31	123.2	197	144	164	217
8	Gujarat	19602	19069	1834	1171	2552	3723	851	4	1960	2815	16	379	395	10302	12600	2298	122.3	12661	10681	6408	8388
9	Haryana	4421	4371	40	542	101	643	25	4	26	55	18	103	121	3513	6376	2863	181.5	3664	3616	708	755
10	Himachal Pradesh	5567	4576	1126	353	779	1132	1508	65	124	1697	21	57	79	543	947	403	174.2	811	601	3764	3975
11	Jammu & Kashmir	22224	3781	2023	267	306	573	114	65	134	313	13	113	126	745	1162	417	156.0	1070	858	2711	2923
12	Jharkhand	7972	7970	2239	710	572	1282	114	102	349	565	1038	1440	2478	1406	1657	251	117.9	4336	2846	3635	5124
13	Karnataka	19179	19050	3073	1436	787	2223	908	283	413	1604	535	1822	2358	9793	11748	1955	120.0	12846	11615	6204	7435
14	Kerala	3886	3886	1082	508	16	524	0	3	97	100	56	77	133	2048	2592	544	126.5	2280	2125	1606	1761
15	Madhya Pradesh	30825	30756	8693	2126	1387	3513	1286	20	1025	2331	493	375	867	15352	23130	7778	150.7	17264	15727	13492	15029
16	Maharashtra	30771	30758	5207	1456	1722	3177	1245	251	916	2412	1200	1418	2618	17344	21874	4530	126.1	21129	18762	9629	11997
17	Manipur	2233	2086	1742	26	1	27	1	6	1	8	0	0	0	309	309	0	100.0	316	309	1770	1777
18	Meghalaya	2243	2241	946	108	132	239		164	391	555	155	60	215	285	340	54	119.0	1056	346	1185	1896
19	Mizoram	2108	2094	1584	87	8	95	5	41	7	53	194	50	244	116	116	0	100.0	408	166	1686	1927
20	Nagaland	1658	1652	863	93	2	95		94	70	164	99	50	150	380	489	108	128.5	694	430	958	1221
21	Odisha	15571	15502	5814	1305	1104	2409	536	198	551	1285	659	949	1608	4386	5069	682	115.6	6743	5335	8759	10167
22	Punjab	5036	5033	262	429	51	480	5	9	62	76	6	58	64	4150	7870	3720	189.6	4286	4208	747	824
23	Rajasthan	34224	34267	2750	1864	2411	4275	1694	23	4152	5870	2024	1869	3894	17479	23954	6475	137.0	25548	19348	8719	14919
24	Sikkim	710	693	584	11		11		8	3	11	4	5	9	77	144	66	185.7	98	82	595	610
25	Tamil Nadu	13006	13033	2125	2184	489	2672	110	250	328	687	1696	1308	3004	4544	5140	596	113.1	8126	5852	4907	7181
26	Tripura	1049	1049	629	141		141	2	14	4	20	2	2	4	256	368	113	144.1	277	258	772	792
27	Uttar Pradesh	24093	24170	1658	2893	479	3371	66	350	423	839	537	1201	1739	16564	25821	9257	155.9	19075	17765	5095	6406
28	Uttarakhand	5348	5673	3485	221	228	449	192	390	315	897	86	51	136	706	1124	418	159.2	1547	757	4126	4916
29	West Bengal	8875	8684	1174	1822	13	1834	3	50	24	76	15	379	395	5205	9678	4473	185.9	5673	5584	3011	3100
30	A & N Islands	825	757	717	7	2	9	4	4	3	11	3	3	6	15	25	10	166.8	28	17	730	740
31	Chandigarh	11	7	0	5		5		0	0	0	0	0	0	1	2	1	151.5	2	1	5	6
32	Dadra and Nagar Haveli	49	49	20	4	0	4	1		0	1	2	2	3	20	24	4	121.0	24	22	25	27
33	Daman & Diu	11	3		0		0		0	0	0	0	0	0	3	3	1	122.6	3	3	0	0
34	Lakshdweep	3	3		1		1								2	3	1	146.8	2	2	1	1
35	Puducherry	48	19	0	19	0	19		1	5	6	2	5	8	16	26	10	161.6	30	21	19	27
	Total	328726	305936	70007	26454	17284	43738	10240	3157	12578	25976	11001	15282	26283	139932	194399	54467	138.9	181950	155214	123985	150722

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

Table 2.4.3: 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 2.4.3: Selected categories of land use in India (Concluded)						
						(Million Hectares)
Year	Net area sown	Total cropped area	Area sown more than once (3-2)	Net Irrigated Area	Gross Irrigated Area	Area Irrigated more than once (6-5)
1	2	3	4	5	6	7
1991-92	141.63	182.24	40.61	49.87	65.68	15.81
1992-93	142.72	185.70	42.98	50.29	66.76	16.47
1993-94	142.34	186.58	44.25	51.34	68.26	16.92
1994-95	142.96	188.05	45.09	53.00	70.65	17.65
1995-96	142.20	187.47	45.27	53.40	71.35	17.95
1996-97	142.93	189.50	46.57	55.11	76.03	20.91
1997-98	141.95	189.99	48.04	55.21	75.67	20.46
1998-99	142.75	191.65	48.90	57.44	78.67	21.23
1999-00	141.06	188.40	47.33	57.53	79.22	21.69
2000-01	141.34	185.34	44.00	55.20	76.19	20.98
2001-02	140.73	188.01	47.28	56.94	78.37	21.43
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	59.23	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	141.90	195.31	53.41	63.64	88.90	25.26
2009-10	139.17	188.99	49.82	61.94	85.08	23.15
2010-11 (P)	141.56	197.32	55.76	63.60	88.63	25.03
2011-12 (P)	140.80	195.25	54.44	65.26	91.53	26.27
2012-13(P)	139.93	194.40	54.47	66.10	92.56	26.46
Source: Directorate of Economics & Statistics, Department of Agriculture & Cooperation.						
(P): Provisional						

Table 2.4.4: Common property resources (CPR) land (ha) per household by type of land and percentages of CPR land to total geographical area and to total non-residential geographical area in different climatic zones

State / UT	Zone	Type of land			All	Ratio of CPR area to		Estd. No. hhs.(00)	Estd. area CPR (00 ha)
		Grazing	Village forest	Others		Total geo. area	Non-resi. geo. area		
1	2	3	4	5	6	7	8	9	10
Andhra Pradesh	DP	0.03	0.02	0.15	0.2	0.08	0.09	62917	12483
	EG	0.02	0	0.12	0.14	0.12	0.15	65416	8063
	all	**0.02**	**0.01**	**0.13**	**0.17**	**0.09**	**0.11**	**11933**	**20546**
Arunachal Pradesh	EHm	0.29	0.64	0.22	1.15	-	-	1625	1874
Assam	Ehm	0.02	0.01	0.01	0.05	0.07	0.09	35114	1613
Bihar	MG	0	0.01	0.03	0.04	0.05	0.06	118105	4994
	EHg	0.08	0.02	0.13	0.24	0.13	0.15	32153	7633
	all	**0.02**	**0.02**	**0.05**	**0.08**	**0.08**	**0.1**	**15025**	**12627**
Gujarat	GC	0.2	0.03	0.49	0.72	0.27	0.33	54468	39165
Haryana	UG	0.01	0.01	0.02	0.05	0.03	0.04	25388	1221
Himachal Pradesh	WHm	0.07	0.16	0.1	0.33	0.12	0.13	10226	3404
Jammu & Kashmir	WHm	0.05	0	0.09	0.14	-	-	7907	1133
Karnataka	WHg	0.04	0.03	0.21	0.28	0.09	0.1	29588	8337
	DP	0.14	0.02	0.08	0.23	0.12	0.14	28125	6555
	WC	0.11	0.03	0.08	0.22	0.07	0.08	11980	2614
	all	**0.09**	**0.02**	**0.14**	**0.25**	**0.1**	**0.11**	**68693**	**17505**
Kerala	WC	0.05	0.02	0.05	0.12	-	-	45411	5392
Madhya Pradesh	EHg	0.25	0.18	0.53	0.97	0.34	0.39	28441	27704
	CHg	0.22	0.16	0.3	0.69	0.2	0.23	69192	47858
	WHg	0.15	0	0.26	0.42	0.11	0.13	9850	4154
	all	**0.22**	**0.15**	**0.36**	**0.74**	**0.22**	**0.26**	**10748**	**79715**
Maharashtra	CHg	0.15	0.02	0.06	0.31	0.14	0.16	9543	2950
	EHg & WHg	0.09	0.12	0.08	0.3	0.11	0.11	88053	26006
	WC	0.04	0.05	0.22	0.31	0.16	0.18	13651	4218
	all	**0.09**	**0.1**	**0.1**	**0.3**	**0.11**	**0.12**	**11124**	**33174**
Manipur	EHm	0.05	0.08	0.04	0.17	-	-	2505	430
Meghalaya	EHm	0.16	0.28	0.28	0.72	-	-	3457	2487
Mizoram	EHm	0.06	3.43	0.87	4.37	-	-	718	3137
Nagaland	EHm	0.14	0.57	0.78	1.48	0.08	0.02	871	1301
Odisha	EHg	0.15	0.15	0.11	0.41	0.12	0.14	36892	15116
	EG	0.04	0.02	0.02	0.09	0.07	0.07	26559	2370
	all	**0.11**	**0.1**	**0.07**	**0.28**	**0.11**	**0.12**	**63451**	**17487**

Continued

Table 2.4.4: Common property resources (CPR) land (ha) per household by type of land and percentages of CPR land to total geographical area and to total non-residential geographical area in different climatic zones

State / UT	Zone	Type of land			All	Ratio of CPR area to		Estd. No. hhs.(00)	Estd. area CPR (00 ha)
		Grazing	Village forest	Others		Total geo. area	Non-resi. geo. area		
1	2	3	4	5	6	7	8	9	10
Punjab	UG	0	0	0.01	0.02	0.01	0.01	27971	490
Rajasthan	CHg	0.25	0.09	0.37	0.72	0.22	0.26	42048	30154
	TD	0.21	0.04	4.51	4.77	0.38	0.28	20329	96941
	all	**0.24**	**0.08**	**1.72**	**2.04**	**0.32**	**0.27**	**62377**	**127094**
Sikkim	Ehm	0.05	-	0.2	0.25	0.14	0.19	848	213
Tamil Nadu	DP	0.01	0.02	0.08	0.12	0.09	0.1	41395	4970
	EG	0.03	0.01	0.015	0.2	0.14	0.17	50708	10031
	WC	0.02	0	0.01	0.03	0.06	0.07	4184	128
	all	**0.02**	**0.02**	**0.12**	**0.16**	**0.12**	**0.13**	**96287**	**15129**
Tripura	EHm	0.01	0.01	0	0.01	0.01	0.01	5602	77
Uttar Pradesh	WHm	0.35	0.19	0.16	0.71	0.61	0.68	19429	13742
	MG	0.01	0.01	0.08	0.1	0.12	0.13	86236	8751
	TG	0	0	0.06	0.07	0.05	0.07	117526	7809
	CHg	0.02	0.04	0.14	0.21	0.09	0.1	6809	1404
	all	**0.04**	**0.02**	**0.08**	**0.14**	**0.12**	**0.15**	**23000**	**31705**
West Bengal	EHm	0	0	0	0.01	0.01	0.01	11521	98
	LG	0	0	0.01	0.02	0.01	0.01	76328	1536
	Ehg	0.01	0.03	0.03	0.07	0.08	0.09	22530	1551
	all	**0**	**0.01**	**0.02**	**0.03**	**0.02**	**0.02**	**110379**	**3186**
A. & N. Islands	Isl	0.05	0.07	0.02	0.13	0.09	0.1	426	57
India	WHm	0.21	0.15	0.13	0.49	0.33	0.37	37562	18279
	EHm	0.04	0.09	0.05	0.18	0.05	0.03	62261	11231
	LG	0	0	0.01	0.02	0.01	0.01	76328	1536
	MG	0.01	0.01	0.05	0.07	0.08	0.09	204342	13745
	TG	0	0	0.06	0.07	0.05	0.07	117526	7809
	UG	0.01	0.01	0.02	0.03	0.02	0.02	56390	1717
	Ehg	0.13	0.12	0.2	0.44	0.19	0.23	124987	55346
	CHg	0.22	0.12	0.3	0.65	0.2	0.23	127592	82365
	WHg	0.09	0.07	0.13	0.29	0.1	0.1	122520	35154
	DP	0.05	0.02	0.11	0.18	0.09	0.1	132436	24007
	EG	0.03	0.01	0.11	0.15	0.12	0.14	134378	20468
	WC	0.06	0.02	0.08	0.16	0.1	0.11	76662	12359
	GC	0.2	0.03	0.48	0.71	0.27	0.33	54858	39193
	TD	0.21	0.04	4.51	4.77	0.38	0.28	20329	96941
	Isl	0.04	0.06	0.02	0.12	0.09	0.1	465	57
	all	**0.07**	**0.05**	**0.19**	**0.31**	**0.15**	**0.16**	**1348687**	**420219**

Note: The villages where area under non-residential geographical area are not available, the total geographical area for such villages had been deducted from the total geographical area of respective region

Source: Report No. 452 ; Common Property Resources in India, Jan-June 1998, NSS 54th Round.

Note: Zone abbreviations

WHm : Western Himalayas

Ehm: Eastern Himalayas (include N.E. Hills) and Brahmaputra Valley

Islands : All Islands

LG: Lower Gangetic Plains

MG : Middle Gangetic Plains

UG: Upper Gangetic Plains

Ehg : Eastern Plateau and Hills

CHg : Central Plateau and Hills

DP : Southern Plateau and Hills

EG :East Coast Plains and Hills

GC: Gujarat Coast Plains and Hills

WC : West Coast Plains and Hills

TD : Western Dry Region

Table 2.4.5 : Net area irrigated from different sources and gross irrigated area - All India

(Thousand Hectares)

Year	Source of Irrigation							Net Irrigated Area (Col.4 to 8)	Gross Irrigated Area	Area Irrigated More than once (col. 10-9)
	Canals			Tanks	Tube-Wells	Other Wells	Other source			
	Government	Private	Total							
1	2	3	4	5	6	7	8	9	10	11
1950-51	7158	1137	8295	3613	*	5978	2967	20853	22563	1710
1951-52	7490	1193	8683	3489	*	6517	2360	21049	23180	2131
1952-53	7511	1350	8861	3303	*	6521	2437	21122	23305	2183
1953-54	7545	1314	8859	4228	*	6685	2097	21869	24363	2494
1954-55	7832	1235	9067	4025	*	6726	2270	22088	24948	2860
1955-56	8025	1360	9385	4423	*	6739	2211	22758	25642	2884
1956-57	7916	1357	9273	4492	*	6566	2202	22533	25707	3174
1957-58	8303	1349	9652	4536	*	6818	2150	23156	26628	2472
1958-59	8391	1279	9670	4759	*	6686	2286	23401	26948	3547
1959-60	8809	1305	10114	4631	*	7083	2209	24037	27454	3417
1960-61	9170	1200	10370	4561	135	7155	2240	24461	27980	3519
1961-62	9339	1163	10502	4612	258	7094	2418	24884	28460	3576
1962-63	9686	1146	10832	4781	901	6748	2403	25665	29453	3788
1963-64	9862	1160	11022	4599	1028	6756	2483	25888	29707	3819
1964-65	10080	1143	11223	4780	1087	6988	2522	26600	30705	4105
1965-66	9859	1099	10958	4258	1293	7360	2475	26344	30901	4557
1966-67	10221	1026	11247	4424	1706	7489	2041	26907	32683	5776
1967-68	20295	948	21243	4493	2112	6999	2346	37193	33207	-3986
1968-69	10985	907	11892	3926	3087	7714	2390	29009	35483	6474
1969-70	11724	881	12605	4059	3739	7438	2356	30197	36974	6777
1970-71	11972	866	12838	4112	4461	7426	2266	31103	38195	7092
1971-72	12246	869	13115	3734	4745	7535	2417	31546	38430	6884
1972-73	12134	862	12996	3619	5393	7571	2255	31834	39055	7221
1973-74	12196	869	13065	3900	5604	7679	2298	32546	40283	7737
1974-75	12657	857	13514	3544	6583	7646	2422	33709	41741	8032
1975-76	12933	858	13791	3972	6843	7601	2386	34593	43363	8770
1976-77	13016	845	13861	3901	7432	7655	2300	35149	43552	8403
1977-78	13734	842	14576	3904	7641	7943	2482	36546	46080	9534
1978-79	14304	845	15149	3937	8159	8270	2544	38059	48307	10248
1979-80	13931	843	14774	3481	9307	8557	2405	38524	49214	10690
1980-81	14450	842	15292	3182	9531	8164	2551	38720	49775	11055
1981-82	15456	490	15946	3376	10334	8403	2444	40503	51412	10909
1982-83	15716	469	16185	2936	10770	8577	2223	40691	51830	11139
1983-84	16294	470	16764	3533	10922	8470	2260	41949	53824	11875
1984-85	15805	470	16275	3021	11566	8828	2455	42145	54529	12384
1985-86	15715	465	16180	2765	11903	8515	2502	41865	54283	12418
1986-87	16039	456	16495	2677	12298	8524	2575	42569	55759	13190
1987-88	15286	460	15746	2523	13185	8611	2827	42892	56036	13144
1988-89	16640	462	17102	2996	13716	9498	2836	46148	61125	14977
1989-90	16646	478	17124	2941	14049	9837	2751	46702	61852	15150
1990-91	16973	480	17453	2944	14257	10437	2932	48023	63204	15181
1991-92	17327	464	17791	2991	15168	10869	3048	49867	65680	15813
1992-93	16503	483	16986	3179	15815	11105	3211	50296	66761	16465
1993-94	16653	485	17138	3170	16376	11220	3435	51339	68254	16915
1994-95	1679	480	2159	3276	17189	11722	3533	37879	70646	32767
1995-96	16561	559	17120	3118	17910	11787	3467	53402	71352	17950
1996-97	16889	220	17109	2821	19338	12457	3388	55113	76025	20912
1997-98	17186	211	17397	2597	19680	12431	3106	55211	75670	20459
1998-99	17099	212	17311	2795	21394	12606	3329	57435	78670	21235
1999-00	17247	194	17441	2539	22042	12597	2912	57531	79216	21685
2000-01	15809	203	16012	2466	22566	11252	2909	55205	76187	20982

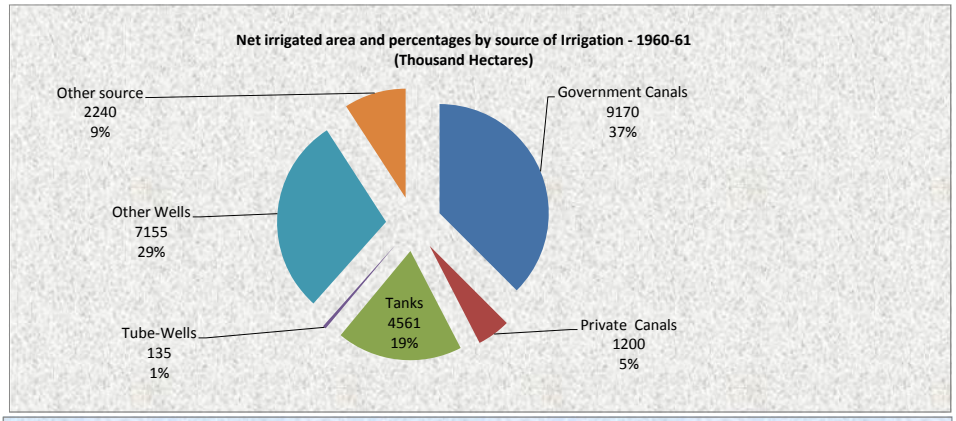
Cont..

Table 2.4.5 : Net area irrigated from different sources and gross irrigated area - All India

(Thousand Hectares)

Year	Source of Irrigation							Net Irrigated Area (Col.4 to 8)	Gross Irrigated Area	Area Irrigated More than once (col. 10-9)
	Canals			Tanks	Tube-Wells	Other Wells	Other source			
	Government	Private	Total							
1	2	3	4	5	6	7	8	9	10	11
2001-02	14993	209	15202	2196	23245	11952	4342	56937	78371	21434
2002-03	13867	206	14073	1811	25627	8728	3659	53898	73056	19158
2003-04	14251	206	14458	1916	26691	9693	4299	57057	78042	20985
2004-05	14553	214	14766	1734	25235	9956	7538	59229	81078	21849
2005-06	16490	227	16718	2083	26026	10044	5966	60837	84280	23442
2006-07	16802	224	17027	2078	26942	10698	5999	62744	86753	24009
2007-08	16531	217	16748	1973	28497	9864	6107	63189	88056	24869
2008-09	16686	195	16881	1981	28367	10389	6020	63638	88896	25258
2009-10	14789	188	14978	1587	28371	9992	7008	61936	85085	23149
2010-11	15476	171	15647	1980	28544	10630	6855	63657	88887	25231
2011-12	15838	172	16010	1918	29942	10595	7228	65693	91730	26037
2012-13	15462	165	15628	1948	30497	10764	7466	66103	92575	26472

Source: Directorate of Economics & Statistics, Department of Agriculture & Cooperation.
(*) : Included under "Other Wells" as separate figures were not collected during these years.
(p): Provisional



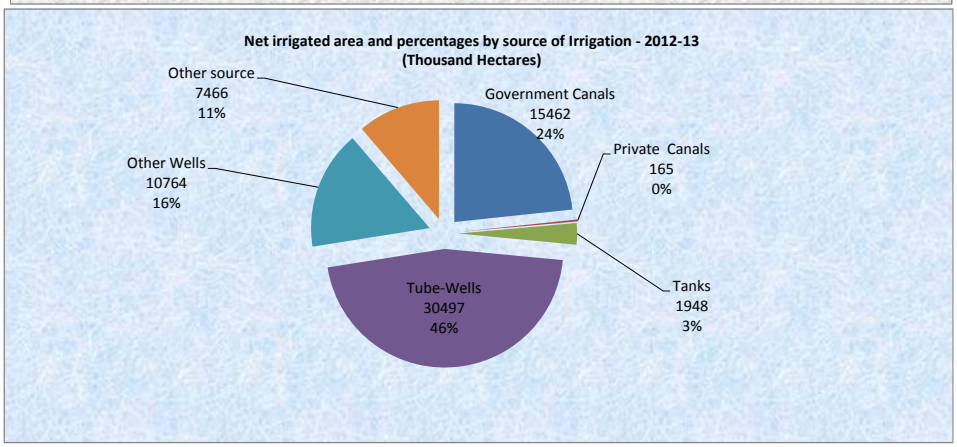


Table 2.4.6 : Growth of Urban Agglomerations & Towns by size class/category during 1901-2011

(in Number)

Year	Class/Category of Cities/Town						
	All Classes	Class-I	Class-II	Class-III	Class-IV	Class-V	Class-VI
1901	1917	25	44	144	427	771	503
1911	1909	26	38	158	388	750	546
1921	2047	29	49	172	395	773	626
1931	2219	31	59	218	479	849	580
1941	2424	49	88	273	554	979	478
1951	3060	76	111	274	675	1195	629
1961	2700	107	139	518	820	848	268
1971	3126	151	219	652	988	820	296
1981*	3949	226	325	883	1247	920	348
1991**	4615	322	421	1161	1451	973	287
2001	5161	441	496	1388	1561	1041	234
2011	7935	468	-	-	-	-	-

Source: National Building Organisation (Housing data tables) Ministry of Housing & Urban Poverty Alleviation, GOI.

Note: Size class by Population

I - 100000 & above II - 5000- 99999 III -20000-49999

IV - 10000 -19999 V - 5000- 9999

* Excludes figures for Assam where census of 1981 was not held.

** Excludes figures of Jammu & Kashmir where census of 1991 was not conducted.

2.5 Water

Water is the primary medium through which climate change influences the Earth's ecosystems and therefore people's livelihoods and well-being. Already, water-related climate change impacts are being experienced in the form of more severe and more frequent droughts and floods. Higher average temperatures and changes in precipitation and temperature extremes are projected to affect the availability of water resources through changes in rainfall distribution, soil moisture, glacier and ice/snow melt, and river and groundwater flows; these factors are expected to lead to further deterioration of water quality as well. The poor, who are the most vulnerable, are also likely to be affected the most.

The following variables/indicators are included in the framework for statistics related to climate change.

(i) Glacial retreat
(ii) Surface water
(iii) Ground water

The following tables are given.

2.5 Water

2.5.1	Water availability in India
2.5.2	Water availability –Basin wise
2.5.3	State wise details of Inland water resources of various type .
2.5.4	Catchment area of major river basins
2.5.5	Ground water resource potential as per basin (prorata basis)
2.5.6	Water quality in Indian rivers – 2002 to 2011
2.5.7	Ground water resources 2009 to 2012
2.5.8	State wise river water quality
2.5.9	Water flow in stream
2.5.10	Waste water generation, collection, treatment in Metro Cities : Status
2.5.11	Sediment load in major river basins 2009-10
2.5.12	Water supply of Class-I cities and Class-II towns (in aggregate)

Data sources

Central Water Commission, Ministry of Water resources: CWC publishes regular data on water resources. Reports are available in CWC Website.
Annual reports of Central Ground Water board. The Reports are available in the Board's website.
Central Pollution Control Board- for data on water quality and waste water treatment.

Table 2.5.1 : Water availability in India		
Sl.No	**Items**	**Quantity**
1	Annual Precipitation (including snowfall)	4000 BCM
2	Average Annual Availability	1869 BCM
3	(i) Per Capita Water Availability (2001) in cubic metres	1816Cu.M
	(ii) Per Capita Water Availability (2010) in cubic metres	1588Cu.M
4	Estimated Utilizable Water Resources	1123 BCM
	(i)Surface Water Resources	690 BCM
	(ii) Ground Water Resources	433 BCM

BCM: Billion Cubic Meters; CuM: Cubic Meter.

Source: Water Resources at a Glance 2011 Report, Central Water Commission

Table 2.5.2: Water availability -Basinwise		
Sl.No	**Name of the River Basin**	**Average Annual Availability (cubic km/year)**
1	Indus (up to Border)	73.31
2	a) Ganga	525.02
	b) Brahmaputra, Barak & Others	585.6
3	Godavari	110.54
4	Krishna	78.12
5	Cauvery	21.36
6	Pennar	6.32
7	East Flowing Rivers Between Mahanadi & Pennar	22.52
8	East Flowing Rivers Between Pennar and Kanyakumari	16.46
9	Mahanadi	66.88
10	Brahmani & Baitarni	28.48
11	Subernarekha	12.37
12	Sabarmati	3.81
13	Mahi	11.02
14	West Flowing Rivers of Kutch, Sabarmati including Luni	15.1
15	Narmada	45.64
16	Tapi	14.88
17	West Flowing Rivers from Tapi to Tadri	87.41
18	West Flowing Rivers from Tadri to Kanyakumari	113.53
19	Area of Inland drainage in Rajasthan desert	Negligible
20	Minor River Basins Draining into Bangladesh & Burma	31
Total		**1869.35**

Source: Ministry of Water Resources -2015.

Table 2.5.3 : State wise details of Inland water resources of various types							
Sl. No.	**Name of the State/UT.**	**Rivers & Canals (Length in kms.)**	**Reservoirs (Lakh Hectares)**	**Tanks & Ponds (Lakh Hectares)**	**Floodplain Lakes & Derelict Water (Lakh Hectares)**	**Brackish Water (Lakh Hectares)**	**Total (Lakh Hectares)**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Andhra Pradesh	11514	2.34	5.17	-	0.60	8.11
2	Arunachal Pradesh	2000	-	2.76	0.42	-	3.18
3	Assam	4820	0.02	0.23	1.10	-	1.35
4	Bihar	3200	0.60	0.95	0.05	-	1.60
5	Chhattisgarh	3573	0.84	0.63	-	-	1.47
6	Goa	250	0.03	0.03	-	NEG	0.06
7	Gujarat	3865	2.43	0.71	0.12	1.00	4.26
8	Haryana	5000	NEG	0.10	0.10	-	0.20
9	Himachal Pradesh	3000	0.42	0.01	-	-	0.43
10	Jammu & Kashmir	27781	0.07	0.17	0.06	-	0.30
11	Jharkhand	4200	0.94	0.29	-	-	1.23
12	Karnataka	9000	4.40	2.90	-	0.10	7.40
13	Kerala	3092	0.30	0.30	2.43	2.40	5.43
14	Madhya Pradesh	17088	2.27	0.60	-	-	2.87
15	Maharashtra	16000	2.79	0.59	-	0.10	3.48
16	Manipur	3360	0.01	0.05	0.04	-	0.10
17	Meghalaya	5600	0.08	0.02	NEG	-	0.10
18	Mizoram	1395	-	0.02	-	-	0.02
19	Nagaland	1600	0.17	0.50	NEG	-	0.67
20	Odisha	4500	2.56	1.14	1.80	4.30	9.80
21	Punjab	15270	NEG	0.07	-	-	0.07
22	Rajasthan	5290	1.20	1.80	-	-	3.00
23	Sikkim	900	-	-	0.03	-	0.03
24	Tamil Nadu	7420	5.70	0.56	0.07	0.60	6.93
25	Tripura	1200	0.05	0.13	-	-	0.18
26	Uttar Pradesh	28500	1.38	1.61	1.33	-	4.32
27	Uttrakhand	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	-	0.00367	0.001600	-	0.33	0.33527
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**	**24.32**	**7.98**	**11.55**	**73.12**
Source : Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture (Annual Report 2014-15)							
NEG: Negligible							

Table 2.5.4 : 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	2525	861452 (1186000)
	b) Brahmaputra	Kailash Range (Tibet)	916 (2900)	194413 (580000)
	c) Barak & other	Manipur Hills (Manipur)		41723
3	Sabarmati	Aravalli Hills (Rajasthan)	371	21674
4	Mahi	Dhar (Madhya Pradesh)	583	34842
5	Narmada	Amarkantak (Madhya Pradesh)	1312	98796
6	Tapi	Betul (Madhya Pradesh)	724	65145
7	Brahmani	Ranchi (Bihar)	799	39033
8	Mahanadi	Nazri Town (Madhya Pradesh)	851	141589
9	Godavari	Nasik (Maharashtra)	1465	312812
10	Krishna	Mahabaleshwar (Maharashtra)	1401	258948
11	Pennar	Kolar (Karnataka)	597	55213
12	Cauvery	Coorg (Karnataka)	800	81155
Total				**2528084**

Source : Central Water Commission, Water year book

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

Table 2.5.5: Ground water resource potential as per basin (prorata basis)							
Sl. No.	**Basin**	**Total Replenishable Ground Water Resource**	**Provision of Domestic Industrial & Other Uses**	**Available for Irrigation**	**Net Draft**	**Balance for future Use**	**% Level of G.W. Developme nt**
		(M.C.M/Yr)	**(M.C.M/Yr)**	**(M.C.M/Yr)**	**(M.C.M/Yr)**	**(M.C.M/Yr)**	
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	Krishna	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 Meter/Year							

Table2.5.6: 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 (µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Ganga	2525	34	2002	3-34	6.4-9.0	19-2720	2.7-11.5	0.5 – 16.8	300-25x10^{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 (µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Tapi	724	10	2002	20-40	7.4-9.0	76-700	4.8-8.8	0.6 – 10.0	40-2100	2-210
		10	2003	18-36	3.1-9.2	119-1130	3.1-10.4	1-10	30-930	2-230
		10	2004	13-39	3.1-9.5	190-790	1.2-8.7	0.7-36	3-5X10^{5}	2-9X10^{4}
		13	2005	26-30	7.2-9.4	186-1084	4-8.4	1-25.1	2-46X10^{4}	2-15X10^{4}
		13	2006	14-31	7.7-9.28	161-923	4.6-9.7	0.3-24	5-11X10^{4}	2-11X10^{4}
		14	2007	23-39	7.3-8.5	210-581	3.7-8.7	1.1-25	17-46 x10^{3}	7-15 x10^{3}
		14	2008	19-41	6.6-8.9	132-26000	2.1- 8.8	0.1-21	0-46 X10^{4}	0-24 X10^{4}
		14	2009	18-42	6.2-8.9	173-45400	3.7-8.2	0.6-12	14-39000	0-14000
		14	2010	15 - 42	7.0-8.7	125- 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 (µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Krishna	1401	17	2002	18-33	6.8-9.5	28-11050	2.9-10.9	0.2 – 10.0	17-33300	3-1 x 10^{3}
		17	2003	18-35	6.7-8.9	36-40000	0.7-12.6	0.5-17	6-7 x 10^{4}	2-2 x 10^{4}
		17	2004	18-38	6.7- 9	71-44000	0.4-9.2	0.3-9	15-124 x 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	2-2900
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.(^{o}C)	pH	Conductivity (µmhos/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
Subarnarek	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 (µmhos/cm)	DO(mg/l)	BOD(mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
Brahmaputr	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 2.5.7 : Ground Water Resources 2009-10

Unit:BCM/Yr

States	Annual Replenishable Ground Water Resources				Total	Natural Discharge 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
Andhra Pradesh	16.040	8.930	4.200	7.330	36.500	3.550	32.950	13.880	1.020	14.900	2.670	17.650	45.000
Arunachal Pradesh	1.570	0.000	0.980	0.000	2.560	0.260	2.300	0.001	0.000	0.001	0.009	2.290	0.040
Assam	23.650	1.990	1.050	0.540	27.230	2.340	24.890	4.850	0.590	5.440	0.980	19.060	22.000
Bihar	19.450	3.960	3.420	2.360	29.190	1.770	27.420	9.390	1.370	10.770	2.140	16.010	39.000
Chhattisgarh	12.070	0.430	1.300	1.130	14.930	1.250	13.680	2.310	0.480	2.800	0.700	10.670	20.000
Delhi	0.130	0.060	0.020	0.090	0.300	0.020	0.280	0.200	0.280	0.480	0.570	0.000	170.000
Goa	0.220	0.010	0.010	0.040	0.290	0.020	0.270	0.040	0.030	0.070	0.040	0.190	27.000
Gujarat	10.590	2.080	0.000	3.150	15.810	0.790	15.020	10.490	0.990	11.490	1.480	3.050	76.000
Haryana	3.520	2.150	0.920	2.720	9.310	0.680	8.630	9.100	0.350	9.450	0.600	-1.070	109.000
Himachal Pradesh	0.330	0.010	0.080	0.020	0.430	0.040	0.390	0.090	0.030	0.120	0.040	0.250	30.000
Jammu & Kashmir	0.610	0.770	1.000	0.320	2.700	0.270	2.430	0.100	0.240	0.330	0.420	1.920	14.000
Jharkhand	4.260	0.140	1.000	0.180	5.580	0.330	5.250	0.700	0.380	1.060	0.560	3.990	20.000
Karnataka	8.170	4.010	1.500	2.250	15.930	0.630	15.300	9.750	0.970	10.710	1.410	6.480	70.000
Kerala	3.790	0.010	1.930	1.110	6.840	0.610	6.230	1.820	1.100	2.920	1.400	3.070	47.000
Madhya Pradesh	30.590	0.960	0.050	5.590	37.190	1.860	35.330	16.080	1.040	17.120	1.740	17.510	48.000
Maharashtra	20.150	2.510	1.940	8.360	32.960	1.750	31.210	14.240	0.850	15.090	1.510	15.100	48.000
Manipur	0.200	0.005	0.160	0.010	0.380	0.040	0.340	0.002	0.001	0.002	0.020	0.310	0.650
Meghalaya	0.790	0.030	0.330	0.005	1.150	0.120	1.040	0.000	0.002	0.002	0.100	0.940	0.180
Mizoram	0.030	0.000	0.020	0.000	0.040	0.004	0.040	0.000	0.000	0.000	0.001	0.040	0.900
Nagaland	0.280	0.000	0.080	0.000	0.360	0.040	0.320	0.000	0.009	0.009	0.030	0.300	3.000
Odisha	12.810	3.560	3.580	3.140	23.090	2.080	21.010	3.010	0.840	3.850	1.220	16.780	18.000
Punjab	5.980	10.910	1.360	5.540	23.780	2.330	21.440	30.340	0.830	31.160	1.000	-9.890	145.000
Rajasthan	8.760	0.620	0.260	1.920	11.560	1.180	10.380	11.600	1.390	12.990	2.720	-3.940	125.000
Sikkim	-	-	-	-	0.080	0.000	0.080	0.000	0.010	0.010	0.020	0.050	16.000
Tamil Nadu	4.910	11.960	4.530	1.670	23.070	2.310	20.760	16.770	0.880	17.650	0.910	3.080	85.000
Tripura	1.100	0.000	0.920	0.170	2.190	0.220	1.970	0.080	0.090	0.170	0.200	1.690	9.000
Uttar Pradesh	38.630	11.950	5.640	20.140	76.350	6.170	70.180	45.360	3.420	48.780	5.300	19.520	70.000
Uttarakhand	1.370	0.270	0.120	0.510	2.270	0.170	2.100	1.340	0.050	1.390	0.060	0.680	66.000
West Bengal	17.870	2.190	5.440	4.860	30.360	2.900	27.460	10.830	0.810	11.650	1.240	15.330	42.000
Total States	**247.870**	**69.510**	**41.840**	**73.150**	**432.430**	**33.730**	**398.700**	**212.370**	**18.050**	**230.410**	**29.090**	**161.060**	**58.000**
Union Territories													
Andaman & Nicobar	-	-	-	-	0.330	0.005	0.320	0.000	0.010	0.010	0.008	0.303	4.000
Chandigarh	0.016	0.001	0.005	0.001	0.023	0.002	0.020	0.000	0.000	0.000	0.000	0.020	0.000
Dadar & Nagar Haveli	0.059	0.005			0.063	0.003	0.060	0.001	0.008	0.009	0.008	0.051	14.000
Daman & Diu	0.006	0.002	0.000	0.001	0.009	0.000	0.008	0.007	0.002	0.009	0.003	-0.002	107.000
Lakshadweep	-	-	-	-	0.012	0.009	0.004	0.000	0.002	0.002	-	-	63.000
Puducherry	0.057	0.067	0.007	0.029	0.160	0.016	0.144	0.121	0.030	0.151	0.031	-0.008	105.000
Total Uts	**0.138**	**0.075**	**0.012**	**0.031**	**0.597**	**0.036**	**0.556**	**0.129**	**0.052**	**0.181**	**0.050**	**0.365**	**33.000**
Grand Total	**248.010**	**69.590**	**41.850**	**73.180**	**433.020**	**33.770**	**399.250**	**212.500**	**18.100**	**230.590**	**29.140**	**161.430**	**58.000**

Cont..

Table 2.5.7 : Ground Water Resources 2010-11

Unit:BCM/Yr

States	Annual Replenishable Ground Water Resources				Total	Natural Discharge 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
Andhra Pradesh	16.040	8.930	4.200	7.330	36.500	3.550	32.950	13.880	1.020	14.900	2.670	17.650	45.000
Arunachal Pradesh	1.570	0.000	0.980	0.000	2.560	0.260	2.300	0.001	0.000	0.001	0.009	2.290	0.040
Assam	23.650	1.990	1.050	0.540	27.230	2.340	24.890	4.850	0.590	5.440	0.980	19.060	22.000
Bihar	19.450	3.960	3.420	2.360	29.190	1.770	27.420	9.390	1.370	10.770	2.140	16.010	39.000
Chhattisgarh	12.070	0.430	1.300	1.130	14.930	1.250	13.680	2.310	0.480	2.800	0.700	10.670	20.000
Delhi	0.130	0.060	0.020	0.090	0.300	0.020	0.280	0.200	0.280	0.480	0.570	0.000	170.000
Goa	0.220	0.010	0.010	0.040	0.290	0.020	0.270	0.040	0.030	0.070	0.040	0.190	27.000
Gujarat	10.590	2.080	0.000	3.150	15.810	0.790	15.020	10.490	0.990	11.490	1.480	3.050	76.000
Haryana	3.520	2.150	0.920	2.720	9.310	0.680	8.630	9.100	0.350	9.450	0.600	-1.070	109.000
Himachal Pradesh	0.330	0.010	0.080	0.020	0.430	0.040	0.390	0.090	0.030	0.120	0.040	0.250	30.000
Jammu & Kashmir	0.610	0.770	1.000	0.320	2.700	0.270	2.430	0.100	0.240	0.330	0.420	1.920	14.000
Jharkhand	4.260	0.140	1.000	0.180	5.580	0.330	5.250	0.700	0.380	1.060	0.560	3.990	20.000
Karnataka	8.170	4.010	1.500	2.250	15.930	0.630	15.300	9.750	0.970	10.710	1.410	6.480	70.000
Kerala	3.790	0.010	1.930	1.110	6.840	0.610	6.230	1.820	1.100	2.920	1.400	3.070	47.000
Madhya Pradesh	30.590	0.960	0.050	5.590	37.190	1.860	35.330	16.080	1.040	17.120	1.740	17.510	48.000
Maharashtra	20.150	2.510	1.940	8.360	32.960	1.750	31.210	14.240	0.850	15.090	1.510	15.100	48.000
Manipur	0.200	0.005	0.160	0.010	0.380	0.040	0.340	0.002	0.001	0.002	0.020	0.310	0.650
Meghalaya	0.790	0.030	0.330	0.005	1.150	0.120	1.040	0.000	0.002	0.002	0.100	0.940	0.180
Mizoram	0.030	0.000	0.020	0.000	0.040	0.004	0.040	0.000	0.000	0.000	0.001	0.040	0.900
Nagaland	0.280	0.000	0.080	0.000	0.360	0.040	0.320	0.000	0.009	0.009	0.030	0.300	3.000
Odisha	12.810	3.560	3.580	3.140	23.090	2.080	21.010	3.010	0.840	3.850	1.220	16.780	18.000
Punjab	5.980	10.910	1.360	5.540	23.780	2.330	21.440	30.340	0.830	31.160	1.000	-9.890	145.000
Rajasthan	8.760	0.620	0.260	1.920	11.560	1.180	10.380	11.600	1.390	12.990	2.720	-3.940	125.000
Sikkim	-	-	-	-	0.080	0.000	0.080	0.000	0.010	0.010	0.020	0.050	16.000
Tamil Nadu	4.910	11.960	4.530	1.670	23.070	2.310	20.760	16.770	0.880	17.650	0.910	3.080	85.000
Tripura	1.100	0.000	0.920	0.170	2.190	0.220	1.970	0.080	0.090	0.170	0.200	1.690	9.000
Uttar Pradesh	38.630	11.950	5.640	20.140	76.350	6.170	70.180	45.360	3.420	48.780	5.300	19.520	70.000
Uttarakhand	1.370	0.270	0.120	0.510	2.270	0.170	2.100	1.340	0.050	1.390	0.060	0.680	66.000
West Bengal	17.870	2.190	5.440	4.860	30.360	2.900	27.460	10.830	0.810	11.650	1.240	15.330	42.000
Total States	**247.870**	**69.510**	**41.840**	**73.150**	**432.430**	**33.730**	**398.700**	**212.370**	**18.050**	**230.410**	**29.090**	**161.060**	**58.000**
Union Territories													
Andaman & Nicobar	-	-	-	-	0.330	0.005	0.320	0.000	0.010	0.010	0.008	0.303	4.000
Chandigarh	0.016	0.001	0.005	0.001	0.023	0.002	0.020	0.000	0.000	0.000	0.000	0.020	0.000
Dadar & Nagar Haveli	0.059	0.005			0.063	0.003	0.060	0.001	0.008	0.009	0.008	0.051	14.000
Daman & Diu	0.006	0.002	0.000	0.001	0.009	0.000	0.008	0.007	0.002	0.009	0.003	-0.002	107.000
Lakshadweep	-	-	-	-	0.012	0.009	0.004	0.000	0.002	0.002	-	-	63.000
Puducherry	0.057	0.067	0.007	0.029	0.160	0.016	0.144	0.121	0.030	0.151	0.031	-0.008	105.000
Total Uts	**0.138**	**0.075**	**0.012**	**0.031**	**0.597**	**0.036**	**0.556**	**0.129**	**0.052**	**0.181**	**0.050**	**0.365**	**33.000**
Grand Total	**248.010**	**69.590**	**41.850**	**73.180**	**433.020**	**33.770**	**399.250**	**212.500**	**18.100**	**230.590**	**29.140**	**161.430**	**58.000**

Cont..

Table 2.5.7 : Ground water resource 2011-12

Unit:BCM/Yr

States	Annual Replenishable Ground Water Resources				Total	Natural Discharge 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
Andhra Pradesh	15.120	6.520	5.490	6.700	33.830	3.070	30.760	12.610	1.540	14.150	2.690	15.890	46.000
Arunachal Pradesh	3.410	0.000	1.040	0.000	4.450	0.450	4.010	0.002	0.001	0.003	0.010	4.000	0.070
Assam	18.950	2.200	8.620	0.590	30.350	2.537	27.810	5.333	0.690	6.026	0.977	21.500	22.000
Bihar	18.920	3.920	3.400	2.380	28.630	2.420	26.210	9.790	1.560	11.360	2.560	13.850	43.000
Chhattisgarh	9.850	0.560	0.910	0.900	12.220	0.640	11.580	3.080	0.520	3.600	0.640	7.850	31.000
Delhi	0.110	0.100	0.020	0.080	0.310	0.020	0.290	0.140	0.260	0.400	0.260	0.010	138.000
Goa	0.135	0.008	0.006	0.072	0.221	0.088	0.133	0.014	0.030	0.044	0.037	0.082	33.000
Gujarat	12.210	2.760	0.000	3.460	18.430	1.080	17.350	11.930	1.050	12.990	1.470	5.320	75.000
Haryana	3.530	2.690	1.010	3.250	10.480	0.680	9.800	11.710	0.720	12.430	0.790	-2.700	127.000
Himachal Pradesh	0.400	0.020	0.120	0.040	0.590	0.060	0.530	0.230	0.080	0.310	0.080	0.220	58.000
Jammu & Kashmir	1.450	1.690	0.360	0.190	3.700	0.370	3.330	0.150	0.580	0.730	0.820	2.350	22.000
Jharkhand	4.460	0.140	1.110	0.260	5.960	0.550	5.410	1.170	0.440	1.610	0.620	3.620	30.000
Karnataka	6.300	4.280	2.730	3.510	16.810	2.000	14.810	9.010	1.000	10.010	1.260	6.180	68.000
Kerala	4.770	0.060	0.640	1.150	6.620	0.590	6.030	1.300	1.500	2.810	1.710	3.020	47.000
Madhya Pradesh	27.490	1.100	0.800	4.560	33.950	1.700	32.250	16.660	1.330	17.990	1.830	13.760	56.000
Maharashtra	22.040	2.670	1.900	9.120	35.730	1.930	33.810	15.910	1.040	16.950	2.000	16.320	50.000
Manipur	0.240	0.010	0.190	0.010	0.440	0.040	0.400	0.003	0.001	0.004	0.050	0.350	1.000
Meghalaya	1.019	0.000	0.215	0.000	1.234	0.123	1.111	0.002	0.000	0.002	0.096	1.013	0.150
Mizoram	0.030	Negligible	0.020	Negligible	0.044	0.004	0.039	0.000	0.000	0.000	0.001	0.039	1.000
Nagaland	0.280	-	0.140	-	0.420	0.040	0.380	-	0.008	0.008	0.010	0.360	2.140
Odisha	11.290	2.530	1.330	2.630	17.780	1.090	16.690	3.470	0.890	4.360	1.270	11.940	26.000
Punjab	5.860	10.570	1.340	4.780	22.560	2.210	20.350	33.970	0.690	34.660	0.950	-14.570	170.000
Rajasthan	8.760	0.670	0.320	2.110	11.860	1.070	10.790	12.860	1.650	14.520	1.840	0.750	135.000
Sikkim	-	-	-	-	-	-	0.046	0.003	0.007	0.010	0.012	0.031	21.000
Tamil Nadu	7.540	11.050	2.160	2.180	22.940	2.290	20.650	14.710	1.850	16.560	1.970	4.700	80.000
Tripura	1.660	0.000	0.730	0.570	2.970	0.230	2.740	0.090	0.070	0.160	0.230	2.420	6.000
Uttar Pradesh	40.780	11.370	5.410	17.700	75.250	6.680	68.570	46.000	3.490	49.480	5.360	17.220	72.000
Uttarakhand	1.260	0.240	0.200	0.460	2.170	0.100	2.070	1.010	0.030	1.050	0.080	0.980	51.000
West Bengal	18.170	2.160	5.430	4.740	30.500	2.920	27.580	10.110	0.790	10.910	1.020	16.750	40.000
Total States	**246.050**	**67.320**	**45.630**	**71.450**	**430.450**	**34.990**	**395.520**	**221.290**	**21.830**	**243.140**	**30.650**	**153.260**	**61.000**
Union Territories													
Andaman & Nicobar	0.245	-	0.065	-	0.310	0.012	0.298	0.001	0.010	0.011	0.015	0.283	4.000
Chandigarh	0.015	0.001	0.005	0.001	0.022	0.002	0.020	0.000	0.000	0.000	0.000	0.020	0.000
Dadar & Nagar Haveli	0.043	0.003	0.009	0.005	0.059	0.003	0.056	0.001	0.007	0.009	0.009	0.047	15.000
Daman & Diu	0.010	0.001	0.000	0.002	0.012	0.001	0.011	0.008	0.003	0.011	0.004	-0.001	99.000
Lakshadweep	-	-	-	-	0.011	0.007	0.004	0.000	0.003	0.003	0.000	0.000	74.000
Puducherry	0.086	0.056	0.008	0.022	0.171	0.017	0.154	0.121	0.029	0.150	0.032	0.050	98.000
Total UT's	**0.400**	**0.060**	**0.090**	**0.030**	**0.590**	**0.040**	**0.540**	**0.130**	**0.050**	**0.180**	**0.060**	**0.400**	**34.000**
Grand Total	**246.450**	**67.380**	**45.710**	**71.480**	**431.030**	**35.030**	**396.060**	**221.420**	**21.890**	**243.320**	**30.710**	**153.660**	**61.000**

Source: Central Ground Water Board, Hydrology Project, Ministry of Water Resource (Note: Total may not tally due to rounding off.) Ground water year book-2011-12

* Ground water recharge due to return flow from irrigation, seepage form canals, recharge from tanks and ponds and recharge from water conservation structures.

 # : The stage of Ground water development is to be computed as give below:

$$Stage\ of\ development\ = \frac{Existing\ Gross\ draft\ for\ all\ uses}{Net\ Annual\ availability} \text{ X } 100$$

Table 2.5.8 : 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	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

continued

Table 2.5.8 : State wise river water quality

Sl.No.	State	BOD (mg/l)			Total Coliform (MPN/100ml)			Fecal Coliform (MPN/100ml)		
		MIN	MAX	MEAN	MIN	MAX	MEAN	MIN	MAX	MEAN
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 Board.

Note : BOD : Bio chemical Oxygen demand

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

Table 2.5.9 : Water flow in stream

(Cusecs)

Sl. No.	Name of Basin/River	Name of Guage Station		No. of CWC Sites	Year for Which Data Given	Maximum Flow		Minimum Flow	
		First Site	Last Site			First Site	Last Site	First Site	Last Site
1	2	3	4	5	6	7	8	9	10
1	Mahi	Mataji	Khanpur	6	2003-2004	4000	1677	0.00	1.80
				6	2009-2010	657.9	465.4	0.00	5.20
2	Tapi	Dedtalai	Ghala	12	2003-2004	1839	1286	0.00	16.63
3	Narmada	Dindori	Garudeshwar	25	2002-2003	666.3	2070	0.85	0.00
				19	2009-2010	772.4	10684	5.01	11.50
4	Godavari	Ghargaon	Polavaram	56	2005-2006	635.8	43703	0.00	13.23
5	Cauvery	Kudige	Musiri	31	2004-2005	1388	632.3	1.06	0.00
				34	2009-2010	677.1	5.92	490.80	3.18
6	Krishna	Karad	Vijaywada	57	2002-2003	1121	158.7	0.00	2.87
				36	2009-2010	1258	27660	0.00	27.61
7	Mahanadi	Baronda	Tikarpara	21	2002-2003	406.7	12306	0.00	154.10
				19	2009-2010	685.4	0	1841.0	146.70
8	Subarnarekha	Muri	Ghatsila	3	2002-2003	7457	2037	0.42	11.33
				8	2009-2010	118	0.17	315.9	0.40
9	Godavari	Dhalegaon	Polavaram	47	2009-2010	320.4	11249	0	74.69
10	Sabarmati	Vautha	Jotsan	6	2009-2010	972.9	10.19	133.7	0.00

Cusecs: Cubic Feet per second

Sources : Water year Books of different River Basins.(Central Water Commission)

Table 2.5.10 : Waste water generation, collection, treatment in Metro Cities : Status

Sl. No.	Name of Metro City	Total Population	Municipal Population	Volume of Waste Water Generated (Million Litre per day)			Waste Water Collected		Capacity	Treatment		Mode of Disposal
				Domestic	Industrial	Total	Volume (Million Litre per day)	%	Million Litre per day	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	Bengaluru	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 2.5.11 : Sediment load in major river basins 2009-10

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 tones)		
		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	3	4	5	6	7	8	9	10	11
1	Mahanadi	Keesinga (14.770)	Kantamal (0.000)	Tikarapara (0.051)	Manendragarh (0.000)	Keesinga (14.770)	Kantamal (0.000)	0.000 - 14.770	0.000 - 0.051	0.000 - 14.770
2	Brahmani	Panposh (4.573)	Tilga (1.469)	Pamposh (0.010)	Tilga (0.000)	Panposh (4.583)	Tilga (1.469)	1.469 - 4.573	0.000 - 0.010	1.469 - 4.583
3	Godavari	Polavaram (12.067)	Saigaon (0.001)	Polavaram (0.027)	Pathsguden (0.000)	Polavaram (12.094)	Saigaon (0.001)	0.001 - 12.067	0.000 - 0.027	0.001 - 12.094
4	Krishna	Yadgir (13.191)	Karad (0.105)	wadenpalli (0.620)	Takali (0.000)	Yadgir (13.195)	Karad (0.109)	0.105 - 13.191	0.000 - 0.620	0.109 - 13.195
5	Cauvery	Biligundulu (0.238)	Thengudi (0.003)	Kudimodi (0.038)	Thengidi (0.002)	Biligundulu (0.279)	Thengudi (0.005)	0.003 - 0.268	0.002 - 0.038	0.005 - 0.279
6	West Flowing River	Kumbidi (0.385)	Ambarampalayam (0.009)	Ramamangalam (0.008)	Kalampur (0.000)	Kumbidi (0.389)	Ambarampalayam (0.011)	0.009 - 0.385	0.000 - 0.008	0.011 - 0.389
7	Tapi	Sarankheda (5.015)	Gopalkheda (0.508)	Berhampur (0.011)	Gopalkheda (0.000)	Sarankheda (5.015)	Gopalkheda (0.508)	0.508 - 5.015	0.000 - 0.011	0.508 - 5.015
8	Narmada	Sandia (47.17)	Chandwads (0.047)	Handia (0.239)	Chandwada (0.000)	Sandia (47.212)	Chandwads (0.137)	0.047 - 47.17	0.000 - 0.383	0.137 - 47.212
9	Mahi, Sabarmati & Others	Mataji (2.311)	Detrol Bridge (0.000)	Kanpur (0.000)	Detrol Bridge (0.000)	Mataji (2.311)	Detrol Bridge (0.000)	0.000 - 2.311	0.000 - 0.000	0.000 - 2.311

Source : Integrated Hydrological Data Book (Non- Classified River Basin), September 2012 ,Central Water Commission

Note: The sediment delivered - and transported by a stream is its sediment load. This can be classified in - three types, depending on sediment size and the competence of the river. The coarsest sediment, consisting of boulders and cobbles as well as sand, moves on or near the bed of the stream and is the bed load of the river. The finer particles, silts and clays, are carried in suspension by the turbulent action of flowing water; and these fine particles, which are moved long distances at the velocity of the flowing water, constitute the suspended load of the river. The remaining component of the - tal sediment load is the dissolved load, which is composed of chemical compounds taken in - solution by the water moving on or in the soils of the drainage basin. These three types of sediment constitute the - tal sediment load of the stream.

Table 2.5.12 : Water supply of Class-I Cities and Class-II Towns (in aggregate)

Sr. No.	State /UT	Total no. of Class-I cities and Class-II town	Total Population (including Class-I cities and Class-II town)	Total Water supply (in MLD)	Per capita water supply
1	2	3	4	5	6
1	Andhra Pradesh	1	107200	15.00	139.93
2	Arunachal Pradesh	99	23591660	2477.03	105.00
3	Assam	13	1991110	503.28	252.76
4	Bihar	37	6897354	1396.43	202.46
5	Chandigarh	1	994820	537.20	540.00
6	Chhattisgarh	14	3081180	489.12	158.74
7	Goa	3	295180	29.53	100.04
8	Delhi	1	14858800	4346.00	292.49
9	Gujarat	59	16858830	2385.64	141.51
10	Haryana	27	6038150	833.07	137.97
11	Himachal Pradesh	1	163490	36.18	221.30
12	Jammu & Kashmir	6	2155050	302.26	140.26
13	Jharkhand	24	5790471	1135.86	196.16
14	Karnataka	59	16902631	2529.78	149.67
15	Kerala	34	5465176	883.03	161.57
16	Madhya Pradesh	48	12540050	1724.55	137.52
17	Maharashtra	84	42758250	12750.05	298.19
18	Manipur	1	249870	43.43	173.81
19	Meghalaya	2	267780	40.12	149.82
20	Mizoram	1	282550	39.56	140.01
21	Nagaland	2	298330	41.76	139.98
22	Odisha	24	4240440	923.97	217.89
23	Puducherry	3	583820	80.56	137.99
24	Punjab	33	7439530	2033.94	273.40
25	Rajasthan	45	11210750	1912.72	170.61
26	Tamil Nadu	84	20107890	1577.40	78.45
27	Tripura	1	214327	30.00	139.97
28	Uttar Pradesh	107	29144800	4814.77	165.20
29	Uttrakhand	7	1318840	232.55	176.33
30	West Bengal	87	21822911	3949.09	180.96
	Total	**908**	**257671240**	**48093.88**	**186.65**

Source: Status of water supply, wastewater generation and treatment in class-I cities & class -II towns of India, Series CUPS/70/2009-10, Central Pollution Control Board

2.6 Transport

The environmental impact of Transport is significant because it is a major user of energy, and burns most of the world's petroleum. This creates air pollution, including nitrous oxides and particulates, and is a significant contributor to global warming through emission of carbon dioxide, for which transport is the fastest-growing emission sector. By subsector, road transport is the largest contributor to global warming.

Environmental regulations have reduced the individual vehicles emission; however, this has been offset by an increase in the number of vehicles, and more use of each vehicle. Some pathways to reduce the carbon emissions of road vehicles considerably have been studied. Energy use and emissions vary largely between modes, causing environmentalists to call for a transition from air and road to rail and human-powered transport, and increase transport electrification and energy efficiency.

The number of vehicles registered in India is on the increase over the years. It indicates the increases in the use of fossil fuel and thereby an increases in GHG emissions. Transport predominantly relies on a single fossil resource, petroleum that supplies most of the total energy used by transport. Transport activity will continue to increase in the future as economic growth fuels transport demand and the availability of transport drives development, by facilitating specialization and trade.

Freight transport has been growing even more rapidly than passenger transport and is expected to continue to do so in the future. Urban freight movements are predominantly by truck, while international freight is dominated by ocean shipping.

GHG emission reduction will be only one of several key issues in transport during the coming decades. In developing countries especially, increasing demand for private vehicles is outpacing the supply of transport infrastructure – including both road networks and public transit networks. The result is growing congestion and air pollution and a rise in traffic fatalities.

Moreover, there is no shortage of alternative energy sources, including oil sands, shale oil, coal-to-liquids, biofuels, electricity and hydrogen. Among these alternatives, unconventional fossil carbon resources would produce less expensive fuels most compatible with the existing transport infrastructure, but lead to increased carbon emissions.

It was observed in the report of the expert committee on development of database on climate change that there has been consistent growth in vehicular registration; however no indication on the emission load is available. The emission load depends on the types of vehicle. In India, we have standard and non-standard vehicular emissions, which also vary from place to place depending on regulatory mechanisms in use by the civic and local authorities in different areas. Some metropolitan cities have standards in consonance with the European Emission standards, but the data are not captured according to the types of vehicles and their average usage per annum.

The variables/indicators identified by the framework for statistics related to climate change are
No. of vehicles (1) Existing (2) Newly Registered - Both fuel usage basis State level.

The Following are the tables included.

2.6 Transport

2.6.1 Total registered motor vehicles in India by States/Uts(category wise)
2.6.2 Total registered motor vehicles in India by States/Uts (Yearwise)
2.6.3 Cargo Movement for National Waterways -1,2 & 3, Goa and Mumbai Waterways
2.6.4 Growth of Indian Shipping
2.6.5 Freight Movement by Road Transport & Railways
2.6.6 Passenger Movement by Road Transport & Railways
2.6.7 Annual total domestic traffic and operating statistics of Indian carriers for last ten years

Data Sources

Road Transport year book- Annual publication of , Transport Research Wing, Ministry of Road Transport & Highways. Reports are available in the Ministry's website.
Air Transport Statistics for the year 2011-12 from Director General of Civil Aviation, Ministry of Civil Aviation.

Table 2.6.1 : Total registered motor vehicles in India by States/UT's (category wise)

(as on 31st March,2010) (in numbers)

Sl. No.	States/UT	Transport						Non-Transport								Grand Total (Transport +Non- Tpt.)
		Multi-axled/Articulated Vehicles/ Trucks & Lorries	Light Motor Vehicles (Goods)	Buses	Taxies	Light Motor Vehicles (Passengers)	Total Transport	Two Wheelers	Cars	Jeeps	Omni Buses	Tractors	Trailers	Others	Total Non-Tpt.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Andhra Pradesh	236211	219332	56664	103290	434448	1049945	65,14,593	7,77,746	29,587	49,130	2,61,509	2,29,149	11,480	78,73,194	89,23,139
2	Arunachal Pradesh##	2355	601	682	343	1449	5430	11,112	2,595	2,284	0	345	155	180	16,671	22,101
3	Assam	124132	32473	13859	24088	51185	245737	8,30,836	2,32,546	20,742	1,225	16,177	10,805	25,653	11,37,984	13,83,721
4	Bihar	66485	0	21209	38204	74968	200866	16,06,613	1,88,031	66,132	…	1,75,500	1,04,272	15,572	21,56,120	23,56,986
5	Chhattisgarh	78488	38434	7658	7499	15047	147126	19,64,769	1,08,326	13,277	30,879	91,621	72,839	6,936	22,88,647	24,35,773
6	Goa	37040	8218	8332	13143	4238	84134*	5,02,042	1,33,717	^	0	2,562	…	4,587	6,42,908	7,27,042
7	Gujarat	259231	367113	60023	67740	464862	1218969	87,16,981	10,57,383	1,52,985	…	4,10,516	2,78,921	36,818	106,53,604	118,72,573
8	Haryana	249991	102541	33520	15081	83745	484878	29,75,418	7,20,441	1,15,852	0	4,90,828	0	4,408	43,06,947	47,91,825
9	Himachal Pradesh	49582	42877	5714	21993	2771	122937	2,83,081	95,791	20,693	634	9,292	1,836	4,077	4,15,404	5,38,341
10	Jammu & Kashmir	35109	43238	23480	15939	10958	128724	4,07,928	1,72,071	11,601	1,219	11,640	2,861	2,861	6,10,181	7,38,905
11	Jharkhand	156196	160778	12256	259542	160778	766936*	17,38,566	1,74,320	52,155	…	35,431	…	…	20,00,472	27,67,408
12	Karnataka	200316	177179	53874	115410	237295	887999^^	64,04,905	10,05,291	40,225	1,05,503	3,18,844	2,15,575	65,634	81,55,977	90,43,976
13	Kerala	68777	251471	383229	84792	491879	1394162^^	29,00,238	8,26,538	1,37,547	3,748	10,665	3,653	1,21,101	40,03,490	53,97,652
14	Madhya Pradesh	105025	72029	35105	99241	67488	378888	51,65,023	3,14,464	41,396	…	4,58,445	2,15,333	17,027	62,11,688	65,90,576
15	Maharashtra	374705	521692	83816	168307	626332	1774852	111,81,762	17,90,259	3,73,958	18,752	3,31,694	2,70,078	27,066	139,93,569	157,68,421
16	Manipur	7639	2871	2769	1595	7266	22140	1,39,650	15,113	11,472	1,524	3,155	680	718	1,72,312	1,94,452
17	Meghalaya	21372	4955	4007	12607	5348	48290*	51,709	37,981	14,328	1	609	2,713	2,482	1,09,823	1,58,113
18	Mizoram	3507	4003	1036	6465	2219	17230	39,902	10,382	8,813	0	227	90	3,812	63,226	80,456
19	Nagaland	65729	16345	5041	6428	13403	106946	55,208	47,984	25,888	497	2,260	1,020	929	1,33,786	254,483 &
20	Odisha	109804	86729	19335	41828	57456	315152	23,02,694	1,33,529	36,726	3,451	64,354	55,370	20,556	26,16,680	29,31,832
21	Punjab	149367	20186	27146	15837	57879	270415	39,56,279	4,84,064	54,798	…	4,97,551	966	10,181	50,03,839	52,74,254
22	Rajasthan	198089	148892	73257	67542	112986	600766	52,30,454	4,55,924	2,03,692	…	6,05,539	69,287	…	65,64,896	71,65,662
23	Sikkim	3214	795	524	7569	0	12102	6,308	8,905	4,869	1,393	49	0	..	21,524	33,626
24	Tamil Nadu	404652	280388	123999	209689	238682	1257410	111,56,048	12,04,156	57,417	19,957	1,50,432	62,260	1,53,853	128,04,123	140,61,533
25	Tripura	10432	6199	2194	3199	15749	37773	97,895	10,095	12,340	…	976	326	714	1,22,346	1,60,119
26	Uttarakhand	18026	16393	7527	18660	11622	72229*	5,83,927	1,19,859	8,103	1,289	42,921	1,508	1,536	7,59,143	8,31,372
27	Uttar Pradesh	137436	131181	28124	38629	123706	459076	94,93,677	8,73,251	1,59,128	18,740	9,53,959	15,373	15,145	115,29,273	119,88,349
28	West Bengal	222716	$	31996	73696	48370	376778	18,64,861	4,35,352	^	…	51,233	…	18,914	23,70,360	27,47,138
	Total States (1)	**3395629**	**2756913**	**1126376**	**1538356**	**3422129**	**12487890**	**861,82,479**	**114,36,114**	**16,76,008**	**2,57,942**	**49,98,334**	**16,15,070**	**5,72,240**	**1067,38,187**	**1192,39,828**
1	A & N Islands	2366	0	825	489	2950	6630	43,762	10,988	^	^	^	^	394	55,144	61,774
2	Chandigarh	2210	15466	3062	3017	0	23755	6,86,316	2,39,014	…	130	149	0	…	9,25,609	9,49,364
3	Dadra & Nagar Haveli	8048	2761	295	142	605	11851	38,635	17,507	549	20	152	77	41	56,981	68,832
4	Daman & Diu	3112	3130	461	45	1173	7921	43,991	19,332	477	42	300	195	84	64,421	72,342
5	Delhi	85384	140872	43250	55530	182784	507820	41,07,912	19,56,574	79,418	89,367	5,294	99	364	62,39,028	67,46,848
6	Lakshadweep	0	494	0	105	321	920	6,206	64	95	0	72	0	498	6,935	7,855
7	Puducherry	7745	7799	2373	1892	5124	24933	4,88,490	69,813	3,881	2,958	900	1,732	6,422	5,74,196	5,99,129
	UT's (2)	**108865**	**170522**	**50266**	**61220**	**192957**	**583830**	**54,15,312**	**23,13,292**	**84,420**	**92,517**	**6,867**	**2,103**	**7,803**	**79,22,314**	**85,06,144**
	Grand Total (1+2)	**350491**	**2927435**	**1176642**	**1599576**	**3615086**	**13071720**	**915,97,791**	**137,49,406**	**17,60,428**	**3,50,459**	**50,05,201**	**16,17,173**	**5,80,043**	**1146,60,501**	**1277,45,972**

Source : Road Transport year book-2009-10 & 2010-11, Transport Research Wing, Ministry of Road Transport & Highways

Table 2.6.1: Total registered motor vehicles in India by States/UT's (category wise)

(as on 31st March,2011) **(In numbers)**

Sl. No.	States/UT	Transport						Non-Transport								Grand Total (Transport +Non- Tpt.)
		Multi-axled/Articulated Vehicles/ Trucks & Lorries	Light Motor Vehicles (Goods)	Buses	Taxies	Light Motor Vehicles (Passengers)	Total Transport	Two Wheelers	Cars	Jeeps	Omni Buses	Tractors	Trailers	Others	Total Non-Tpt.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Andhra Pradesh	2,41,663	2,57,147	60,622	1,14,923	5,13,266	11,87,621	74,88,771	8,80,817	29,652	53,531	2,92,427	2,42,270	14,258	90,01,726	101,89,347
2	Arunachal Pradesh##	…	…	…	…	…	…	..	..	..	..	..	..	..	..	1,44,534
3	Assam	1,36,090	35,788	14,741	28,161	59,742	2,74,522	9,58,935	2,69,605	20,861	1,243	18,714	11,620	26,628	13,07,606	15,82,128
4	Bihar	73,472	…	22,703	43,623	92,390	2,32,188	18,99,017	1,36,845	75,878	…	1,96,555	1,15,214	17,512	24,41,021	26,73,209
5	Chhattisgarh	83,674	43,936	8,596	8,723	17,566	1,62,495	22,32,929	1,31,862	15,062	33,739	1,02,699	78,940	8,311	26,03,542	27,66,037
6	Goa (c)	39,422	9,402	8,907	13,306	4,309	90,751 *	5,41,934	1,49,869	…	0	2,890	…	4,631	6,99,324	7,90,075
7	Gujarat	2,76,290	4,02,514	62,386	74,512	5,11,270	13,26,972	95,07,556	12,18,030	1,60,800	…	4,42,737	2,94,885	42,155	116,66,163	129,93,135
8	Haryana	2,75,162	1,14,384	35,646	19,978	94,770	5,39,940	33,70,426	8,55,596	1,13,384	0	4,87,321	0	10,336	48,37,063	53,77,003
9	Himachal Pradesh	51,899	47,395	6,186	23,791	2,805	1,32,076	3,31,418	1,16,176	22,756	949	9,576	1,853	6,910	4,89,638	6,21,714
10	Jammu & Kashmir	35,414	46,792	25,858	21,307	12,420	1,41,791	4,46,791	1,98,238	1,18,301	1,818	13,538	3,242	3,242	7,85,170	9,26,961
11	Jharkhand	1,72,371	1,80,934	12,847	2,96,771	1,80,934	863,333 *	19,47,572	2,01,269	59,892	…	41,116	…	…	22,49,849	31,13,182
12	Karnataka	2,17,113	1,98,378	58,012	1,29,272	2,59,429	973,110 ^^	70,33,045	11,31,201	41,229	1,09,075	3,41,559	2,33,297	67,967	89,57,373	99,30,483
13	Kerala	72,534	2,88,447	3,90,430	96,666	5,44,485	1,507,041 *, ^^	32,94,953	9,85,736	1,37,547	3,798	11,209	3,656	1,28,079	45,64,978	60,72,019
14	Madhya Pradesh	1,12,954	82,673	36,647	1,10,730	76,207	4,19,211	57,83,120	3,66,674	49,566	…	4,98,997	2,19,731	18,403	69,36,491	73,55,702
15	Maharashtra	3,89,941	5,83,847	89,861	1,68,496	6,40,700	18,72,845	124,29,011	20,27,080	3,94,647	18,677	3,71,075	2,93,576	27,188	155,61,254	174,34,099
16	Manipur	8,249	3,207	2,776	1,896	9,954	26,082	1,45,286	17,019	11,901	1,600	3,185	715	714	1,80,420	2,06,502
17	Meghalaya	23,064	6,058	4,116	14,507	6,000	53,746 *	56,790	43,901	15,011	1	665	2,765	2,858	1,21,991	1,75,737
18	Mizoram	3,844	4,862	1,088	7,246	2,477	19,517	47,978	11,583	9,211	0	252	92	4,015	73,131	92,648
19	Nagaland	77,968	25,158	5,573	6,716	14,284	1,29,699	61,085	50,249	26,313	501	2,340	1,023	1,443	1,42,954	2,72,653
20	odisha	1,19,145	1,00,546	20,616	44,585	62,830	3,47,722	26,14,980	1,61,024	41,966	3,668	74,439	65,016	29,223	29,90,316	33,38,038
21	Punjab##	1,49,367	20,186	27,146	15,837	57,879	2,70,415	39,56,279	4,84,064	54,798	…	4,97,551	966	10,181	50,03,839	52,74,254
22	Rajasthan	2,22,959	1,62,837	77,980	76,317	1,23,328	6,63,421	58,59,719	5,20,385	2,27,910	…	6,44,305	70,525	…	73,22,844	79,86,265
23	Sikkim	3,547	823	586	8,011	0	12,967	6,843	12,264	5,251	1,399	59	0	…	25,816	38,783
24	Tamil Nadu	4,33,579	3,11,084	1,34,887	2,43,425	2,91,605	14,14,580	123,93,788	13,50,722	58,080	19,957	1,67,066	66,269	1,67,783	142,23,665	156,38,245
25	Tripura	10,934	7,568	2,295	3,468	18,074	42,339	1,17,486	11,224	14,434	…	1,010	349	831	1,45,334	1,87,673
26	Uttarakhand	19,474	19,695	8,066	20,896	13,820	81,951	1,17,486	11,224	14,434	…	1,010	349	831	1,45,334	1,87,673
27	Uttar Pradesh	1,50,670	1,56,388	31,922	47,364	1,46,351	5,32,695	105,63,850	9,84,937	1,76,398	21,559	9,78,627	15,126	14,040	127,54,537	132,87,232
28	West Bengal	2,48,776	$	34,184	80,012	58,633	4,21,605	22,60,657	4,92,454	^	…	57,505	#	28,403	28,39,019	32,60,624
	Total States (1)	**36,49,575**	**31,10,049**	**11,84,677**	**17,20,539**	**38,15,528**	**137,40,635**	**960,58,814**	**129,56,415**	**18,89,724**	**2,72,817**	**53,03,581**	**17,21,969**	**6,36,954**	**1188,40,274**	**1327,25,443**
1	A & N Islands	2,429	…	846	489	3,248	7,012	48,819	12,863	…	…	…	…	406	62,088	69,100
2	Chandigarh	2,490	21,841	3,684	3,275	0	31,290	7,11,007	2,65,135	…	287	173	0	…	9,76,602	10,07,892
3	Dadra & Nagar Haveli	8,591	3,036	314	146	620	12,707	43,010	19,687	561	22	177	77	116	63,650	76,357
4	Daman & Diu	3,646	3,274	474	46	1,216	8,668 *	47,247	20,501	499	42	313	205	113	68,920	77,588
5	Delhi	86,301	1,56,030	45,757	62,839	1,90,693	5,41,620	43,95,086	21,16,107	79,488	89,368	5,384	99	519	66,86,051	72,27,671
6	Lakshadweep	0	590	0	140	366	1,096	6,888	87	99	0	84	0	499	7,657	8,753
7	Puducherry	7,832	8,811	2,493	1,943	5,217	26,296	5,53,711	76,678	3,882	3,045	993	1,759	6,439	6,46,507	6,72,803
	UT's (2)	**1,11,289**	**1,93,582**	**53,568**	**68,878**	**2,01,360**	6,28,689	**58,05,768**	**25,11,058**	**84,529**	**92,764**	**7,124**	**2,140**	**8,092**	**85,11,475**	**91,40,164**
	Grand Total (1+2)	**37,60,864**	**33,03,631**	**12,38,245**	**17,89,417**	**40,16,888**	**143,69,324**	**1018,64,582**	**154,67,473**	**19,74,253**	**3,65,581**	**53,10,705**	**17,24,109**	**6,45,046**	**1273,51,749**	**1418,65,607**

Source : Road Transport year book-2009-10 & 2010-11, Transport Research Wing, Ministry of Road Transport &

…: Not reported. ^ : Included in cars. # : Included in tractors ## :Data relates to 2009-10 * : includes Motor Cycles on hire

$: Included in Multi-axled/Articulated Vehicles/Trucks & Lorries. ^^: includes other vehicles not covered in 'transport vehicles' &: Includes 13751 Government Vehicles(for which category-wise break-up is not available.)

Note: **Motor Vehicle** means nay mechanically propelled vehicle adapted for use upon road whether the power of propulsion is transmitted there to from an external or internal source and includes a chassis to which a body has not been attached and a trailer; but does not include a vehicle running upon fixed rails or a vehicle of a special type adapted for use only in a factory (or in any other enclosed premises) or a vehicle having less than four wheels fitted with engine capacity or not exceeding thirty five cubic centimeters.

Transport vehicle means a public service vehicle or a goods vehicle.

Table 2.6.1 : Total registered motor vehicles in India by States/Uts (category wise)

(as on 31st March,2012) **(in**

Sl. No.	States/UT	Transport						Non-Transport								Grand Total (Transport +Non- Tpt.)
		Multi-Axled/Articulated Vehicles/ Trucks & Lorries	Light Motor Vehicles (Goods)	Buses	Taxies	Light Motor Vehicles (Passengers)	Total Transport	Two Wheelers	Cars	Jeeps	Omni Buses	Tractors	Trailers	Others	Total Non-Tpt.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Andhra Pradesh	253415	302124	70075	129322	576480	1331416	9291132	1058184	30400	60897	342416	289422	20461	11092912	12424328
2	Arunachal Pradesh##	..	..	.	.	..	..	..	..	..	..	..	..	..	..	151279
3	Assam	144183	47296	15787	33999	67921	309186	1101265	311917	20968	1248	19655	15290	27591	1497934	1807120
4	Bihar	83191		24097	52218	113088	272594	2230069	160340	84949	..	219509	126618	18801	2840286	3112880
5	Chhattisgarh	91068	50373	12049	13515	17913	184918	2503781	154529	16561	33739	115524	85129	9857	2919120	3104038
6	Goa (c)	42395	11447	9513	14338	3853	100749*	589377	167544	^	0	3114	#	4825	764860	865609
7	Gujarat	301533	448958	67546	83038	561740	1462815	10512304	1411898	167991	..	495136	317509	46064	12950902	14413717
8	Haryana	292735	124897	39153	23793	103995	584573	3755349	989519	121202	0	516658	0	10809	5393537	5978110
9	Himachal Pradesh	53763	43092	14592	25030	3963	140440	384832	171382	12704	..	20916	220	6110	596164	736604
10	Jammu & Kashmir	38482	51412	25765	25577	13759	154995	480815	230328	24920	2687	15574	3289	4290	761903	916898
11	Jharkhand	191253	202638	13561	333420	202638	965287*	1851060	227386	67139	..	47114	..	..	2192699	3157986
12	Karnataka	233422	221160	62501	142700	285408	1062081^	7737366	1269430	42179	113204	363993	251553	69795	9847520	10909601
13	Kerala	76330	323891	396826	108877	601507	1622543*^^	3811343	1151566	137547	3798	11602	3656	151259	5270771	6893314
14	Madhya Pradesh	121916	95702	40551	122969	86068	467206	6411155	424644	51197	..	545115	224033	20809	7676953	8144159
15	Maharashtra	411418	656407	100097	175797	640040	1983759	13921763	2307841	423305	19021	419291	324824	32557	17448602	19432361
16	Manipur	8599	4054	2868	2567	11854	29942	148942	17299	12241	1605	3326	394	774	184581	214523
17	Meghalaya	25451	7210	4323	16205	6744	59933	65712	49728	15682	3	751	2794	3234	137904	197837
18	Mizoram	4285	6194	1141	8183	2955	22758	60278	13839	4082	0	274	79	520	79072	101830
19	Nagaland	84008	17799	5542	6970	14429	128748	61546	53074	27083	505	2482	1072	1908	147670	291438 &
20	Orissa	130030	109719	21917	56464	74313	392443	2946118	186323	44396	3668	83079	73110	29393	3366087	3758530
21	Punjab##	125898	75860	30160	18539	66734	317191	4729594	616549	63527	..	517743	1172	17163	5945748	6262939
22	Rajasthan	362028	69509	83345	89053	134345	738280	6629743	591069	254840	..	699881	71665	..	8247198	8985478
23	Sikkim	3930	947	613	8816		14306	7447	13933	6086	1484	76	2	..	29028	43334
24	Tamil Nadu	467225	353883	144251	278005	301982	1545346	13846378	1504735	58718	19957	186670	71403	179041	15866902	17412248
25	Tripura	11166	8452	2312	3530	19203	44663	129343	12390	15542	..	1015	357	908	159555	204218
26	Uttarakhand	23786	26670	8504	25415	13004	97379	897651	188152	9762	1903	41847	5883	1465	1146663	1244042
27	Uttar Pradesh	162813	176164	34428	59379	175649	608433	12410064	1108100	200316	23473	1064284	15278	15326	14836841	15445274
28	West Bengal	281995		35603	84591	63424	465613	2717713	575085		..	70980	..	31350	3395128	3860741
	Total States (1)	**4026318**	**3435858**	**1267120**	**1942310**	**4163009**	**15107598**	**109232140**	**14966784**	**1913337**	**287192**	**5808025**	**1884752**	**704310**	**134796540**	**150070437**
1	A & N Islands	2484	0	903	489	3803	7679	54220	14632	^	^	^	^	532	69384	77063
2	Chandigarh	2689	23015	5170	3491	0	34365	737263	286584	^	0	196	#	0	1024043	1058408
3	Dadra & Nagar Haveli	8935	3380	321	151	632	13419	48550	21762	568	0	36	186	0	71102	84521
4	Daman & Diu	3818	3434	512	49	1230	9043	52339	22175	542	51	352	213	141	75813	84856
5	Delhi	4792	124547	20142	62335	68653	280469	4661714	2172069	68648	89373	1343	0	76504	7069651	7350120
6	Lakshadweep	0	728	0	207	420	1355	7698	122	121	0	102	0	499	8542	9897
7	Puducherry	7849	10544	2596	1990	5221	28200	625251	85418	3882	3123	1077	1781	6544	727076	755276
	Uts	**30567**	**165648**	**29644**	**68712**	**79959**	**374530**	**6187035**	**2602762**	**73761**	**92547**	**3106**	**2180**	**84220**	**9045611**	**9420141**
	Grand Total (1+2)	**4056885**	**3601506**	**1296764**	**2011022**	**4242968**	**15482128**	**115419175**	**17569546**	**1987098**	**379739**	**5811131**	**1886932**	**788530**	**143842151**	**159490578**

Source : Road Transport year book, Transport Research Wing, Ministry of Road Transport & Highways

^ : Included in cars. # : Included in tractors ## :Category -wise break-up not reported …: Not reported. $: Included in Multi-axled/Articulated Vehicles/Trucks & Lorries.

^^: includes other vehicles not covered in 'transport vehicles' & : Includes 15020 Government vehicle (for category-wise break-up is not available) * : includes Motor Cycles on hire

Table 2.6.2 : Total registered motor vehicles in India by States/UT's (Yearwise)

(in numbers)

Sl. No.	States/UT	Total Transport			Total Non- Transport		
1	2	2010	2011	2012	2010	2011	2012
1	Andhra Pradesh	1049945	11,87,621	1331416	78,73,194	90,01,726	11092912
2	Arunachal Pradesh##	5430	…	..	16,671	..	..
3	Assam	245737	2,74,522	309186	11,37,984	13,07,606	1497934
4	Bihar	200866	2,32,188	272594	21,56,120	24,41,021	2840286
5	Chhattisgarh	147126	1,62,495	184918	22,88,647	26,03,542	2919120
6	Goa	84134*	90,751 *	100749*	6,42,908	6,99,324	764860
7	Gujarat	1218969	13,26,972	1462815	106,53,604	116,66,163	12950902
8	Haryana	484878	5,39,940	584573	43,06,947	48,37,063	5393537
9	Himachal Pradesh	122937	1,32,076	140440	4,15,404	4,89,638	596164
10	Jammu & Kashmir	128724	1,41,791	154995	6,10,181	7,85,170	761903
11	Jharkhand	766936*	863,333 *	965287*	20,00,472	22,49,849	2192699
12	Karnataka	887999^^	973,110 ^^	1062081^	81,55,977	89,57,373	9847520
13	Kerala	1394162^^	1,507,041 *, ^^	1622543* ^^	40,03,490	45,64,978	5270771
14	Madhya Pradesh	378888	4,19,211	467206	62,11,688	69,36,491	7676953
15	Maharashtra	1774852	18,72,845	1983759	139,93,569	155,61,254	17448602
16	Manipur	22140	26,082	29942	1,72,312	1,80,420	184581
17	Meghalaya	48290*	53,746 *	59933	1,09,823	1,21,991	137904
18	Mizoram	17230	19,517	22758	63,226	73,131	79072
19	Nagaland	106946	1,29,699	128748	1,33,786	1,42,954	147670
20	Odisha	315152	3,47,722	392443	26,16,680	29,90,316	3366087
21	Punjab	270415	2,70,415	317191	50,03,839	50,03,839	5945748
22	Rajasthan	600766	6,63,421	738280	65,64,896	73,22,844	8247198
23	Sikkim	12102	12,967	14306	21,524	25,816	29028
24	Tamil Nadu	1257410	14,14,580	1545346	128,04,123	142,23,665	15866902
25	Tripura	37773	42,339	44663	1,22,346	1,45,334	159555
26	Uttarakhand	72229*	81,951	97379	7,59,143	1,45,334	1146663
27	Uttar Pradesh	459076	5,32,695	608433	115,29,273	127,54,537	14836841
28	West Bengal	376778	4,21,605	465613	23,70,360	28,39,019	3395128
	Total States (1)	**12487890**	**137,40,635**	**15107598**	**1067,38,187**	**1188,40,274**	**134796540**
1	A & N Islands	6630	7,012	7679	55,144	62,088	69384
2	Chandigarh	23755	31,290	34365	9,25,609	9,76,602	1024043
3	Dadra & Nagar Haveli	11851	12,707	13419	56,981	63,650	71102
4	Daman & Diu	7921	8,668 *	9043	64,421	68,920	75813
5	Delhi	507820	5,41,620	280469	62,39,028	66,86,051	7069651
6	Lakshadweep	920	1,096	1355	6,935	7,657	8542
7	Puducherry	24933	26,296	28200	5,74,196	6,46,507	727076
	UT's (2)	**583830**	6,28,689	**374530**	**79,22,314**	**85,11,475**	**9045611**
	Grand Total (1+2)	**13071720**	**143,69,324**	**15482128**	**1146,60,501**	**1273,51,749**	**143842151**

Source : Road Transport year book, Transport Research Wing,

Table 2.6.3 : Cargo Movement on Waterways

STRETCH		2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Type of cargo moved
National Wateways-1 The Ganga	**MT**	1497964	1348385	1811070	1871178	3309839	2716000	3349000	Cement, Fly Ash, Iron Ore Fines,
	TKM	709153891	705570044	1047703720	1227702794	1454368323	1511900000	1851200000	Coal, Steel Shed, Tyres, Iron fines,
	BTKM	0.709	0.705	1.048	1.228	1.454	1.5119	1.8512	Iron Ingots, Galvanized Steel Plain
National Wateways-2 The Brahmaputra	**MT**	2140491	2179435	2114895 ^	2163745 ^	2406448 ^	2427000	2475000	Bamboo, Bamboo products, Coal,
	TKM	56874896	55171401	59126385	57335351	61327453	58000000	59400000	Plant & machinery, Cement,
	BTKM	0.057	0.055	0.059	0.057	0.061	0.058	0.0594	Building material, fertilizer, Food
National Wateways-3 West Coast Canal	**MT**	673127	766214	667197	885694	1343770	1236000	1066000	Phosphoric Acid, Sulphur, Zinc,
	TKM	8872101	10912125	9750256	14227990	13251939	13900000	11600000	Furnace oil, Rock Phosphate,
	BTKM	0.009	0.011	0.01	0.014	0.013	0.0139	0.0116	Various commodities in
Sub Total of National Waterways(1+2+3)	**MT**	**4311582**	**4294034**	**4593162**	**4920617**	**7060057**	**6379000**	**6890000**	
	TKM	**774900888**	**771653570**	**1116580361**	**1299266135**	**1528947714**	**1583800000**	**1922200000**	
	BTKM	**0.775**	**0.772**	**1.117**	**1.299**	**1.529**	**1.5838**	**1.9222**	
The GOA Waterways-4	**MT**	38500000	45580000	53030000	54500000	43279347	10677000	5990000	Iron ore, iron ore pellets, coal & pig iron.
	TKM	1925000000	2279000000	2651500000	2725000000	2163967350	1024000000	27000000	
	BTKM	1.925	2.279	2.651	2.725	2.164	1.024	0.027	
Mumbai Waterways-5	**MT**	12906154	10155962	11991109	14875355	19947750	24196000	24774000	Coal, cement, bauxite, iron ore
	TKM	696932316	548421948	647519886	803269170	1077178521	455100000	469100000	pellets, stone, HR steel, project
	BTKM	0.697	0.548	0.648	0.803	1.077	0.4551	0.4691	cargo and related raw material,
Grand Total(1+2+3+4+5)	**MT**	**55717736**	**60029996**	**69614271**	**74295972**	**70287155**	**41252000**	**32263000**	
	TKM	**3396833204**	**3599075518**	**4415600247**	**4827535305**	**4770093586**	**3062900000**	**2418300000**	
	BTKM	**3.397**	**3.599**	**4.416**	**4.828**	**4.77**	**3.0629**	**2.4183**	

Source: Ministry of Shipping and Road Transport(Statistics of Inland Water Transport 2013-14)

Note: 1. These figures are collected by IWAI field offices from IWT operators.

2. Average IWT distance of 50 Km in Goa and 54 Km in Mumbai waterways considered.

3. ^ Provisional data subject to receipt of final report from IWTD, Govt of Assam. Data extrapolated considering average of previous 3 years.

4. Cargo handled in Kolkata-Bangladesh-Kolkata route is included in the traffic on National Waterway No.I. The route is a link between NW-I & NW-II through Bangladesh

MT : Million tonne

TKM : Tonne Kms

BTKM : Billion Tonnes Km

Table 2.6.4 :Growth of Indian Shipping

('000 GRT)

Year	Coastal			Overseas			Total		
	No. of Vessels	Gross Registered tonnage	Average GRT	No. of Vessels	Gross Registered tonnage	Average GRT	No. of Vessels	Gross Registered tonnage	Average GRT
1	2	3	4	5	6	7	8	9	10
1980	58	253	Nil	325	5426	16.7	383	5679	14.8
1985	95	296	3.1	273	5654	20.7	368	5950	16.2
1990	162	523	3.2	256	5504	21.5	418	6027	14.4
1991	169	561	3.3	246	5378	21.9	415	5939	14.3
1992	187	640	3.4	254	5678	22.4	441	6288	14.3
1993	202	642	3.2	241	5625	23.3	443	6267	14.1
1994	206	681	3.3	231	5665	24.5	437	6346	14.5
1995	219	698	3.2	251	6304	25.1	470	7002	14.9
1996	231	705	3.1	253	6347	25.1	484	7052	14.6
1997	232	654	2.8	244	6224	25.5	476	6878	14.4
1998	247	654	2.6	237	6131	25.9	484	6785	14.0
1999	269	680	2.5	241	6373	26.4	510	7053	13.8
2000	312	709	2.3	237	6244	26.3	549	6953	12.7
2001	329	731	2.2	228	6237	27.4	557	6968	12.5
2002	424	805	1.9	193	5402	28.0	617	6207	10.1
2003	429	806	1.9	196	5817	29.7	625	6623	10.6
2004	454	808	1.8	215	6893	32.1	669	7701	11.5
2005	485	816	1.7	236	7427	31.5	721	8243	11.4
2006	526	841	1.6	250	7576	30.3	776	8417	10.8
2007	573	893	1.6	277	8136	29.4	850	9030	10.6
2008	616	964	1.6	296	8346	28.2	912	9310	10.2
2009	662	980	1.5	312	8499	27.2	974	9479	9.7
2010	700	1013	1.4	340	9152	26.9	1040	10165	9.8
2011	750	1048	1.4	372	10013	26.9	1122	11061	9.9
2012	804	1086	1.4	350	9331	26.7	1154	10417	9.0
2013	835	1135	1.4	364	9248	25.0	1199	10383	8.7
2014	846	1218	1.4	358	9090	25.0	1204	10309	8.6

Source: Indian Shipping Statistics 2014, Ministry of Road and Transport & Highways (Transport Research wing)

Table 2.6.5 :Freight Movement by Road Transport & Railways :1999-2000 to 2011-12

(Billion Tonnes Kilometers)

Year	Road Transport	Railways
1999-2000	467 (60.5)	305.2 (39.5)
2000-01	494 (61.3)	312.4 (38.7)
2001-02	515.0 (60.7)	333.2 (39.3)
2002-03	545.0 (60.70)	353.2 (39.3)
2003-04	595.0 (61.0)	381.2 (39.0)
2004-05	646.0 (61.1)	411.3 (-38.9)
2005-06	658.9 (59.9)	441.8 (40.1)
2006-07	766.2 (61.4)	481.0 (38.6)
2007-08	851.7 (62.0)	521.3 (38.0)
2008-09	920.2 (62.5)	551.4 (37.5)
2009-10	1015.1 (62.8)	600.5 (37.2)
2010-11	1128.4 (64.3)	625.7 (35.7)
2011-12	1212.4 (64.5)	667.6 (35.5)

Note: Figures for Road Transport form 2007-08 to 2011-12 have been estimated by Transport Research Wing, Ministry of Road Transport & Highways, Govt. of India on the basis of actual GDP growth rate and elasticity of road transport with respect to GDP.

Figures in parantheses indicate percentages

1. Working group report on Road Transport for twelfth five years plan

2. Railways year book, Ministry of Railways.

Transport vehicle means a public service vehicle or goods vehicle

Source: Road Transport Year Book (2010-11 &2011-12)

Table 2.6.6 :Passenger Movement by Road Transport & Railways: 1999-2000 to 2011-12

(Billion Passengers Kilometres)

Year	Road Transport	Railways
1999-2000	1831.6 (81.0)	430.7 (19.0)
2000-01	2075.5 (82.0)	457.0 (18.0)
2001-02	2413.1 (83.1)	490.9 (16.9)
2002-03	2814.7 (84.5)	515.0 (15.5)
2003-04	3070.2 (85.0)	541.2 (15.0)
2004-05	3469.3 (85.8)	575.7 (14.2)
2005-06	4251.7 (87.4)	615.6 (12.6)
2006-07	4545.8 (86.7)	694.8 (13.3)
2007-08	4860.3 (86.3)	770.0 (13.7)
2008-09	5196.5 (86.1)	838.0 (13.9)
2009-10	5555.9 (85.2)	903.4 (14.8)
2010-11	5940.3 (86.0)	978.5 (14.1)
2011-12	6351.2 (85.9)	1046.5 (14.1)

Note: Figures for Road Transport form 2007-08 to 2011-12 have been estimated by Transport Research Wing, Ministry of Road Transport & Highways, Govt. of India on the basis of actual GDP growth rate and elasticity of road transport with respect to GDP.

Figures in parantheses indicate percentages

1. Working group report on Road Transport for twelfth five years plan
2. Railways year book, Ministry of Railways.

Transport vehicle means a public service vehicle or goods vehicle

Road Transport Year Book (2010-11 &2011-12)

Table 2.6.7 : Anuual -Total domestic traffic and operating statistics of Indian carriers

Year	Aircraft flow		Passengers		Available seat Kms. (Million)	Pax. load factor (%)	Cargo carried (Tonne)*			Tonne Kms. Performed (Million)				Available tonne Kms. (Million)	Weight load factor (%)
	Hours (No)	Kms. (000)	Carried (No)	Kms. performed (Million)			Frieght	Mail	Total	Pax	Fright	Mail	Total		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2002-03	295173	165827	13951034	12848	22833	56.3	156254.0	23331	179585	1086	164	23	1273	2380.8	53.5
2003-04	343795	189336	15676948	14566	24936	58.4	176611.0	20879	197490	1257	191	19	1467	2551.3	57.5
2004-05	398714	213618	19445043	18030	27790	64.9	218004.0	27147.0	245151.0	1558.0	229.2	29.0	1816.2	2840.2	63.9
2005-06	475352	252668	25204988	23709	35077	67.6	224958.0	31523.0	256481.0	2067.0	238.0	35.0	2340.0	3488.0	67.1
2006-07	648408	347912	35792747	33519	48702	68.8	245652.0	20769.0	266421.0	2910.0	252.0	23.0	3185.0	4750.0	67.1
2007-08	805934	439378	44384302	41718	60590	68.9	282288.0	20277.2	302565.2	3637.1	271.8	21.4	3930.4	5983.7	65.7
2008-09	808442	426099	39467072	37704	59160	63.7	252971.0	24637.0	277608.0	3259.7	236.4	23.8	3519.9	5908.5	59.6
2009-10	820991	412594	45337263	43959	61091	72.0	298245.0	296558.5	594803.5	3705.9	285.6	28.6	4020.0	6129.0	65.6
2010-11	892630	438559	53842538	52707	68216	77.3	360766.0	21279.0	382045.0	4363.3	374.0	20.3	4757.6	6777.7	70.2
2011-12	987925	500233	60837455	59084	78639	75.1	345248.0	15464.0	360712.0	5066.0	375.0	8.0	5449.0	8032.6	68.0
2012-13**	897988	473521	57867052	56739	76148	74.5	358087.0	4220.6	362307.6	4857.2	395.0	16.9	5269.1	7806.5	67.5
2013-14	964664	494808	60668409	59139	80716	73.3	387853.0	3660.0	391513.0	5101.5	439.8	18.4	5559.6	8243.1	67.4

Source: Air Transport Statistics,Directorate General of Civil Aviation, Ministry of Civil Aviation

NOTE:- * Cargo carried by Blue Dart and Deccan Cargo Express & Logistics as scheduled cargo operators have not been indicated. Here cargo carried by Schduled domestic Airlines(Indian Carriers) has been given.

** Revised figures

2.7 Energy

Climate change, and more specifically the carbon emissions from energy production and use, is one of the more vexing problems facing society today. The energy sector particularly closely associated with climate change because energy is central both to the problem and to its resolution. Energy-related emissions (including energy used in transportation) account for over two thirds of anthropogenic greenhouse gas (GHG) emissions and contribute well over 80% of worldwide emissions of CO2, the main GHG, as a direct result of fossil fuel combustion. Energy also accounts for around one third of the global emissions of methane, the second largest source of GHGs, in fugitive emissions, mainly from natural gas production; transportation; and coal production. In addition, energy contributes a small share of global emissions of N2O, the third largest source, principally from biomass burning.

After the liberalization and globalization, India is on a high growth path and with about 7-8% GDP growth rate per annum. The energy generation has grown manifold due to the ever increasing demand for energy since 1992. Coal, Gas and Diesel being the major sources of power in India, the emissions of GHGs are also on the rise. The GHG emission level estimation, however, depends on utilization of installed capacity. In addition to this, the unorganized sector is also engaged in power generation through low capacity diesel generator sets and coal-fired generators. The framework for statistics related to climate change included the following indicators/ variables.

Energy

(i) Hydro (ii) Coal (iii) Diesel (iv) Gas
(v) Nuclear (vi) Renewable (Annual data National/state wise.)

The following are the tables included in this report.

2.7 Energy

2.7.1 Installed capacity of power utilities – 2013-2015.
2.7.2 Electricity generation (in gigawatt-hrs)
2.7.3 Growth of installed generating capacity in India (Megawatt) (1947-2013)
2.7.4 Annual gross generation of power by source
2.7.5 State wise production of coal and lignite
2.7.6 Production of coal from opencast ,working by mechanization and overburden removed
2.7.7 Inventory of geological reserves of coal by type
2.7.8 Domestic production of petroleum products in India
2.7.9 Industry wise off- take of natural gas in India

Data sources

Central Electricity Authority (CEA) under the Ministry of Power provide all data on electricity generation and distribution. The website of CEA has the relevant data.
Indian Bureau of Mines (IBM) Nagpur provide data on Coal and Lignite.
Directorate General of Coal Safety, Dhanbad provides data on coal mines.
Coal Controller of India for data on coal inventory.
Ministry of Petroleum and Natural Gas for data on Domestic production of petroleum products and natural gas.

Table 2.7.1: Installed capacity of power utilities on 31st March, 2015

(Mega Watts)

Sl. No.	State/Union Territory	Thermal			Total Thermal	Nuclear	Hydro Renewable	RES** (MNRE)	Grand Total
		Coal	Gas	Diesel					
1	2	3	4	5	6	7	8	9	10
I	**Northern Region**	**39431.00**	**5331.26**	**12.99**	**44775.25**	**1620.00**	**17066.78**	**5935.77**	**69397.80**
1	Delhi	135.00	2050.40	0.00	2185.40	0.00	0.00	0.00	2185.40
1	Haryana	3160.00	25.00	3.92	3188.92	0.00	884.51	70.10	4143.53
3	Himachal Pradesh	0.00	0.00	0.13	0.13	0.00	393.60	638.91	1032.64
4	Jammu & Kashmir	0.00	175.00	8.94	183.94	0.00	780.00	147.53	1111.47
5	Punjab	2630.00	25.00	0.00	2655.00	0.00	2230.23	156.20	5041.43
6	Rajasthan	4590.00	603.80	0.00	5193.80	0.00	987.96	23.85	6205.61
7	Uttar Pradesh	4923.00	0.00	0.00	4923.00	0.00	524.10	25.10	5472.20
8	Uttarkhand	0.00	0.00	0.00	0.00	0.00	1252.15	174.81	1426.96
9	Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Private sector	11992.50	108.00	0.00	12100.50	0.00	2148.00	4699.27	18947.77
11	Central sector	12000.50	2344.06	0.00	14344.56	1620.00	7866.23	0.00	23830.79
II	**Western Region**	**66219.51**	**10915.41**	**17.48**	**77152.40**	**1840.00**	**7447.50**	**11271.07**	**97710.97**
1	Goa	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05
2	Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Gujarat	4720.00	2321.82	17.28	7059.10	0.00	772.00	15.60	7846.70
4	Madhya Pradesh	4320.00	0.00	0.00	4320.00	0.00	1703.66	86.16	6109.82
5	Chhatisgharh	2780.00	0.00	0.00	2780.00	0.00	120.00	52.00	2952.00
6	Maharashtra	9560.00	672.00	0.00	10232.00	0.00	2884.84	327.43	13444.27
7	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Private sector	33101.50	4388.00	0.20	37489.70	0.00	447.00	10789.83	48726.53
9	Central sector	11738.01	3533.59	0.00	15271.60	1840.00	1520.00	0.00	18631.60
III	**Southern Region**	**30342.50**	**4962.78**	**939.32**	**36244.60**	**2320.00**	**11398.03**	**13784.68**	**63747.31**
1	Andhra Pradesh	3517.03	0.00	0.00	3517.03	0.00	1721.99	101.92	5340.94
2	Tanalgana	3175.47	0.00	0.00	3175.47	0.00	2012.54	119.11	5307.12
3	Karnataka	2720.00	0.00	127.92	2847.92	0.00	3599.80	1031.66	7479.38
4	Kerala	0.00	0.00	234.60	234.60	0.00	1881.50	158.42	2274.52
5	Tamil Nadu	4770.00	523.20	0.00	5293.20	0.00	2182.20	123.05	7598.45
6	NLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Puducherry	0.00	32.50	0.00	32.50	0.00	0.00	0.00	32.50
8	Private sector	4770.00	4047.50	576.80	9394.30	0.00	0.00	12250.52	21644.82
9	Central sector	11390.00	359.58	0.00	11749.58	2320.00	0.00	0.00	14069.58
IV	**Eastern Region**	**28582.87**	**190.00**	**17.20**	**28790.07**	**0.00**	**4113.12**	**432.86**	**33336.05**
1	Bihar	210.00	0.00	0.00	210.00	0.00	0.00	70.70	280.70
2	Jharkhand	1190.00	0.00	0.00	1190.00	0.00	130.00	4.05	1324.05
3	West Bengal	5220.00	100.00	12.06	5332.06	0.00	977.00	98.40	6407.46
4	D.V.C.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Odisha	420.00	0.00	0.00	420.00	0.00	2061.92	64.63	2546.55
6	Sikkim	0.00	0.00	5.00	5.00	0.00	0.00	52.11	57.11
7	Private sector	8541.38	0.00	0.14	8541.52	0.00	99.00	142.97	8783.49
8	Central sector	13001.49	90.00	0.00	13091.49	0.00	845.20	0.00	13936.69
V	**North-Eastern Region**	**60.00**	**1662.70**	**142.74**	**1865.44**	**0.00**	**1242.00**	**256.64**	**3364.08**
1	Assam	60.00	276.20	20.69	356.89	0.00	100.00	34.11	491.00
2	Arunachal Pradesh	0.00	0.00	15.88	15.88	0.00	0.00	103.90	119.78
3	Meghalaya	0.00	0.00	2.05	2.05	0.00	282.00	31.03	315.08
4	Tripura	0.00	169.50	4.85	174.35	0.00	0.00	16.01	190.36
5	Manipur	0.00	0.00	45.41	45.41	0.00	0.00	5.45	50.86
6	Nagaland	0.00	0.00	2.00	2.00	0.00	0.00	29.67	31.67
7	Mizoram	0.00	0.00	51.86	51.86	0.00	0.00	36.47	88.33
8	Private sector	0.00	24.50	0.00	24.50	0.00	0.00	0.00	24.50
9	Central sector	0.00	1192.50	0.00	1192.50	0.00	860.00	0.00	2052.50
	State	**0.00**	**0.00**	**70.02**	**70.02**	**0.00**	**0.00**	**11.10**	**81.12**
	Andaman & State	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	lakshadweep State	0.00	0.00	9.97	9.97	0.00	0.00	0.00	9.97
	Private sector	0.00	0.00	20.00	20.00	0.00	0.00	5.85	25.85
	Central sector	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	All INDIA	**164635.88**	**23062.15**	**1199.75**	**188897.78**	**5780.00**	**41267.43**	**31692.12**	**267637.33**

Source : Central Electricity Authority .

Note: 1. RES includes SHP,BP,U&I, Solar and Wind Energy. Installed capacity in respect ot RES (MNER) as on 30.9.2013

2. The installed capacity in respect of old Talcher TPS and Bairasul HEP stations is reduced to 460 MW and 180 MW from 470 MW and 198 MW as earlier respectively.

Table 2.7.1: Installed capacity of power utilities on 31st March, 2014

(Mega Watts)

Sl. No.	State/Union Territory	Thermal			Total Thermal	Nuclear	Hydro Renewable	RES** (MNRE)	Grand Total
		Coal	Gas	Diesel					
1	2	3	4	5	6	7	8	9	10
I	**Northern Region**	**35283.50**	**5281.26**	**12.99**	**40577.75**	**1620.00**	**16330.76**	**5935.77**	**64464.28**
1	Delhi	135.00	2050.40	0.00	2185.40	0.00	0.00	0.00	2185.40
1	Haryana	3160.00	25.00	3.92	3188.92	0.00	884.51	70.10	4143.53
3	Himachal Pradesh	0.00	0.00	0.13	0.13	0.00	393.60	638.91	1032.64
4	Jammu & Kashmir	0.00	175.00	8.94	183.94	0.00	780.00	147.53	1111.47
5	Punjab	2630.00	25.00	0.00	2655.00	0.00	2230.23	156.20	5041.43
6	Rajasthan	3865.00	553.80	0.00	4418.80	0.00	987.96	23.85	5430.61
7	Uttar Pradesh	4923.00	0.00	0.00	4923.00	0.00	524.10	25.10	5472.20
8	Uttaranchal	0.00	0.00	0.00	0.00	0.00	1252.15	174.81	1426.96
9	Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Private sector	8570.00	108.00	0.00	8678.00	0.00	2148.00	4699.27	15525.27
11	Central sector	12000.50	2344.06	0.00	14344.56	1620.00	7130.21	0.00	23094.77
II	**Western Region**	**58019.51**	**10139.31**	**17.48**	**68176.30**	**1840.00**	**7447.50**	**11271.07**	**88734.87**
1	Goa	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05
2	Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Gujarat	4470.00	1945.72	17.28	6433.00	0.00	772.00	15.60	7220.60
4	Madhya Pradesh	3782.50	0.00	0.00	3782.50	0.00	1703.66	86.16	5572.32
5	Chhatisgharh	2780.00	0.00	0.00	2780.00	0.00	120.00	52.00	2952.00
6	Maharashtra	8400.00	672.00	0.00	9072.00	0.00	2884.84	327.43	12284.27
7	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Private sector	26849.00	3988.00	0.20	30837.20	0.00	447.00	10789.83	42074.03
9	Central sector	11738.01	3533.59	0.00	15271.60	1840.00	1520.00	0.00	18631.60
III	**Southern Region**	**26582.50**	**4962.78**	**939.32**	**32484.60**	**1320.00**	**11398.03**	**13784.68**	**58987.31**
1	Andhra Pradesh	5092.50	0.00	0.00	5092.50	0.00	3734.53	221.03	9048.06
2	Karnataka	2720.00	0.00	127.92	2847.92	0.00	3599.80	1031.66	7479.38
3	Kerala	0.00	0.00	234.60	234.60	0.00	1881.50	158.42	2274.52
4	Tamil Nadu	4770.00	523.20	0.00	5293.20	0.00	2182.20	123.05	7598.45
5	NLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Puducherry	0.00	32.50	0.00	32.50	0.00	0.00	0.00	32.50
7	Private sector	3360.00	4047.50	576.80	7984.30	0.00	0.00	12250.52	20234.82
8	Central sector	10640.00	359.58	0.00	10999.58	1320.00	0.00	0.00	12319.58
IV	**Eastern Region**	**25327.88**	**190.00**	**17.20**	**25535.08**	**0.00**	**4113.12**	**432.86**	**30081.06**
1	Bihar	210.00	0.00	0.00	210.00	0.00	0.00	70.70	280.70
2	Jharkhand	1190.00	0.00	0.00	1190.00	0.00	130.00	4.05	1324.05
3	West Bengal	5220.00	100.00	12.06	5332.06	0.00	977.00	98.40	6407.46
4	D.V.C.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Odisha	420.00	0.00	0.00	420.00	0.00	2061.92	64.63	2546.55
6	Sikkim	0.00	0.00	5.00	5.00	0.00	0.00	52.11	57.11
7	Private sector	6741.38	0.00	0.14	6741.52	0.00	99.00	142.97	6983.49
8	Central sector	11546.50	90.00	0.00	11636.50	0.00	845.20	0.00	12481.70
V	**North-Eastern Region**	**60.00**	**1208.50**	**142.74**	**1411.24**	**0.00**	**1242.00**	**256.66**	**2909.90**
1	Assam	60.00	276.20	20.69	356.89	0.00	100.00	34.11	491.00
2	Arunachal Pradesh	0.00	0.00	15.88	15.88	0.00	0.00	103.90	119.78
3	Meghalaya	0.00	0.00	2.05	2.05	0.00	282.00	31.03	315.08
4	Tripura	0.00	169.50	4.85	174.35	0.00	0.00	16.01	190.36
5	Manipur	0.00	0.00	45.41	45.41	0.00	0.00	5.45	50.86
6	Nagaland	0.00	0.00	2.00	2.00	0.00	0.00	29.66	31.66
7	Mizoram	0.00	0.00	51.86	51.86	0.00	0.00	36.47	88.33
8	Private sector	0.00	24.50	0.00	24.50	0.00	0.00	0.03	24.53
9	Central sector	0.00	738.30	0.00	738.30	0.00	860.00	0.00	1598.30
	State	**0.00**	**0.00**	**70.02**	**70.02**	**0.00**	**0.00**	**11.10**	**81.12**
	Andaman & State	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	lakshadweep State	0.00	0.00	9.97	9.97	0.00	0.00	0.00	9.97
	Private sector	0.00	0.00	20.00	20.00	0.00	0.00	5.85	25.85
	Central sector	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	All INDIA	**145273.39**	**21781.85**	**1199.75**	**168254.99**	**4780.00**	**40531.41**	**31692.14**	**245258.54**

Source : Central Electricity Authority .

Note: 1. RES includes SHP,BP,U&I, Solar and Wind Energy. Installed capacity in respect ot RES (MNER) as on 30.9.2013

2. The installed capacity in respect of old Talcher TPS and Bairasul HEP stations is reduced to 460 MW and 180 MW from 470 MW and 198 MW as earlier respectively.

Table 2.7.1: Installed capacity of power utilities on 31st March, 2013

(Mega Watts)

Sl. No.	State/Union Territory	Thermal			Total Thermal	Nuclear	Hydro Renewable	RES** (MNRE)	Grand Total
		Coal	Gas	Diesel					
1	2	3	4	5	6	7	8	9	10
I	**Northern Region**	32413.50	4781.26	12.99	37207.75	1620.00	15467.75	5589.25	59884.75
1	Delhi	135.00	1550.40	0.00	1685.40	0.00	0.00	0.00	1685.40
1	Haryana	3160.00	25.00	3.92	3188.92	0.00	884.51	70.10	4143.53
3	Himachal Pradesh	0.00	0.00	0.13	0.13	0.00	393.60	587.91	981.64
4	Jammu & Kashmir	0.00	175.00	8.94	183.94	0.00	780.00	130.53	1094.47
5	Punjab	2630.00	25.00	0.00	2655.00	0.00	2230.23	244.50	5129.73
6	Rajasthan	3615.00	553.80	0.00	4168.80	0.00	987.96	30.25	5187.01
7	Uttar Pradesh	4923.00	0.00	0.00	4923.00	0.00	524.10	25.10	5472.20
8	Uttaranchal	0.00	0.00	0.00	0.00	0.00	1252.15	174.82	1426.97
9	Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Private sector	6450.00	108.00	0.00	6558.00	0.00	2148.00	4326.04	13032.04
11	Central sector	11500.50	2344.06	0.00	13844.56	1620.00	6267.20	0.00	21731.76
II	**Western Region**	49257.01	8988.31	17.48	58262.80	1840.00	7447.50	8986.93	76537.23
1	Goa	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05
2	Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Gujarat	4470.00	1594.72	17.28	6082.00	0.00	772.00	32.90	6886.90
4	Madhya Pradesh	2995.00	0.00	0.00	2995.00	0.00	1703.66	86.16	4784.82
5	Chhattisgarh	2280.00	0.00	0.00	2280.00	0.00	120.00	52.00	2452.00
6	Maharashtra	8400.00	672.00	0.00	9072.00	0.00	2884.84	303.75	12260.59
7	Dadra & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Private sector	19374.00	3188.00	0.20	22562.20	0.00	447.00	8512.07	31521.27
9	Central sector	11738.01	3533.59	0.00	15271.60	1840.00	1520.00	0.00	18631.60
III	**Southern Region**	25032.50	4962.78	939.32	30934.60	1320.00	11353.03	12251.85	55859.48
1	Andhra Pradesh	5092.50	0.00	0.00	5092.50	0.00	3734.53	223.03	9050.06
2	Karnataka	2720.00	0.00	127.92	2847.92	0.00	3599.80	901.35	7349.07
3	Kerala	0.00	0.00	234.60	234.60	0.00	1881.50	174.73	2290.83
4	Tamil Nadu	4170.00	523.20	0.00	4693.20	0.00	2137.20	118.55	6948.95
5	NLC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Puducherry	0.00	32.50	0.00	32.50	0.00	0.00	0.00	32.50
7	Private sector	2910.00	4047.50	576.80	7534.30	0.00	0.00	10834.19	18368.49
8	Central sector	10140.00	359.58	0.00	10499.58	1320.00	0.00	0.00	11819.58
IV	**Eastern Region**	23457.88	190.00	17.20	23665.08	0.00	3981.12	454.91	28101.11
1	Bihar	430.00	0.00	0.00	430.00	0.00	0.00	70.70	500.70
2	Jharkhand	1190.00	0.00	0.00	1190.00	0.00	130.00	4.05	1324.05
3	West Bengal	4970.00	100.00	12.06	5082.06	0.00	977.00	143.40	6202.46
4	D.V.C.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Odisha	420.00	0.00	0.00	420.00	0.00	2061.92	64.30	2546.22
6	Sikkim	0.00	0.00	5.00	5.00	0.00	0.00	52.11	57.11
7	Private sector	5771.38	0.00	0.14	5771.52	0.00	0.00	120.35	5891.87
8	Central sector	10676.50	90.00	0.00	10766.50	0.00	812.20	0.00	11578.70
V	**North-Eastern Region**	60.00	1187.50	142.74	1390.24	0.00	1242.00	252.68	2884.92
1	Assam	60.00	276.20	20.69	356.89	0.00	100.00	31.11	488.00
2	Arunachal Pradesh	0.00	0.00	15.88	15.88	0.00	0.00	103.91	119.79
3	Meghalaya	0.00	0.00	2.05	2.05	0.00	282.00	31.03	315.08
4	Tripura	0.00	148.50	4.85	153.35	0.00	0.00	16.01	169.36
5	Manipur	0.00	0.00	45.41	45.41	0.00	0.00	5.45	50.86
6	Nagaland	0.00	0.00	2.00	2.00	0.00	0.00	28.67	30.67
7	Mizoram	0.00	0.00	51.86	51.86	0.00	0.00	36.47	88.33
8	Private sector	0.00	24.50	0.00	24.50	0.00	0.00	0.03	24.53
9	Central sector	0.00	738.30	0.00	738.30	0.00	860.00	0.00	1598.30
	State	0.00	0.00	70.02	70.02	0.00	0.00	6.10	76.12
	Andaman & State	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	Lakshadweep State	0.00	0.00	9.97	9.97	0.00	0.00	0.00	9.97
	Private sector	0.00	0.00	20.00	20.00	0.00	0.00	0.85	20.85
	Central sector	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	All INDIA	130220.89	20109.85	1199.75	151530.49	4780.00	39491.40	27541.72	223343.61

Source : Central Electricity Authority

RES**: Renewable Energy Sources

Table 2.7.2 : Electricity generation (in gigawatt-hrs)

Parameter	2004-05	2005-06	2006-07	2007-08	2008-09	2009-2010	2010-11
1	2	3	4	5	6	7	8
Public sector	535839.94	562056.45	603851.13	641693.47	651369.69	679932.71	703870.97
Private sector	58616.26	61763.08	66803.03	80932.03	89797.67	119917.89	140877.24
Total (Utilities)	**594456.20**	**623819.53**	**670654.16**	**722625.50**	**741167.36**	**799850.60**	**844748.21**

Source : Central Electricity Authority

Table 2.7.3 : Growth of installed generating capacity in India (Megawatt)

Sr. No.	As on	Hydro	Thermal				Nuclear	RES#	Grand 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	39623	132288	20360	1200	153848	4780	27542	225793
25	31.03.14	40531	145273	21782	1200	168255	4780	29463	243029
26	31.03.15	41267	164636	23062	1200	188898	5780	31692	267637

Source: Central Electricity Authority
RES: Renewable Energy Sources
: RES:- Renewable Energy Sources includes Hydro capacity of 25.00 MW and below (as on 31.01.2010)

* : After accounting for derations/uprations etc. and reconciliation with utilities, the installed capacity figure of 36863 MW would work out to 38990 as on 31.03.2012.

Table 2.7.4: Annual gross generation of power by source

(in MU units)

Sl. No.	Year	Hydro	Steam	Diesel & Wind	Gas	Nuclear	Total
1	2	3	4	5	6	7	9
1	1980-81	46542	60714	62	522	3001	110840
2	1985-86	51021	112540	51	1757	4982	170350
3	1990-91	71641	178322	111	8113	6141	264329
4	1991-92	72757	197163	134	11450	5524	287029
5	1992-93	69869	211124	162	13480	6726	301362
6	1993-94	70463	233151	311	14728	5398	324050
7	1994-95	82712	243110	545	18475	5648	350490
8	1995-96	72759	273744	714	24858	7982	380057
9	1996-97	68901	289378	1554	26985	9071	395889
10	1997-98	74582	300731	1929	34423	10083	421747
11	1998-99	82690	308056	2136	43480	12015	448367
12	1999-00	80637	377814	3989	49773	13267	480680
13	2000-01	74481	357006	3822	48311	16928	499548
14	2001-02	73580	370884	6403	47099	19475	517439
15	2002-03	64014	389550	7052	52687	19390	532693
16	2003-04	75243	407284	6867	57928	17780	565102
17	2004-05	84495	424083	2519	59474	16845	587416
18	2005-06	103057	435097	1988	60128	17239	617510
19	2006-07	116369	461340	2489	63719	18607	662523
20	2007-08	128702	486763	3297	68931	16777	704469
21	2008-09	118981	512527	4709	72865	14713	723794
22	2009-10	112038	539982	4243	96651	18636	771551
23	2010-11	119868	561757	2994	100257	26266	811143
24	2011-12	135794	612880	2461	93464	32287	876887

Source: Monthly Generation Report of Central Electricity Authority

MU : Million Units

Table 2.7.5 : Statewise production of coal and lignite

(Million tonnes)

Sl. No.	States	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
I.	**Coal**	**296.7**	**296.5**	**304.1**	**313.7**	**327.8**	**341.2**	**361.2**	**382.6**	**407.0**	**430.8**	**457.0**	**492.8**	**532.1**	**532.7**	**540.0**	**556.4**	**565.8**
1	Andhra Pradesh	28.9	27.3	29.6	30.3	30.8	33.2	33.9	35.3	36.1	37.7	40.6	44.5	50.4	51.3	52.2	53.2	50.5
2	Arunachal Pradesh	—	—	—	—	—	—	—	—	—	—	—	0.1	0.2	0.3	0.2	0.07	0.0
3	Assam	0.7	0.6	0.6	0.7	0.6	0.6	0.7	0.6	1.1	1.1	1.1	1.2	1.1	1.1	0.6	0.6	0.7
4	Chhatisgarh	—	—	—	50.2	53.6	56.8	61.5	69.3	76.4	83.0	90.2	101.9	110.0	113.8	114.0	117.8	128.0
5	Jharkhand	81.0	76.2	76.5	75.4	76.8	78.6	79.5	78.0	85.4	88.8	90.9	96.3	105.9	108.9	109.6	111.3	113.1
6	Meghalaya	-	4.2	4.1	4.1	5.1	4.4	5.4	5.3	5.6	5.8	6.5	5.7	5.8	7.0	7.2	5.6	5.7
7	Madhya Pradesh	84.4	84.9	87.9	42.5	44.2	45.7	49.8	52.5	55.6	60.0	67.8	71.3	74.07	71.1	71.1	75.9	75.6
8	Maharashtra	26.2	25.3	27.7	28.8	30.8	31.4	32.9	34.5	36.1	36.2	36.4	38.7	41.0	39.3	39.2	39.1	37.2
9	Odisha	42.0	43.5	43.6	44.8	47.8	52.2	60.1	66.6	70.5	81.2	89.5	98.4	106.4	102.6	105.5	110.1	112.9
10	Uttar Pradesh	15.7	15.6	16.2	16.9	16.5	17.8	15.8	16.8	15.7	12.2	11.4	12.0	14.0	15.5	16.2	16.1	14.7
11	West Bengal	17.5	18.8	18.0	20.1	21.4	20.5	21.5	23.6	24.5	24.9	22.5	22.9	23.1	21.7	24.2	26.5	28.2
II.	**Lignite**	**23.1**	**23.4**	**22.2**	**24.2**	**24.8**	**26.0**	**28.0**	**30.5**	**30.1**	**31.1**	**34.0**	**32.4**	**34.1**	**37.7**	**42.3**	**46.5**	**44.3**
1	Gujarat	4.9	5.0	4.4	5.9	6.2	6.9	6.7	8.3	8.9	9.7	11.8	10.1	10.5	13.1	14.8	14.5	11.6
2	Rajasthan	-	0.2	0.2	0.2	0.3	0.5	0.7	0.5	0.7	0.5	0.6	1.0	1.2	1.5	3.0	7.1	7.6
3	Tamilnadu	18.1	18.2	17.6	18.2	18.4	18.6	20.6	21.6	20.4	21.0	21.6	21.3	22.3	23.1	24.6	24.8	25.1

Source : Indian Bureau of Mines

P: Provisional

Table 2.7.6 : Production of coal from opencast, working by mechanisation and overburden removed

(Tonnes)

Sl. No.	States	2011				2012			
		Total Opencast Output	Output by Mechanisation		Overburden Removed (in '000 Cubic metres)	Total Opencast Output	Output by Mechanisation		Overburden Removed (in '000 Cubic metres)
			Fully Mechanised	Manual/ Semi Mechanised			Fully Mechanised	Manual/ Semi Mechanised	
1	2	3	4	5	6	7	8	9	10
I	**COAL**	**491616687**	**491616687**	**5121331**	**1342982**	**507156124**	**507156124**		**802246**
1	Andhra Pradesh	56329398	56329398	-	266617	52475549	52475549	-	210965
2	Assam	749505	749505	-	5008	677739	677739	-	4883
3	Chhattisgarh	112721722	112721722	-	109483	113041737	113041737	-	78933
4	Jharkhand	103028603	103028603	-	382894	110082403	110082403	-	109828
5	Jammu & Kashmir	-	-	-	-	-	-	-	-
6	Madhya Pradesh	44390612	44390612	-	137625	36717204	36717204	-	138696
7	Maharashtra	38629230	38629230	-	296660	36821877	36821877	-	93459
8	Odisha	92886851	92886851	5121331	34574	108080808	108080808	-	52894
9	Uttar Pradesh	28522000	28522000	-	80535	29735500	29735500	-	65453
10	West Bengal	14358766	14358766	-	29586	19523307	19523307	-	47135
11	Meghalaya	-	-	-	-	-	-	-	-
II	**LIGNITE**								
1	Gujarat	14324128	14324128	-	172583	15286113	15286113	-	**41178**
2	Rajasthan	2095601	2095601	-	38342	6196328	6196328	-	45861
3	Tamilnadu	23764067	23764067	-	71969	24767575	24767575	-	153632

Source : Directorate General of Mines Safety, Dhanbad

Table 2.7.7 : Inventory of geological reserves of coal by type

(Million tonnes)

Sl. No.	Types of Coal	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
1	**Coking**					
	I. Prime coking	1-1-2003	4614	699	0	**5313**
		1-1-2004	4614	699	0	**5313**
		1-1-2005	4614	699	0	**5313**
		1-1-2006	4614	699	0	**5313**
		1-4-2007	4614	699	0	**5313**
		1-4-2008	4614	699	0	**5313**
		1-4-2009	4614	699	0	**5313**
		1-4-2010	4614	699	0	**5313**
		1-4-2011	4614	699	0	**5313**
		1-4-2012	4614	699	0	**5313**
		1-4--2013	4614	699	0	**5313**
		1-4--2014	4614	699	0	**5313**
	II. Medium coking	1-1-2003	11325	11839	1889	**25053**
		1-1-2004	11325	11839	1889	**25053**
		1-1-2005	11417	11765	1889	**25070**
		1-1-2006	11445	11751	1881	**25077**
		1-4-2007	11853	11601	1880	**25334**
		1-4-2008	12308	12136	1880	**26324**
		1-4-2009	12448	12064	1880	**26393**
		1-4-2010	12573	11940	1880	**26393**
		1-4-2011	12573	12001	1880	**26454**
		1-4-2012	12837	11951	1800	**26669**
		1-4--2013	13269	11893	1879	**27041**
		1-4--2014	13303	11869	1879	**27049**
	III. Blendable/semi-coking	1-1-2003	482	907	222	**1610**
		1-1-2004	482	1003	222	**1707**
		1-1-2005	482	1003	222	**1707**
		1-1-2006	482	1003	222	**1707**
		1-4-2007	482	1003	222	**1707**
		1-4-2008	482	1003	222	**1707**
		1-4-2009	482	1003	222	**1707**
		1-4-2010	482	1003	222	**1707**
		1-4-2011	482	1003	222	**1707**
		1-4-2012	482	1003	222	**1707**
		1-4--2013	482	1003	222	**1707**
		1-4--2014	482	1004	222	**1708**
2	**Non-coking** (Including High Sulphur)	1-1-2003	73664	99168	35940	**208772**
		1-1-2004	75096	102736	35787	**213619**
		1-1-2005	76447	103623	35686	**215756**
		1-1-2006	78858	106210	35195	**220263**
		1-4-2007	81624	107362	36042	**225027**
		1-4-2008	84425	110378	36388	**231191**
		1-4-2009	88175	109804	35819	**233798**
		1-4-2010	92129	117012	34257	**243398**
		1-4-2011	96333	123768	32287	**252388**
		1-4-2012	100211	128515	31082	**259808**
		1-4--2013	104816	129037	30999	**264852**
		1-4--2014	107509	128937	31047	**267494**
	Total	1-1-2003	90085	112613	38050	**240748**
		1-1-2004	91517	116277	37898	**245692**
		1-1-2005	92960	117090	37797	**247847**
		1-1-2006	95399	119663	37298	**252360**
		1-4-2007	98573	120665	38144	**257382**
		1-4-2008	101829	124216	38490	**264535**
		1-4-2009	105720	123570	37921	**267211**
		1-4-2010	109798	130654	36359	**276811**
		1-4-2011	114002	137471	34389	**285862**
		1-4-2012*	118145	142169	33182	**293497**
		1-4--2013*	123182	142632	33100	**298914**
		1-4--2014*	125909	142506	33148	**301564**

Source : Office of the Coal Controller, Kolkata

* Including Sikkim

Note: The coal resources of India are available in older Gondwana Formations of peninsular India and younger Tertiary formations of north- eastern region. Based on the results of Regional Promotional Exploration, where the boreholes are normally placed 1-2 Km apart, the resources are classified into '**Indicated'** or '**Inferred'** category. Subsequent deailed exploration in selected blocks, were boreholes are less than 400 meter apart, upgrades the resources into more reliable '**Proved**' category

Table 2.7.8 : 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.

* : Estimated from calendar year figures

P : Provisional

Table 2.7.8 : Domestic production of petroleum products in India - Concld.

(000' Tonne)

Sl. No.	Year	Heavy Ends				Others**	Total
		Fuel Oil	Lubricants	Petroleum Coke	Bitumen		
1	2	10	11	12	13	14	15
1	1970-71	4090	231	151	805	501	17110
2	1971-72	4098	140	142	1009	999	18639
3	1972-73	3688	304	132	1109	267	17860
4	1973-74	3931	318	131	1093	1072	19495
5	1974-75	4243	387	137	873	668	19611
6	1975-76	5083	342	160	697	436	20829
7	1976-77	4728	368	163	945	511	21432
8	1977-78	5332	413	155	992	521	23219
9	1978-79	5644	490	122	962	527	24193
10	1979-80	6351	487	99	1103	573	25794
11	1980-81	6120	426	86	1082	533	24123
12	1981-82	6908	407	141	1298	493	28182
13	1982-83	7964	434	149	1397	528	31073
14	1983-84	8000	470	136	1069	556	32926
15	1984-85	7886	414	181	944	601	33236
16	1985-86	7955	501	192	1107	645	39881
17	1986-87	8011	491	264	1224	737	42761
18	1987-88	8466	478	257	1370	653	44728
19	1988-89	8171	497	275	1548	896	45699
20	1989-90	8952	547	275	1671	959	48690
21	1990-91	9429	561	229	1603	1142	48562
22	1991-92	9637	390	216	1710	1416	48349
23	1992-93	10403	533	221	1862	1219	50359
24	1993-94	10304	489	233	1874	1020	51084
25	1994-95	9822	504	259	1845	1088	52927
26	1995-96	9579	633	256	2032	1199	55081
27	1996-97	10298	619	246	2283	1291	59005
28	1997-98	11080	593	282	2158	1129	61308
29	1998-99	11030	586	286	2419	1163	64544
30	1999-00	11352	728	465	2485	3048	79411
31	2000-01	11392	684	2473	2721	4518	95614
32	2001-02	12227	651	2784	2561	4246	100004
33	2002-03	12167	684	2659	2941	5408	104140
34	2003-04	13372	666	2743	3397	6170	113463
35	2004-05	14970	646	3162	3349	3777	118579
36	2005-06	14305	677	3182	3576	4419	124405
37	2006-07	15697	825	3779	3891	5746	139748
38	2007-08	15805	881	4129	4507	7103	149472
39	2008-09	17684	874	4241	4713	6033	155148
40	2009-10	18346	950	3709	4889	13279	184610
41	2010-11	20519	884	2711	4478	15142	194821
42	2011-12	18433	1028	7837	4610	14429	203202
43	2012-13	15054	896	10943	4670	17650	217736
44	2013-14	13405	941	12068	4785	17927	220756
45	2014-15 (P)	11919	946	12448	4632	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 2.7.9 : Industry-wise off-take of natural gas in India

(Million Cubic Metre)

Sl No.	Year	Energy Purposes							Non-Energy Purposes		Grand Total
		Power Generation	Industrial Fuel	Tea Plantation	Domestic fuel	Captive Use/LPG shrinkage	Others**	Total	Fertilizer Industry	Others	
1	2	3	4	5		6			7	8	9
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	8973	31025
37	2006-07	11963	3205	170	443	5034	40	20855	8497	10513	31368
38	2007-08	12037	3323	160	38	1804	1324	18686	9823	11893	30579
39	2008-09	12603	5912	154	102	1885	1535	22191	9082	10798	32989
40	2009-10	21365	2322	167	246	5433	1838	31371	13168	15135	46506
41	2010-11	25787	903	193	2524	6781	765	36953	11464	14302	51255
42	2011-12	20765	1694	175	3192	6366	1851	34043	11330	12965	47008
43	2012-13	14478	1059	182	2752	6194	683	25348	11496	13874	39222
44	2013-14	10534	1077	196	2921	4742	713	20183	11060	13782	33965
45	2014-15(P)	10720	395	0	5416	1005	154	17690	15190	29266	46956

Source : Ministry of Petroleum & Natural Gas.

P :Provisional ** Sponge iron use. 0 Not available Neg:Negligible

Section – III

Indicators for observed and assessed impacts of climate change.

3.1 Ocean

Rise in Sea Level and Sea surface Temperature is one of the major impact of Climate Change that affect a major proportion of mankind. IPCC has estimated a sea level rise of 1 to 2 mm per year globally. Although only 2 percent of the world's land lies at or below 10 meters of elevation, these areas contain 10 percent of the world's human population—634 million people that are directly threatened by sea level rise. The small island nations of the Pacific Ocean are the most immediately vulnerable to the impacts of climate change and particularly to sea level rise. For example, nearly 50,000 of the 100,000 people in Kiribati live within 3 meters above sea level.

In India The Kavaratti island which is the Capital of Lakshadweep Islands is 2 to 5 m above the mean sea level on the western side and 2 to 3 m on the eastern side has a population of 11300 (2009). The Maldives, consisting of over 1,100 islands to the west of India, is the world's lowest-lying nation. On average the islands are only 1.3 meters above sea level. The 325,000 (plus 100,000 expatriate workers who are not counted in the census) residents of the islands are threatened by rising sea levels.

The survival of coral reefs, mangroves, sea grasses, and other critical habitat-forming species hinges on their ability to move into shallower waters. Slow-growing species are most unlikely to be able to keep pace with the rising sea level. Critical coastal habitats—for instance, sea turtle nesting beaches—are lost as the sea level rises. Natural and manmade barriers such as cliffs, sea walls, and costal developments stand in the way of migrating further inland.

Measures of sea level refer to the level of the ocean's surface halfway between high and low tide. For centuries, sea level was measured using tide gauges. Since the mid-20th century, and especially over the last decade, satellites have played an increasingly significant role in measuring sea level. In addition to monitoring current sea levels, scientists have been trying to understand the history of changes in the height of the oceans. Using archeological information gleaned from salt marshes and coral reefs, past sea levels can be established.

Since the beginning of the 20th century, the seas have continued to rise at an average rate of 1.7 ± 0.5 mm per year, according to the IPCC. This increase, however, has not happened at a constant rate. The first noted increase was over the period of 1961 to 2003, when the average rate of sea level rise was 1.8 ± 0.5 mm per year

Factors Driving Sea Level Rise

Sea level rise is due to a number of causes, some of which may exert a more regional influence than others. These include:

Thermal expansion – As seawater becomes warmer it expands. Heat in the upper layer of the ocean is released quickly into the atmosphere. However, heat absorbed by the deeper layers of the ocean will take much longer to be released and therefore, be stored in the ocean much longer and have significant impacts on future ocean warming.

An increase in freshwater inputs from mountain glaciers, ice sheets, ice caps, and sea ice, as well as other atmospheric and hydrologic cycles due to rising global surface and ocean temperatures

Physical forces – Subsidence and lifting are associated with tectonic activity and the extraction of water and resources such as gas and oil. These types of forces don't actually change the volume of the ocean, only the relative sea level. However, these changes do affect movement over land, as well as estimates from satellite altimetry.

Ocean current variations – Large, regional ocean currents which move large quantities of water from one location to another also affect relative sea level without changing the actual volume of the ocean. For example, el Niño moves water from one side of the Pacific to the other every three or four years. These large-scale variations also affect the relative sea level of certain areas.

Global mean ocean temperature has been rising because about 10% the heat energy produced by greenhouse gases during the past half-century has been trapped in the oceans. Loss of mass from glaciers

world-wide, as well as from the ice sheets of Greenland and Antarctica contributes another 1.2 ± 0.64 mm to sea level rise per year.

Impacts of Sea Level Rise

As the world's oceans rise, low-lying coastal areas will disappear. Flooding of coastal areas will become more common and more severe as storm surges have easier access to these lower-lying areas. The occurrence of extreme high water events related to storm surges, high tides, surface waves, and flooding rivers will also increase. Flooding and loss of land will have significant impacts on humans, wildlife, and entire ecosystems.

Ecosystem Impacts

Migratory marine organisms will most likely be able to adapt. However, the rate of sea level rise will hamper the successful migration of a number of organisms. As ocean levels rise, coastal and low-lying areas and ecosystems will be flooded. Higher sea levels will likely have significant impacts on the structure, function, and capacity of coastal and inland ecosystems, influencing their capabilities to perform ecosystem services.

Coastal development also creates obstacles to plant and animal life as they are trying to adapt to changes in the ecosystem. For example mangrove forests, which act as buffers to storm surges and tidal waves, are being submerged by rising sea levels. The mangroves would normally re-establish themselves at the new low-tide zone, however, buildings and other types of development on the coast are blocking them. These changes in coastal and terrestrial ecosystems and resources will consequentially impact ocean circulation as well as sediment and nutrient flow in coastal areas

The framework for statistics related to climate change has identified the following variables/indicators .

Ocean Level & Temperature

(i)Sea surface temperature
(ii) Sea level Rise

Data related is available with the National Institute of Oceanography. Only one table on coral reefs is included in this publication.

Table 3.1.1 :Region wise area of different classes of Coral Reefs in India

Lakshadweep				Gulf of Kachchh	
Sr. No	**Class Name**	**Area Km^2**	**Sr. No**	**Class Name**	**Area Km^2**
1	Shallow Lagoon	107.15	1	Turbid Water	7.62
2	Deep Lagoon	135.88	2	Mud	90.01
3	Inlet	0.48	3	Sand	13.13
4	Lagoonal Patch Reef	1.6	4	Matty Algae	3.82
5	Beach/Exposed Sand	9.78	5	Algae with Mud and Sand	30.04
6	Lagoon(Shallow Sandy)	110.21	6	Inner Reef (Live Corals with Algae)	77.11
7	Sea Grass/Algae	9.77	7	Outer Reef (Live Corals with Algae)	26.77
8	Boulders/Dead Corals	7.31	8	Algal Ridge (live Corals with Algae)	14.81
9	Live Corals Zone (Open/Scattered)/Aligned Coral Zone	29.77	9	Sea Grass/Algae	5.74
10	Live Corals Zone (Dense)/Aligned Coral Zone	7.24	10	Live Corals (More than 80%)	16.25
11	Coralline shelf	118	11	Deep Water Live Corals	5.46
12	Live Corals Zone (Deep Lagoon)	57.17	12	Deep Corals with sand and Algae	1.01
13	Live Corals Zone (Intermediate Depth)	4.48	13	Dead Corals	2.28
14	Coral Knolls	2.47	14	Sandy Substrate	2.52
15	Reef Front (Live Corals)	3.48	15	Reef Slope (No Live Corals)	0.19
			16	Windward Reef Front	3.6
Gulf of Manner			**Andaman & Nicobar Islands**		
S. No.	**Class Name**	**Area Km^2**	**S. No.**	**Class Name**	**Area Km^2**
1	Sand	1.65	1	Sandy Beach	16.71
2	Sandy substrate	18.56	2	Sandy Substrate (<5 m)	49.07
3	Sandy substrate Deep	34.12	3	Sandy Substrate Deep (>5 m)	67.23
4	Sea Grass	11.16	4	Rock with sandy substrate	25.52
5	Rubbles Zone	1.01	5	live Corals with Rocks	5.74
6	Live Corals Zone with sea grass	9.15	6	Live Corals with Sand	3.12
7	Dead Corals	2.45	7	Exposed Rocky Land	5.2
8	Windward Reef Front	3.22	8	Sea Grass	0.04
9	Algal Ridge	0.32	9	Dead Corals	0.12

Source: State of Forest Report 2011, MOEF

3.2 : Temperature and Precipitation.

There is a scientific consensus that climate change is occurring, and that human activities are the primary driver. Evidence of climate change includes the instrumental temperature record, rising sea levels, and decreased snow cover in the Northern Hemisphere. According to the Intergovernmental Panel on Climate Change (IPCC), most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in human greenhouse gas concentrations. Further There is a direct influence of global warming on precipitation. Increased heating leads to greater evaporation and thus surface drying, thereby increasing the intensity and duration of drought. However, the water holding capacity of air increases by about 7% per 1°C warming, which leads to increased water vapor in the atmosphere. Hence, storms, whether individual thunderstorms, extra-tropical rain or snow storms, or tropical cyclones, supplied with increased moisture, produce more intense precipitation events.

The temperature increase is wide spread across the globe and is greater at higher northern latitudes. It is estimated that there is a 100-year linear trend of 0.740C increase. It is observed since 1961 that the average temperature of the global ocean has been taking up over 80% of the heat being added to the climate system. Warming of the climate system induces increase in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.

In India, an increase in the surface air temperature has been observed in the past century. A warming trend is visible along the west coast, central India, interior peninsula and the North-Eastern India, but some cooling trends are also visible in the North-West India and parts of South-India. (NAPCC, 2008). To analyze the comparative change in the Indian peninsula, both sea level temperature and land surface temperature are required to be recorded on long term basis at different climatic zones of the country.

Indian monsoon rains are the backbone of Indian economy as most of our agricultural activities, rivers and replenishment of ground water sources have a direct dependence on monsoon rains. Monsoon rains are a manifestation of the complex interactions between land, ocean and atmosphere. Rainfall data are collected by the India Meteorological Department (IMD) in respect of the meteorological subdivisions of the country on day-to-day basis. A significantly long series of rainfall data are therefore available to analyze patterns of change in distribution, intensity and duration of rainfall.

The framework for statistics related to climate change included the following variables/indicators .

Temperature /Precipitation
(i) Rain Fall Max/Min./Avg
(ii) Snowfall
(iii) Temperature Max/Min/Avg
(iv) Relative Humidity.

The following are the tables included.

3.2 Temperature and Precipitation
3.2.1 Annual and seasonal minimum and maximum temperature(°C) - India(1901-2012)
3.2.2 Annual and seasonal mean temperature (°C) - India(1901-2012)
3.2.3 All India area weighted monthly and annual rainfall (in mm) (1901-2012)
3.2.4 Season-wise distribution of rainfall in India

Data Sources

India Meteorological Department (IMD) under Ministry of Earth Sciences is the source of Temperature and Precipitation data.

Table: 3.2.1 Annual and Seasonal Minimum and Maximum Temperature(°C) - India (1901-2014)

Year	Annual		Jan-Feb		Mar-May		June-Sept		Oct-Dec	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1901	19.51	28.96	14.16	23.27	20.67	31.46	23.38	31.27	16.59	27.25
1902	19.44	29.22	13.64	25.75	21.12	31.76	23.28	31.09	16.50	26.49
1903	19.25	28.47	13.87	24.24	20.25	30.71	23.40	30.92	16.29	26.26
1904	19.22	28.49	13.72	23.62	20.72	30.95	22.96	30.66	16.44	26.40
1905	19.03	28.30	12.81	22.25	19.97	30.00	23.43	31.33	16.39	26.57
1906	19.51	28.73	13.72	23.03	20.76	31.11	23.45	30.86	16.88	27.29
1907	19.08	28.65	14.46	24.23	19.87	29.92	22.98	30.80	16.14	27.36
1908	19.09	28.83	13.68	24.42	20.61	31.43	23.19	30.72	15.70	26.64
1909	19.13	28.38	13.33	23.52	20.40	31.02	22.97	30.33	16.61	26.88
1910	19.01	28.53	13.68	24.20	20.35	31.14	23.15	30.48	15.72	26.20
1911	19.31	28.62	13.81	23.90	20.41	30.70	23.26	31.14	16.66	26.31
1912	19.27	28.95	14.56	24.88	20.54	31.10	23.12	31.15	16.02	26.57
1913	19.09	28.67	13.91	24.25	20.24	30.89	22.96	30.92	16.24	26.42
1914	19.41	28.66	14.03	24.59	20.33	30.73	23.47	30.84	16.66	26.40
1915	19.64	28.94	13.73	23.22	21.00	31.06	23.72	31.51	16.79	27.19
1916	19.34	28.82	13.64	24.57	20.95	31.88	23.31	30.52	16.23	26.31
1917	19.02	28.11	13.60	24.52	19.72	30.06	23.29	30.24	16.25	25.74
1918	19.02	28.66	13.24	23.57	20.15	30.68	23.06	31.10	16.33	26.78
1919	19.37	28.66	14.22	23.71	20.53	31.17	23.33	30.80	16.36	26.60
1920	19.07	28.76	13.79	23.64	20.15	30.40	23.01	31.08	16.26	27.45
1921	19.54	28.86	13.85	23.91	21.16	32.05	23.18	30.81	16.34	26.43
1922	19.32	28.80	14.31	24.43	20.56	31.21	23.27	30.90	16.03	26.38
1923	19.36	28.74	13.88	23.73	20.83	31.40	23.24	30.98	16.37	26.43
1924	19.52	28.80	14.11	23.94	20.86	31.44	23.42	30.96	16.56	26.49
1925	19.24	28.67	13.05	23.57	20.90	31.47	23.18	30.67	16.43	26.59
1926	19.37	28.70	14.63	24.73	20.36	30.21	23.69	31.14	15.92	26.61
1927	19.30	28.59	13.81	23.76	20.30	30.72	23.18	30.80	16.80	26.73
1928	19.61	28.98	14.57	24.21	20.86	31.51	23.23	31.14	16.90	26.74
1929	19.40	28.76	13.71	23.53	21.00	31.72	23.17	31.03	16.55	26.28
1930	19.21	28.65	13.27	23.20	20.70	30.94	23.10	30.98	16.51	26.90
1931	19.73	29.15	14.52	24.55	21.01	31.71	23.44	31.16	16.97	26.97
1932	19.32	29.09	13.72	24.51	20.65	31.17	23.36	31.25	16.33	27.18
1933	19.35	28.49	14.08	24.13	20.25	30.43	23.34	30.41	16.63	26.92
1934	19.22	29.03	13.78	24.53	20.50	31.28	23.37	31.22	16.16	26.94
1935	19.21	28.76	13.84	23.41	20.39	31.15	23.07	30.85	16.41	26.88
1936	19.53	28.71	13.96	24.11	20.87	31.17	23.18	30.68	17.03	26.69
1937	19.25	28.70	14.11	24.13	20.39	30.84	23.40	31.22	16.02	26.26
1938	19.28	28.70	13.61	23.31	21.25	31.74	23.14	30.59	15.95	26.71
1939	19.16	28.85	13.95	24.25	20.08	30.76	23.23	31.06	16.29	27.05
									Continued	

Table: 3.2.1 Annual and Seasonal Minimum and Maximum Temperature(°C) - India (1901-2014)

Year	Annual		Jan-Feb		Mar-May		June-Sept		Oct-Dec	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1940	19.24	28.88	13.57	24.46	20.31	30.66	23.25	30.93	16.62	27.24
1941	19.85	29.46	14.25	24.37	21.53	32.12	23.52	31.37	17.00	27.62
1942	19.45	28.98	14.10	24.03	21.19	31.80	23.37	30.99	16.20	27.23
1943	19.06	28.80	13.75	24.03	20.33	30.80	23.10	30.83	16.02	27.33
1944	19.18	28.89	13.45	23.62	20.39	31.03	23.29	31.25	16.38	27.16
1945	18.89	28.97	12.93	23.86	20.26	31.19	23.36	31.48	15.52	26.82
1946	19.38	29.37	13.55	25.49	20.73	31.50	23.25	31.23	16.76	27.30
1947	19.23	28.84	13.57	23.99	21.05	31.78	23.46	31.20	16.08	26.70
1948	19.49	28.73	14.03	23.62	20.81	31.27	23.32	30.84	16.70	26.77
1949	19.28	28.89	13.87	24.49	21.01	31.27	23.29	30.88	15.80	26.79
1950	18.95	28.47	13.39	24.02	20.28	30.72	23.25	30.48	15.72	26.58
1951	19.36	29.09	13.20	24.16	20.27	30.67	23.24	31.13	17.16	27.77
1952	19.51	29.16	14.53	25.17	20.91	31.13	23.39	31.11	16.27	27.26
1953	19.71	29.43	14.22	24.71	21.55	32.19	23.52	31.12	16.46	27.56
1954	19.33	28.92	14.02	24.20	21.11	31.89	23.28	30.90	15.84	26.46
1955	19.19	28.76	14.02	24.90	20.29	30.88	23.23	30.72	16.13	26.59
1956	19.29	28.63	13.25	24.40	21.09	31.53	23.07	30.25	16.46	26.37
1957	19.30	28.64	13.60	23.87	20.09	30.42	23.23	31.07	17.06	26.82
1958	19.92	29.34	14.58	25.43	21.18	31.74	23.64	31.23	17.26	27.01
1959	19.60	29.02	13.82	24.05	20.93	31.71	23.48	30.99	16.96	27.03
1960	19.27	29.31	13.99	25.49	20.25	31.17	23.40	31.29	16.32	27.36
1961	19.27	28.72	13.79	24.18	20.76	31.47	23.38	30.75	15.96	26.30
1962	19.20	28.89	13.52	24.24	20.53	31.31	23.21	31.08	16.32	26.65
1963	19.28	29.04	13.39	24.73	20.24	30.94	23.14	31.28	17.08	27.00
1964	19.11	29.09	13.38	24.29	20.87	31.89	23.01	30.82	15.96	27.20
1965	18.98	29.16	13.76	24.67	19.76	30.73	22.80	31.37	16.57	27.61
1966	19.31	29.41	14.32	25.54	20.46	31.69	23.12	31.24	16.40	27.26
1967	19.08	29.14	13.57	25.31	20.07	31.04	23.07	31.32	16.43	26.90
1968	18.83	29.07	12.82	23.68	20.02	31.24	22.94	31.55	16.18	27.19
1969	19.32	29.61	13.40	24.99	20.76	32.02	23.17	31.55	16.69	27.71
1970	19.16	29.47	13.92	25.19	20.77	32.03	23.11	31.16	15.76	27.50
1971	18.77	29.15	13.18	24.99	20.16	31.58	22.72	30.91	15.84	27.17
1972	18.91	29.31	12.70	24.49	20.10	31.49	22.91	31.67	16.53	27.21
1973	19.38	29.44	14.12	25.35	20.88	32.19	23.34	31.28	16.09	26.97
1974	18.76	29.26	12.77	24.34	20.57	31.92	22.67	31.39	15.73	27.03
1975	18.62	28.89	13.26	24.12	20.03	31.62	22.51	30.66	15.58	26.99
1976	18.90	29.27	13.18	24.61	19.83	31.45	22.66	31.09	16.76	27.76
1977	19.31	29.41	13.51	25.15	20.42	31.65	23.09	31.22	17.01	27.59
1978	19.25	29.23	13.50	24.36	20.41	31.57	23.09	31.11	16.79	27.64
1979	19.55	29.63	13.94	24.99	20.30	31.70	23.27	31.87	17.56	27.67

Table: 3.2.1 Annual and Seasonal Minimum and Maximum Temperature(°C) - India (1901-2014)										
Year	Annual		Jan-Feb		Mar-May		June-Sept		Oct-Dec	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1980	19.53	29.58	14.07	25.21	20.97	32.20	23.22	31.36	16.82	27.51
1981	19.25	29.32	13.94	24.90	20.67	31.64	23.14	31.34	16.17	27.24
1982	19.21	29.12	13.77	24.51	20.06	30.79	23.10	31.55	16.81	27.26
1983	19.14	29.11	13.57	24.62	20.10	30.84	23.41	31.48	16.20	27.23
1984	19.25	29.28	13.62	24.11	20.90	32.12	23.12	31.09	16.18	27.46
1985	19.30	29.61	13.93	25.29	20.94	32.51	22.98	31.28	16.33	27.35
1986	19.09	29.33	13.61	24.64	20.31	31.58	22.92	31.44	16.43	27.40
1987	19.42	29.72	13.81	25.07	20.32	31.37	23.53	32.24	16.80	27.82
1988	19.33	29.55	14.07	25.39	20.72	31.75	23.17	31.34	16.33	27.76
1989	18.96	29.18	13.02	24.51	20.18	31.35	22.93	31.11	16.41	27.57
1990	19.29	29.14	13.91	25.00	20.23	30.84	23.19	31.18	16.74	27.50
1991	19.29	29.32	13.73	24.74	20.63	31.46	23.29	31.45	16.34	27.40
1992	19.15	29.23	13.57	24.60	20.07	31.32	23.15	31.28	16.62	27.49
1993	19.34	29.55	13.91	25.31	20.41	31.61	23.25	31.47	16.69	27.74
1994	19.48	29.46	14.45	25.09	20.76	31.85	23.32	31.30	16.43	27.52
1995	20.39	30.18	14.99	25.68	21.47	32.40	24.16	32.01	17.84	28.52
1996	19.55	29.58	15.28	26.30	20.93	32.07	23.29	31.19	16.24	27.29
1997	19.21	29.05	13.13	24.63	20.14	31.26	23.45	31.77	17.21	26.65
1998	19.84	29.70	14.49	24.96	20.97	31.89	23.67	31.75	17.03	27.83
1999	19.53	29.81	14.43	25.16	20.85	32.45	23.24	31.55	16.65	27.95
2000	19.48	29.75	13.84	24.82	20.77	32.22	23.25	31.25	16.88	28.53
2001	19.49	29.99	13.60	25.88	21.04	32.61	23.36	31.62	16.95	28.13
2002	19.78	30.23	13.93	25.37	21.38	33.06	23.41	32.02	16.79	28.36
2003	19.70	29.75	14.32	25.32	21.00	32.05	23.56	31.72	16.76	27.70
2004	19.69	29.79	14.39	25.47	21.30	32.69	23.27	31.42	16.84	27.65
2005	19.58	29.60	14.63	24.96	20.85	31.81	23.46	31.84	16.43	27.50
2006	20.07	30.06	15.47	27.44	20.96	32.08	23.44	31.39	17.56	27.78
2007	19.69	29.84	14.47	25.73	21.06	32.32	23.59	31.40	16.62	28.03
2008	19.60	29.64	13.60	24.72	20.82	32.11	23.30	31.25	17.43	28.29
2009	19.94	30.30	14.95	26.51	21.15	32.57	23.59	32.24	17.20	27.96
2010	20.15	30.13	14.51	25.96	22.09	33.47	23.57	31.43	17.42	27.78
2011	19.58	29.82	13.84	25.33	20.68	32.07	23.56	31.55	17.16	28.23
2012	19.54	29.81	13.68	25.03	20.78	32.33	23.68	31.77	16.80	27.88
2013	19.83	29.81	14.38	25.58	21.14	32.58	23.61	31.33	16.82	27.83
2014	19.77	29.72	14.26	24.90	20.66	31.82	23.80	32.00	17.20	27.81
Source: Ministry of Earth Science (data.gov.in)										

Table 3.2.2: Annual and Seasonal Mean Temperature (°C) - India(1901-2014)					
Year	Annual	Jan-Feb	Mar-May	June-Sept	Oct-Dec
1901	24.23	18.71	26.06	27.30	21.92
1902	24.33	19.70	26.44	27.18	21.49
1903	23.80	19.05	25.47	27.17	21.27
1904	23.86	18.66	25.84	26.83	21.42
1905	23.71	17.58	24.99	27.37	21.48
1906	24.12	18.37	25.93	27.15	22.08
1907	23.87	19.35	24.89	26.89	21.76
1908	23.95	19.04	26.02	26.95	21.17
1909	23.78	18.42	25.71	26.53	21.75
1910	23.77	18.93	25.74	26.81	20.96
1911	23.96	18.85	25.53	27.18	21.48
1912	24.11	19.72	25.81	27.13	21.29
1913	23.88	19.09	25.56	26.93	21.32
1914	24.03	19.31	25.53	27.15	21.52
1915	24.29	18.47	26.03	27.60	22.01
1916	24.08	19.10	26.41	26.92	21.27
1917	23.56	19.05	24.89	26.75	21.01
1918	23.83	18.40	25.39	27.07	21.54
1919	24.01	18.96	25.85	27.06	21.48
1920	23.91	18.72	25.27	27.05	21.85
1921	24.33	19.06	26.60	26.99	21.39
1922	24.05	19.40	25.88	27.07	21.20
1923	24.05	18.80	26.12	27.11	21.40
1924	24.15	19.02	26.14	27.18	21.52
1925	23.95	18.31	26.18	26.92	21.51
1926	24.04	19.68	25.28	27.41	21.26
1927	23.94	18.77	25.51	26.98	21.76
1928	24.29	19.39	26.19	27.18	21.81
1929	24.08	18.62	26.36	27.10	21.42
1930	23.93	18.23	25.81	27.04	21.71
1931	24.44	19.54	26.36	27.29	21.97
1932	24.21	19.12	25.91	27.32	21.75
1933	23.92	19.10	25.34	26.87	21.77
1934	24.13	19.15	25.89	27.29	21.55
1935	23.98	18.62	25.77	26.96	21.65
1936	24.12	19.03	26.02	26.94	21.86
1937	23.98	19.11	25.61	27.32	21.14
1938	23.98	18.46	26.50	26.86	21.31
1939	24.01	19.10	25.41	27.16	21.67

Table 3.2.2: Annual and Seasonal Mean Temperature (°C) - India(1901-2014)

Year	Annual	Jan-Feb	Mar-May	June-Sept	Oct-Dec
1940	24.06	19.03	25.49	27.08	21.91
1941	24.65	19.31	26.87	27.45	22.30
1942	24.22	19.07	26.49	27.18	21.72
1943	23.93	18.89	25.57	26.97	21.68
1944	24.03	18.54	25.70	27.27	21.76
1945	23.92	18.35	25.71	27.43	21.16
1946	24.42	19.52	26.12	27.24	22.13
1947	24.04	18.78	26.42	27.32	21.39
1948	24.11	18.83	26.04	27.08	21.73
1949	24.08	19.18	26.14	27.08	21.29
1950	23.71	18.71	25.50	26.87	21.14
1951	24.22	18.68	25.47	27.19	22.45
1952	24.34	19.86	26.04	27.25	21.77
1953	24.57	19.47	26.87	27.33	22.01
1954	24.13	19.11	26.50	27.09	21.15
1955	23.97	19.46	25.58	26.98	21.35
1956	23.96	18.83	26.31	26.66	21.41
1957	23.97	18.73	25.25	27.15	21.94
1958	24.62	20.01	26.45	27.43	22.13
1959	24.30	18.93	26.31	27.19	22.00
1960	24.29	19.72	25.70	27.34	21.84
1961	24.00	18.98	26.11	27.06	21.17
1962	24.04	18.91	25.91	27.14	21.47
1963	24.15	19.07	25.57	27.21	22.04
1964	24.10	18.83	26.38	26.90	21.58
1965	24.07	19.22	25.24	27.08	22.10
1966	24.36	19.93	26.07	27.17	21.83
1967	24.11	19.44	25.55	27.19	21.68
1968	23.94	18.25	25.62	27.22	21.69
1969	24.46	19.18	26.39	27.35	22.20
1970	24.26	19.56	26.39	27.06	21.55
1971	23.91	19.05	25.78	26.75	21.48
1972	24.10	18.57	25.78	27.27	21.88
1973	24.41	19.74	26.53	27.30	21.53
1974	24.00	18.54	26.24	27.02	21.38
1975	23.74	18.69	25.77	26.57	21.30
1976	24.07	18.87	25.61	26.87	22.25
1977	24.35	19.35	26.03	27.13	22.30
1978	24.24	18.95	25.94	27.12	22.22
1979	24.57	19.47	25.97	27.54	22.59

Table 3.2.2: Annual and Seasonal Mean Temperature (°C) - India(1901-2014)

Year	Annual	Jan-Feb	Mar-May	June-Sept	Oct-Dec
1980	24.55	19.64	26.58	27.26	22.17
1981	24.27	19.42	26.14	27.22	21.68
1982	24.15	19.14	25.41	27.31	22.02
1983	24.12	19.09	25.45	27.43	21.71
1984	24.26	18.85	26.51	27.10	21.82
1985	24.45	19.61	26.72	27.12	21.84
1986	24.20	19.12	25.94	27.17	21.90
1987	24.57	19.42	25.85	27.88	22.29
1988	24.42	19.70	26.24	27.22	22.00
1989	24.03	18.76	25.69	26.98	21.94
1990	24.21	19.44	25.55	27.18	22.11
1991	24.28	19.21	26.02	27.32	21.87
1992	24.15	19.06	25.64	27.15	22.04
1993	24.43	19.61	25.98	27.34	22.21
1994	24.46	19.76	26.30	27.30	21.97
1995	25.29	20.33	26.94	28.07	23.19
1996	24.55	20.79	26.49	27.22	21.76
1997	24.10	18.87	25.69	27.60	21.89
1998	24.76	19.72	26.41	27.69	22.42
1999	24.67	19.75	26.66	27.38	22.29
2000	24.60	19.33	26.47	27.23	22.68
2001	24.73	19.75	26.82	27.47	22.52
2002	25.00	19.65	27.22	27.71	22.58
2003	24.72	19.82	26.52	27.64	22.23
2004	24.74	19.93	27.06	27.33	22.24
2005	24.58	19.79	26.33	27.64	21.93
2006	25.06	21.33	26.52	27.40	22.66
2007	24.77	20.10	26.69	27.49	22.32
2008	24.61	19.16	26.46	27.26	22.87
2009	25.11	20.72	26.86	27.89	22.58
2010	25.13	20.19	27.83	27.50	22.60
2011	24.67	19.54	26.38	27.54	22.71
2012	24.69	19.34	26.55	27.71	22.35
2013	24.82	19.98	26.85	27.46	22.50
2014	24.73	19.58	26.24	27.88	22.47

Source: Ministry of Earth Science (data.gov.in)

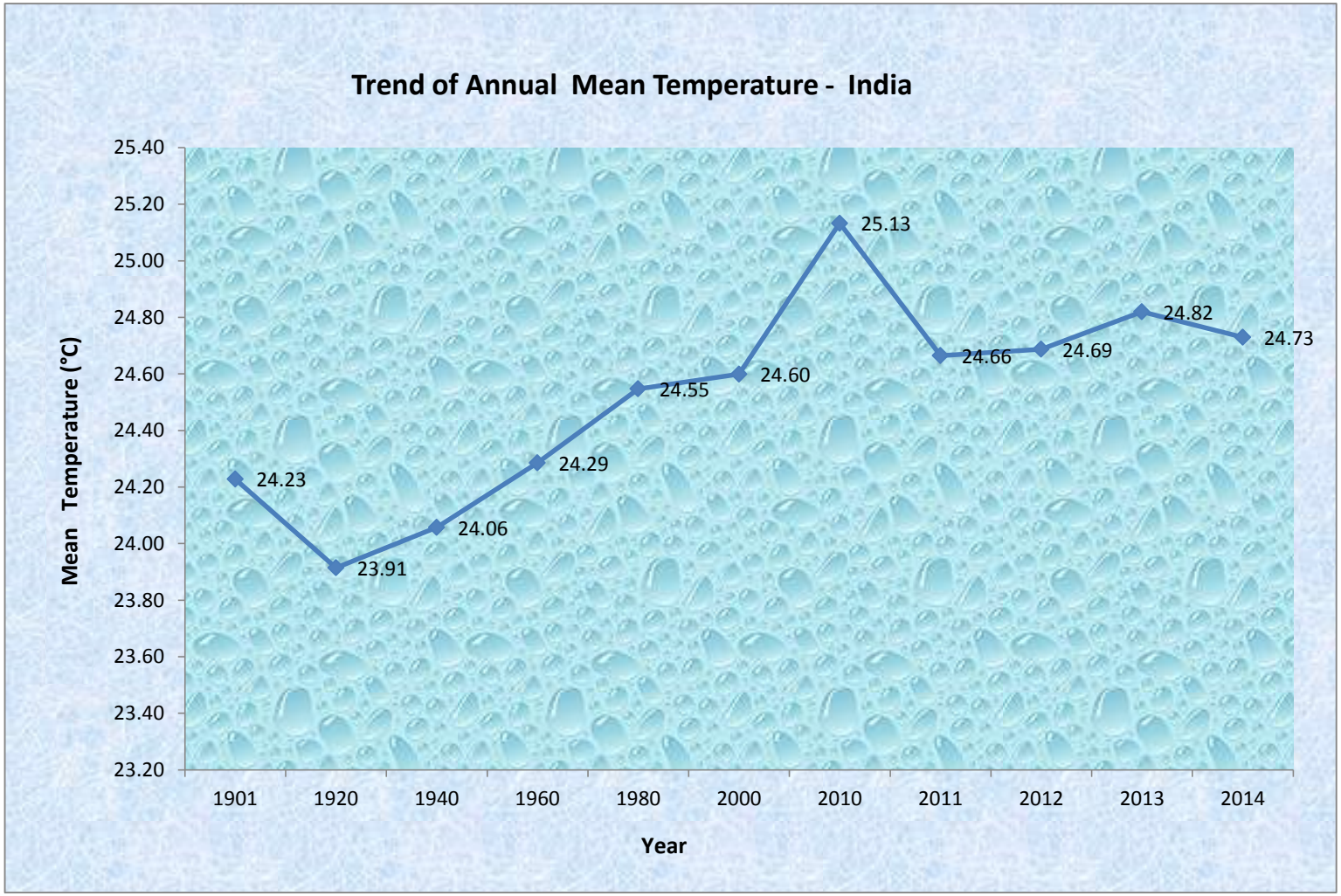

Trend of Annual Mean Temperature - India
Mean Temperature (°C)
25.40
25.20
25.00
24.80
24.60
24.40
24.20
24.00
23.80
23.60
23.40
23.20
24.23
23.91
24.06
24.29
24.55
24.60
25.13
24.66
24.69
24.82
24.73
1901
1920
1940
1960
1980
2000
2010
2011
2012
2013
2014
Year

Table 3.2.3 All India Area Weighted Monthly and Annual Rainfall (in mm) - India (1901-2014)													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
1901	34.7	38.6	17.8	38.9	50.6	113.2	241.4	271.6	124.7	52.4	38.7	8.2	1030.8
1902	7.4	4.2	19.0	44.1	48.8	111.7	284.9	201.0	200.2	62.5	29.4	25.2	1038.4
1903	16.7	8.0	31.1	17.1	59.5	120.3	293.2	274.0	198.1	119.5	40.3	18.0	1195.9
1904	14.9	9.7	31.4	33.7	73.8	165.5	260.3	207.7	130.8	69.8	11.2	16.4	1025.1
1905	24.7	20.3	41.8	33.8	55.8	93.7	253.0	201.7	178.1	54.9	9.6	10.1	977.5
1906	21.4	49.9	31.4	15.8	37.2	177.0	286.5	251.4	183.9	50.6	17.7	26.3	1149.2
1907	16.0	45.5	37.4	62.0	32.7	153.1	225.4	308.3	95.4	23.0	23.1	12.9	1034.8
1908	19.9	17.1	8.3	31.0	45.4	125.6	320.5	306.0	150.8	38.4	6.8	7.4	1077.4
1909	22.7	15.2	6.6	61.6	51.2	207.2	302.3	228.7	157.7	37.5	10.0	27.9	1128.5
1910	13.5	10.3	13.7	29.0	40.8	211.9	247.2	283.4	185.9	108.2	34.6	5.4	1183.9
1911	40.4	5.5	43.0	23.1	48.2	191.3	163.1	209.9	178.5	71.5	42.4	12.1	1028.9
1912	20.3	21.6	19.9	37.9	43.8	107.1	326.3	259.2	119.2	58.2	51.7	5.3	1070.4
1913	6.3	38.1	23.7	25.7	72.9	214.8	269.8	192.6	109.6	68.6	16.8	23.2	1061.8
1914	5.0	26.9	25.4	42.8	67.9	157.0	342.0	239.7	191.3	45.5	20.7	21.6	1185.9
1915	19.8	37.5	44.1	33.6	63.9	155.1	227.9	226.9	171.7	90.5	45.2	8.2	1124.4
1916	4.6	20.1	11.0	35.2	59.4	232.0	265.0	309.7	199.6	139.2	46.3	2.9	1324.8
1917	7.6	37.9	20.5	40.1	74.0	230.7	282.7	292.8	278.1	161.3	29.1	9.3	1463.9
1918	11.8	4.0	36.6	35.8	103.6	212.3	183.8	240.9	111.8	19.5	44.7	15.5	1020.2
1919	48.8	20.2	19.1	32.7	59.5	194.7	304.6	285.3	163.1	91.5	50.1	18.2	1287.9
1920	23.9	21.3	55.1	38.2	52.5	163.7	295.7	191.6	123.0	45.9	25.2	3.0	1039.1
1921	37.6	7.4	17.8	43.9	51.2	193.9	293.7	274.4	203.3	70.5	16.1	15.3	1225.0
1922	28.9	9.8	14.3	33.0	48.8	204.9	314.9	218.9	199.8	62.0	55.6	13.3	1204.2
1923	21.6	38.9	21.2	31.0	58.1	102.0	337.8	272.8	173.8	58.0	17.6	15.8	1148.6
1924	21.1	21.9	14.0	30.7	61.4	136.8	328.7	255.4	238.4	65.8	57.1	14.6	1245.9
1925	13.0	11.2	15.3	44.1	100.8	204.7	300.9	234.5	140.2	67.2	41.5	16.1	1189.5
1926	28.3	10.3	55.7	39.4	57.8	98.7	316.9	330.5	210.1	57.3	10.9	10.3	1226.2
1927	13.1	34.7	22.4	36.3	50.4	177.7	346.6	253.2	173.6	69.3	57.2	10.1	1244.6
1928	20.9	40.3	21.1	34.6	54.4	178.9	303.5	229.0	144.0	127.7	21.6	24.4	1200.2
1929	29.6	18.6	14.4	54.6	65.9	194.1	296.7	241.0	125.5	92.9	19.6	40.1	1193.2
1930	23.5	23.2	28.9	51.0	55.9	181.5	288.6	212.0	174.1	96.7	53.0	10.3	1198.5
1931	12.4	32.9	19.0	37.3	59.4	134.5	319.6	303.9	191.1	120.5	41.4	21.0	1292.8
1932	9.2	22.9	20.1	31.0	85.7	141.7	328.3	237.9	181.9	69.4	60.3	14.4	1202.9
1933	16.5	29.6	25.1	48.1	102.4	215.1	279.7	313.4	211.6	93.6	20.5	16.5	1372.0
1934	23.3	11.5	16.1	46.8	47.3	217.7	284.8	294.4	166.8	65.8	32.4	10.5	1217.5
1935	26.9	20.7	19.0	41.5	36.8	159.4	313.5	246.9	185.3	49.9	16.7	11.2	1127.9
1936	12.3	41.8	37.8	33.5	82.7	245.8	292.5	236.7	193.9	66.4	57.2	21.2	1321.8
1937	6.3	50.6	19.0	56.3	58.0	162.2	336.2	208.2	174.0	94.6	20.3	18.9	1204.4
1938	29.9	30.7	33.4	34.2	70.9	273.4	300.2	249.7	171.6	75.4	16.2	5.0	1290.5
1939	13.3	32.1	30.6	40.7	40.6	172.9	272.4	231.5	154.9	91.2	29.6	1.7	1111.6

Table 3.2.3 All India Area Weighted Monthly and Annual Rainfall (in mm) - India (1901-2014)													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1940	13.0	25.8	47.7	26.9	80.8	173.8	308.4	278.1	125.5	63.0	40.9	17.4	1201.3
1941	22.9	16.4	20.4	31.5	81.0	171.8	238.7	228.4	154.0	62.1	26.5	20.3	1073.9
1942	21.4	46.0	20.6	44.7	63.7	191.5	339.6	287.0	182.5	34.5	17.7	23.5	1272.9
1943	56.8	9.8	32.5	47.9	94.3	167.8	308.9	228.4	211.4	89.0	17.1	5.2	1269.2
1944	27.6	37.8	54.9	31.9	61.0	155.6	349.1	287.0	156.2	92.3	29.4	15.6	1298.5
1945	34.2	10.2	20.1	47.1	53.6	159.1	333.3	246.7	214.5	80.6	17.9	4.9	1222.0
1946	4.4	19.1	24.5	48.0	71.3	214.0	318.3	296.3	145.0	84.4	76.0	35.8	1337.2
1947	22.4	18.3	26.0	39.1	55.9	130.1	314.4	290.4	240.0	69.8	7.2	22.6	1236.3
1948	25.2	29.0	39.5	42.5	91.3	164.1	347.7	282.7	178.0	61.2	71.1	10.0	1342.2
1949	12.6	28.8	24.1	53.0	89.3	164.3	316.8	243.2	227.0	95.1	10.6	4.7	1269.6
1950	35.4	25.4	36.7	28.7	49.4	135.7	331.6	235.6	202.6	57.7	27.5	7.9	1174.2
1951	15.7	12.1	44.4	54.4	59.4	163.3	252.7	222.8	124.6	73.9	31.3	5.8	1060.6
1952	10.5	19.8	37.4	32.4	69.7	165.6	286.6	256.6	120.0	79.6	9.2	22.5	1110.1
1953	30.2	10.6	25.3	38.3	47.1	162.2	323.1	299.2	179.9	85.8	12.3	8.0	1222.1
1954	37.6	37.2	17.1	22.8	53.9	145.5	297.2	232.0	246.7	73.8	3.6	13.9	1181.4
1955	20.8	4.1	21.3	30.6	72.6	177.7	236.8	313.8	215.7	146.3	26.4	9.3	1275.4
1956	17.0	11.1	31.5	28.1	85.5	211.0	354.1	254.3	163.9	150.1	44.0	11.9	1362.6
1957	31.1	10.9	24.2	39.5	71.2	153.2	300.8	265.4	131.7	64.0	28.6	11.3	1131.9
1958	12.4	16.5	19.1	36.9	80.5	123.7	316.9	324.9	225.7	114.7	30.0	10.9	1312.3
1959	31.8	23.8	21.3	25.9	75.3	169.8	375.5	265.1	237.3	119.7	26.0	5.3	1376.9
1960	13.8	2.7	35.2	20.0	57.7	157.3	320.0	252.9	184.7	68.5	33.7	8.3	1154.8
1961	26.1	34.8	26.0	28.5	77.6	192.9	336.6	287.6	234.9	122.2	21.7	10.4	1399.2
1962	12.6	21.6	16.0	43.6	70.8	137.1	281.6	276.9	211.0	78.4	18.3	29.9	1198.0
1963	6.8	9.8	41.7	50.6	60.9	168.0	258.6	316.7	164.9	99.1	28.4	15.5	1220.9
1964	18.6	14.1	19.0	40.0	52.1	177.2	345.7	273.7	200.4	67.4	22.8	13.3	1244.4
1965	11.8	28.1	26.7	45.1	52.7	116.1	270.1	192.8	129.5	34.0	18.2	22.2	947.4
1966	13.1	25.4	20.3	30.6	57.2	178.8	252.5	212.5	143.9	56.1	51.0	16.7	1058.0
1967	11.1	14.2	63.3	29.5	42.8	144.0	305.6	264.3	170.3	40.6	12.1	56.1	1154.0
1968	29.4	19.8	27.5	32.6	46.7	149.6	309.9	212.8	129.5	67.1	21.8	12.6	1059.3
1969	12.7	14.5	20.1	39.7	63.4	130.2	317.8	273.4	172.7	55.0	35.8	12.7	1147.8
1970	23.2	27.3	25.9	29.2	69.7	215.9	245.6	313.0	212.7	75.3	15.7	1.6	1255.0
1971	16.1	23.6	10.8	52.8	75.0	229.9	267.2	267.3	146.5	99.9	15.9	12.0	1216.9
1972	10.3	27.6	21.6	37.1	55.3	123.3	204.0	219.5	127.5	65.7	31.4	23.7	947.1
1973	21.0	21.8	21.2	27.5	56.5	149.9	277.4	311.0	182.1	114.6	18.9	17.7	1219.5
1974	16.1	12.9	20.5	33.7	64.2	122.0	283.6	232.5	145.3	101.6	10.7	12.1	1055.3
1975	15.4	20.8	28.7	28.3	50.2	175.6	310.7	292.5	224.6	121.9	22.8	3.3	1294.8
1976	11.5	24.5	25.5	36.3	45.4	160.3	294.1	294.0	144.2	33.0	55.0	7.6	1131.6
1977	21.0	10.2	14.6	68.3	84.4	187.2	323.4	245.4	147.8	85.6	65.8	16.1	1269.7
1978	12.3	27.0	44.2	33.1	60.2	208.8	290.0	282.0	161.9	49.1	49.9	18.8	1237.2
1979	20.9	35.0	28.9	21.2	54.2	140.5	239.6	210.6	136.8	51.8	76.1	14.4	1030.2

Table 3.2.3 All India Area Weighted Monthly and Annual Rainfall (in mm) - India (1901-2014)													
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
1980	12.8	22.3	32.5	34.6	55.3	227.8	295.0	263.8	145.7	49.3	24.2	19.0	1182.3
1981	29.3	20.4	48.0	37.3	67.1	151.3	309.1	237.0	184.5	45.1	27.4	14.0	1170.7
1982	23.8	24.2	45.7	49.8	59.0	137.8	230.8	276.9	124.9	51.7	46.0	13.9	1084.4
1983	18.5	23.3	43.4	57.0	70.1	150.8	282.2	304.3	251.6	85.9	10.8	22.9	1320.9
1984	19.0	35.9	22.8	45.3	60.4	192.3	291.9	256.5	144.6	61.0	15.7	15.3	1160.8
1985	23.2	9.9	20.1	39.5	63.0	156.5	290.1	231.7	149.6	114.1	18.8	28.4	1144.9
1986	15.5	36.6	29.9	50.0	49.4	182.6	264.2	228.3	128.4	74.7	49.6	28.4	1137.6
1987	13.2	23.8	28.8	43.9	67.0	133.9	223.2	242.1	152.2	94.4	44.4	21.9	1088.9
1988	10.4	28.7	53.7	41.7	70.4	161.8	374.8	295.3	217.7	53.6	16.2	17.8	1342.1
1989	15.4	15.3	28.8	34.6	57.5	184.7	302.3	236.2	163.1	51.9	20.3	17.2	1127.4
1990	16.0	44.2	54.0	43.8	112.9	191.3	282.9	293.6	197.4	104.1	30.2	31.0	1401.4
1991	14.3	28.1	27.8	51.7	68.9	184.7	279.2	268.1	140.7	61.8	30.2	14.7	1170.2
1992	16.0	16.5	24.8	26.1	59.3	139.7	262.5	274.0	171.7	64.7	41.6	5.6	1102.7
1993	18.2	25.6	41.6	27.0	71.3	172.1	305.4	203.2	208.5	87.9	30.5	16.5	1207.8
1994	25.0	27.9	25.2	45.9	53.1	205.7	350.0	282.2	149.4	82.8	25.5	22.6	1295.3
1995	31.3	29.4	28.3	32.4	82.4	143.3	323.4	269.0	179.0	78.0	36.8	9.2	1242.4
1996	22.9	23.2	32.1	31.4	56.0	185.7	262.1	292.4	146.1	100.5	13.6	16.9	1182.9
1997	14.3	10.4	30.3	46.0	48.6	171.7	281.5	261.9	151.4	61.1	57.6	48.3	1183.1
1998	16.4	28.2	39.1	36.3	49.2	163.9	278.4	243.8	196.5	107.4	39.3	10.3	1208.8
1999	13.7	11.2	8.8	19.3	94.9	169.9	261.7	213.2	183.0	117.2	20.0	3.7	1116.6
2000	18.4	28.2	17.9	34.7	71.6	179.0	263.5	221.1	134.5	41.9	14.6	10.0	1035.4
2001	6.7	11.6	19.9	44.6	62.9	221.2	281.1	205.5	111.0	100.4	19.7	16.1	1100.7
2002	17.1	20.1	23.8	38.6	59.8	172.6	143.8	246.1	137.9	55.6	15.6	5.0	935.9
2003	7.3	42.3	36.7	36.6	40.1	169.3	306.5	243.6	183.4	92.7	11.5	17.2	1187.3
2004	25.1	10.0	12.8	55.2	80.6	171.1	250.5	254.0	131.5	95.0	17.9	2.8	1106.5
2005	28.1	41.8	42.5	37.7	46.1	143.2	334.1	190.1	206.9	99.3	27.2	11.2	1208.3
2006	17.7	11.9	35.6	32.7	75.0	141.8	287.6	281.3	178.6	51.8	34.6	13.1	1161.6
2007	1.7	36.7	35.2	30.6	46.8	192.5	286.2	257.4	206.8	55.7	14.4	15.3	1179.3
2008	18.4	19.3	41.2	29.5	43.7	202.0	245.0	265.8	165.1	51.6	25.5	11.0	1118.0
2009	12.0	12.0	14.2	25.1	56.0	85.7	280.7	192.5	139.4	71.4	53.7	11.1	953.7
2010	7.5	17.0	14.0	39.0	73.8	138.1	300.7	274.7	197.7	69.0	61.4	22.7	1215.5
2011	6.8	25.8	22.4	41.1	53.1	183.5	246.0	284.9	186.9	38.1	20.1	7.6	1116.3
2012	26.5	12.7	11.3	47.5	31.7	117.8	250.2	262.4	193.5	58.7	30.7	11.7	1054.7
2013	11.3	40.1	15.7	30.3	57.8	219.8	310.1	254.9	152.6	129.3	14.0	6.7	1242.6
2014	19.3	27.4	36.1	22.1	72.9	95.2	261.1	237.4	187.9	60.1	14.4	10.7	1044.6

Source: Ministry of Earth Science (data.gov.in)

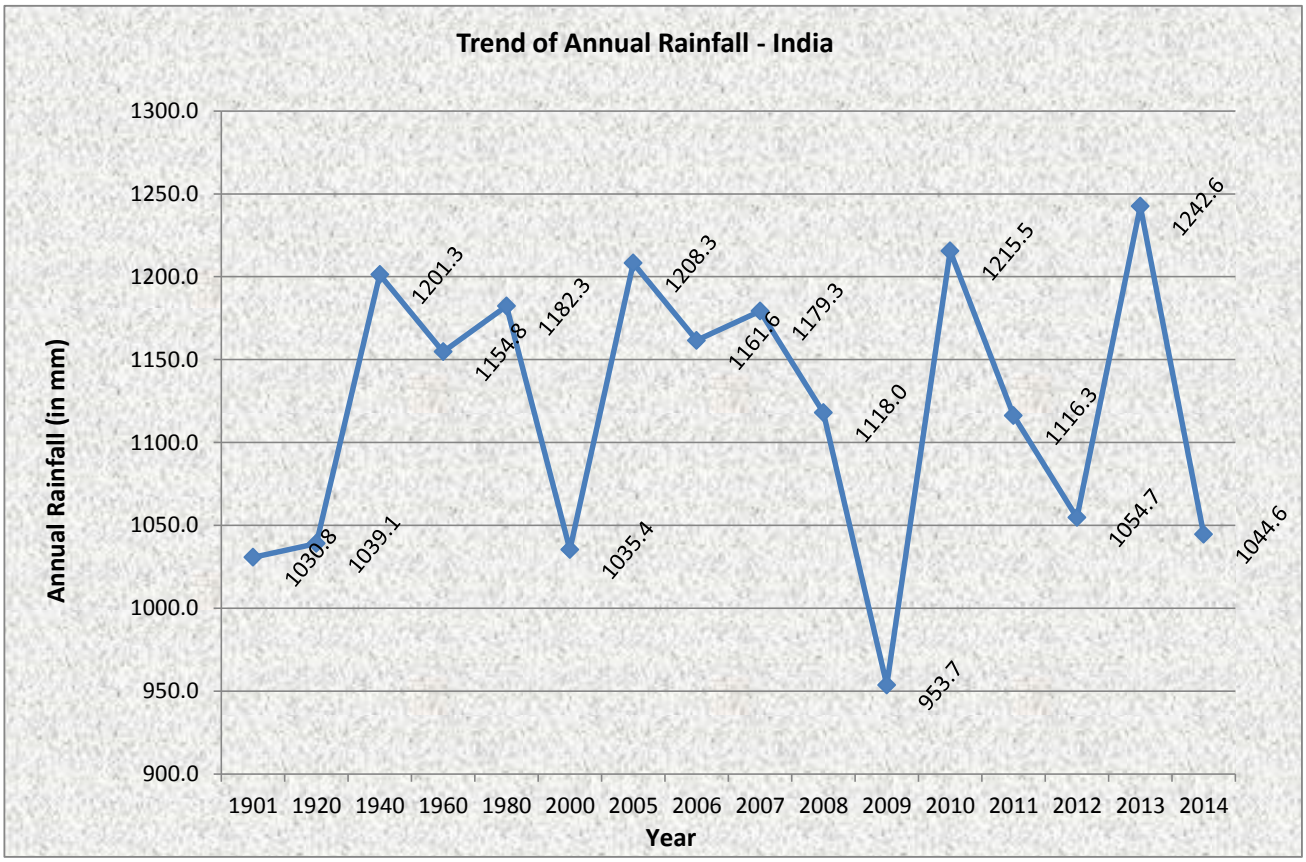

Trend of Annual Rainfall - India
Annual Rainfall (in mm)
1300.0
1250.0
1200.0
1150.0
1100.0
1050.0
1000.0
950.0
900.0
1030.8
1039.1
1201.3
1154.8
1182.3
1035.4
1208.3
1161.6
1179.3
1118.0
953.7
1215.5
1116.3
1054.7
1242.6
1044.6
1901 1920 1940 1960 1980 2000 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Year

Table 3.2.4 : Season-wise distribution of rainfall in India

(In Millimeters)

Year	Monsoon Season (June- September)		Post Monsoon (October- December)		Winter season (January -February)		Pre-monsoon Season (March-May)		Overall rainfall (June-May)	
	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal
1992-93	830.7	899.2	106.5	114.1	37.9	41	116.5	121.3	1091.6	1175.6
1993-94	902.1	908.9	131.6	119.6	44.5	40.8	106.1	123.3	1184.3	1192.6
1994-95	999.2	906.8	121.5	119.6	53.1	41.1	123.5	123.2	1297.3	1190.7
1995-96	904.5	904.7	117.8	119.9	37.4	40.8	94.9	123.9	1154.6	1189.3
1996-97	927.6	905.7	128	120.8	21	40.6	118.9	123.2	1195.5	1190.3
1997-98	927.4	908.6	187.7	119.5	44.1	41.9	132.3	128.3	1291.5	1198.3
1998-99	945.2	903.6	178.8	121.8	28.4	42.8	123.1	130.6	1275.5	1198.8
1999-00	866.9	903.2	144.7	121.8	43.1	42.5	128.8	129.5	1183.5	1197
2000-01	833.7	902.3	64.1	121.7	16.2	42.2	129.7	129.3	1043.7	1195.5
2001-02	826	901.1	137.7	121.7	35	41.2	121.5	132	1120.2	1196
2002-03	737.1	911.7	83.4	123.7	53.2	38.3	107.7	131.7	981.4	1205.4
2003-04	947.3	902.7	134.6	125	34.5	39.2	161.6	129.6	1278	1196.5
2004-05	779.6	893.3	111.8	125.7	69.8	43.8	124.7	134.5	1085.9	1197.3
2005-06	879.3	892.5	138.4	125.8	27.8	43.9	139.9	134.6	1185.4	1196.8
2006-07	886.6	892.2	99.3	125.9	34.3	43.8	112.8	133.6	1133	1195.5
2007-08	936.9	892.2	85.4	125.9	42.6	43.2	115.3	133.5	1180.2	1194.8
2008-09	873.2	892.2	87.2	125.9	23.6	43.8	91	134.5	1075	1196.4
2009-10	689.8	892.2	135.5	125.9	24.6	43.8	122.9	133.7	972.8	1195.6

Source: ENVS; Indian Institute of Tropical Meteorology, Pune, India.

3.3 Glaciers and Landslides.

A glacier is a mass of ice consisting of compacted and recrystallized ice on land that flows down under its own weight due to gravity. Glaciers are lying largely or wholly on land and showing evidence of past or present movement. Snowfields that persist through the summer melt season are not glaciers because they lack motion. Presently, glaciers cover nearly 15 million km^2 or about 10 % of land surface and contain 2.15 % of all water on Earth. 96 % of all glacial ice on this planet is in Antarctica (84.5%) and Greenland (12%), both of which are nearly covered by glaciers. Australia is the only continent lacking glaciers. Glaciers are one of the most important processes modifying Earth's surface through erosion, transport and deposition. These processes result in carving out the earth's surface and formation of easily recognizable landforms, both erosional and depositional. Majority of the present day glacial landforms are developed during the Pleistocene epoch, commonly called as Ice Age (1.6 million to 10,000 years ago). Erosion of mountains by valley glaciers produces U-shaped glacial troughs and hanging valleys. Sharp angular landforms including cirques, aretes and horns, etc. are also products of glaciers. When a large valley glacier directly calves in to a sea, it is known as fjiord.

Geological Survey of India has prepared a detailed inventory of glaciers based on Survey of India toposheets, aerial photographs and satellite imageries with limited field checks. As per the latest available data, Indian Himalaya contains 9,575 glaciers distributed in the States of Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh. Highest concentration of glaciers is in Jammu & Kashmir while least concentration is in Arunachal Pradesh.

Glaciers are one of the most important sources of fresh water. The ice locked up in the glacier melts during summer ablation season and augment water in the rivers. In winters, glaciers melt only due to pressure melting and base flow is maintained. In India, perennial Himalayan rivers owe their existence to the glaciers. Another important economic aspect of glaciers is the huge volume of sand and gravel generated due to glacial erosion and transportation. These sediments are used as building material. The wide distribution in space and time make glaciers as one of the most important proxy record for the study of climate change.

The retreat of glaciers suggests climate change. Moreover, as glaciers are directly linked to climate, their deposits and landforms provide evidence for interpretation of climatic changes that have taken place during the past. The studies carried out by the Geological Survey of India since the beginning of twentieth century, have revealed that majority of glaciers of the Himalayan region are passing through a phase of recession as has been the case with the glaciers located in other parts of the world. The retreat of the glaciers is continuing but there has not been any alarming change in the rate of retreat of the glaciers during couple of decades. Few long-term data, however, do suggest higher rate of recession after 1950 or so. Even in the Himalayan region, the rate of recession in different climatic zones is found to be variable in different years.

This variable rate of recession can be attributed to several factors like micro as well as macroclimate, orography, size of the glacier, nature of nourishment, etc. The recession of glaciers could be attributed to the phenomenon of global warming. The recession may result due to subnormal snowfall, higher temperature during summer, less severe winter or a combination of all of them. Thus, overall climate change may be considered as the driving force behind the recession of glaciers.

During the last ten years GSI has monitored twenty five glaciers, viz. Hamtah, Jobri, Beas Kund, Gl. No. 30, Sara Umga, Mantalai (Gl. No. 115), Tal, Manimahesh, Yoche Lungpa, Mulkila, Panchi nala – I, Panchi nala –II, Gangstang, Tingal Goh in Himachal Pradesh and Bandarpunch, Jaundar Bamak, Jhajju Bamak, Tilku, Meola, Jhulang, Chipa, Pindari, Bhagirathi Kharak, Adikailash, Nikarchu and Ramganga in Uttarakhand.

GSI has undertaken a few pilot studies on artificial retardation and augmentation of glacier melt. The studies do indicate that the recession of glaciers can be checked to a very limited extent (site

specific only) through artificial measures. However, such projects cannot be undertaken on large scale in view of the nature of Indian Himalayan glaciers (debris covered), economic feasibility, scale of operation and likely pollution. Since the recession of glaciers is a natural process and we cannot single out any one meteorological parameter responsible for the present situation, the possible mitigation strategy should include (a) monitoring of the glaciers, (b) expansion and diversification of the meteorological observation network, (c) construction of dams in the Himalayan region for better utilisation of the water resources, (e) reduction in deforestation activities, new afforestation programmes and preservation of ecology, particularly in high altitude regions.

The framework for statistics related to climate change included variables/indicators on (1) Glacier Advancement/ Retraction and (2) Landslide hazards.

The following are the tables included

3**.3 Glacier/ Landslide**

3.3.1 Distribution of glaciers in Indus and Ganga Basin
3.3.2 Net Mass Balance, in millions of cubic meters of water equivalent recorded for some of the glaciers in the Himalayas
3.3.3 Average melt water discharge, in million cubic meters, per day, recorded at some of the glaciers during the melt season
3.3.4 Suspended sediment load, in metric tonnes, (daily average) carried in the melt water streams of small glaciers in the Himalayas, during the melt season
3.3.5 General features of Chhota Shigri, Dokriani and Chorabari glaciers
3.3.6 Annual retreat/advance, in metres, recorded at the snouts of the Chhota Shigri, Dokriani and Chorabari glaciers.
3.3.7 Mass balance and melt water discharge data of Chhota Shigri and Dokriani glaciers
3.3.8 Glacier terminus position changes in Sikkim (1976-2005)
3.3.9 Retreat of some glaciers in the NWH in the last century

Data Sources

MOEF Discussion Paper: "Himalayan Glaciers: A State of- Art Review of Glacial Studies, Glacial Retreat and Climate Change". Data in the paper mainly compiled from Geological Survey of India. The report is available in MOEF website.

Table 3.3.1: Distribution of glaciers in Indus and Ganga Basin							
5-Q-Indus Basin				**5-O-Ganga Basin**			
Basin	**No. of glacier**	**Glacier covered Area (km^2)**	**Ice volume (km^3)**	**Basin**	**No. of glacier**	**Glacier covered Area (km^2)**	**Ice volume (km^3)**
Ravi	172	193		Yamuna	52	144	12.2
Chenab	1,278	3,059	8.04	Bhagirathi	238	755	67.02
Jhelum	133	94	206.3	Alaknanda	407	1,229	86.38
Beas	277	579		Ghagra	271	729	43.77
Satluj	926	635	3.3	Tista	449	706	39.61
Upper Indus	1,796	8,370	36.93	Brahamputra	161	223	10
Shyok	2,454	10,810					
Nubra	204	4,288	34.95				
Giligit	535	8,240					
Kishenganga	222	163	73.58				
Total	**7997**	**36431**			**1578**	**3786**	**259**
Total number of glaciers:9,575							
Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF							

Table 3.3.2: Net Mass Balance, in millions of cubic metres of water equivalent recorded for some of the glaciers in the Himalayas

Name	74-75	75-76	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91
Nehnar	...	0.41	0.78	1.47	0.91	0.56	0.81	0.3	0.02	0.79							
Gara	(+)2.50	(+)1.30	4.33	4.63	3.45	3.57	1.03	(+)0.33		..							
Gorgarang	...	...	1.36	1.22	0.5	0.99	1.97	(+)0.53	(+) 0.10	1.53	0.85						
Shaune Garang								1.19	(+)0.11	3.94	3.15	1.05	3.93	3.1	(+)1.68	1.35	4.1
Dunagiri								...	...	...	1.98	2.41	2.65	3.3	2.5	3.1	
Tipra Bank								2.39	1.06	1.63	1.9	4.24	..	..	0.98		
Changme Khangpu						1.7	1.77	1.33	1.31								

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

(+): Values indicate a positive balance, and other indicate negative balance

Table 3.3.3: Average melt water discharge, in million cubic metres, per day, recorded at some of the glaciers during the melt season																	
Name	**74**	**75**	**76**	**77**	**78**	**79**	**80**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**92**
Nehnar, J&K 5Q21407 022					0.08	0.07	0.06	0.09	0.13	0.15							
Gara, H.P. 5Q22204 050	0.09	0.16	0.08	0.04	0.11	0.04	0.09	0.1									
Shaunegarang H.P. 5Q22213 084									0.51	0.27	0.33	0.39	0.45	0.46	0.43		
Dunagri Uttarakhand 5O13209 044											0.15	0.22	0.22		0.16	0.2	0.22
Tiprabank Uttarakhand 5O132 06 092								0.5	0.71	0.6	0.59				0.98		
Zemu, Sikkim 5O201 05 032			24	24													
Changme Khangpu, Sikkim 5O20104 022							0.4										
Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF																	

Table 3.3.4: Suspended sediment load, in metric tonnes, (daily average) carried in the melt water streams of small glaciers in the Himalayas, during the melt season.

Glacier with code number	Orientation	Area (km^2)	Cumulative specific bal.(m)	Summer mean daily discharge (10^6 m3	Av. Daily suspended sediment (Tonnes)	Year of observation
Neh Nar, 5Q21407 022 J&K	N	1.69	(-)	0.1	6	1974-1984
Triloknath, 5Q21209 019 H.P.	NE	7	-	0.33	63	1995-1996
Gara, 5Q22204 050 H.P.	NE	5.19	(-)2.87	0.12	22	1974-1983
ShauneGarang 5Q22213 084 H.P.	W-N	4.94	(-) 2.87	0.41	30	1981-1991
Hamtah, 5Q21212 180 H.P.	NW-N	3.24	(-)8.40	0.38	127	2000-2006
Tipra Bank, 5O13206 092 Uttarakhand	NW-N	7	(-)1.34	0.67	40	1981-1988
Dunagiri, 5O13209 044 Uttarakhand	N-NW	2.56	(-) 6.26	0.2	47	1984-1992

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

(-): Values indicate a negative balance

Table 3.3.5: General features of Chhota Shigri, Dokriani and Chorabari glaciers

Parameters	Chhota Shigri glaciers	Dokriani glaciers	Chorabari glaciers
Co-ordinates			
a) Latitude	32°12′ to 32°17′N	30°49′ to 30°52′N	30° 42′ to 30° 47′N
b) Longitude	77°30′ to 77° 32′E	78°47′ to 78°51′E	79° 01′ -79° 12′E
Length	9 km	5 km.	6.5km
Catchment area	45.0 km2	15.1 km2	27.8 km2
Glacier ice cover	8.75 km2	5.76 km2	5.90 km2
Accumulation area	5.43 km2	3.85 km2	2.19 km2
Ablation area	3.32 sq km	1.19 sq km	3.71km2
Snout altitude	4055 m (in 1989)	3910 m (in 2007)	3860m (in 2008)
Orientation	North facing	NW facing	South facing
Surface Slope	12.5°	12°	11°
Debris cover	15.-20%	30.-40%	60-65%
Mass balance w.e.	$-1.35x10^6m^3$ (1987-89)	$-2.55x10^6m^3$ (1992-2000)	$-4.4x10^6m^3$ (2003-07)
Glacier ice thickness	15 m to 130 m 1	5 m to 120 m	-
Equilibrium line altitude (ELA)	4840--4845m (1987-1989)	5030--5100m (1992-2000)	4960-5000 (2003-2008)

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

Table 3.3.6: Annual retreat/advance, in meters, recorded at the snouts of the Chhota Shigri, Dokriani and Chorabari glaciers.

Name	62-84	85-86	88-87	88-89	92-93	93-94	94-95	95-97	97-98	98-99	99-20			Area km^2
Chhota Shigri	7.6	2.58	17.5 (Adv)											8.75
	62-91	91-92	92-93	93-94	94-95	95-97	97-98	99-92	20-01	01-02	02-03	02-03	03-04	
Dokriani	16.5	16.5	16.5	18.5	18.7	17.8	18.5	18.5	18.75	17	18	7	22	5.76
	Averaged retreat 1962-2003							Averaged retreat 2003-2008						
Chorabari	6.5							9.7						

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

Table 3.3.7: Mass balance and melt water discharge data of Chhota Shigri and Dokriani glaciers

Mass Balance in millions of cubic meters ($x10^6m^3$) of water equivalent

Name/Period	87-88	88-89	92-93	93-94	94-95	97-98	98-99	99-2000	Area km2	
Chhota Shigri	(-)1.01	(-)1.70							8.75	
Dokriani			(-)1.54	(-)1.58	(-)2.17	(-)2.41	(-)3.19	(-)2.65	5.76	

Average daily melt water discharge in millions of cubic meters ($x10^6m^3$) during ablation season

Name/Period	88	89	94	98	99	2000	01	02	03	04	Catchments area Km^2	Glacier area
Chhota Shigri	0.88	0.87									45.0	8.75
Dokriani			0.34	0.3	0.24	0.29	0.31	0.4	0.32	0.36	15.1	5.76

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

Table 3.3.8: Glacier Terminus Position Changes in Sikkim (1976-2005)

Name	Area 2005($Km^{2)}$	1976-78	Rate (1976-78)	1988-2000	Rate (1988-2000)	2000-05	Rate (2000-05)	Total	Average
Changme	5.45	0	0	-56	-4.67	-22	-3.67	-78	-2.60
Changsand	9.24	-102	-8.5	-180	-15	-389	-64.83	-671	-22.37
Chuma	3.94	-83	-6.92	-96	-8	-68	-11.33	-247	-8.23
E.Langpo	4.94	-213	-17.75	-229	-19.08	-277	-46.17	-719	-23.97
Gyamtang	2.57	-200	-16.67	-10	-0.83	-150	-25	-360	-12.00
Jongsand	10.23	-119	-9.92	-24	-2	-1003	167.17	-1146	-38.20
Jumthul	7.97	-61	-5.08	-125	-10.42	-169	-28.17	-355	-11.83
Kangkyong	23.31	-78	-6.5	-28	-2.33	-124	-20.67	-230	-7.67
Lohank	5.45	-152	-12.67	-106	-8.83	-555	-92.5	-813	-27.10
N.Lohank	5.43	-50	-4.17	-168	-14	-180	-30	-398	-13.27
Onglaktang	7.9	-18	-1.5	-106	-8.83	-174	-29	-298	-9.93
Rathoung	5.23	-50	-4.17	-215	-17.92	-281	-46.83	-546	-18.20
Rula glacier	3.85	-82	-6.83	-15	-1.25	39	6.5	-58	-1.93
S. Lhonak	10	-279	-23.25	-334	-27.83	-380	-63.33	-993	-33.10
S.Simpu	7.38	73	6.08	-169	-14.08	-422	-70.33	-518	-17.27
Talung	25.51	0	0	-31	-2.58	-102	-17	-133	-4.43
Tasha	4.01	0	0	-160	-13.33	97	16.17	-63	-2.10
Tasha 1	2.73	105	8.75	-168	-14	-60	-10	-123	-4.10
Tenbawa	6.59	-124	-10.33	0	0	0	0	-124	-4.13
Theukang	2.2	-60	-5	-111	-9.25	-112	-18.67	-283	-9.43
Tista glacier	8.2	-149	-12.42	-225	-18.75	-71	-11.83	-445	-14.83
Toklung	2.74	-117	-9.75	-48	-4	-166	-27.67	-331	-11.03
Tongshong	5.93	-97	-8.08	-104	-8.67	-219	-36.5	-420	-14.00
Umaram	6.14	42	3.5	-613	-51.08	150	25	-421	-14.03
Yulhe	2.17	30	2.5	-40	-3.33	49	8.17	39	1.30
Zemu	90.94	-495	-41.25	92	7.67	-19	-3.17	-422	-14.07
Average			-7.3		-10.48		-29.54		-13.02

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

Table 3.3.9 : Retreat of some glaciers in the NWH in the last century

Glacier name	Basin	Time-span	Year	Retreat of snout in m	Average retreat (m/yr)
Triloknath	Chenab	1969-95	27	400	14.81
Bara Shigri	-do-	1906-56	51	1750	34.31
		1957-77	21	250	11.90
		1978-95	18	650	36.11
		1996-2000*	4	950	**237.50**
Chhota Shigri	-do-	1962-95	34	225	6.62
		1988-2000*	13	1100	**84.62**
Pindari	Ganga	1845-66	122	2840	23.28
Milam	-do-	1849-1997	149	2472	16.59
Gangotri	-do-	1849-1900	51	682	13.37
		1901-35	35	527	15.06
		1936-56	20	173	8.65
		1957-64	7	227	32.43
		1965-71	6	555	**92.50**
		1972-2002	29	1424	49.10
Siachen	Nubra	1962-1984*	22	504	22.91
		1985-2001*	17	432	25.41
South Terong	-do-	1962-1984*	22	3100	**140.91**
		1985-2001*	17	870	**51.18**

.* Obtained from remotely sensed data.

(Abnormally high rates of retreat are shown in bold figures)

Source: Himalayan Glaciers, A State-of-Art Review of Glacial Studies, Glacial Retreat and Climate Change-2009, MOEF

3.4 Biodiversity

Biodiversity, in simple terms, is a measure of the health of ecosystems. More technically, biodiversity can be defined as degree of variations of life forms within a species, ecosystem, biome and the entire Earth. Conservation of biodiversity, in any ecosystem acts as a bulwark against abrupt instabilities and makes it more resilient. Economically too, biodiversity is important for agriculture, food security, industry, medicine etc. Biodiversity also proffers rich externalities in various forms – recreation, aesthetics, environmental conservation

Biodiversity of any given area being a function of precipitation, temperature, soils, altitude etc. India is considered very rich in biodiversity. It is estimated that about 1/6th plant species of entire world belong to India. An area with a high concentration of endemic species is called a "hotspot". Out of the twelve hotspots of the world, two (North East and Western Ghat areas) are in India.

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.

Climate change affects biodiversity in many ways. Impacts on species include changes in distribution and abundance, the timing of seasonal events and habitat use and, as a consequence there are likely to be changes in the composition of plant and animal communities. Habitats and ecosystems are also likely to change character by, for example, showing altered water regimes, increased rates of decomposition in bogs and higher growth rates in forests.

Biodiversity also has an important role in climate change adaptation and mitigation. For example, soils, forests and oceans hold vast stores of carbon. The way managed habitats are used will affect how much of that carbon is released in gaseous form into the atmosphere. How we address climate change and maintain healthy ecosystems so that they provide ecosystem goods and services essential for human well-being is now a key challenge for society. Understanding the ongoing impacts of climate change on ecosystems is an essential prerequisite to addressing this challenge.

The framework for statistics related to climate change included the following variables/indicators .

Biodiversity

(i) Total Species
(ii) Endangered
(iii) Endemic
(iv) Invasive

The Following Tables are included.

3.4 Biodiversity

3.4.1 Estimated faunal diversity in India
3.4.2 Percentage endemism in Indian faunal groups
3.4.3 Population trends in threatened Indian species (IUCN Red list 2004)
3.4.4 Number of species in major groups of plants and microorganisms
3.4.5 State-wise distribution of endemic wetland plants, threatened birds, fishes and turtles
3.4.6 Comparison of marine faunal diversity in the world and India
3.4.7 Estimated tiger numbers for States and landscapes in India
3.4.8 Estimated population of wild elephants
3.4.9 Elephant reserves with estimated population in India as per 2005 Census
3.4.10 National Parks (NP) and Wildlife Sanctuaries (WLS) in various biogeographic zones of India
3.4.11 Biosphere reserves setup in India

Data Sources

MOEF: National Biodiversity Action Plan 2008.
MOEF: India's 4th National Report to the convention on Biological Diversity MOEF-2009
Botanical Survey of India.
MOEF: Projects on Tiger and Elephant
National Wildlife Database, Wildlife Institute of India, 2009
MOEF: Annual Reports.

Table 3.4.1 : Estimated faunal diversity in India			
Taxonomic group	**No. of species**		**% in India**
	World	**India**	
PROTISTA (Protozoa)	**31250**	**3500**	**11.20**
ANIMALIA	153122	13033	8.51
Mesozoa	71	10	14.08
Porifera	5000	500	10.00
Cnidaria	10105	1042	10.31
Ctenphora	100	12	12.00
Platyhelminthes	17511	1650	9.42
Rotifera	2500	330	13.20
Gastrotricha	3000	100	3.33
Kinorhyncha	100	10	10.00
Nematoda	30028	2902	9.66
Acanthocephala	800	229	28.63
Sipuncula	145	35	24.14
Mollusca	66535	5169	7.77
Echiura	127	43	33.86
Annelida	17000	1000	5.88
Onycophora	100	1	1.00
Arthropoda	1181398	74175	6.28
Crustacea	60000	3549	5.92
Insecta	1020007	63423	6.22
Arachnida	73451	5850	7.96
Pyconogonida	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	4000	200	5.00
Entoprocta	60	10	16.67
Brachiopoda	300	3	1.00
Chaetognatha	111	30	27.03
Tardigrada	514	30	5.84
Echinodermata	6600	779	11.80
Hemichordata	120	12	10.00
Chordata	64669	5665	8.76
Protochordata	2106	119	5.65
Pisces	32120	3022	9.41
Amphibia	6771	342	5.05
Reptilia	9230	526	5.70
Aves	9026	1233	13.66
Mammalia	5416	423	7.81
Total	**2829628**	**189246**	**6.69**

Source: India's Fifth National Report to the convention on Biological Diversity- 2014, Ministry of Environment and Forests(MoEF)

Table 3.4.2: Percentage endemism in Indian faunal groups	
Group	**Percentage Endemism**
Protozoa	
Free living *	7.21
Parasitic *	41.33
Mesozoa	14.08
Porifera	
Freshwater	-
Cnidaria	10.31
Platyhelminthes	9.42
Rotifera	13.20
Gastrotricha	3.33
Kinorhyncha	10.00
Nematoda	9.66
Acanthocephala	28.63
Mollusca	
Terrestrial *	33.50
Freshwater *	41.80
Echiura	33.86
Annelida	5.88
Oligochaeta *	77.80
Hirundinea *	42.37
Arthropoda	
Crustacea	5.91
Insecta	6.22
Arachnida	7.96
Phoronida	27.27
Bryozoa	5.00
Entoprocta	16.67
Chaetognatha	27.03
Chordata	
Pisces	9.41
Ambhibia	5.05
Reptilia	5.70
Aves	13.66
Mammalia	7.81

Source: India's Fifth National Report to the convention on Biological Diversity- 2014, Ministry of Environment and Forests(MoEF)

* India's 4th National Report to the convention on Biological Diversity, 2009

Table 3.4.3: Population trends in threatened Indian species (IUCN Red list 2004)						
Group	**Threatened**	**No change or stable**	**Upwards or improving**	**Downwards or decreasing**	**Indeterminate**	**Trends not available**
Mammals	213	4	1	47	87	74
Birds	149	2	-	80	10	57
Reptiles	33	-	-	2	2	29
Amphibia	148	5	-	68	73	2
Pisces	75	-	-	21	42	12
Crustacea	12	-	-	-	-	12
Mollusca	5	-	-	-	1	4
Hymenoptera	5	-	-	-	-	5
Lepidoptera	4	-	-	-	1	4
Odonata	3	-	-	-	1	3
Anoplura	1	-	-	-	-	1
Total	**648**	**11**	**1**	**218**	**217**	**203**
Source: India's 4th National Report to the convention on Biological Diversity, MOEF-2009						

Table 3.4.4: Number of species in major groups of plants and microorganisms						
Plant groups	**No. of species**				**% of India to the world**	
	India		**World**			
	2009	**2014**	**2009**	**2014**	**2009**	**2014**
Virus/Bacteria	850	986	8050	11813	10.56	8.35
Algae	7175	7284	40000	40000	17.94	18.21
Fungi	14500	14883	72000	98998	20.14	15.03
Lichens	2223	2401	13500	17000	16.47	14.12
Bryophytes	2500	2523	14500	16236	17.24	15.54
Pteridophytes	1200	1267	10000	12000	12.00	10.56
Gymnosperms	67	74	650	1021	10.31	7.25
Angiosperms	17527	18043	250000	268600	7.01	6.72
Total	**46042**	**47513**	**408700**	**465668**	**-**	-

Source: Botanical Survey of India.

Table 3.4.5: State-wise distribution of endemic wetland plants, threatened birds, fishes and turtles

State	Endemic plants	Threatened birds	Threatened fishes	Threatened turtles
Tamil Nadu	46	3	35	4
Kerala	65	0	37	3
Karnataka	64	5	15	2
Goa	17	0	15	0
Andhra Pradesh	13	6	19	2
Odisha	6	0	22	6
Madhya Pradesh & Chhattisgarh	20	5	16	7
Maharashtra	69	2	19	3
Gujarat	11	6	12	1
Rajasthan	9	6	17	3
Haryana	0	6	15	1
Punjab	0	4	15	5
Jammu & Kashmir	2	2	20	2
Himachal Pradesh	0	2	19	0
Uttar Pradesh	3	13	34	10
Bihar & Jharkhand	5	6	19	9
West Bengal	5	6	32	11
Assam	2	10	35	10
North East States*	5	12	34	9
Total	342	94	430	88

* Arunachal Pradesh, Meghalaya, Nagaland, Manipur, Mizoram, Sikkim, Tripura

Source: Vijayan et al. 2004; SACON, Coimbatore(table reproduced from

India's 4th National Report to the convention on Biological Diversity, MOEF-2009)

Table 3.4.6: Comparison of marine faunal diversity in the world and India			
Group	**World**	**India**	
		Total aquatic	**Marine***
Protista	31250	3500	750
Mesozoa	71	10	10
Porifera	5000	500	486
Cnidaria	10105	1042	790
Ctenophora	100	12	12
Gastrotricha	3000	100	88
Kinorhyncha	100	10	99
Platyhelminthes	17511	1650	550
Annelida	17000	1000	440
Mollusca	66535	5169	3370
Crustacea	60000	3549	2,440
Merostomata	4	2	2
Pycnogonida	600	17	16
Sipuncula	145	35	38
Echiura	127	43	33
Tardigrada	514	30	10
Chaetognatha	111	30	30
Echinodermata	6600	779	765
Hemichordata	120	12	12
Protochordate	2106	119	116
Pisces	32120	3022	1800
Amphibia	6771	342	3
Reptilia	9230	526	26
Aves	9026	1233	145
Mammalia	5416	423	29

Source: India's Fifth National Report to the convention on Biological Diversity- 2014, Ministry of Environment and Forests(MoEF)
* Data 2009

Table 3.4.7: Estimated tiger numbers for States and landscapes in India					
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**	**6737**
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	168	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**	**10046**	**11445**
Source: National Tiger Conservation Authority, Project Tiger, 'Status of Tigers, Co- Predators, and Prey in India 2010', Ministry of Environment & Forests					
* Likely to be revised as sampling is ongoing in the state .+ From scat DNA					
Note: Tiger Km^2 not available for the year 2014					

Table 3.4.8 : Estimated population of wild elephants					
STATE	**Population in the Year**				
	1993	**1997**	**2002**	**2007**	**2012**
Arunachal	2102	1800	1607	1690	1690#
Assam	5524	5312	5246	5281	5281#
Meghalaya	2872	1840	1868	1811	1811#
Nagaland	178	158	145	152	212
Mizoram	15	22	33	-	-
Manipur	50	30	12	-	-
Tripura	100	70	40	59	59#
West Bengal	200	276	328	325-350	325-350#
Jharkhand	550*	618*	772	624	688
Odisha	1750	1800	1841	1862	1930
Chhattisgarh	-	-	-	122	215
Uttarakhand	828*	1130*	1582	1346	1346#
Uttar Pradesh	47	70	85	380	380
Tamil Nadu	2307	2971	3052	3867	3726
Karnataka	5500	6088	5838	4035	3900-7458##
Kerala	3500	3600	3850	6068	6177
Andhra Pradesh	46	57	74	28	41
Maharashtra	-	-	-	7	4
Andaman & Nicobar	35	35	40	-	-
Grand Total		**25604**	**25877**	**27657-27682**	**27785-31368**

Source: Project Elephant Division, Ministry of Environment and Forest, 2013

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

Census figures as per 2007. The census report of 2012 is still awaited from the states

3900-7458 (Confidence Limit)

Table 3.4.9 : Elephant reserves with estimated population in India as per 2005 Census				
Sl.	**Elephant Range**	**Elephant Reserve**	**State**	**Total Area (Sq. Km)**
I	Eastern India (South West Bengal- Jharkhand-Orissa)	1. Mayurjharna ER (24.10.02)	West Bengal	414
		2. Singhbhum ER (26.9.01)	Jharkhand	4530
		3. Mayurbhanj ER (29.9.01)	Odisha	3214
		4. Mahanadi ER (20.7.02)	Odisha	1038
		5.Sambalpur ER (27.3.02)	Odisha	427
		6.Badalkhol-Tamorpingla	Chhattisgarh	1048.3
II	North Brahamputra (Arunachal –Assam)	7. Kameng ER (19.6.02)	Arunachal Pradesh	1892
		8. Sonitpur ER (6.3.03)	Assam	1420
III	South Brahamputra (Assam- Arunachal)	9. Dihing-Patkai ER (17.4.03)	Assam	937
		10. South Arunachal ER (29-2-08)	Arunachal Pradesh	1957.5
IV	Kaziranga (Assam-Nagaland)	11. Kaziranga – Karbi Anglong ER (17.4.03)	Assam	3270
		12. Dhansiri-Lungding ER (19.4.03)	Assam	2740
		13. Intanki ER (28.2.05)	Nagaland	202
V	Eastern Dooars (Assam-W. Bengal)	14. Chirang-Ripu ER (7.3.03)	Assam	2600
		15. Eastern Dooars ER (28.8.02)	West Bengal	978
VI	E. Himalayas (Meghalaya)	16 Garo Hills ER (31.10.01)	Meghalaya	3500
VII	Nilgiri –Eastern Ghat (Karnataka- Kerala-Tamilnadu-Andhra)	17. Mysore ER (25.11.02)	Karnataka	6724
		18. Wayanad ER (2.4.02)	Kerala	1200
		19. Nilgiri ER (19.9.03)	Tamil Nadu	4663
		20. Rayala ER (9.12.03)	Andhra Pradesh	766
VIII	South Nilgiri (Kerala-Tamilnadu)	21. Nilambur ER (2.4.02)	Kerala	1419
		22. Coimbatore ER (19.9.03)	Tamil nadu	566
IX	Western Ghat (Tamilnadu- Kerala)	23. Anamalai ER (19.9.03)	Tamil nadu	1457
		24. Anamudi ER (2.4.02)	Kerala	3728
X	Periyar (Kerala-Tamilnadu)	25. Periyar (2.4.02)	Kerala	3742
		26. Srivilliputtur ER(19.9.03)	Tamil nadu	1249
XI	Northern India (Uttarakhand-U.P.)	27. Shivalik ER (28.10.02)	Uttarakhand	5405
		28. Uttar Pradesh ER(9.9.09)	U.P.	744
Total				**61830.80**

Source: Project Elephant Division, Ministry of Environment and forests & Climate Change.

Table 3.4.10: National Parks (NP) and Willdlife Sancturies (WLS) in various biogeographic zones of India

Zone no	Zone Name	Zone Area*	% of India's Geographic Area	No. of NPs	Area*	% of Biozone Area	No of WLS	Area*	% of Biozone Area	No of NPs +WLS	Area*	% of Biozone Area
1	Trans Himalaya	184823	5.62	3	5809	3.14	4	10438.56	5.65	7	16247.56	8.79
2	Himalaya	210673	6.41	12	7366.92	3.5	65	16065.85	7.63	77	23432.77	11.12
3	Deserts	214014	6.51	1	3162	1.48	5	12914.09	6.03	6	16076.09	7.51
4	Semi-Arid	539479	16.41	10	1505.78	0.28	81	12410.66	2.3	91	13916.44	2.58
5	Western Ghats	132179	4.02	16	3673.52	2.78	47	10018.86	7.58	63	13692.38	10.36
6	Deccan Peninsula	1380339	41.99	24	9712.24	0.7	127	44329.08	3.21	151	54041.32	3.92
7	Gangetic Plain	354848	10.79	6	2363.62	0.67	32	5473.24	1.54	38	7836.86	2.21
8	Coasts	91319	2.78	5	1731.18	1.9	20	2959.45	3.24	25	4690.63	5.14
9	North East	171340	5.21	13	2674	1.56	36	3418.62	2	49	6092.62	3.56
10	Islands	8249	0.25	9	1156.91	14.02	96	389.39	4.72	105	1546.3	18.75
11	**Grand Total**	**3287263**	**99.99**	**99**	**39155.17**	**1.19**	**513**	**118417.8**	**3.60**	**612**	**157573**	**4.79**

Source: National Wildlife Database, Wildlife Institute of India, 2009

Note : * : Square Km

Table 3.4.11: Biosphere reserves setup in India				
Sl. No.	**Name of Biosphere Reserve**	**Area (in sq.km.)**	**Date of Notification**	**Location (State) and Bio-Geographic Zones**
1	**2**	**3**	**4**	**5**
1	Nilgiri	5520.00	01.08.1986	Part of Wynad, Nagarhole, Bandipur and Mudumalai, Nilambur, Silent Valley and Siruvani hills (Tamil Nadu, Kerala and Karnataka)-Western Ghats
2	Nanda Devi	5860.69	18.01.1988	Part of Chamoli, Pithoragarh & Almora Districts 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	4926.00	03.03.1999	Part of Betul, Hoshangabad and Chindwara Districts of Madhya Pradesh-Semi-Arid-Gujarat Rajputana
12	Kanchanjunga	2619.92	07.02.2000	Parts of North and West Sikkim
13	Agasthyamalai	1828.00	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	3835.51	30.3.2005	Part of Anuppur and Dindori Distt.,of MP, part of Bilaspur distts., of Chhattisgarh State (Madhya Pradesh & Chattisgarh)
15	Kachchh	12454.00	29.01.2008	Parts of Kachchh, Rajkot, Surendranagar and Patan Civil Districts of Gujarat State
16	Cold Desert	7770.00	28.08.09	Pin Valley National Park and surroundings; Chandratal and Sarchu & Kibber Wildlife Sanctuary in Himachal Pradesh.
17	Seshachalam	4756.00	20.09.2010	Seshachalam hill range in Eastern Ghats encompsssing part of Chitoor and Kadapa district in Andhra Pradesh
18	Panna	2998.98	25.08.2011	Part of Panna and Chhattarpur district in Madhya Pradesh
Source: Ministry of Environment and Forests, as on Dec, 2014				

3.5 Health

Climate change is a major problem caused by the increase of human activities leading to several direct and indirect impacts on health. The weather has a direct impact on our health. If the overall climate becomes warmer, there will be an increase in health problems. It is anticipated that there will be an increase in the number of deaths due to greater frequency and severity of heat waves and other extreme weather events. The elderly, the very young and those suffering from respiratory and cardiovascular disorders will probably be affected by such weather extremes as they have lesser coping capacity. An extreme rise in the temperature will affect people living in the urban areas more than those in the rural areas. This is due to the 'heat islands' that develop here owing to the presence of concrete constructions, paved and tarred roads. Higher temperatures in the cities would lead to an increase in the ground-level concentration of ozone thereby increasing air pollution problems. Indirectly, changes in weather pattern, can lead to ecological disturbances, changes in food production levels, increase in the distribution of malaria, and other vector-borne diseases. Fluctuation in the climate especially in the temperature, precipitation, and humidity can influence biological organisms and the processes linked to the spread of infectious diseases.. Due to global warming there will be an increase in the areas of habitat of disease-spreading insects such as the mosquito, causing an increase in the transmission of infection through these carriers. Disease-causing agents, called pathogens, can be transmitted through food, water, and animals such as deer, birds, mice, and insects. Climate change could affect all of these transmitters.

There is a high incidence of occurrence of vector borne diseases like Malaria, Kala-azar, Japanese Encephalitis, filaria, Chikungunia etc., in the immediate past. It is observed that changes in climatic patterns may alter the distribution of vector species and increase its spread in new areas. An increase in temperature and relative humidity may enlarge the transmission windows. Effluent emissions to water bodies and salination of rivers through sea level rise may increase the incidence of water borne diseases. Deaths due to heat wave are reported from several parts of the country from time to time, particularly during the summer.

The expert Committee identified the Health deterioration as one of the impacts of the Climate Change. framework for statistics related to climate change included the following variables/indicators .

1) Recurring Endemic Diseases
(2) Newly Reported Endemic diseases

The following Tables are included in this chapter on the above indicators.

3.5 Health

3.5.1 Malaria cases and deaths in the country since 2008
3.5.2 Dengue cases and deaths in the country since 2007
3.5.3 Clinically suspected chikungunya fever cases since 2007
3.5.4 Details of AES/JE cases and deaths since 2008
3.5.5 Kala-azar cases and deaths in the country since 2007
3.5.6 State-wise cases & deaths due to cholera in India since 2007
3.5.7 State/UT wise cases and deaths due to acute diarrhoeal disease in India since 2007

3.5.8 State/UT wise cases and deaths due to Enteric Fever (Typhoid) in India since 2007

Data Sources

National Vector Borne Disease Control Programme (Dte. NVBDCP), Ministry of Health and Family Welfare provide data on Vector Bourne diseases like Malaria, Chikungunia, Dengue and Kala-azar. (http://www.nvbdcp.gov.in/).
National Health Profile of India, Central Bureau of Health Intelligence, MOHFW. CBHI publishes the "National Health Profile of India every year. Available in the website http://cbhidghs.nic.in/index.asp.

TABLE 3.5.1: Malaria cases and deaths in the country since 2010

STATE/UTs.	2010			2011			2012			2013			2014 (P)			2015 *		
	Malaria cases	Pf cases	Deaths	Malaria cases	Pf cases	Deaths	Malaria cases	Pf cases	Deaths	Malaria cases	Pf cases	Deaths	Malaria cases	Pf cases	Deaths	Malaria cases	Pf cases	Deaths
Andhra Pradesh	33393	23259	20	34949	24089	5	24699	15695	2	19787	13385	0	21077	15511	0	13509	11014	0
Arunachal Pradesh	17944	5412	103	13950	4856	17	8368	2789	15	6398	2181	21	6082	2338	9	3316	777	0
Assam	68353	48330	36	47397	34707	45	29999	20579	13	19542	14969	7	14540	11210	11	8402	6251	0
Bihar	1908	933	1	2643	1273	0	2605	838	0	2693	715	1	2043	699	0	843	387	0
Chhattisgarh	152209	120080	47	136899	107472	42	124006	96924	90	110145	89418	43	128993	108874	53	55648	47392	5
Goa	2368	275	1	1187	135	3	1714	170	0	1530	131	0	824	42	0	263	23	0
Gujarat	66501	13729	71	89764	16112	127	76246	10483	29	58513	9122	38	41608	6253	16	13270	1075	0
Haryana	18921	764	0	33401	1133	1	26819	569	1	14471	247	3	4485	45	1	670	2	0
Himachal Pradesh	210	2	0	247	2	0	216	3	0	141	0	0	102	1	0	21	1	0
Jammu & Kashmir	802	43	0	1091	45	0	864	34	0	698	24	0	291	21	0	65	3	0
Jharkhand	199842	89357	16	160653	70302	17	131476	48188	10	97786	38263	8	103735	46448	8	26915	12264	1
Karnataka	44319	7936	11	24237	2648	0	16466	1278	0	13302	967	0	14794	1329	2	5715	465	0
Kerala	2299	271	7	1993	271	2	2036	236	3	1634	243	0	1751	305	6	773	193	1
Madhya Pradesh	87165	31092	31	91851	31940	109	76538	24039	43	78260	28775	49	96879	41638	26	17760	5826	4
Maharashtra	139198	32387	200	96577	21401	118	58517	11875	96	43677	9198	80	53385	25770	68	20829	9455	13
Manipur	947	487	4	714	314	1	255	83	0	120	42	0	145	72	0	106	54	0
Meghalaya	41642	39374	87	25143	24018	53	20834	19805	52	24727	22885	62	39168	37149	73	20881	19347	44
Mizoram	15594	14664	31	8861	8373	30	9883	9437	25	11747	10340	21	23145	21083	31	13600	11900	0
Nagaland	4959	1877	14	3363	950	4	2891	821	1	2285	519	1	1936	647	2	661	215	2
Odisha	395651	350428	247	308968	281577	99	262842	244503	79	228858	208488	67	395035	342280	89	233070	194133	44
Punjab	3477	71	0	2693	64	3	1689	43	0	1760	31	0	1036	14	0	174	1	0
Rajasthan	50963	2331	26	54294	2973	45	45809	1394	22	33139	1086	15	15118	603	4	2032	68	0
Sikkim	49	14	0	51	14	0	77	14	0	39	13	0	35	18	0	14	5	0
Tamil Nadu	17086	623	3	22171	925	0	18869	576	0	15081	539	0	8729	339	0	2795	109	0
Telangana													5189	4602	0	1718	1483	1
Tripura	23939	21254	15	14417	13812	12	11565	10915	7	7396	6998	7	51240	49653	96	18231	16944	14
Uttarakhand	1672	183	0	1277	123	1	1948	111	0	1426	108	0	1171	89	0	369	17	0
Uttar Pradesh	64606	1382	0	56968	1857	0	47400	740	0	48346	590	0	41612	326	0	11521	43	0
West Bengal	134795	24693	47	66368	10858	19	55793	8669	30	34717	3705	17	26484	4981	65	8675	2590	22
A.N.Islands	2484	803	0	1918	607	0	1539	696	0	1005	334	0	557	109	0	212	29	0
Chandigarh	351	6	0	582	9	0	201	3	0	150	2	0	114	0	0	26	0	0
D & N Haveli	5703	2243	0	5150	2082	0	4940	2149	1	1778	513	0	669	90	1	215	14	0
Daman & Diu	204	60	0	262	55	0	186	33	0	91	5	0	56	4	0	28	2	0
Delhi	251	1	0	413	1	0	382	1	0	353	8	0	98	0	0	17	0	0
Lakshadweep	6	0	0	8	0	0	9	0	0	8	0	0	0	0	0	2	0	0
Puducherry	175	0	0	196	6	1	143	2	0	127	2	0	79	3	0	32	2	0
All India Total	**1599986**	**834364**	**1018**	**1310656**	**665004**	**754**	**1067824**	**533695**	**519**	**881730**	**463846**	**440**	**1102205**	**722546**	**561**	**482378**	**342084**	**151**

Pf: Plasmodium falsiparum : Malaria caused by Pf is the most dengerous form of malaria.

Source: National Vector Borne Disease Control Programme (NVBDCP),Directorate general of Health Services, Ministry of Health & Family Welfare.

(P): Provisional

* Upto July 2015

TABLE 3.5.2: Dengue cases and deaths in the country since 2007

Sl. No.	Affected States/UTs	2007		2008		2009		2010		2011		2012		2013		2014 *		2015**	
		Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1	Andhra Pradesh	587	2	313	2	1190	11	776	3	1209	6	2299	2	910	1	1262	5	673	0
2	Arunachal Pradesh	0	0	0	0	0	0	0	0	0	0	346	0	0	0	15695	0	473	0
3	Assam	0	0	0	0	0	0	237	2	0	0	1058	5	4526	2	85	0	22	0
4	Bihar	0	0	1	0	1	0	510	0	21	0	872	3	1246	5	297	0	10	0
5	Chhattisgarh	0	0	0	0	26	7	4	0	313	11	45	0	83	2	440	9	25	0
6	Goa	36	0	43	0	277	5	242	0	26	0	39	0	198	2	168	1	73	0
7	Gujarat	570	2	1065	2	2461	2	2568	1	1693	9	3067	6	6272	15	2320	3	657	0
8	Haryana	365	11	1137	9	125	1	866	20	267	3	768	2	1784	5	214	2	10	0
9	Himachal Pradesh	0	0	0	0	0	0	3	0	0	0	73	0	89	2	2	0	4	0
10	J & K	0	0	0	0	2	0	0	0	3	0	17	1	1837	3	1	0	0	0
11	Jharkhand	0	0	0	0	0	0	27	0	36	0	42	0	161	0	36	0	7	0
12	Karnataka	230	0	339	3	1764	8	2285	7	405	5	3924	21	6408	12	3358	2	2298	4
13	Kerala	603	11	733	3	1425	6	2597	17	1304	10	4172	15	7938	29	2575	11	2101	15
14	Madhya Pradesh	51	2	3	0	1467	5	175	1	50	0	239	6	1255	9	2131	13	42	0
15	Meghalaya	0	0	0	0	0	0	1	0	0	0	27	2	43	0	0	0	0	0
16	Maharashtra	614	21	743	22	2255	20	1489	5	1138	25	2931	59	5610	48	8573	54	601	1
17	Manipur	51	1	0	0	0	0	7	0	220	0	6	0	9	0	83	0	0	0
18	Mizoram	0	0	0	0	0	0	0	0	0	0	6	0	7	0	19	0	18	0
19	Nagaland	0	0	0	0	25	0	0	0	3	0	0	0	0	0	0	0	0	0
20	Odisha	4	0	0	0	0	0	29	5	1816	33	2255	6	7132	6	6433	9	114	0
21	Punjab	28	0	4349	21	245	1	4012	15	3921	33	770	9	4117	25	472	8	64	0
22	Rajasthan	540	10	682	4	1389	18	1823	9	1072	4	1295	10	4413	10	1243	7	105	0
23	Sikkim	0	0	0	0	0	0	0	0	2	0	2	0	38	0	5	0	0	0
24	Tamil Nadu	707	2	530	3	1072	7	2051	8	2501	9	12826	66	6122	0	2804	3	1795	5
25	Tripura	0	0	0	0	0	0	0	0	0	0	9	0	8	0	6	0	10	0
26	Telangana													0	0	704	1	58	0
27	Uttar Pradesh	132	2	51	2	168	2	960	8	155	5	342	4	1414	5	200	0	31	0
28	Uttarakhand	0	0	20	0	0	0	178	0	454	5	110	2	54	0	106	0	0	0
29	West Bengal	95	4	1038	7	399	0	805	1	510	0	6456	11	5920	47400	740	4	266	0
30	A& N Islands	0	0	0	0	0	0	25	0	6	0	24	0	67	0	139	0	107	0
31	Chandigarh	99	0	167	0	25	0	221	0	73	0	351	2	107	0	13	0	2	0
32	Delhi	548	1	1312	2	1153	3	6259	8	1131	8	2093	4	5574	6	995	3	40	0
33	D&N Haveli	0	0	0	0	0	0	46	0	68	0	156	1	190	0	641	1	0	0
34	Daman&Diu	0	0	0	0	0	0	0	0	0	0	96	0	61	0	46	0	2	0
35	Puducherry	274	0	35	0	66	0	96	0	463	3	3506	5	2215	0	1322	1	266	0
	Total	**5534**	**69**	**12561**	**80**	**15535**	**96**	**28292**	**110**	**18860**	**169**	**50222**	**242**	**75808**	**47587**	**53128**	**137**	**9874**	**25**

Source: National Vector Borne Disease Control Programme (NVBDCP),Directorate general of Health Services, Ministry of Health & Family Welfare.

P: Provisional * Provisinal till 31st December ** Provisinal till 29th July 2015.

Table 3.5.3: Clinically suspected chikungunya fever cases since 2007

Sl. No.	Affected States/UTs	2007	2008	2009	2010	2011	2012	2013*	2014*	2015**
1	Andhra Pradesh	39	5	591	116	99	2827	4827	1359	133
2	Assam			0	0	0	0	742	0	0
3	Bihar	0	0	0	0	91	34	0	0	0
4	Goa	93	52	1839	1429	664	571	1049	1205	240
5	Gujarat	3223	303	1740	1709	1042	1317	2890	574	66
6	Haryana	20	35	2	26	215	9	1	3	1
7	Jharkhand	0	0	0	0	816	86	61	11	21
8	Karnataka	1705	46510	41230	8740	1941	2382	5295	6962	8023
9	Kerala	24052	24685	13349	1708	183	66	273	272	96
10	Madhya Pradesh	0	0	30	113	280	20	139	161	29
11	Meghalaya	0	0	0	16	168	0	0	0	0
12	Maharashtra	1762	853	1594	7431	5113	1544	1578	1572	55
13	Odisha	4065	4676	2306	544	236	129	35	10	0
14	Punjab	0	0	0	1	0	1	0	2	0
15	Rajasthan	2	3	256	1326	608	172	76	50	7
16	Tamil Nadu	45	46	5063	4319	4194	5018	859	543	150
17	Telangana							0	1687	986
18	Tripura							0	34	66
19	Uttar Pradesh	4	11	0	5	3	13	0	4	0
20	Uttarakhand	0	0	0	0	18	0	0	0	0
21	West Bengal	19138	17898	5270	20503	4482	1381	646	1032	227
22	A& N Islands	0	0	0	59	96	256	202	161	51
23	Chandigarh	0	0	0	0	1	0	1	0	0
24	Delhi	203	14	18	120	110	6	18	0	0
25	D&N Haveli	0	0	0	0	0	100	2	8	0
26	Lakshadweep	5184	0	0	0	0	0	0	0	0
27	Puducherry	0	0	0	11	42	45	146	399	166
	Total	**59535**	**95091**	**73288**	**48176**	**20402**	**15977**	**18840**	**16049**	**10317**

Source: National Vector Borne Disease Control Programme (NVBDCP),Directorate General of Health Services, Ministry of Health & Family Welfare.

* Provisional till 31st December

** Provisional till 29th July 2015.

Table 3.5.4: Details of Japanese encephalitis (JE) and Acute Encephalitis Syndrome (AES) cases and deaths from 2008

Continued.

Sl. No.	Affected States/UTs	2008				2009				2010				2011			
		AES Cases	Deaths	JE Cases	Deaths	AES Cases	Deaths	JE Cases	Deaths	AES Cases	Deaths	JE Cases	Deaths	AES Cases	Deaths	JE Cases	Deaths
1	Andhra Pradesh	22	0	16	0	49	0	35	0	139	7	7	5	73	1	15695	1
2	Arunachal Pradesh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Assam	319	99	157	33	462	92	218	46	469	117	142	40	1319	250	489	113
4	Bihar	203	45	0	0	325	95	0	0	50	7	0	0	821	197	145	18
5	Delhi	0	0	0	0	0	0	0	0	0	0	0	0	9	0	9	0
6	Goa	39	0	3	0	66	3	1	0	80	0	9	0	91	1	1	0
7	Haryana	13	3	0	0	12	10	1	0	1	1	1	0	90	14	12	3
8	Jharkhand	0	0	0	0	0	0	0	0	18	2	2	2	303	19	101	5
9	Karnataka	3	0	0	0	246	8	7	0	143	1	3	0	397	0	23	0
10	Kerala	2	0	0	0	3	0	0	0	19	5	0	0	88	6	37	3
11	Maharashtra	24	0	0	0	5	0	4	0	34	17	0	0	35	9	6	0
12	Manipur	4	0	0	0	6	0	1	0	118	15	45	5	11	0	9	0
13	Meghalaya																
14	Nagaland	0	0	0	0	9	2	9	2	11	6	2	0	44	6	29	5
15	Punjab	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
16	Tamil Nadu	144	0	7	0	265	8	18	0	466	7	11	1	762	29	83	3
17	Tripura																
18	Uttarakhand	12	0	10	0	0	0	0	0	7	0	7	0	0	0	0	0
19	Uttar Pradesh	3012	537	193	36	3073	556	302	50	3540	494	325	59	3492	579	224	27
20	West Bengal	58	0	41	1	454	5	57	5	70	0	1	0	714	58	101	3
	Total	**3855**	**684**	**427**	**70**	**4975**	**779**	**653**	**103**	**5167**	**679**	**555**	**112**	**8249**	**1169**	**1214**	**181**

Source: National Vector Borne Disease Control Programme (NVBDCP),Directorate General of Health Services, Ministry of Health & Family Welfare.

Table 3.5.4: Details of Japanese encephalitis (JE) and Acute Encephalitis Syndrome (AES) cases and deaths from 2008

Concluded.

Sl. No.	Affected States/UTs	2012				2013				2014				2015 (P) Till 30.6.15			
		AES Cases	Deaths	JE Cases	Deaths	AES Cases	Deaths	JE Cases	Deaths	AES Cases	Deaths	JE Cases	Deaths	AES Cases	Deaths	JE Cases	Deaths
1	Andhra Pradesh	64	0	3	0	345	3	7	3	31	0	0	0				
2	Arunachal Pradesh	0	0	0	0	0		0	0	102	9	32	3				
3	Assam	1343	229	463	100	1388	272	495	134	2194	360	761	165	114	7	28	2
4	Bihar	745	275	8	0	417	143	14	0	1358	355	20	2	74	15	0	0
5	Delhi	0	0	0	0	0	0	0	0	0	0	0	0				
6	Goa	84	0	9	0	48	1	3	1	17	0	0	0				
7	Haryana	5	0	3	0	2	0	2	0	6	1	5	1				
8	Jharkhand	16	0	1	0	270	5	89	5	288	2	90	2	4	0	0	0
9	Karnataka	189	1	1	0	162	0	2	0	75	0	13	0				
10	Kerala	29	6	2	0	53	6	2	0	6	2	3	2				
11	Maharashtra	37	20	3	0	0	0	0	0	0	0	0	0	42	0	5	0
12	Manipur	2	0	0	0	1	0	0	0	16	0	1	0	0	0	0	0
13	Meghalaya					0	0	0	0	212	3	72	3				
14	Nagaland	21	2	0	0	20	0	4	0	20	1	6	0				
15	Punjab	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
16	Tamil Nadu	935	64	25	4	77	8	33	0	346	4	36	3	220	0	12	0
17	Tripura					211	0	14	0	323	0	14	0	84	3	18	3
18	Uttarakhand	174	2	1	0	0	0	0	0	2	0	2	0				
19	Uttar Pradesh	3484	557	139	23	3096	609	281	47	3329	627	191	34	355	58	6	2
20	West Bengal	1216	100	87	13	1735	226	140	12	2385	348	415	78	417	60	23	4
21	Telengana									155	5	0	0				
	Total	**8344**	**1256**	**745**	**140**	**7825**	**1273**	**1086**	**202**	**10867**	**1717**	**1661**	**293**	**1310**	**143**	**92**	**11**

Source: National Vector Borne Disease Control Programme (NVBDCP),Directorate General of Health Services, Ministry of Health & Family Welfare.

Table 3.5.5: Kala-azar cases and deaths in the country since 2007

Sl. No.	Affected States/UTs	2007		2008		2009		2010		2011		2012		2013		2014		2015(P)*	
		Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1	Assam	0	0	98	0	26	0	12	0	5	0	6	0	4	0	1	0	1	0
2	Bihar	37819	172	28489	142	20519	80	23084	95	25222	76	16036	27	10730	17	15695	10	4037	3
3	Delhi#	19	0	34	0	12	0	92	0	19	0	11	0	6	0	0	0	1	0
4	Gujarat#	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Himachal Pradesh	0	0	0	0	0	0	6	1	1	0	0	0	0	0	0	0	0	0
6	Jharkhand	4803	20	3690	5	2875	12	4305	5	5960	3	3535	1	2515	0	937	0	747	0
7	Madhya Pradesh	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Punjab#	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
9	Sikkim	0	0	4	1	5	0	3	0	7	0	5	0	8	0	5	0	3	0
10	Uttrakhand	2	0	0	0	2	0	1	0	0	0	7	1	0	0	4	0	2	0
11	Uttar Pradesh	69	1	26	0	17	1	14	0	11	1	5	0	11	1	11	0	52	0
12	West Bengal	1817	9	1256	3	756	0	1482	4	1962	0	995	0	595	2	668	1	325	0
	Total	**44533**	**203**	**33598**	**151**	**24212**	**93**	**29000**	**105**	**33187**	**80**	**20600**	**29**	**13869**	**20**	**17321**	**11**	**5168**	**3**

Source: National Vector Borne Disease Control Programme (NVBDCP),Directorate General of Health Services, Ministry of Health & Family Welfare.

P = Provisional

*As per the reports received from state till July 2015

#:Imported

Table 3.5.6 : State-wise cases & deaths due to cholera in India since 2007

Sl. No.	Affected States/UTs	2007		2008		2009		2010		2011		2012		2013		2014(P)	
		Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1	Andhra Pradesh	80	0	153	0	308	4	178	0	227	0	109	0	31	0	0	0
2	Arunachal Pradesh	-	-	0	0	3	0	0	0	0	0	0	0	0	0	0	0
3	Assam	0	0	-	-	21	0	0	0	0	0	0	0	0	0	0	0
4	Bihar	-	-	-	-	0	0	-	-	0	0	0	0	0	0	0	0
5	Chattisgarh	10	0	0	0	3	0	12	0	1	0	13	0	2	0	20	0
6	Goa	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Gujarat	66	0	50	0	309	0	132	1	79	0	71	0	327	1	159	0
8	Haryana	22	0	27	0	17	1	105	0	1	0	16	0	16	0	7	0
9	Himachal Pradesh	0	0	0	0	0	0	5	0	0	0	3	0	0	0	0	0
10	J & K	0	0	0	0	0	0	2976	3	0	0	0	0	0	0	0	0
11	Jharkhand	-	0	-	-	-	-	-	-	0	0	0	0	9	0	0	0
12	Karnataka	117	2	254	1	143	0	301	3	166	0	175	0	200	0	86	0
13	Kerala	5	1	7	0	62	2	2	0	19	1	4	1	23	0	3	0
14	Madhya Pradesh	1	0	14	0	7	4	3	0	0	0	12	0	8	0	17	0
15	Maharashtra	527	0	96	0	183	1	384	1	210	2	317	0	293	1	252	2
16	Manipur	2	0	-	-	-	-	0	0	0	0	0	0	0	0	0	0
17	Meghalaya	0	0	0	0	0	0	-	-	0	0	0	0	0	0	1	1
18	Mizoram	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Nagaland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Odisha	35	0	-	-	0	-	2	0	0	0	0	0	0	0	0	0
21	Punjab	11	0	12	0	19	0	43	1	9	0	0	0	0	0	55	0
22	Rajasthan	1	0	0	0	1	0	37	0	0	0	0	0	5	0	56	0
23	Sikkim	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Tamil Nadu	297	0	990	0	818	0	156	0	580	0	523	0	42	3	10	0
25	Tripura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Uttar Pradesh	6	0	0	0	1	-	-	-	0	0	0	0	0	0	21	0
27	Uttrakhand	1	0	0	0	0	0	20	0	9	0	0	0	1	0	12	0
28	West Bengal	176	0	236	0	486	0	570	0	652	0	181	0	120	0	173	0
29	A& N Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	Chandigarh	28	0	15	0	35	0	-	-	0	0	0	0	0	0	15	0
31	D&N Haveli	0	0	0	0	0	0	1	0	8	0	33	0	25	0	28	1
32	Daman & Diu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Delhi	1212	0	824	0	1066	-	77	0	380	7	111	0	25	0	51	1
34	Lakshadweep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	Puduchery	0	0	2		0	0	0	0	0	0	15	0	3	0	3	0
	Total	**2635**	**3**	**2680**	**1**	**3482**	**12**	**5004**	**9**	**2341**	**10**	**1583**	**1**	**1130**	**5**	**969**	**5**

Source: National Health Profile of India,Central Bureau of Health Intelligence, MOHFW.

Table 3.5.7 : State/UT wise cases and deaths due to acute diarrhoeal disease in India since 2007

Sl. No.	State/UT	2007		2008		2009		2010		2011		2012		2013		2014(P)	
		Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1	Andhra Pradesh**	1516795	198	1748983	16	2322963	111	2291375	214	2235614	107	2092340	100	1855496	110	1336690	10
2	Arunachal Pradesh	-	-	37546	2	26909	7	19104*	3	32228	11	44570	7	30756	3	12657	5
3	Assam	293648	911	93712	745	190070	0	75681	0	96816	16	134295	147	105876	147	58587	64
4	Bihar	-	-	-	-	-	-	-	-	130276*	0	493559	8	550281	24	550038	24
5	Chattisgarh	125463	11	149531	37	125069	11	51480*	2	64575	5	108238	26	104966	37	112888	32
6	Goa	10322	0	15549	1	20103	0	16417	5	15146	2	13696	1	16485	0	16039	4
7	Gujarat	337610	3	331979	2	337608	3	357922	3	367450	0	410508	7	427523	8	504857	3
8	Haryana	265006	30	246957	46	240017	33	215717	43	224223	21	215111	27	168527	27	197898	8
9	Himachal Pradesh	341266	33	342870	17	334699	24	284548	28	310227	51	338708	58	349904	56	350459	52
10	Jammu Division	199532	0	259380	4	329742	5	324255	4	342670	0	550645	2	381062	1	333498	0
	Kashmir Division	221839	0	157345	0	188936	0	169883	1	202041	0			210169	0	181515	0
11	Jharkhand	59563	6	70505	4	64817	5	58767	0	98258	1	72170	6	81045	4	79430	28
12	Karnataka	828026	80	723128	84	787179	81	583103	62	591989	49	582347	84	545794	81	819777	23
13	Kerala	450107	12	364147	1	371714	4	373945	2	260938	0	360743	10	372440	12	402106	9
14	Madhya Pd.	577770	302	549421	148	565568	134	305438	107	290705	92	488743	91	535012	89	768021	112
15	Maharashtra	825044	199	990299	401	640056	39	813445	12	507046	4	457001	1	527115	0	646380	4
16	Manipur	21745	16	17426	4	20614	9	13869	12	17605	39	27469	56	25333	37	29954	32
17	Meghalaya	120435	60	133478	39	174769	24	181411	16	148801	20	201819	19	186023	12	183631	27
18	Mizoram	17356	10	20143	41	21841	17	16148	12	16192	11	15957	7	13518	12	14201	10
19	Nagaland	16048	6	15922	0	33970	0	36535	0	30458	1	20939	0	21672	0	21783	0
20	Odisha	455004	68	535028	76	663651	91	681659	104	632493	143	743493	235	656838	217	750262	169
21	Punjab	185825	84	180720	31	190473	51	204936	39	190022	15	197059	27	183533	13	170438	22
22	Rajasthan	228597	38	358853	41	244836	27	223106	11	227571	7	508512	12	545293	18	676832	17
23	Sikkim	45032	9	42506	3	46629	6	55223	2	44094	2	53516	0	42410	1	37275	2
24	Tamil Nadu	109758	140	428365	16	517896	18	455668	49	210074	24	199930	17	278701	23	259452	14
25	Tripura	133993	19	126471	39	147400	33	119945	88	109777	83	98417	22	92826	17	79216	22
26	Uttar Pradesh	87961	18	85591	29	111240	70	100065	42	79643	26	101927	21	828367	272	745457	301
27	Uttrakhand	575496	137	406439	107	453863	159	431893	164	554770	185	740328	254	84792	12	90428	14
28	West Bengal	2592432	1118	2681699	829	2443284	725	1970448	398	1854651	288	2033180	280	1830310	302	1896182	200
29	A& N Island	19506	4	24477	0	30416	0	28028	8	19679	0	33513	3	29391	0	23947	2
30	Chandigarh	10715	7	-	-	10468	7	-	-	42615	0	38218	0	44664	2	39277	29
31	D&N Haveli	50178	3	60748	1	94537	0	69265	1	81322	1	74007	0	62259	0	63337	0
32	Daman & Diu	283	0	4645	0	6849	0	8169	0	12638	0	12559	0	8615	2	12831	0
33	Delhi	160773	70	117766	86	145171	107	115478	89	102983	62	136567	98	129367	62	113677	73
34	Lakshadweep	6679	0	5115	0	4590	1	6742	0	4693	0	5461	0	7496	0	6750	0
35	Puduchery	103832	11	81922	15	76543	16	82659	5	80766	3	96210	21	79751	28	87248	11
	Total	**10993639**	**3603**	**11408666**	**2865**	**11984490**	**1818**	**10742327**	**1526**	**10231049**	**1269**	**11701755**	**1647**	**11413610**	**1629**	**11673018**	**1323**

Source: National Health Profile of India,Central Bureau of Health Intelligence, MOHFW.

- : Not Reported

* : Data of only small number of districts

**Excludes data of 10 districts of Telangana from July Onwards

Table 3.5.8 : State/UT wise cases and deaths due to enteric fever (Typhoid) in India since 2007

Sl. No.	State/UT	2007		2008		2009		2010		2011		2012		2013		2014(P)	
		Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1	Andhra Pradesh**	124644	18	133174	17	136585	8	170763	5	180297	6	279816	37	256458	6	186446	5
2	Arunachal Pradesh*	-	-	5578	1	3739	23	5715	10	7885	9	11821	10	7359	4	4512	3
3	Assam	4166	37	1955	75	4422	0	4140	0	4541	5	12016	10	6521	0	4233	29
4	Bihar*	-	-	-	-	-	-	-	-	14787	0	142341	3	261791	2	273007	4
5	Chattisgarh*	38854	0	40231	0	53291	5	38532	0	42115	1	54417	6	27457	2	32438	0
6	Goa	425	0	1429	1	623	0	431	0	285	0	290	0	355	0	573	0
7	Gujarat	5724	1	4918	0	7156	1	9778	0	14371	0	24325	0	22962	1	29505	0
8	Haryana	6638	1	11233	1	21183	31	22361	2	25469	1	34427	1	27115	0	29990	1
9	Himachal Pradesh	21360	0	24029	2	20252	4	24417	3	28074	2	40041	3	37128	2	48786	6
10	Jammu Division	41460	0	47364	0	74416	0	69713	1	59465	0	68157	0	47563	0	36269	1
	Kashmir Division	19625	0	10682	0	19537	0	21134	0	22882	0			23296	0	21268	0
11	Jharkhand	12209	0	37598	5	34172	10	35872	0	27009	3	19624	39	24806	7	34355	7
12	Karnataka	61610	5	54572	16	50434	11	34296	6	38727	2	55163	1	61485	9	90318	1
13	Kerala	4261	4	5920	5	4331	2	4621	1	3322	0	4670	1	4325	3	2269	0
14	Madhya Pradesh	46863	38	62746	37	57883	39	33792	25	32490	20	68280	29	114578	28	155197	31
15	Maharashtra	67661	14	81188	8	79162	12	94363	0	50095	1	71094	2	81458	1	96927	0
16	Manipur	5278	1	4460	1	5247	3	3859	0	5498	7	13731	5	10927	17	10636	10
17	Meghalaya	37124	2	7478	0	10066	0	8169	1	9235	2	6916	10	9134	1	8996	8
18	Mizoram	909	2	1395	9	1163	4	1115	0	2270	1	2062	1	2765	3	2758	4
19	Nagaland	6458	5	8409	0	15569	0	19014	0	14962	2	10437	0	12736	0	11192	0
20	Odisha	26734	22	40153	32	50341	33	45692	29	59903	104	73087	89	60337	56	87568	38
21	Punjab	19855	6	20927	4	22444	1	28248	6	36263	9	42536	4	35136	5	34651	1
22	Rajasthan	6072	0	15168	8	11469	0	10575	0	7902	0	27018	4	65331	5	83540	4
23	Sikkim	315	0	217	0	218	0	689	0	551	0	401	0	186	0	716	0
24	Tamil Nadu	24037	128	86228	1	143948	1	112879	51	50185	0	34611	0	31440	1	26181	0
25	Tripura	2618	4	8328	4	2025	1	2068	5	3553	0	6198	3	12849	1	14861	0
26	Uttar Pradesh	10447	0	9649	0	23009	49	16489	2	13760	1	28698	4	224748	161	224976	203
27	Uttrakhand	82387	53	48806	31	65096	72	71037	158	117537	80	143516	65	25956	0	28939	14
28	West Bengal	118940	82	136543	74	133095	78	146428	74	127180	34	143179	29	108695	39	90086	42
29	A& N Island	689	1	1675	0	2608	0	1266	1	1343	1	1340	1	1501	3	881	0
30	Chandigarh	422	3	-	-	498	0	-	-	3190	0	3023	0	3251	0	6021	0
31	D&N Haveli	688	0	1541	0	2653	0	2221	0	2269	0	2559	0	4323	0	2439	0
32	Daman & Diu	50	0	486	0	920	0	1652	0	964	0	1265	0	888	0	167	0
33	Delhi	21198	24	19340	32	40646	47	32542	60	42976	55	47957	71	32691	29	25131	14
34	Lakshadweep	2	0	11	0	4	0	13	0	14	0	5	0	3	0	3	0
35	Puduchery	637	1	1038	2	1126	1	11001	0	11077	0	2678	0	2591	1	1477	3
	Total	**820360**	**452**	**934469**	**366**	**1099331**	**436**	**1084885**	**440**	**1062446**	**346**	**1477699**	**428**	**1650145**	**387**	**1707312**	**429**

Source: National Health Profile of India,Central Bureau of Health Intelligence, MOHFW.

* : Data of only a few districts

**Excludes data of 10 districts of Telangana from July Onwards

3.6 Soil and Land

Soil degradation is the decline in soil quality caused by its improper use, usually for agricultural, postural, industrial or urban purposes. Soil degradation is a serious global environmental problem and may be exacerbated by climate change. It encompasses physical, chemical and biological deterioration. Examples of soil degradation are loss of organic matter, decline in soil fertility, decline in structural condition, erosion, adverse changes in salinity, acidity or alkalinity, and the effects of toxic chemicals, pollutants or excessive flooding.

Soils host the majority of the world's biodiversity and healthy soils are essential to securing food and fibre production and providing an adequate water supply over the long term. Ecosystem services provided by soils are integral to the carbon and water cycles and include cultural functions. There are strong links between climate change and soil condition.

The framework for statistics related to climate change included soil and land degradation as an indicator/variable .
The following Tables are included.

3.6 Soil and Land

3.6.1 State-wise major soil (traditional nomenclature)type area
3.6.2 State-wise Estimated Consumption of Fertilizer per hectare
3.6.3 All-India consumption of fertilisers in terms of nutrients (N, P & K)
3.6.4 NPK Consumption ratio during the year 2007-08 to 2011-12
3.6.5 State-wise number of soil testing laboratories in country, their analyzing capacity and its utilization during -2013-14
3.6.6a Wasteland classification system as per Waste Land Atlas of India
3.6.6b Non- wasteland classes as per Waste Land Atlas of India
3.6.7 State and category wise total area under wastelands (sq.km) during 2008-09 vis-a-vis 2005-06 and change in wasteland during the period
3.6.8 Category wise total area under wastelands (sq.km) during 2008-09 vis-a-vis 2005-06 and change in different categories
3.6.9 Change matrix showing inter-class area changes (sq.km) in different wasteland categories in India during 2005-06 and 2008-09
3.6.10 Change Matrix showing inter-class area changes (sq.km) in India during 2005-06 and 2008-09
3.6.11 State-wise and category-wise distribution of wastelands (sq.km) during 2008-09 vis-a- vis 2005-06

Data Sources

National Bureau of Soil Survey and Land Use Planning (ICAR) Nagpur
Compendium of Soil Health- January 2012: Ministry of Agriculture, Department of Agriculture & Cooperation (INM Division)
Department of Agriculture & Cooperation, Ministry of Agriculture
Source: Wastelands Atlas of India 2011, Department of Land resource, Ministry of Rural Development .

Table 3.6.1 : State-wise major soil (traditional nomenclature)type area

Sr. No.	State	Major Soils Area (Thousand ha)																								
		Alluvial soils	Coastal Alluvial soils	Black Soils	Brown forest soils	Beaches	Mountain meadow soils	Laterites	Sub-montane soils	Salt Waste	Sand dunes	Greeks and Lagoons	Gullied land	Glaciers	Desert Soils	Hill Soils	Water bodies	Peat Soils	Red Soils	Rock outerops	Rock Land	Terai Soils	Mangrove swamps	Miscellaneous	Others	Total
1	Jammu & Kashmir	11869.76					60.14		103.84					850.60			113.70		-	9225.56					-	22223.60
2	Himachal Pradesh	1054.00					-							248.04					2917.11	1348.15						5567.30
3	Punjab	3897.48													957.51	131.81									49.40	5036.20
4	Haryana	3828.93		12.74											409.07										170.46	4421.20
5	Delhi	94.58																	6.06						47.66	148.30
6	Uttar Pradesh *	23089.58		1494.46															3926.97			83.01			847.08	29441.10
7	Rajasthan	6992.47		1678.12						36.92	49.08				22381.95				588.22	1656.60				837.46	2586.22	36807.04
8	Gujarat	6703.43	2021.06	5308.68											2534.87				101.40						2932.96	19602.40
9	Goa	281.98																	70.04						18.18	370.20
10	Madhya Pradesh*	11867.72		15203.57															16601.28	13.51					658.52	44344.60
11	Maharashtra	8577.24		15423.78	276.72			64.05											4302.86	274.75					1844.60	30764.00
12	Andhra Pradesh	2432.68	785.15	4727.26				7003.35											9930.11						2625.95	27504.50
13	Karnataka	1825.54	913.21	6685.43	263.30			4446.77											4344.98		355.61				344.26	19179.10
14	Tamil Nadu	704.44	178.64	2334.74				1934.27											7009.01	73.21	474.57				296.92	13005.80
15	Kerala	315.16	191.20					955.16											2044.90	202.88					177.00	3886.30
16	Puducherry **	11.31	10.53	14.61		0.92		1.32				0.09	0.20						0.74						9.48	49.20
17	Bihar (including Jharkhand)	9012.82		11.52															7113.67	18.72					470.12	16626.85
18	Odisha	4527.71	2214.89	908.30				1960.63								1372.06			3948.85						638.26	15570.70
19	West Bengal	3247.43	3369.40					1727.96								238.54				18.20					273.67	8875.20
20	Sikkim													101.40					523.16			78.34			6.70	709.60
21	Arunachal Pradesh	251.61																	8004.46						118.23	8374.30
22	Assam	1204.68																	6292.32						346.80	7843.80
23	Nagaland																		1604.44						53.46	1657.90
24	Manipur	318.04														428.44			1432.40	3.90					49.92	2232.70
25	Mizoram	107.30																	1840.44						160.36	2108.10
26	Tripura	243.08														90.92		2.40	706.69						5.51	1048.60
27	Meghalaya	167.62																	2075.28							2242.90
28	Andaman & Nicobar	197.00	362.70																89.57				114.46		61.17	824.90
29	Lakshadweep		2.49								0.05													0.56	0.10	3.20

Source: National Bureau of Soil Survey and Land Use Planning (ICAR) Nagpur

* Including Uttarakhand (with UP) and Chhattisgarh(with MP)

** and Karaikal

Table 3.6.2 : State-wise Estimated Consumption of Fertilizer per hectare

(Kg/Hectare)

State	2011-12				2012-13				2013-14			
	N	P	K	Total	N	P	K	Total	N	P	K	Total
Andhra Pradesh	143.71	75.81	23.41	242.93	129.44	51.89	18.33	199.66	153.55	54.32	18.85	226.72
Karnataka	100.83	65.24	27.60	193.67	73.94	32.31	20.72	126.97	78.37	36.67	21.01	136.05
Kerala	50.92	24.85	37.43	113.20	46.26	23.66	34.20	104.12	51.06	26.42	43.55	121.03
Tamil Nadu	116.22	53.72	44.81	214.75	97.56	37.86	25.33	160.75	93.27	33.47	27.03	153.77
Puducherry	541.11	144.44	113.33	798.88	420.00	104.44	60.37	584.81	449.26	77.41	56.67	583.34
A&N Island	20.56	20.56	9.44	50.56	23.89	17.78	13.89	55.56	25.56	19.44	16.11	61.11
Lakshadweep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gujarat	90.38	31.85	10.14	132.37	76.96	19.69	5.84	102.49	88.52	24.09	6.92	119.53
Madhya Pradesh	47.16	33.34	3.53	84.03	48.09	31.78	3.15	83.02	53.76	28.17	2.5	84.43
Chhatttisgarh	62.92	31.31	10.92	105.15	66.24	31.78	8.21	106.23	63.08	28.72	8.43	100.23
Maharashtra	73.51	46.17	18.23	137.91	62.44	32.66	17.73	112.83	72.41	35.29	19.37	127.07
Rajasthan	37.28	16.98	1.07	55.33	39.44	14.53	0.88	54.85	37.97	11.51	0.21	49.69
Goa	18.66	16.28	11.52	46.46	16.95	9.94	5.91	32.80	18.23	8.05	5.55	31.83
Daman & Diu	20.00	3.33	0.00	23.33	46.67	6.67	3.33	56.67	26.67	6.67	3.33	36.67
D& N Haveli	27.27	18.64	0.00	45.91	26.36	17.27	0.00	43.63	24.55	15.91	0.45	40.91
Haryana	157.33	56.96	5.78	11.52	157.65	47.86	2.57	208.08	146.49	30.58	2.41	179.48
Punjab	179.20	56.76	6.69	242.65	187.94	58.50	3.04	249.48	172.55	41.14	3.04	216.73
Uttar Pradesh	118.84	39.68	6.45	164.97	129.87	45.19	5.14	180.20	115.18	29.63	4.06	148.87
Uttarakhand	109.35	28.54	9.13	147.02	107.15	21.01	6.57	134.73	118.89	19.24	5.67	143.80
Himachal Pradesh	34.49	10.20	9.39	54.08	35.46	7.17	7.50	50.13	35.03	8.69	9.03	52.75
J & K	56.96	24.68	4.56	86.20	65.31	20.76	8.40	94.47	57.83	21.87	9.37	89.07
Delhi	8.97	5.64	0.26	14.87	28.97	1.79	0.00	30.76	93.33	0.00	0.00	93.33
Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bihar	126.56	38.84	15.09	180.49	145.31	42.58	11.77	199.66	124.88	27.44	12.55	164.87
Jharkhand	94.04	33.47	9.04	136.55	89.11	60.62	7.74	157.47	65.72	13.79	2.94	82.45
Odisha	65.15	27.29	1.24	93.68	63.46	25.02	10.27	98.75	63.05	23.71	11.37	98.13
West Bengal	88.95	50.91	33.04	172.90	88.10	48.51	30.23	166.84	74.09	28.11	28.97	131.17
Assam	36.19	11.76	18.09	66.04	36.19	11.76	18.09	66.04	36.24	9.99	19.19	65.42
Tripura	28.09	14.80	7.36	50.25	36.87	19.49	12.21	68.57	28.73	21.27	11.73	61.73
Manipur	18.05	2.66	1.21	21.92	24.88	3.51	1.32	29.71	22.66	3.75	3.18	29.59
Meghalaya	9.65	3.66	0.74	14.05	9.91	3.39	1.00	14.30	10.35	3.07	0.8	14.22
Nagaland	1.58	1.03	0.42	3.03	2.32	1.46	0.80	4.58	2.26	1.48	0.72	4.46
Arunachal Pradesh	1.96	0.36	0.11	2.43	1.60	0.11	0.32	2.03	0.00	0.00	0.00	0.00
Mizoram	9.48	2.16	0.62	12.26	16.91	0.93	0.31	18.15	30.31	2.37	2.99	35.67
Sikkim	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ALL INDIA AVERAGE	**88.61**	**40.54**	**13.19**	**142.34**	**86.15**	**34.08**	**10.56**	**130.79**	**85.79**	**28.85**	**10.75**	**125.39**

Source: Agricultural Statisatics at Glance 2014, Ministry of Agriculture, Department of Agriculture & Cooperation (Integrated Nutrient Management Division)

N : Nitrogen P : Phosphorous K : Potash (Potassium)

Table 3.6.3 : All-India consumption of fertilisers in terms of nutrients (N, P & K)- a time series

(Thousand Tonnes)

Year	N	P	K	Total
1950-51	58.7	6.9	-	65.6
1955-56	107.5	13.0	10.3	130.8
1960-61	210.0	53.1	29.0	292.1
1965-66	574.8	132.5	77.3	784.6
1970-71	1487.0	462.0	228.0	2177.0
1975-76	2148.6	466.8	278.3	2893.7
1980-81	3678.1	1213.6	623.9	5515.6
1985-86	5660.8	2005.2	808.1	8474.1
1986-87	5716.0	2078.9	850.0	8644.9
1987-88	5716.8	2187.0	880.5	8784.3
1988-89	7251.0	2720.7	1068.3	11040.0
1989-90	7386.0	3014.2	1168.0	11568.2
1990-91	7997.2	3221.0	1328.0	12546.2
1991-92	8046.3	3321.2	1360.5	12728.0
1992-93	8426.8	2843.8	883.9	12154.5
1993-94	8788.3	2669.3	908.4	12366.0
1994-95	9507.1	2931.7	1124.7	11.5
1995-96	9822.8	2897.5	1155.8	13876.1
1996-97	10301.8	2976.8	1029.6	14308.1
1997-98	10901.8	3913.6	1372.5	16187.9
1998-99	11353.8	4112.2	1331.5	16797.5
1999-00	11592.7	4798.3	1678.7	18069.7
2000-01	10920.2	4214.6	1567.5	16702.3
2001-02	11310.2	4382.4	1667.1	17359.7
2002.03	10474.1	4018.8	1601.2	16094.1
2003-04	11077.0	4124.3	1597.9	16799.1
2004-05	11713.9	4623.8	2060.6	18398.3
2005-06	12723.3	5203.7	2413.3	20340.3
2006-07	13772.9	5543.3	2334.8	21651.0
2007-08	14419.1	5514.7	2636.3	22570.1
2008-09	15090.5	6506.2	3312.6	24909.3
2009-10	15580.0	7274.0	3632.4	26486.4
2010-11	16558.2	8049.7	3514.3	28122.2
2011-12	17300.3	7914.3	2575.4	27790.0
2012-13	16820.9	6653.4	2061.8	25536.2
2013-14	16750.1	5633.5	2098.9	24482.4

Source: Department of Agriculture & Cooperation, Ministry of Agriculture

N : Nitrogen P : Phosphorous K : Potash (Potassium)

Table 3.6.4 : NPK Consumption ratio during the year 2007-08 to 2011-12

Major States	2007-08			2008-09			2009-10			2010-11			2011-12		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
Andhra Pradesh	3.8	1.7	1	3.5	1.7	1	3.6	1.8	1	3.9	2.1	1	6.1	3.2	1
Karnataka	2.4	1.2	1	2.1	1.4	1	2.1	1.4	1	2.6	1.7	1	3.7	2.4	1
Kerala	1.3	0.6	1	1.2	0.6	1	1.2	0.6	1	1.2	0.7	1	1.4	0.7	1
Tamil Nadu	1.8	0.7	1	1.8	0.7	1	1.9	0.8	1	2.1	0.9	1	2.6	1.2	1
Pondicherry	2.3	1.0	1	2.6	0.9	1	3.1	0.8	1	3.5	0.9	1	4.8	1.3	1
WEST ZONE															
Gujarat	7.2	2.9	1	5.8	2.5	1	5.3	2.4	1	6.9	2.9	1	8.9	3.1	1
Madhya Pradesh	10.5	5.7	1	8.9	5.9	1	8.3	5.3	1	7.8	5.8	1	13.4	9.4	1
Chattisgarh	5.2	2.2	1	4.4	2.2	1	5.4	2.8	1	4.7	2.5	1	5.8	2.9	1
Maharashtra	3.0	1.5	1	2.8	1.6	1	2.6	1.8	1	2.5	1.7	1	4.0	2.5	1
Rajasthan	33.7	12.5	1	30.2	13.6	1	20.8	9.1	1	24.9	11.8	1	34.9	15.9	1
Goa	1.9	1.0	1	1.4	1.3	1	1.2	1.2	1	1.9	1.3	1	1.6	1.4	1
NORTH ZONE															
Haryana	39.8	10.9	1	32.2	10.7	1	15.9	5.5	1	20.5	7.1	1	27.2	9.8	1
Punjab	34.3	9.0	1	23.6	6.7	1	18.4	5.9	1	19.1	5.9	1	26.8	8.5	1
Uttar Pradesh	15.1	4.5	1	11.5	3.6	1	9.0	3.2	1	11.0	4.1	1	18.4	6.2	1
Uttaranchal	11.2	2.4	1	8.8	2.4	1	11.2	2.9	1	8.0	2.2	1	12.0	3.1	1
Himachal Pradesh	3.7	1.0	1	3.2	1.0	1	2.8	1.0	1	2.8	0.9	1	3.7	1.1	1
J & K	11.9	3.6	1	8.1	3.3	1	5.7	1.9	1	6.5	3.3	1	12.5	5.4	1
EAST ZONE															
Bihar	11.0	2.3	1	5.7	1.5	1	5.3	1.5	1	5.8	1.9	1	8.4	2.6	1
Jharkhand	9.2	4.7	1	7.0	3.6	1	4.8	2.8	1	8.8	4.2	1	10.4	3.7	1
Orissa	4.3	1.9	1	3.3	1.7	1	3.7	1.9	1	3.3	1.7	1	5.8	2.4	1
West Bengal	2.2	1.3	1	1.7	1.0	1	1.6	1.0	1	2.0	1.4	1	2.7	1.5	1
Assam	1.8	1.0	1	2.0	0.8	1	1.9	0.7	1	1.9	0.8	1	2.0	0.6	1
Tripura	3.4	1.2	1	2.7	1.3	1	2.6	1.0	1	2.3	1.3	1	3.8	2.0	1
Manipur	11.0	2.6	1	6.4	1.3	1	29.6	2.8	1	17.0	3.7	1	15.0	2.2	1
Meghalaya	7.7	3.7	1	6.5	1.7	1	7.1	2.4	1	6.3	3.2	1	13.1	5.0	1
Nagaland	3.9	2.1	1	3.9	2.7	1	2.9	1.9	1	4.5	2.8	1	3.8	2.5	1
ALL INDIA	**5.5**	**2.1**	**1**	**4.6**	**2.0**	**1**	**4.3**	**2.0**	**1**	**4.7**	**2.3**	**1**	**6.7**	**3.1**	**1**

Source: Ministry of Agriculture and Farmers Welfares, Department of Agriculture & Cooperation (Integrated Nutrient Management Division)

N : Nitrogen P : Phosphorous K : Potash (Potassium)

Note : Lakshadweep, D& N Haveli & Chandigarh data is not available.

Table 3.6.5: State-wise number of soil testing laboratories in country, their analyzing capacity and its utilization during -2013-14

Name of State	No of Soil testing laboratories				Total			Annual Analyzing capacity in '000'	Sample Analyzed in '000'	Capacity Utilization (%)
	State Govt.		Fert. Industry							
	Static	Mobile	Static	Mobile	Static	Mobile	Total			
South Zone										
Andhra Pradesh	55	5	27	1	82	6	88	413.00	345.79	83.73
Karnataka*	56	0	6	2	62	2	64	295.66	194.81	65.89
Kerala	14	11	1	0	15	11	26	218.00	134.68	61.78
Tamil Nadu	30	16	1	1	31	17	48	5796.72	4823.54	83.21
Puducherry*	2	0	0	0	2	0	2	4.00	4.41	110.25
Total	**157**	**32**	**35**	**4**	**192**	**36**	**228**	**6727.38**	**5503.23**	**81.80**
West Zone										
Gujarat	132	2	4	1	136	3	139	1412.00	1199.13	84.92
Madhya Pradesh	50	7	2	4	52	11	63	378.00	346.52	91.67
Maharashtra	123	23	8	4	131	27	158	2241.35	967.27	43.16
Rajasthan	34	22	1	2	35	24	59	536.00	402.69	75.13
Chhattisgarh	7	5	1	0	8	5	13	105.00	116.02	110.50
Goa	2	0	0	0	2	0	2	23.00	14.96	65.04
Total	**348**	**59**	**16**	**11**	**364**	**70**	**434**	**4695.35**	**3046.59**	**64.89**
North Zone				11.52113						
Haryana	35	3	2	0	37	3	40	365.00	247.89	67.92
Punjab	54	12	2	3	56	15	71	631.50	282.11	44.67
Uttarakhand	13	3	0	0	13	3	16	106.54	95.23	89.38
Uttar Pradesh	255	18	5	3	260	21	281	4159.50	3404.58	81.85
Himachal Pradesh	11	4	0	0	11	4	15	125.00	124.38	99.50
J & K	8	5	0	0	8	5	13	52.00	43.61	83.87
Delhi	1	0	0	0	1	0	1	5.00	0.46	9.20
Total	**377**	**45**	**9**	**6**	**386**	**51**	**437**	**5444.54**	**4198.26**	**77.11**
East Zone										
Bihar	39	0	0	0	39	0	39	230.00	248.71	108.13
Jharkhand	8	0	0	0	8	0	8	40.00	10.67	26.68
Odisha	17	6	1	0	18	6	24	270.00	255.06	94.47
West Bengal	10	8	0	2	10	10	20	112.40	60.43	53.76
Total	**74**	**14**	**1**	**2**	**75**	**16**	**91**	**652.40**	**574.87**	**88.12**
NE Zone										
Assam	7	4	0	0	7	4	11	84.00	60.76	72.33
Tripura	2	4	0	0	2	4	6	35.00	17.54	50.11
Manipur	4	4	0	0	4	4	8	40.00	1.37	3.43
Meghalaya	3	3	0	0	3	3	6	30.00	27.65	92.17
Nagaland	3	0	0	0	3	0	3	45.00	14.30	31.78
Arunachal Pradesh	5	3	0	0	5	3	8	9.00	7.86	87.33
Sikkim	4	2	0	0	4	2	6	37.00	39.87	107.76
Mizoram	3	3	0	0	3	3	6	27.00	25.00	92.59
Total	**31**	**23**	**0**	**0**	**31**	**23**	**54**	**307.00**	**194.35**	**63.31**
Grand Total	**987**	**173**	**61**	**23**	**1048**	**196**	**1244**	**17826.67**	**13517.30**	**75.83**

Source: Compendium of Soil Health- 2013-14, Ministry of Agriculture & Farmers Welfares, Department of Agriculture & Cooperation (Integrated Nutrient Management Division)

Table 3.6.6a : Wasteland Classification system

Wasteland classes	
Category	**Waste Land Class Code**
Gullied and/ or ravinous land (Medium)	1
Gullied and/ or ravinous land (Deep)	2
Land with Dense Scrub	3
Land with Open Scrub	4
Waterlogged and Marshy land (Permanent)	5
Waterlogged and Marshy land (Seasonal)	6
Land affected by salinity/alkalinity(Moderate)	7
Land affected by salinity/alkalinity (Strong)	8
Shifting Cultivation - Current Jhum	9
Shifting Cultivation - Abandoned Jhum	10
Under-utilised/degraded forest (Scrub domin)	11
Under-utilised/degraded forest (Agriculture)	12
Degraded pastures/ grazing land	13
Degraded land under plantation crop	14
Sands - Riverine	15
Sands - Coastal	16
Sands - Desertic	17
Sands - Semi Stab. - Stab > 40 m	18
Sands - Semi Stab. - Stab 15 - 40 m	19
Mining Wastelands	20
Industrial Wastelands	21
Barren Rocky Area	22
Snow Covered/ Glacial Area	23

Table 3.6.6b Non-wasteland classes in 2008-09 considered for change analysis

Non-Wasteland classes	
Category	**Non Waste Land Class Code**
Built - Up	24
Industrial Area	25
Cropland	26
Fallow Land	27
Plantation	28
Forest (Dense/ Open)	29
Forest Plantation	30
Grasslands	31
Water bodies	32

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

Table 3.6.7: State Category wise total area under wastelands (sq.km) during 2008-09 vis-a-vis 2005-06 and change in Wasteland during the period

State	No of Districts	Total Geographic Area (TGA)	Total Waste Land(WL)		Change	Total Reduction	Total Increase	% of WL to TGA		% Change over 2005-06
			2005-06	2008-09				2005-06	2008-09	
Andhra Pradesh	23	275068	38788.22	37296.62	-1491.60	1682.10	190.46	14.10	13.56	-0.54
Arunachal Pradesh	16	83743	5743.83	14895.24	9151.41	108.48	9259.89	6.86	17.79	10.93
Assam	23	78438	8778.02	8453.86	-324.16	862.56	538.04	11.19	10.78	-0.41
Bihar	37	94171	6841.09	9601.01	2759.92	1895.09	4654.41	7.26	10.20	2.93
Chhattisgarh	16	135194	11817.82	11482.18	-335.64	379.06	43.15	8.74	8.49	-0.25
Delhi	1	1483	83.34	90.21	6.87	3.62	10.27	5.62	6.08	0.46
Goa	2	3702	496.27	489.08	-7.19	11.48	3.99	13.41	13.21	-0.19
Gujarat	25	196024	21350.38	20108.06	-1242.32	2858.99	1616.67	10.89	10.26	-0.63
Haryana	21	44212	2347.05	2145.98	-201.07	232.20	31.92	5.31	4.85	-0.45
Himachal Pradesh	12	55673	22470.05	22347.88	-122.17	197.25	75.57	40.36	40.14	-0.22
Jammu & Kashmir *	14	101387	73754.38	75435.77	1681.39	1191.48	2872.78	72.75	74.40	1.66
Jharkhand	24	79706	11670.14	11017.38	-652.76	1183.50	531.16	14.64	13.82	-0.82
Karnataka	27	191791	14438.12	13030.62	-1407.50	1477.98	70.82	7.53	6.79	-0.73
Kerala	14	38863	2458.69	2445.62	-13.07	247.55	234.44	6.33	6.29	-0.03
Madhya Pradesh	48	308252	40042.98	40113.27	70.29	258.95	329.25	12.99	13.01	0.02
Maharashtra	35	307690	38262.81	37830.82	-431.99	469.93	38.22	12.44	12.30	-0.14
Manipur	9	22327	7027.47	11.52	-7015.95	2391.10	1012.14	31.48	0.05	-31.42
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**	**461384.15**	**-10877.80**	**32340.38**	**27098.42**	**14.91**	**14.57**	**-0.34**

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

* Unmapped areas (J&K) 120849.00

Table 3.6.8 :Category wise total area under wastelands (sq.km) during 2008-09 vis-a-vis 2005-06 and change in different categories

Waste Land Classification Code	Category	Total WL			% to TGA		
		2005-06	2008-09	Change	2005-06	2008-09	Change
1	Gullied and/or ravinous land-Medium	7005.47	6145.96	-859.51	0.22	0.19	-0.03
2	Gullied and/or ravinous land-Deep/very deep ravine	1714.80	1266.06	-448.74	0.05	0.04	-0.01
3	Land with dense scrub	93372.62	86979.91	-6392.71	2.95	2.75	-0.20
4	Land with open scrub	91645.83	93033.00	1387.17	2.89	2.94	0.05
5	Waterlogged and Marshy land-Permanent	2532.46	1757.07	-775.39	0.08	0.06	-0.02
6	Waterlogged and Marshy land-Seasonal	2994.22	6946.31	3952.09	0.09	0.22	0.13
7	Land affected by salinity/alkalinity-Moderate	5451.63	5414.53	-37.10	0.17	0.17	0.00
8	Land affected by salinity/alkalinity-Strong	1737.81	1391.09	-346.72	0.05	0.04	-0.01
9	Shifting cultivation area-Current Jhum	5625.07	4814.68	-810.39	0.18	0.15	-0.03
10	Shifting cultivation area-Abandoned Jhum	4608.44	4210.46	-397.98	0.15	0.13	-0.02
11	Under utilised/degraded forest-Scrub dominated	85787.78	83699.71	-2088.07	2.71	2.64	-0.07
12	Agricultural land inside notified forest land	16381.53	15680.26	-701.27	0.52	0.50	-0.02
13	Degraded pastures/grazing land	7197.14	6832.17	-364.97	0.23	0.22	-0.01
14	Degraded land under plantation crops	314.14	278.53	-35.61	0.01	0.01	0.00
15	Sands- Riverine	2439.86	2111.96	-327.90	0.08	0.07	-0.01
16	Sands- Coastal sand	719.31	654.47	-64.84	0.02	0.02	0.00
17	Sands- Desert Sand	5280.07	3934.8	11.52	0.17	0.12	-0.05
18	Sands- Semi-stabilized to stabilized (>40m) dune	11188.21	9279.75	-1908.46	0.35	0.29	-0.06
19	Sands- Semi-stabilized to stabilized moderately high (15- 40m) dune	15627.63	14273.03	-1354.60	0.49	0.45	-0.04
20	Mining Wastelands	506.58	593.65	87.07	0.02	0.02	0.00
21	Industrial wastelands	63.99	58.00	-5.99	0	0.00	0.00
22	Barren rocky area	69372.54	59482.29	-9890.25	2.19	1.88	-0.31
23	Snow cover and/or glacial area	40694.8	58183.44	17488.64	1.29	1.84	0.55
	Total	472261.93	467021.13	-5240.80	14.91	14.75	-0.16

WL : Waste Land ; TGA : Total Geographic Area.

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

3.6.9 Change matrix showing inter-class area changes (sq.km) in different wasteland categories in India during 2005-06 and 2008-09

WL Category	WL during2005-06 remaining as WL in 2008-09																							WL Becoming Non WL	Category Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
1	5035.88	21.78	642.63	406.40	-	0.35	6.93	0.10	-	-	242.70	0.32	0.10	-	3.29	-	1.25	-	-	0.30	-	4.62	0.00	638.82	**7005.47**
2	28.89	1219.27	315.77	59.28	-	-	-	-	-	-	4.65	-	0.45	-	-	-	0.81	-	-	-	-	0.12	18.78	67.30	**1715.32**
3	55.78	0.04	75594.40	5085.50	3.18	28.93	253.14	-	152.40	30.24	1341.16	98.16	12.40	33.39	5.97	0.13	4.08	-	39.65	19.45	-	161.65	12.30	10441.01	**93372.96**
4	32.11	9.18	3275.45	80140.81	3.88	43.80	247.13	2.66	155.43	45.69	809.55	12.77	12.12	0.93	8.98	0.05	1.78	58.30	29.46	37.29	2.11	99.03	436.77	6180.02	**91645.30**
5	0.31	-	4.63	33.84	1507.19	465.19	5.05	0.58	-	-	0.30	0.48	0.01	-	0.91	3.86	-	-	-	-	-	-	-	510.81	**2533.16**
6	0.85	-	76.56	84.15	91.82	1853.40	8.26	0.18	-	-	2.44	23.00	1.29	-	17.03	-	-	-	-	-	-	-	-	835.10	**2994.08**
7	12.59	0.05	39.69	141.16	4.50	13.82	4594.58	15.90	-	-	1.70	-	0.27	5.31	1.95	1.44	0.01	-	0.62	2.04	0.03	1.33	-	614.64	**5451.63**
8	0.14	0.01	3.32	25.64	2.62	1.87	147.28	1366.60	-	-	0.54	-	--	0.59	0.22	-	-	-	-	0.53	-	0.16	-	188.21	**1737.73**
9	-	-	403.06	628.63	-	-	-	-	1567.66	2162.52	58.78	0.55	-	-	-	-	-	-	-	-	-	1.16	-	802.71	**5625.07**
10	-	-	596.34	845.07	-	-	-	-	387.85	1908.30	188.49	0.07	-	-	-	-	-	-	-	-	-	0.80	-	681.75	**4608.67**
11	16.44	2.44	1725.21	1235.20	0.80	4.38	-	-	113.21	6.96	77660.96	497.14	26.27	6.89	1.19	-	-	-	-	2.65	0.04	25.96	79.73	4383.12	**85788.59**
12	702.30	-	10.24	10.56	0.02	0.39	-	-	0.05	-	460.23	14593.31	-	0.26	-	-	-	-	-	3.90	-	7.64	-	592.46	**16381.36**
13	-	0.48	117.83	179.38	0.07	0.58	0.92	0.30	-	--	11.30	0.90	6233.79	0.07	0.96	-	7.99	0.83	4.05	0.99	0.13	0.20	13.23	622.98	**7196.98**
14	-	-	19.98	10.85	-	1.38	-	-	-	-	0.73	0.14	0.21	215.88	-	0.40	-	-	0.01	-	-	-	-	64.57	**314.15**
15	1.98	-	87.21	86.15	0.86	0.49	0.63	0.06	-	-	0.17	-	1.68	-	1990.03	-	-	-	-	0.46	-	0.77	0.49	268.49	**2439.47**
16	-	-	8.03	8.99	-	0.32	1.66	-	-	-	4.56	0.13	-	0.92	0.10	635.93	-	-	-	-	-	-	-	58.87	**719.51**
17	-	-	111.58	11.52	0.23	-	-	0.06	-	-	0.03		2.59	-	1.05	-	3565.82	0.08	111.66	-	0.05	1.57	0.57	1401.16	**5207.97**
18	-	-	179.15	59.48	0.43	5.34	-	-	-	-	-	-	0.90	-	-	-	70.93	9151.68	1147.19	-	-	-	-	573.11	**11188.21**
19	-	-	303.86	69.87	-	0.14	-	-	-	-	-	-	2.48	-	0.18	-	89.16	66.99	12772.23	-	-	3.19	-	2318.97	**15627.07**
20	-	-	9.68	14.22	0.72	0.06	0.35	-	-	-	1.25	-	0.02	0.14	0.04	-	-	-	-	451.76	-	0.07	-	28.28	**506.59**
21	-	-	0.02	3.83	-	-	0.28	-	-	-	0.14	-	-	-	-	-	-	-	-	1.05	50.39	-	-	8.35	**64.06**
22	64.28	9.85	584.10	888.51	0.72	0.01	0.12	-	0.41	-	542.81	61.56	12.46	-	14.79	-	-	-	-	14.46	0.66	56785.11	9906.11	486.60	**69372.56**
23	-	-	1.22	81.94	-	-	-	-	-	-	1007.22	-	105.11	1.41	-	-	-	-	-	-	-	1746.21	37178.99	572.65	**40694.75**
999*	194.41	2.96	2869.98	2849.92	140.02	4525.87	148.19	4.66	2437.67	56.75	1360.00	391.74	420.02	12.75	65.27	12.67	192.97	1.88	168.16	58.77	4.58	642.69	10536.48		
Category Total (2008-09)	**6145.96**	**1266.06**	**86979.94**	**92960.90**	**1757.06**	**6946.32**	**5414.52**	**1391.10**	**4814.68**	**4210.46**	**83699.71**	**15680.27**	**6832.07**	**278.54**	**2111.96**	**654.48**	**3934.80**	**9279.76**	**14273.03**	**593.65**	**57.99**	**59482.28**	**58183.45**	**32339.98**	

* Figures at the bottom row against category 999 are non-wasteland in 2005-06. These have become wasteland in 2008-09 as per the categories in the column heads

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

Table 3.6.10 Change Matrix showing inter-class area changes (sq.km) in India during 2005-06 and 2008-09

WL Category	WL in 2005-06 continued as WL in 2008-09	WL 2005-06 becoming non-WL in 2008-09										Category Total (2005-06)
		Non Waste Land Category										
		24	25	26	27	28	29	30	31	32	Total	
1	6366.65	7.73	0.75	477.52	80.84	56.05	7.60	2.28	-	6.05	638.82	**7005.47**
2	1648.02	9.30	-	41.25	13.76	-	0.57	1.78	-	0.64	67.30	**1715.32**
3	82931.95	140.33	22.37	3433.86	2966.89	355.47	2252.01	987.00	14.34	268.74	10441.01	**93372.96**
4	85465.28	213.99	48.91	3789.46	1204.50	219.52	395.80	79.68	5.79	222.37	6180.02	**91645.30**
5	2022.35	16.45	0.42	280.71	6.62	3.20	0.13	-	2.10	201.18	510.81	**2533.16**
6	2158.98	57.93	2.72	635.87	13.86	9.96	2.35	4.06	7.24	101.11	835.10	**2994.08**
7	4836.99	22.75	9.36	479.62	87.53	4.93	0.18	0.59	-	9.68	614.64	**5451.63**
8	1549.52	13.31	2.91	117.14	17.58	13.05	-	-	-	24.22	188.21	**1737.73**
9	4822.36	48.24	-	11.77	2.78	0.07	737.94	1.83	-	0.08	802.71	**5625.07**
10	3926.92	13.46	-	7.58	0.14	-	640.34	20.21	-	0.02	681.75	**4608.67**
11	81405.47	34.18	8.33	397.96	37.24	42.33	3125.87	682.38	0.41	54.42	4383.12	**85788.59**
12	15788.9	17.95	3.13	188.07	228.57	0.12	34.78	66.44	11.84	41.56	592.46	**16381.36**
13	6574	29.61	3.14	315.44	193.57	26.06	1.22	0.44	26.87	26.63	622.98	**7196.98**
14	249.58	4.05	0.46	23.05	1.09	18.63	11.17	1.93	3.67	0.52	64.57	**314.15**
15	2170.98	1.77	1.75	59.95	15.99	2.81	-	-	-	186.22	268.49	**2439.47**
16	660.64	10.38	-	11.52	0.83	19.62	0.08	0.19	-	16.85	59.47	**720.11**
17	3878.91	0.97	0.49	875.46	504.58	0.56	0.13	2.78	-	16.19	1401.16	**5280.07**
18	10615.1	-	-	357.73	211.88	2.27	-	0.29	0.94	-	573.11	**11188.21**
19	13308.1	0.43	-	1667.12	616.94	6.63	-	27.83	-	0.02	2318.97	**15627.07**
20	478.31	1.74	9.43	6.90	0.36	5.71	-	-	-	4.14	28.28	**506.59**
21	55.71	5.53	1.82	0.78	0.05	-	-	-	-	0.17	8.35	**64.06**
22	68885.96	36.99	21.69	219.84	54.26	20.17	28.48	5.65	13.60	85.92	486.60	**69372.56**
23	40122.1	-	-	3.35	-	-	436.80	0.06	131.90	0.54	572.65	**40694.75**
999	27098.41											
WL Category Total (2008-09)	**467021.19**	**687.09**	**137.68**	**13401.95**	**6259.86**	**807.16**	**7675.45**	**1885.42**	**218.70**	**1267.27**		

* Figures at the bottom row against category 999 are non-wasteland in 2005-06. These have become wasteland in 2008-09.

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

Table 3.6.11 : State-wise and category-wise distribution of wastelands (sq.k.m) during 2008-09 vis-a- vis 2005-06

WL	Andhra Pradesh			Arunachal Pradesh			Assam			Bihar			Chhattisgarh		
Class	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change
1	405.48	381.81	-23.67	-	-	-	-		-	71.83	71.44	-0.39	142.90	74.68	-68.22
2	2.89	3.00	0.11	-	-	-	-		-	-	-	-	-	15.50	15.50
3	10323.01	9613.83	-709.18	957.70	633.27	-324.43	1956.80	2008.32	51.52	954.39	543.97	-410.42	1049.85	979.44	-70.41
4	7416.17	7153.17	-263.00	2162.04	1554.94	-607.10	1626.68	2111.47	484.79	2761.16	1948.44	-812.72	3052.58	2962.15	-90.43
5	109.07	108.01	-1.06	-	0.15	0.15	494.69	317.67	-177.02	694.65	358.39	-336.26	-	0.74	0.74
6	-	0.22	0.22	-	1.60	1.60	1025.46	570.39	-455.07	869.40	5379.36	4509.96	-	-	-
7	1215.10	1165.63	-49.47	-	-	-	-	-	-	-	-	-	0.28	0.28	0.00
8	504.83	490.12	-14.71	-	-	-	-	-	-	3.97	1.65	-2.32	-	-	-
9	15.15	16.14	0.99	1025.07	961.04	-64.03	160.15	258.86	98.71	-	-	-	-	0.02	0.02
10	1.30	1.76	0.46	506.39	1078.52	572.13	79.41	136.33	56.92	-	-	-	-	0.14	0.14
11	13123.06	12843.74	-279.32	20.46	1197.77	1177.31	1300.80	929.51	-371.29	1198.63	1090.42	-108.21	2943.76	2954.52	10.76
12	1835.48	1743.79	-91.69	-	3.91	3.91	2132.50	2063.03	-69.47	76.85	46.64	-30.21	3616.45	3596.66	-19.79
13	132.37	132.41	0.04	186.11	220.29	34.18	-	2.84	2.84	60.63	34.57	-26.06	-	-	-
14	37.79	35.31	-2.48	-	-	-	-	-	-	11.54	1.32	-10.22	-	-	-
15	32.12	28.20	-3.92	-	0.04	0.04	0.01	52.64	52.63	6.82	17.98	11.16	179.10	174.10	-5.00
16	318.72	298.62	-20.10	-	-	-	-	-	-	-	-	-	-	-	-
17	3.76	4.34	0.58	11.52	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	0.35	0.35	-	-	-	-	-	-	-	-	-	-	-	-
20	14.39	15.52	1.13	-	-	-	1.51	2.13	0.62	0.22	3.78	3.56	5.91	5.97	0.06
21	1.77	2.39	0.62	-	-	-	-	-	-	6.66	6.29	-0.37	-	0.12	0.12
22	3295.73	3258.27	-37.46	150.09	133.67	-16.42	-	0.66	0.66	124.35	96.77	-27.58	827.00	717.85	-109.15
23	-	-	-	735.98	9110.04	8374.06	-	-	-	-	-	-	-	-	-
Total WL	**38788.19**	**37296.63**	**-1491.56**	**5755.36**	**14895.24**	**9139.88**	**8778.01**	**8453.85**	**-324.16**	**6841.10**	**9601.02**	**2759.92**	**11817.83**	**11482.17**	**-335.66**
TGA		**275068.00**			**83743.00**			**78438.00**			**94171.00**			**135194.00**	
% to TGA	**14.10**	**13.56**	**-0.54**	**6.87**	**17.79**	**10.91**	**11.19**	**10.78**	**-0.41**	**7.26**	**10.20**	**2.93**	**8.74**	**8.49**	**-0.25**

TGA: Total Geographic Area. WL: Waste Land

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

WL Class:

1. Gullied and/ or ravinous land (Medium)
2. Gullied and/ or ravinous land (Deep)
3. Land with Dense Scrub
4. Land with Open Scrub
5. Waterlogged and Marshy land (Permanent)
6. Waterlogged and Marshy land (Seasonal)
7. Land affected by salinity/alkalinity (Medium)
8. Land affected by salinity/alkalinity (Strong)
9. Shifting Cultivation - Current Jhum
10. Shifting Cultivation - Abandoned Jhum
11. Under-utilised/degraded forest (Scrub domin)
12. Under-utilised/degraded forest (Agriculture)
13. Degraded pastures/ grazing land
14. Degraded land under plantation crop
15. Sands-Riverine
16. Sands-Coastal
17. Sands-Desertic
18. Sands-Semi Stab.-Stab>40m
19. Sands-Semi Stab.-Stab 15-40m
20. Mining Wastelands
21. Industrial wastelands
22. Barren Rocky/Stony waste
23. Snow covered /Glacial area

(Area in sq.km.) Contd.....

Table 3.6.11: State-wise and category-wise distribution of wastelands (sq.k.m) during 2008-09 vis-a- vis 2005-06 ((Area in sq.km.) Contd.....

WL	Delhi			Goa			Gujarat			Haryana			Himachal Pradesh		
Class	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change
1	0.72	0.73	0.01	-	-	-	398.46	337.74	-60.72	-	1.22	1.22	170.23	167.79	-2.44
2	6.12	6.18	0.06	-	-	-	1.70	0.93	-0.77	0.96	0.96	-	4.52	14.70	10.18
3	7.51	8.77	1.26	51.89	87.90	36.01	11597.91	9817.36	-1780.55	2.98	30.06	27.08	1103.65	1036.37	-67.28
4	56.09	60.93	4.84	216.38	199.53	-16.85	6670.86	6539.36	-131.50	837.95	762.90	-75.05	2268.19	2319.10	50.91
5	5.29	4.54	-0.75	42.79	40.64	-2.15	-	0.21	0.21	20.86	18.37	-2.49	-	-	-
6	-	2.60	2.60	9.48	12.15	2.67	83.98	23.67	-60.31	51.22	30.48	-20.74	10.45	6.17	-4.28
7	0.15	0.06	-0.09	-	-	-	718.36	1129.73	411.37	69.61	66.21	-3.40	-	-	-
8	-	-	-	-	-	-	-	-	-	23.26	19.77	-3.49	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	7.42	6.37	-1.05	58.78	56.71	-2.07	1392.12	1796.44	404.32	171.02	135.07	-35.95	1290.43	1272.29	-18.14
12	-	-	-	3.24	3.58	0.34	150.82	244.63	93.81	-	10.13	10.13	-	-	-
13	-	-	-	-	-	-	44.88	15.20	-29.68	914.58	859.95	-54.63	164.36	164.20	-0.16
14	-		-	14.69	10.18	-4.51	50.97	48.04	-2.93	75.63	52.26	-23.37	-	-	-
15	-		-	-	-	-	-	0.90	0.90	1.79	1.03	-0.76	49.38	39.36	-10.02
16	-		-	3.39	3.39	0.00	75.69	66.82	-8.87	-	-	-	-	-	-
17	-		-	-	-	-	-	-	-	-	0.63	0.63	-	-	-
18	-		-	-	-	-	-	-	-	-	-	-	-	-	-
19	-		-	-	-	-	-	-	-	41.19	22.13	-19.06	-	-	-
20	0.04	0.04	0.00	30.95	22.86	-8.09	16.52	14.13	-2.39	35.36	33.18	-2.18	7.46	7.98	0.52
21	-	-	-	0.35	0.35	0.00	-	-	-	2.51	1.62	-0.89	-	-	-
22	-	-	-	64.33	51.79	-12.54	148.09	72.92	-75.17	98.13	100.01	1.88	5314.17	2620.17	-2694.00
23	-	-	-	-	-	-	-	-	-	-	-	-	12087.20	14700.10	2612.90
Total WL	**83.34**	**90.22**	**6.88**	**496.27**	**489.08**	**-7.19**	**21350.36**	**20108.08**	**-1242.28**	**2347.05**	**2145.98**	**-201.07**	**22470.04**	**22348.23**	**-121.81**
TGA		**1483.00**			**3702.00**			**196024.00**			**44212.00**			**55673.00**	
% to TGA	**5.62**	**0.06**	**0.46**	**13.41**	**13.21**	**-0.19**	**10.89**	**10.26**	**-0.63**	**5.31**	**4.85**	**-0.45**	**40.36**	**40.14**	**-0.22**

TGA: Total Geographic Area. WL: Waste Land

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

WL Class :

1. Gullied and/ or ravinous land (Medium)
2. Gullied and/ or ravinous land (Deep)
3. Land with Dense Scrub
4. Land with Open Scrub
5. Waterlogged and Marshy land (Permanent)
6. Waterlogged and Marshy land (Seasonal)
7. Land affected by salinity/alkalinity (Medium)
8. Land affected by salinity/alkalinity (Strong)
9. Shifting Cultivation - Current Jhum
10. Shifting Cultivation - Abandoned Jhum
11. Under-utilised/degraded forest (Scrub domin)
12. Under-utilised/degraded forest (Agriculture)
13. Degraded pastures/ grazing land
14. Degraded land under plantation crop
15. Sands-Riverine
16. Sands-Coastal
17. Sands-Desertic
18. Sands-Semi Stab.-Stab>40m
19. Sands-Semi Stab.-Stab 15-40m
20. Mining Wastelands
21. Industrial wastelands
22. Barren Rocky/Stony waste
23. Snow covered /Glacial area

(Area in sq.km.) Contd.....

Table 3.6.11 : State-wise and category-wise distribution of wastelands (sq.k.m) during 2008-09 vis-a- vis 2005-06 ((Area in sq.km.) Contd.....

WL	Jammu & Kashmir			Jharkhand			Karnataka			Kerala			Madhya Pradesh		
Class	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change
1	423.14	226.24	-196.90	106.14	191.47	85.33	127.11	67.97	-59.14	-	-	-	1493.69	1444.79	-48.90
2	553.24	503.09	-50.15	-	-	-	-	-	-	-	-	-	8.37	8.47	0.10
3	1617.25	1411.66	-205.59	2074.06	2811.69		4745.46	3178.98	-1566.48	725.62	609.50	-116.12	6361.08	6785.52	424.44
4	2280.70	2117.23	-163.47	3600.33	2515.75	-1084.58	1656.52	2452.96	796.44	787.78	718.32	-69.46	16231.47	15886.04	-345.43
5	74.67	84.79	10.12	0.36	0.41	0.05	13.23	9.57	-3.66	5.06	2.05	-3.01	-	-	-
6	0.86	0.95	0.09	-	0.31	0.31	4.63	8.97	4.34	14.91	6.18	-8.73	-	-	-
7	16.65	15.47	-1.18	-	-	-	512.97	346.58	-166.39	-	-	-	-	-	-
8	56.68	52.66	-4.02	-	-	-	0.35	0.20	-0.15	-	-	-	--	-	-
9	-	-	-	-	-	-	-	0.24	0.24	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	4019.26	5165.47	1146.21	4400.59	4555.44	154.85	5245.32	5133.94	-111.38	572.25	560.05	-12.20	12256.23	12417.22	160.99
12	238.29	221.99	-16.30	518.99	620.94	101.95	644.85	764.44	119.59	-	-	-	3136.55	3084.65	-51.90
13	125.55	123.04	-2.51	-	-	-	6.36	6.45	0.09	-	208.10	208.10	20.19	20.23	0.04
14	41.61	48.91	7.30	-	-	-	9.04	8.32	-0.72	-	0.18	0.18	-	-	-
15	1671.02	1468.58	-202.44	--	0.02	0.02	11.62	9.80	-1.82	16.48	16.14	-0.34	-	3.26	3.26
16	-	-	-	-	-	-	9.22	8.63	-0.59	28.70	25.99	-2.71	-	-	-
17	226.07	209.51	-16.56	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	3.88	3.70	-0.18	7.82	27.37	19.55	28.36	27.62	-0.74	0.20	12.91	12.71	75.72	98.68	22.96
21	4.98	4.64	-0.34	0.29	0.62	0.33	-	-	-	-	-	-	1.48	1.48	0.00
22	46379.45	41314.61	-5064.84	961.56	293.35	-668.21	1423.09	1005.95	-417.14	307.68	286.20	-21.48	458.19	362.95	-95.24
23	16021.09	22463.22	6442.13	-	-	-	-	-	-	-	-	-	-	-	-
Total WL	**73754.39**	**75435.76**	**1681.37**	**11670.14**	**11017.37**	**-652.77**	**14438.13**	**13030.62**	**-1407.51**	**2458.68**	**2445.62**	**-13.06**	**40042.97**	**40113.29**	**70.32**
TGA		**101387.00**			**79706.00**			**191791.00**			**38863.00**			**308252.00**	
% to TGA	**72.75**	**74.40**	**1.66**	**14.64**	**13.82**	**-0.82**	**7.53**	**6.79**	**-0.73**	**6.33**	**6.29**	**-0.03**	**12.99**	**13.01**	**0.02**

TGA: Total Geographic Area. WL: Waste Land

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

WL Class :

1. Gullied and/ or ravinous land (Medium)
2. Gullied and/ or ravinous land (Deep)
3. Land with Dense Scrub
4. Land with Open Scrub
5. Waterlogged and Marshy land (Permanent)
6. Waterlogged and Marshy land (Seasonal)
7. Land affected by salinity/alkalinity (Medium)
8. Land affected by salinity/alkalinity (Strong)
9. Shifting Cultivation - Current Jhum
10. Shifting Cultivation - Abandoned Jhum
11. Under-utilised/degraded forest (Scrub domin)
12. Under-utilised/degraded forest (Agriculture)
13. Degraded pastures/ grazing land
14. Degraded land under plantation crop
15. Sands-Riverine
16. Sands-Coastal
17. Sands-Desertic
18. Sands-Semi Stab.-Stab>40m
19. Sands-Semi Stab.-Stab 15-40m
20. Mining Wastelands
21. Industrial wastelands
22. Barren Rocky/Stony waste
23. Snow covered /Glacial area

(Area in sq.km.) Contd.....

Table 3.6.11 : State-wise and category-wise distribution of wastelands (sq.k.m) during 2008-09 vis-a- vis 2005-06 ((Area in sq.km.) Contd…..

WL	Mahatashtra			Manipur			Meghalaya			Mizoram			Nagaland		
Class	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change
1	547.03	510.89	-36.14	-		-	-		-	-	-	-	-	-	-
2	-	-	-	-		-	-		-	-	-	-	-	-	-
3	11251.44	11041.61	-209.83	3718.87	2267.01	-1451.86	454.43	579.08	124.65	-	2265.82	2265.82	972.55	944.79	-27.76
4	13242.14	13118.20	-123.94	900.54	2412.01	1511.47	2640.10	2683.48	43.38	36.32	472.25	435.93	1011.02	1948.90	937.88
5	59.03	59.30	0.27	-	-	-	-	-	-	-	-	-	-	-	-
6	1.76	1.74	-0.02	-	-	-	-	0.41	0.41	-	-	-	-	0.02	0.02
7	41.00	41.06	0.06	-	-	-	-	-	-	-	-	-	-	-	-
8	26.36	26.36	0.00	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	752.10	270.31	-481.79	291.87	272.52	-19.35	1028.53	612.71	-415.82	1239.09	1514.95	275.86
10	-	-	-	100.10	201.32	101.22	157.12	268.11	110.99	1589.03	1049.37	-539.66	1588.65	842.47	-746.18
11	10026.96	9956.45	-70.51	1555.86	495.45	-1060.41	67.11	68.88	1.77	3367.26	558.12	-2809.14	-	0.12	0.12
12	1189.18	1206.16	16.98	-	2.44	2.44	-	0.40	0.40	-	0.37	0.37	-	13.39	0.39
13	149.72	148.95	-0.77	-	-	-	-		-	-	-	-	-	-	-
14	21.25	20.67	-0.58	-	-	-	-		-	-	-	-	-	-	-
15	3.65	3.61	-0.04	-	-	-	-	0.16	0.16	-	-	-	-	-	-
16	29.48	29.99	0.51	-	-	-	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	30.45	40.62	10.17	-	-	-	-	0.04	0.04	-	-	-	-	-	-
21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	1643.37	1625.19	-18.18	-	-	-	255.13	254.34	-0.79	-	-	-	3.87	2.09	-1.78
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total WL	**38262.82**	**37830.80**	**-432.02**	**7027.47**	**5648.54**	**-1378.93**	**3865.76**	**4127.42**	**261.66**	**6021.14**	**4958.64**	**-1062.50**	**4815.18**	**5266.73**	**451.55**
TGA		**307690.00**			**22327.00**			**22429.00**			**21081.00**			**16579.00**	
% to TGA	**12.44**	**12.30**	**-0.14**	**31.48**	**25.30**	**-6.18**	**17.24**	**18.40**	**1.17**	**28.56**	**23.52**	**-5.04**	**29.04**	**31.77**	**2.72**

TGA: Total Geographic Area. WL: Waste Land

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

WL Class:

1. Gullied and/ or ravinous land (Medium)
2. Gullied and/ or ravinous land (Deep)
3. Land with Dense Scrub
4. Land with Open Scrub
5. Waterlogged and Marshy land (Permanent)
6. Waterlogged and Marshy land (Seasonal)
7. Land affected by salinity/alkalinity (Medium)
8. Land affected by salinity/alkalinity (Strong)
9. Shifting Cultivation - Current Jhum
10. Shifting Cultivation - Abandoned Jhum
11. Under-utilised/degraded forest (Scrub domin)
12. Under-utilised/degraded forest (Agriculture)
13. Degraded pastures/ grazing land
14. Degraded land under plantation crop
15. Sands-Riverine
16. Sands-Coastal
17. Sands-Desertic
18. Sands-Semi Stab.-Stab>40m
19. Sands-Semi Stab.-Stab 15-40m
20. Mining Wastelands
21. Industrial wastelands
22. Barren Rocky/Stony waste
23. Snow covered /Glacial area

(Area in sq.km.) Contd…..

Table 3.6.11: State-wise and category-wise distribution of wastelands (sq.k.m) during 2008-09 vis-a- vis 2005-06 ((Area in sq.km.) concluded

WL	Odisha			Punjab			Rajasthan			Sikkim			Tamilnadu		
Class	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change	2005-06	2008-09	Change
1	671.19	431.29	-239.90	82.12	79.49	-2.63	1020.17	1087.52	67.35	-	-	-	107.97	125.29	17.32
2	-	-	-	-	-	-	864.75	437.49	-427.26	-	-	-	0.91	0.91	0.00
3	5445.08	5158.18	-286.90	109.94	131.35	21.41	23661.70	21086.05	-2575.65	6.37	20.23	13.86	2128.14	2082.87	-45.27
4	1383.29	1591.41	208.12	95.29	85.08	-10.21	14619.38	15359.37	739.99	-	-	-	2027.41	1981.04	-46.37
5	424.04	333.46	-90.58	78.01	76.49	-1.52	64.88	48.00	-16.88	-	-	-	55.31	54.06	-1.25
6	35.56	68.95	33.39	34.39	41.70	7.31	54.94	70.36	15.42	-	-	-	68.25	65.27	-2.98
7	8.47	5.36	-3.11	30.14	28.63	-1.51	347.12	323.84	-23.28	-	-	-	296.00	239.59	-56.41
8	23.09	20.76	-2.33	27.87	23.52	-4.35	269.12	226.57	-42.55	-	-	-	83.82	28.19	-55.63
9	1023.83	874.70	-149.13	-	-	-	-	-	-	-	-	-	-	-	-
10	421.61	563.44	141.83	-	-	-	-	-	-	-	-	-	-	-	-
11	4781.34	5122.53	341.19	69.47	60.78	-8.69	11365.78	10962.97	-402.81	60.96	61.18	0.22	2600.55	2519.76	-80.79
12	1842.28	1677.57	-164.71	-	0.28	0.28	854.34	159.68	-694.66	-	-	-	61.13	75.81	14.68
13	-	1.42	1.42	-	-	-	3918.42	3438.40	-480.02	-	-	-	1041.74	934.04	-107.70
14	1.88	-	-	-	-	-	-	0.89	0.89	-	-	-	41.88	31.84	-10.04
15	2.79	2.53	-0.26	97.92	86.94	-10.98	196.69	112.78	-83.91	-	-	-	34.15	32.73	-1.42
16	34.15	23.14	-11.01	-	-	-	-	-	-	-	-	-	200.63	180.89	-19.74
17	-	-	-	394.35	322.57	-71.78	4655.88	3397.75	-1258.13	-	-	-	-	-	-
18	-	-	-	-	-	-	11188.21	9279.75	-1908.46	-	-	-	-	-	-
19	-	-	-	-	-	-	15586.44	14250.55	-1335.89	-	-	-	-	-	-
20	7.90	7.96	0.06	-	-	-	106.86	116.18	9.32	-	-	-	90.18	94.97	4.79
21	10.67	10.75	0.08	-	-	-	9.06	13.67	4.61	-	-	-	3.94	4.07	0.13
22	531.11	532.31	1.20	-	-	-	4905.72	4557.27	-348.45	579.90	362.22	-217.68	283.56	270.43	-13.13
23	-	-	-	-	-	-	-	-	-	2633.66	2829.51	195.85	-	-	-
Total WL	**16648.28**	**16425.76**	**-222.52**	**1019.50**	**936.83**	**-82.67**	**93689.46**	**84929.09**	**-8760.37**	**3280.89**	**3273.14**	**-7.75**	**9125.57**	**8721.76**	**-403.81**
TGA		**155707.00**			**50362.00**			**342239.00**			**7096.00**			**130058.00**	
% to TGA	**10.69**	**10.55**	**-0.14**	**2.02**	**1.86**	**-0.16**	**27.38**	**24.82**	**-2.56**	**46.24**	**46.13**	**-0.11**	**7.02**	**6.71**	**-0.31**

TGA: Total Geographic Area. WL: Waste Land

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

WL Class:

1. Gullied and/ or ravinous land (Medium)
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11. Under-utilised/degraded forest (Scrub domin)
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14. Degraded land under plantation crop
15. Sands-Riverine
16. Sands-Coastal
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18. Sands-Semi Stab.-Stab>40m
19. Sands-Semi Stab.-Stab 15-40m
20. Mining Wastelands
21. Industrial wastelands
22. Barren Rocky/Stony waste
23. Snow covered /Glacial area

concluded

3.7 Agriculture

The impact of climate change on agriculture could result in problems with food security and may threaten the livelihood activities upon which much of the population depends. Climate change can affect crop yields (both positively and negatively), as well as the types of crops that can be grown in certain areas, by impacting agricultural inputs such as water for irrigation, amounts of solar radiation that affect plant growth, as well as the prevalence of pests.

India is a predominantly agriculture-oriented economy, as 52% of the population directly depends on agriculture either as farmers or agricultural laborers, and their concentration is higher at 76% in the villages. Variation in climate will have a direct impact on the majority of the livelihood of the people. Food production in India is sensitive to climate change like variations in temperature and monsoon rainfall. Rise in temperature has a direct impact on the Rabi crop and every 1^0C rise will reduce wheat production by 4 to 5 Million Tonnes. Every small change in temperature and rainfall has significant effect on the quality and quantity of fruits, vegetables, tea, coffee, basmati rice and aromatic and medicinal plants.

The Frame work has included the following indicators/variables on impact of climate change in agriculture.
Yield loss of major crops/ biomass loss due to
(a)drought (moderate /severe
(b)cyclone
(c) floods
(d)heat waves
(e)flowering
(f)early vegetative
(g)early maturity
(h)early harvesting

Data is not readily available for most of the variables above. ICAR under Ministry of Agriculture conducts various studies on the subjects. However data on average yield is a parallel indicator for change in productivity over the years.

The following tables are included.

3.7 Agriculture
3.7.1 Area under crops - All India
3.7.2 Average yield of principal crops

Data Sources

Table 3.7.1 : Area under crops (Foodgrains) - 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		127992
1987-88	38866	16116	9171	5645	2242	23213	1139	2929	99321	5794	3346	12415	21555	120876
1988-89	41756	14499	12156	5894	2275	24065	1087	2722	104454	6798	3514	12807	23119	127573
1989-90	42178	14602	11056	5946	2299	23461	1001	2574	103117	6446	3600	13363	23409	126526
1990-91	42744	14158	10735	5893	2145	24046	972	2372	103065	7471	3609	13803	24883	127948
1991-92	42661	12481	10268	5878	2109	23378	964	2102	99841	5591	3639	13449	22679	122520
1992-93	41860	13222	10854	6087	2039	24644	925	2015	101646	6434	3596	13539	23569	125215
1993-94	42687	12942	9738	6102	2017	25202	809	1917	101414	6326	3454	13631	23411	124825
1994-95	42894	11843	10333	6104	1897	25887	897	1811	101666	7500	3283	13500	24283	125949
1995-96	43016	11477	9558	6117	1929	25105	838	1786	99826	7121	3470	13046	23637	123463
1996-97	43529	11435	10297	6270	1864	25991	765	1634	101785	7040	3517	12760	23317	125102
1997-98	43581	10798	9940	6376	1757	26741	871	1653	101717	7456	3341	13201	23998	125715
1998-99	44898	9905	9527	6338	1862	27466	806	1563	102365	8535	3404	12576	24515	126880
1999-00	45456	9882	9103	6574	1736	27671	746	1432	102600	6295	3454	12369	22118	124718
2000-01	44761	9915	10022	6805	1816	25797	789	1449	101354	5318	3665	12343	21326	122680
2001-02	44677	9807	9744	6683	1732	26318	682	1321	100964	6424	3340	13494	23258	124222
2002-03	41209	9278	7936	6742	1512	25271	689	1221	93858	5898	3339	12160	21397	115255
2003-04	42293	9403	10961	7275	1779	26964	675	1164	100514	7084	3451	13923	24458	124972
2004-05	42637	9048	9432	7434	1669	26885	620	1097	98822	6688	3432	13768	23888	122710
2005-06	43920	8682	9745	7628	1648	26687	630	1000	99940	6790	3537	13345	23672	123612
2006-07(P)	43535	8459	9577	7775	1329	28325	654	963	100617	7375	3342	13527	24244	124861
2007-08(P)	43684	7827	9700	8101	1521	28575	660	924	100992	7743	3598	13527	24868	125860
2008-09(P)	45211	7543	8858	8128	1505	28022	717	889	100873	7920	3274	12570	23764	124637
2009-10(P)	42569	7792	8901	8261	1268*	28547	622	900	98860	8170	3470	11303	22943	121803
2010-11(P)	42861	7381	9610	8550	1286*	29070	707	847	100312	9190	4371	12593	26154	126466
2011-12(P)	44012	6250	8780	8781	1176*	29861			98860	8301	4010			
2012-13(P)	42754	6214	7301	8670	1179*	30003	695	754.1	97571	8522	3891	15489	27901	125472
2013-14(P)	43955	5820	7890	9430	1138	31190	757	697	99738.1	10220	3885	16533	30639	130377

Source: Agricultural Statistics at a Glance 2014,Directorate of Economics and Statistics, Ministry of Agriculture

(P): Provisional *As per 2nd advance estimates released on 08.02.2013

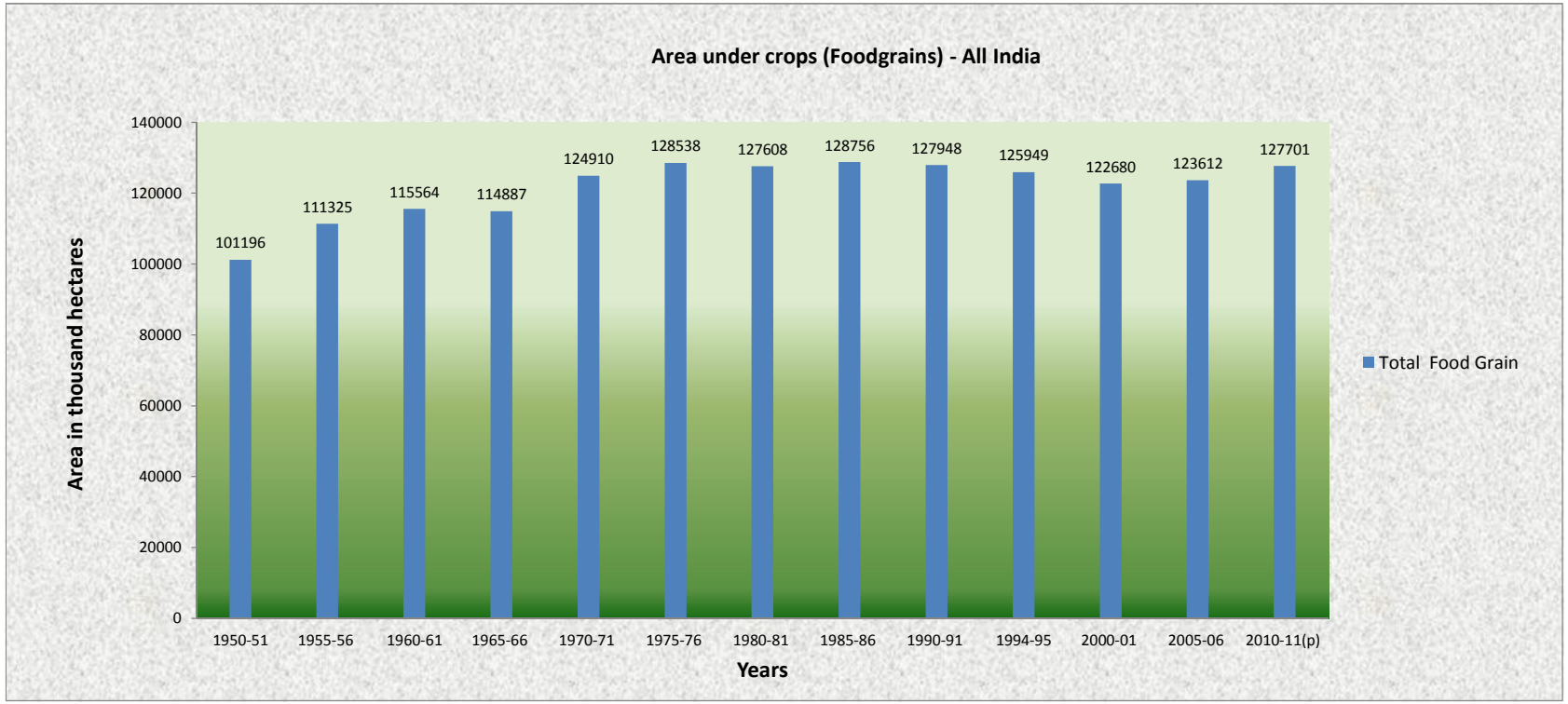

Area under crops (Foodgrains) - All India
Area in thousand hectares
140000
120000
100000
80000
60000
40000
20000
0
101196
111325
115564
114887
124910
128538
127608
128756
127948
125949
122680
123612
127701
1950-51
1955-56
1960-61
1965-66
1970-71
1975-76
1980-81
1985-86
1990-91
1994-95
2000-01
2005-06
2010-11(p)
Years
Total Food Grain

Table 3.7.2 : Average yield of principal crops

Quintals per hectare

Year	Food grains (cereals)									Food grains (pulses)				Total food grains	Oilseeds					
	Rice	Jowar	Bajra	Maize	Ragi/ Marua	Small millets	Wheat	Barley	Total Cereals	Gram	Tur	Other pulses	Total pulses		Groundnuts (nuts in shells)	Sesame	Rapseed & mustard	Linseed	Caster seed	Total oilseeds
2000-01	19.01	7.80	6.88	18.22	15.53	4.10	27.08	18.40	18.44	7.44	6.18	**4.90**	5.44	16.26	9.80	3.02	**9.40**	3.45	**8.20**	**8.10**
2001-02	20.80	7.70	8.69	20.00	14.42	4.40	27.62	21.60	19.80	8.53	6.79	**4.60**	6.07	17.34	11.30	4.18	**10.00**	3.90	**9.10**	**9.10**
2002-03	17.44	7.50	6.10	16.81	9.30	3.80	26.10	20.06	17.53	7.17	6.51	**4.20**	5.42	15.35	6.90	3.06	**8.50**	3.93	**7.30**	**6.90**
2003-04	20.78	7.20	11.41	20.41	11.80	4.70	27.13	19.75	19.83	8.11	6.70	**5.30**	6.35	17.27	13.60	4.60	**11.60**	4.12	**11.10**	**10.60**
2004-05	19.84	8.00	8.59	19.07	15.67	4.30	26.02	19.58	19.03	8.15	6.67	**4.20**	5.77	16.52	10.20	3.66	**10.40**	3.78	**10.70**	8.85
2005-06	21.02	8.80	8.02	19.38	15.34	4.40	26.19	19.38	19.68	8.08	7.65	**4.20**	5.97	17.15	11.90		**11.20**	3.95	**11.50**	10.04
2006-07	21.31	8.40	8.86	19.12	12.26	4.70	27.08	20.55	20.20	8.45	6.50	**4.60**	6.12	17.56	8.70	3.63	**11.00**	3.85	**12.10**	9.16
2007-08	22.02	10.20	10.42	23.35	15.52	**5.30**	28.02	19.85	21.51	7.62	8.26	**4.80**	6.24	18.60	14.60	4.21	10.01	3.49	**9.20**	11.15
2008-09	21.78	**9.62**	10.15	24.14	14.77	**4.91**	29.07	23.94	21.83	8.95	6.71	**4.80**	6.59	19.09	11.60	3.54	11.43	4.15	**13.50**	10.06
2009-10	21.25	**8.60**	7.31	20.24	14.89	**4.60**	28.39	21.72	20.75	9.15	7.11	**9.00**	6.30	17.98	9.90	3.03	11.83	4.49	**13.70**	9.58
2010-11	22.39	**9.49**	10.79	25.40	17.05	**5.53**	29.89	23.57	22.56	8.95	6.55	**5.60**	6.91	19.30	14.10	4.29	11.85	4.08	**15.30**	11.93
2011-12	23.93	**9.57**	11.71	24.78	16.41	**5.65**	31.77	25.16	24.15	9.28	6.62	**5.70**	6.99	20.78	13.23	4.26	11.21	4.73	**15.60**	11.33
2012-13	24.61	**8.50**	11.98	25.66	13.92	**5.78**	31.17	25.21	24.48	10.36	7.76	**6.26**	7.89	21.29	9.95	4.02	12.62	5.02	**15.92**	11.68
2013-14	24.16	**9.57**	11.84	26.76	16.61	**6.30**	31.45	27.18	24.62	9.60	8.13	**6.60**	7.64	21.20	17.50*	4.26	11.85	4.84	**16.37**	11.53

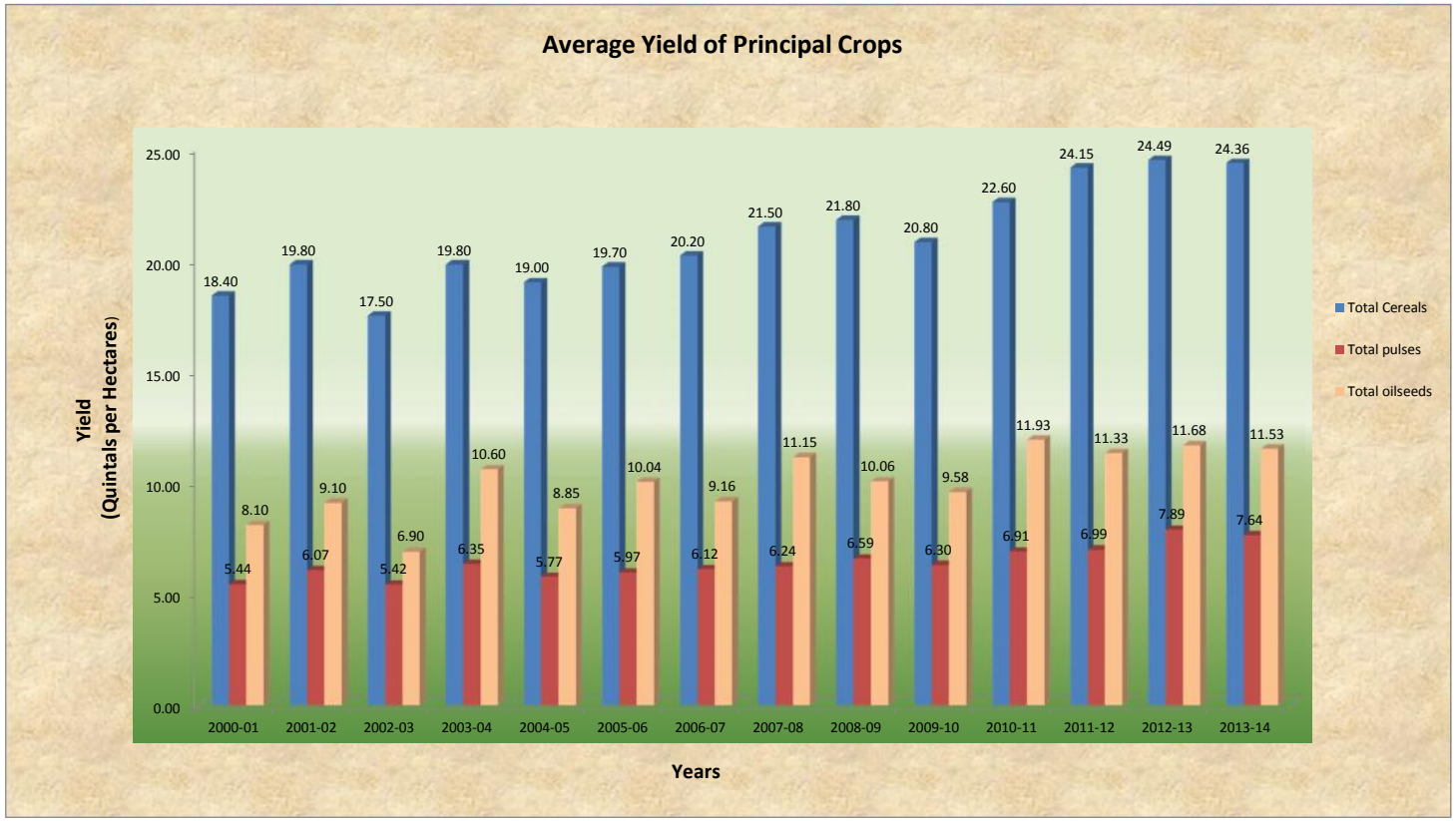
Table 3.7.2 : Average yield of principal crops

Year	Cotton	Jute	Mesta	Tea	Coffee	Rubber	Banana	Sugarcane	Tobacco	Potatoes	Pepper (black)	Chillies	Ginger	Coconut @	Turmeric
2000-01	1.90	20.26	11.77	**16.80**	**9.60**	**15.80**	281.33	685.78	13.18	184.04	2.98	11.76	33.41	68.46	37.26
2001-02	1.86	21.82	11.31	**16.80**	**9.40**	**15.70**	289.53	673.70	15.65	198.06	2.85	12.15	35.28	67.17	33.68
2002-03	1.91	21.39	10.56	**16.40**	**8.60**	**15.90**	279.92	635.76	15.06	173.00	3.20	10.81	31.77	65.29	34.79
2003-04	3.07	21.73	10.87	**16.90**	**8.30**	**16.60**	291.63	593.80	14.86	178.87	3.14	15.96	35.48	63.10	37.63
2004-05	3.18	21.86	11.08	**17.40**	**8.30**	**17.00**	289.72	647.52	14.98	179.23	3.20	16.07	37.67	66.15	45.25
2005-06	3.62	23.62	11.36	**17.10**	**8.00**	**18.00**	285.75	669.19	13.51	170.58	3.57	15.51	35.37	75.95	49.52
2006-07	4.21	23.42	12.10	**17.20**	**8.40**	**18.80**	348.02	690.22	12.74	149.43	2.81	16.27	37.08	81.65	44.08
2007-08	4.67	22.59	12.19	**16.73**	**6.75**	**12.99**	331.41	688.77	12.55	183.31	2.39	16.11	36.76	77.60	45.32
2008-09	4.03	22.07	11.41	**17.22**	**6.65**	**13.06**	369.77	645.53	14.56	188.10	1.99	16.30	34.99	53.33	45.35
2009-10	4.03	24.92	11.21	**17.56**	**7.25**	**12.11**	343.63	700.20	15.59	199.51	2.60	15.68	35.83	57.12	43.82
2010-11	4.99	23.29	11.15	**17.12**	**7.46**	**12.11**	358.80	700.91	17.94	227.23	1.83	15.44	47.11	82.91	50.92
2011-12	4.91	23.89	12.48	**17.30**	**7.66**	**12.30**	357.25	716.68	16.13	217.53	2.03	15.86	48.73	101.08	53.37
2012-13	4.86	23.96	12.37	**17.30**	**7.66**	**12.06**	341.61	682.54	15.42	227.60	4.22	16.43	50.10	106.00	50.00
2013-14	5.10	26.39	13.38	**17.30**	**7.66**	**12.06**	355.26	698.38	**15.42**	219.67	4.00	17.4**	49.16	103.21	52.49**

Source: Directorate of Economic and Statistics, Ministry of Agriculture; Tea board, Ministry of Commerce & Industry

@ in terms of million nuts *As per 2nd advance estimates released on 08.02.2013

Included in others ** As per 3rd advavance estimates.


Average Yield of Principal Crops
Yield (Quintals per Hectares)
25.00
20.00
15.00
10.00
5.00
0.00
18.40
5.44
8.10
19.80
6.07
9.10
17.50
5.42
6.90
19.80
6.35
10.60
19.00
5.77
8.85
19.70
5.97
10.04
20.20
6.12
9.16
21.50
6.24
11.15
21.80
6.59
10.06
20.80
6.30
9.58
22.60
6.91
11.93
24.15
6.99
11.33
24.49
7.89
11.68
24.36
7.64
11.53
2000-01
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
Years
Total Cereals
Total pulses
Total oilseeds

3.8 Disasters and Extreme Events

Extreme climate events include heat waves, cold snaps, tropical cyclones, storm surges, floods, droughts and bushfires. Extreme climate events can have a serious impact on the environment and society, including loss of life, property and livelihoods. In recent years, the occurrence of extreme climate events and the associated damage has become highly visible. While it is not established that the extreme events are all caused by climate change, it is believed that climate change contribute to many extreme events. The committee therefore regarded extreme events as one of the impacts of the climate change and occurrence of extreme events in the country and corresponding loss are included in the Climate change Statistics Report.
The following Tables are included in this section

3.8 Disasters and Extreme Events

3.8.1 Year-wise damage caused due to floods, cyclonic storms, landslides etc. during in India
3.8.2 State wise details of damage due to cyclonic storms/heavy rains /floods/landslides etc.
3.8.3 Distribution of deaths by natural disasters in India 2000-2014
3.8.4 Number of heat waves in India
3.8.5 Number of cold waves in India
3.8.6 Deaths due to heat waves in India (1979- 2008)
3.8.7 Drought years with percentage area of the country effected by drought
3.8.8 Number of cyclonic storms/severe cyclonic storms formed over the North Indian Ocean

Data Sources

Annual report of Ministry of home Affairs : The data on damage caused due to floods, cyclonic storms, landslides etc. and also are obtained from the Annual Reports of Ministry of home Affairs. Available in MHA website.
Accidental deaths and Suicides in India, Annual publication by National Crime Record Bureau give data on deaths due to various natural calamities.
MHA Report ' Disaster Management in India-2011' available in MHA website
http://data.gov.in/dataset/number-cyclonic-stormssevere-cyclonic-storms-formed-over-north-indian-ocean for data related to cyclonic storms formed over the north Indian ocean.

TABLE 3.8.1 Year-wise damage caused due to floods, cyclonic storms, landslides etc.				
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	948	24360	671761	15.34

Source: Ministry of Home Affairs (MHA)

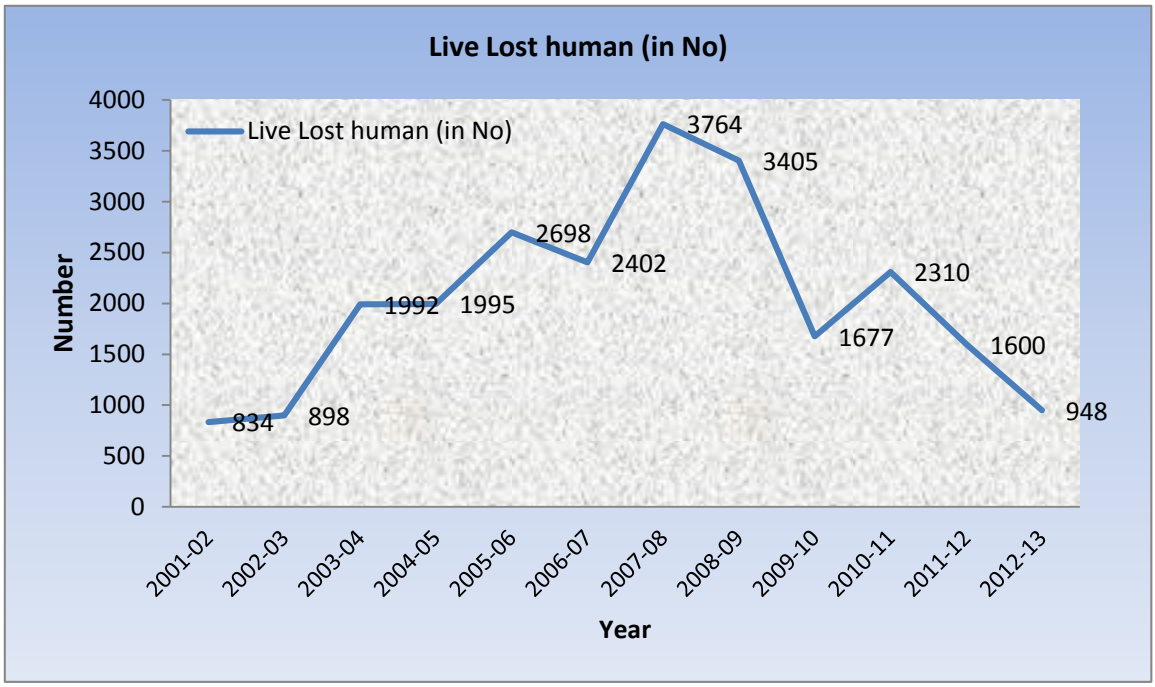


Table 3.8.2: State wise details of damage due to cyclonic storms/heavy rains /floods/landslides etc.

Sl. No.	States/ UTs	2006-07				2007-08 (P)			
		No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)	No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)
1	2	3	4	5	6	4	4	5	6
1	Andhra Pradesh	247	366308	322074	8.13	134	47598	235814	1.93
2	Arunachal Pradesh	-	-	-	-	4	14736	12987	0.28
3	Assam	7	20	2367	0.11	134	-	15846	6.75
4	Bihar	25	19	17447	0.75	976	988	690466	16.62
5	Chhattisgarh	37	9653	15820	10.15	15	53	12482	0.026
6	Gujarat	293	8421	161625	7.47	486	9707	41756	4.68
7	Goa	-	-	5	0.002	3	-	1100	n
8	Haryana	6	-	-	-	-	-	-	-
9	Himachal Pradesh	48	846	4379	0.94	98	3087	10820	1.13
10	Jammu & Kashmir	25	2677	11835	0.61	-	-	-	-
11	Jharkhand	5	101	3011	0.03	2	2	986	0.01
12	Karnataka	123	236	204401	1.55	222	12958	231698	5
13	Kerala	180	2269	114435	0.24	262	2813	58804	0.38
14	Madhya Pradesh	168	6107	129998	-	76	307	18321	0.04
15	Mizoram	-	-	-	-	12	8	2243	0.04
16	Maharashtra	423	13417	594516	12.59	155	1477	47045	-
17	Meghalaya	-	-	-	neg.	-	-	-	n
18	Odisha	90	1656	120356	3.09	91	662	104712	3.19
19	Punjab	8	16	224	0.02	7	18	527	0.28
20	Rajasthan	146	42253	254844	17.36	63	5114	10058	n
21	Tamil Nadu	23	67	444	17.37	52	159	726	-
22	Tripura	4	-	-	-	8	-	3	-
23	Uttar Pradesh	508	588	-	-	261	157	165064	5.13
24	Uttarakhand	-	-	-	-	83	275	979	-
25	West Bengal	36	697	160575	0.45	348	4154	996948	24.91
26	Puducherry	-	268	285	neg.	2	150	159	2.15
	Total	**2402**	**455619**	**2118641**	**80.862**	**3494**	**104423**	**2659544**	**72.546**

n: Negligible - : Not available (P) : Provisional

Continued

Table 3.8.2 : State wise details of damage due to cyclonic storms/heavy rains /floods/landslides etc.

S.No.	State/UT	2009-10 (P)				2010-11 (P)			
		No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)	No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	108	44132	213748	2.82	133	17230	38152	12.07
2	Arunachal Pradesh	-	-	-	-	44	10163	19409	1.64
3	Assam	8	12	240	0.298	57	3623	383408	1.87
4	Bihar	63	2	6050	n	93	142	138092	0.32
5	Chhattisgarh	5	3	1321	-	-	-	-	-
6	Goa	3	265	1053	0.034	1	1	101	-
7	Gujarat	94	456	12641	0.029	232	541	4735	0.67
8	Haryana	9	16	2216	0.083	38	67	5362	1.31
9	Himachal Pradesh	25	104	2670	-	62	5889	6656	0.26
10	Jammu & Kashmir	-	-	-	-	239	1805	2901	0.14
11	Jharkhand	-	-	-	-	22	74	4726	0.0014
12	Karnataka	396	9043	665877	24.22	82	215	14400	0.14
13	Kerala	142	177	22744	0.39	103	87	15328	0.03
14	Madhya Pradesh	56	148	11356	-	38	5	143	-
15	Maharashtra	65	31509	75441	8.79	8	5	9	-
16	Meghalaya	-	-	-	-	-	-	6	-
17	Mizoram	-	-	-	-	4	-	10127	0.02
18	Odisha	59	-	13547	1.33	10	260	5339	0.3
19	Punjab	8	-	72	0.06	38	108	2040	0.84
20	Rajasthan	48	3509	221	-	-	-	-	-
21	Sikkim	1	-	-	-	3	300	511	-
22	Tamil Nadu	108	312	8437	-	-	-	-	-
23	Uttar Pradesh	254	101	2893	4.61	530	1049	157523	8.15
24	Uttarakhand	87	362	412	-	214	1771	23851	5.02
25	West Bengal	137	38744	318786	4.47	112	7	180374	0.3
26	A & N Islands	-	-	-	-	6	-	-	-
27	Puducherry	-	7	1	n	-	-	346	0.01
	Total	**1676**	**128902**	**1359726**	**47.134**	**2069**	**43342**	**1013539**	**33.0914**

n: Negligible - : Not available

(P) : Provisional

Continued

Table 3.8.2 : State wise details of damage due to cyclonic storms/heavy rains /floods/landslides etc.

S.No.	State/UT	2011 -12(P)				2012 -13(P)			
		No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)	No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	0	0	0	0	61	1858	30973	8.37
2	Arunachal Pradesh	47	929	2443	0	70	891	1819	0.13
3	Assam	13	-	277	4.17	168	9921	531186	3.28
4	Bihar	37	-	1603	-	8	-	1713	0.08
5	Chhattisgarh	0	0	0	0	5	65	-	-
6	Gujarat	53	175	4734	-	26	67	2676	-
7	Goa	1	-	134	n	1	2	34	-
8	Himachal Pradesh	51	2374	10838	1.56	29	127	2449	1.57
9	J&K	19	-	-	-	-	-	-	-
10	Karnataka	84	51	419	-	-	-	-	-
11	Kerala	152	531	14222	1.18	47	619	2455	0.172
12	Madhya Pradesh	-	-	-	-	-	-	-	-
13	Maharashtra	106	-	-	-	-	-	-	-
14	Nagaland	0	0	0	0	36	2560	5253	0.97
15	Odisha	87	1493	290780	4.19	4	-	522	0.02
16	Punjab	14	4	26	-	8	3034	149	0.0271
17	Sikkim	77	1333	23903	0.14	47	105	2780	0.1
18	Tamil Nadu	57	669	99904	2.12	15	90	4831	0.173
19	Uttar Pradesh	692	268	22858	5.25	17	-	1344	0.04326
20	Uttarakhand	19	10	107	-	201	772	5569	0.3854
21	West Bengal	79	33	317481	0.09	241	4234	77981	0.02148
22	Puducherry	12	1256	86439	0.17	-	15	27	-
	Total	**1600**	**9126**	**876168**	**18.87**	**984**	**24360**	**671761**	**15.34**

Continued

n: Negligible - : Not available (P) : Provisional 0 : not affected

* This includes 60 lives lost in Sikkim, 11 lives lost in West Bengal and 10 lives lost in Bihar due to earthquake of 18.09.2011.

** This includes 4,693 no. of huts.

Table 3.8.2 : State wise details of damage due to cyclonic storms/heavy rains /floods/landslides etc.

S.No.	State/UT	2013 -14(P)#				2014 -15(P)##			
		No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)	No. of Human lives lost	No. of Cattle heads lost	No. of Houses damaged	Cropped area affected (lakh hectares)
1	2	3	4	5	6	7	8	9	10
1	Andhra Pradesh	60	2517	59639	13.12	61	4777	40379	3.30
2	Arunachal Pradesh	52	401	2316	2.20	61	1992	2742	0.80
3	Assam	-	-	-	0.013	90	8961	138000	3.67
4	Bihar	231	6458	156986	4.00	144	28	5621	1.16
5	Gujarat	186	274	407	-	27	112	875	-
6	Goa	-	-	139	0.04	-	-	41	-
7	Himachal Pradesh	52	23648	5633	0.53	45	698	1963	0.136
8	J&K	30	74	72574	-	282	61326	253184	6.48
9	Karnataka	86	286	11061	2.27	27	85	19125	0.91
10	Kerala	182	1366	10672	0.11	132	527	8292	0.20
11	Madhya Pradesh	390	1166	22816	9.25	-	-	-	-
12	Maharashtra	365	2164	147369	7.49	151	53	44	-
13	Nagaland	-	2680	982	0.08	17	2860	14537	0.31
14	Odisha	59	5688	474250	11.00	50	672	83140	3.65
15	Punjab	41	954	9774	4.00	31	127	24795	1.06
16	Tripura	-	-	-	-	21	-	1139	0.015
17	Uttar Pradesh	380	519	54994	7.97	132	107	75564	5.00
18	Uttarakhand	3379**	9470	10625	0.36	66	348	1824	0.013
19	West Bengal	183	45285	169296	1.31	169	145	33621	0.508
20	Puducherry	1	48	694	0.003	-	-	-	-
	Total	**5677****	**102998**	**1210227**	**63.746**	**1674**	**92180**	**725390**	**26.85**

Source: Annual Report of various years, Ministry of Home Affairs **Concluded**

** Includes persons missing in natural disasters

#As on 28.02.215 ##As on 31.12.2014

Table 3.8.3: Distribution of deaths by natural disasters in India 2000-2014

Sl.No	Causes	2000		2001		2002		2003		2004		2005		2006		2007	
		Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths
1	Avalanche	13	0.25	55	0.32	47	0.97	70	1.47	9	0.15	238	2.90	18	0.32	33	0.51
2	Cold and Exposure	762	14.44	641	3.69	525	10.89	835	17.57	570	9.43	646	7.86	694	12.25	802	12.35
3	Cyclone/tornado	115	2.18	93	0.54	62	1.29	120	2.53	1512	25.01	1438	17.49	96	1.70	118	1.82
4	Earthquake	1	0.02	13702	78.87	5	0.10	6	0.13	44	0.73	724	8.81	8	0.14	14	0.22
5	Epidemic	102	1.93	103	0.59	64	1.33	78	1.64	69	1.14	103	1.25	76	1.34	47	0.72
6	Flood	1863	35.31	399	2.30	484	10.04	453	9.53	754	12.47	785	9.55	1097	19.37	1348	20.75
7	Heat Stroke	534	10.12	505	2.91	720	14.93	807	16.98	756	12.50	1075	13.08	754	13.31	932	14.35
8	Landslide	264	5.00	254	1.46	235	4.87	334	7.03	357	5.90	590	7.18	274	4.84	312	4.80
9	Lightening	1472	27.90	1507	8.67	1383	28.69	1792	37.71	1842	30.47	2064	25.11	2387	42.15	2790	42.95
10	Torrential Rains	150	2.84	114	0.66	1296	26.88	257	5.41	133	2.20	557	6.78	259	4.57	100	1.54
	Total	**5276**	**100.00**	**17373**	**100.00**	**4821**	**100.00**	**4752**	**100.00**	**6046**	**100.00**	**8220**	**100.00**	**5663**	**100.00**	**6496**	**100.00**

continued

Table 3.8.3: Distribution of deaths by natural disasters in India 2000-2014

Sl.No	Causes	2008		2009		2010		2011		2012		2013		2014	
		Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths	Number of Deaths	% to total deaths
1	Avalanche	47	0.84	22	0.41	45	0.69	60	1.07	40	0.72	52	0.83	23	0.38
2	Cold and Exposure	836	14.98	742	13.73	937	14.45	849	15.10	997	17.86	946	15.09	913	15.03
3	Cyclone/tornado	99	1.77	128	2.37	106	1.63	117	2.08	47	0.84	52	0.83	62	1.02
4	Earthquake	6	0.11	2	0.04	8	0.12	69	1.23	3	0.05	9	0.14	2	0.03
5	Epidemic	73	1.31	75	1.39	57	0.88	127	2.26	80	1.43	57	0.91	48	0.79
6	Flood	861	15.43	726	13.43	965	14.88	585	10.41	420	7.52	700	11.16	541	8.91
7	Heat Stroke	616	11.04	1071	19.81	1274	19.65	793	14.11	1247	22.34	1216	19.39	1248	20.55
8	Landslide	340	6.09	394	7.29	347	5.35	302	5.37	282	5.05	264	4.21	499	8.22
9	Lightening	2553	45.76	2113	39.09	2622	40.44	2550	45.36	2263	40.54	2833	45.18	2582	42.51
10	Torrential Rains	148	2.65	132	2.44	123	1.90	170	3.02	203	3.64	142	2.26	156	2.57
	Total	**5579**	**100.00**	**5405**	**100.00**	**6484**	**100.00**	**5622**	**100.00**	**5582**	**100.00**	**6271**	**100.00**	**6074**	**100.00**

Source: National Crime Record Bureau, Ministry of Home Affairs

concluded

Table 3.8.4 : Number of heat waves in India						
Sl.No.	State	Epochs				
		1911-67	1968-77	1978-99	2000-2009	1911-2009
1	West Bengal	31	2	28	6	67
2	Bihar	76	9	28	4	117
3	Uttar Pradesh	105	6	23	-	134
4	Rajasthan	27	3	42	14	86
5	Gujarat, Saurashtra & Kutch	43	1	7	2	53
6	Punjab	-	2	-	6	8
7	Himachal Pradesh	-	1	-	1	2
8	Jammu & Kashmir	-	-	-	-	-
9	Maharashtra	26	5	35	12	78
10	Madhya Pradesh	32	4	15	5	56
11	Odisha	25	8	18	22	73
12	Andhra Pradesh	21	-	3	2	26
13	Assam	-	4	19	-	23
14	Haryana, Delhi & Chandigarh	-	1	2	2	5
15	Tamil Nadu	5	-	2	1	8
16	Karnataka	0	-	-	1	1

Source: IMD Disastrous weather Events annual report; EMDAT (reproduced from 'MHA Report Disaster Management in India-2011')

Note : Epoch is referred as number of events.

Table 3.8.5:Number of cold waves in India

Sl.No.	State	Epochs					
		1901-10	1911-67	1968-77	1978-99	2000-2009	1901-2009
1	West Bengal	2	14	3	28	7	54
2	Bihar	7	27	8	67	12	121
3	Uttar Pradesh	21	51	8	47	13	140
4	Rajasthan	11	124	7	53	12	207
5	Gujarat, Saurashtra & Kutch	2	85	6	6		99
6	Punjab	3	34	4	19	10	70
7	Himachal Pradesh	-	-	4	18	4	26
	Jammu & Kashmir	1	189	6	15	2	213
9	Maharashtra	-	60	4	18	1	83
10	Madhya Pradesh	9	88	7	12	1	117
11	Odisha	4	5	-	-	3	15
12	Andhra Pradesh	2	-	--	-	-	2
13	Assam	1	1	-	-	2	4
14	Haryana, Delhi & Chandigarh	-	-	4	15	15	34
15	Tamil Nadu	-	-	-	-	-	-
16	Karnataka	-	10	-	-	-	10
17	Jharkhand	-	-	-	-	1	1

Source: IMD Disastrous weather Events annual report; EMDAT (reproduced from MHA Report ' Disaster Management in India-2011')

Note : Epoch is referred as number of events.

Table 3.8.6 : Deaths due to heat waves in India (1979- 2008)	
Year	**No. of Deaths**
1979	361
1980	156
1981	72
1982	16
1983	182
1984	58
1985	142
1986	156
1987	91
1988	637
1989	44
1990	2
1991	252
1992	114
1993	42
1994	434
1995	412
1996	20
1997	20
1998	1662
1999	126
2000	57
2001	70
2002	806
2003	1539
2004	117
2005	587
2006	135
2007	476
2008	294

Source: IMD Disastrous weather Events annual report; EMDAT (reproduced from 'MHA Report Disaster Management in India-2011')

Table 3.8.7: Drought years with percentage area of the country effected by drought

Sl. No.	Year	Moderate drought (%)	Severe drought (%)	Total (%)
1	1877	30.6	28.9	59.5
2	1891	22.4	0.3	22.7
3	1899	44.1	24.3	68.4
4	1901	19.3	10.7	30.0
5	1904	17.5	16.9	34.4
6	1905	25.2	12.0	37.2
7	1907	27.9	1.2	29.1
8	1911	13.0	15.4	28.4
9	1913	24.5	0.0	24.5
10	1915	18.8	3.4	22.2
11	1918	44.3	25.7	70.0
12	1920	35.7	2.3	38.0
13	1925	21.1	0.0	21.1
14	1939	17.8	10.7	28.5
15	1941	35.5	0.0	35.5
16	1951	35.1	0.0	35.1
17	1965	38.3	0.0	38.3
18	1966	35.4	0.0	35.4
19	1968	22.0	0.0	21.9
20	1972	36.6	3.8	40.4
21	1974	27.1	6.9	34.0
22	1979	33.0	1.8	34.8
23	1982	29.1	0.0	29.1
24	1985	25.6	16.7	42.3
25	1987	29.8	17.9	47.7
26	2002	19.0	10.0	29.0
27	2009	32.5	13.5	46.0

Source: IMD ; Disaster Management in India-2011, Ministry of Home Affairs

Definitions of Drought

There is no universally accepted definition of drought. However, drought is broadly perceived in three different ways :

i. Meteorological drought: When actual rainfall over an area is significantly less than the climatological mean.
ii. Hydrological drought: When there is marked depletion of surface water causing very low stream flow and drying of lakes, reservoirs and rivers.
iii. Agricultural drought: When inadequate soil moisture produces acute crop stress and affects productivity.

Meteorological drought need not necessarily result in agricultural drought, since timely rainfall during critical crop phases may save the crop, or irrigation water may be available. However, rainfall being the ultimate source of water, in the event of an extreme rainfall deficiency, its agricultural and hydrological impacts are inevitable.

It is common for drought conditions to exist on a sub-division or district level even when the monsoon is normal for the country as a whole. For such small areas, IMD defines a moderate meteorological drought when the rainfall is 26-50% below normal and a severe meteorological drought when it is more than 50% below normal.

When the rainfall deficiency for the country as a whole is more than 10% of normal and more than 20% of the country's area is affected by drought conditions, the situation is defined as an all-India drought year.

Source: http://www.imd.gov.in/section/nhac/dynamic/mid1.htm

Table: 3.8.8 : Number of cyclonic storms/severe cyclonic storms formed over the North Indian Ocean

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1951	0	0	0	1	0	0	1	0	0	0	1	1	**4**
1952	0	0	0	0	1	0	1	0	0	0	2	0	**4**
1953	0	0	0	1	0	0	0	1	0	0	0	0	**2**
1954	0	0	0	0	0	0	0	0	1	0	0	1	**2**
1955	0	0	0	0	1	0	0	0	2	1	2	0	**6**
1956	0	0	0	1	1	1	0	0	0	1	0	0	**4**
1957	0	0	0	0	0	0	0	1	0	0	1	1	**3**
1958	0	0	0	0	1	0	0	0	0	2	2	0	**5**
1959	0	0	0	0	1	2	1	0	1	1	0	0	**6**
1960	0	0	0	0	2	0	0	0	0	2	1	0	**5**
1961	0	0	0	0	3	1	0	0	1	0	0	0	**5**
1962	0	0	0	0	1	0	0	0	1	1	1	1	**5**
1963	0	0	0	0	2	0	0	0	0	3	0	1	**6**
1964	0	0	0	0	1	1	0	1	0	0	3	1	**7**
1965	0	0	0	0	2	0	0	0	0	0	1	3	**6**
1966	0	0	0	1	0	0	0	0	2	0	4	1	**8**
1967	1	0	0	0	1	0	0	0	0	3	0	1	**6**
1968	0	0	0	0	1	0	0	0	2	1	2	1	**7**
1969	0	0	0	0	1	0	0	1	0	2	1	1	**6**
1970	0	0	0	0	2	1	0	0	1	1	2	0	**7**
1971	0	0	0	0	1	1	0	0	1	2	1	1	**7**
1972	0	0	0	1	0	0	1	0	2	1	1	1	**7**
1973	0	0	0	0	0	1	1	0	0	1	2	1	**6**
1974	0	0	0	1	1	1	0	1	2	0	1	0	**7**
1975	0	0	0	0	2	1	0	0	0	1	3	0	**7**
1976	0	0	0	0	2	0	0	0	2	2	2	1	**9**
1977	0	0	0	0	1	1	0	0	0	1	3	0	**6**
1978	0	0	0	0	1	0	0	1	0	1	2	0	**5**
1979	0	0	0	0	1	1	0	1	1	0	1	0	**5**
1980	0	0	0	0	0	0	0	0	0	1	0	2	**3**
1981	0	0	0	0	0	0	0	1	1	1	2	1	**6**
1982	0	0	0	0	2	0	0	0	0	2	1	0	**5**
1983	0	0	0	0	0	0	0	0	0	2	1	0	**3**
1984	0	0	0	0	0	0	0	0	0	1	2	0	**3**
1985	0	0	0	0	2	0	0	0	1	2	1	1	**7**
1986	0	0	0	0	0	0	0	0	0	0	1	0	**1**
1987	1	0	0	0	0	1	0	0	0	1	2	0	**5**
1988	0	0	0	0	0	0	0	0	0	1	2	0	**3**
1989	0	0	0	0	1	0	1	0	0	0	1	0	**3**
1990	0	0	0	0	1	0	0	0	0	0	0	1	**2**
1991	0	0	0	1	1	0	0	0	0	0	1	0	**3**
1992	0	0	0	0	1	1	0	0	0	1	3	0	**6**
1993	0	0	0	0	0	0	0	0	0	0	1	1	**2**
1994	0	0	0	0	1	1	0	0	0	1	1	0	**4**
1995	0	0	0	0	0	0	0	0	0	1	2	0	**3**
1996	0	0	0	0	0	2	0	0	0	1	1	1	**5**
1997	0	0	0	0	1	0	0	0	1	0	1	0	**3**
1998	0	0	0	0	1	1	0	0	0	1	2	1	**6**
1999	0	1	0	0	1	0	0	0	0	2	0	0	**4**
2000	0	0	1	0	0	0	0	0	0	1	1	1	**4**
2001	0	0	0	0	1	0	0	0	1	2	0	0	**4**
2002	0	0	0	0	0	0	0	0	0	0	2	0	**2**
2003	0	0	0	0	1	0	0	0	0	0	1	1	**3**
2004	0	0	0	0	2	0	0	0	0	1	0	1	**4**
2005	1	0	0	0	0	0	0	0	1	0	1	1	**4**
2006	0	0	0	1	0	0	0	0	1	1	0	0	**3**
2007	0	0	0	0	1	2	0	0	0	0	1	0	**4**
2008	0	0	0	1	0	0	0	0	0	1	2	0	**4**
2009	0	0	0	1	1	0	0	0	0	0	1	1	**4**
2010	0	0	0	0	1	1	0	0	0	1	1	0	**4**
2011	0	0	0	0	0	0	0	0	0	0	1	1	**2**
2012	0	0	0	0	0	0	0	0	0	2	0	0	**2**

Source: Indian Meteorology Department, Ministry of Earth and Science , May 2013

Section – IV

Indicators for climate change- Mitigation and adaptation.

4. 1 Climate Change Mitigation and Adaptation

Climate change mitigation are actions to limit the magnitude and/or rate of long-term climate change. Climate change mitigation generally involves reductions in human (anthropogenic) emissions of greenhouse gases (GHGs). Mitigation may also be achieved by increasing the capacity of carbon sinks, e.g., through reforestation. By contrast, adaptation to global warming are actions taken to manage the eventual (or unavoidable) impacts of global warming, e.g., by building dikes in response to sea level rise. Examples of mitigation include switching to low-carbon energy sources, such as renewable and nuclear energy, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere. Energy efficiency can also play a major role, for example, through improving the insulation of buildings. Another approach to climate change mitigation is geoengineering.
The framework for statistics related to climate change included the following variables/ indicators .
Solar Energy
Solar Cells
Solar Lanterns
Solar Water Heater
Solar Electricity Generation Plants and Capacity

Energy Use

(i) Use of fuel like Condensed Natural Gas(CNG), Liquid Petroleum Gas (LPG)
(ii) Industries adopted fuel efficient technologies
(iii) Use of Compact Fluorescent Light (CFL)

Dry-land Agriculture

Crop Varieties for drought prone areas
Varieties of pest-resistant crops

Afforestation
Forest Cover/Area

The following chapters and tables are included.

4.1 Renewable Energy

4.1.1 State-wise cumulative installations of Solar Photovoltaic Systems
4.1.2 State wise details of Small hydro power projects (upto 25 MW) set up & under implementation (as on 31.03.2012)
4.1.3 Distribution of family- type biogas plants (number of installations)
4.1.4 State- wise break-up of the energy parks and energy clubs as on 31.03.2012
4.1.5 Source wise and State wise estimated potential of renewable power in India (In Mega Watts as on 31.03.2012)

4.2 Energy use
4.2.1 State-wise installed capacity of grid interactive renewable power as on 31st March 2013

4.3 Dry Land Agriculture

4.3.1 Categorization of blocks/mandals/talukas in India for ground water development as on 31st March, 2009
4.3.2 State wise area (in Hectares) under organic farming (Registered under accredited certification bodies) for the year 2010-11
4.3.3 State wise area (in ha) under organic certification (including wild harvest) 2011-12
4.3.4 Commodity-wise production details of top ten products (2011-12) (in metric tonnes)
4.3.5 Category wise production of certified organic products for the year 2010-2011 (in metric tonnes)
4.3.6 State wise details of different organic manures produced/available (lakh mt) (2011-12)
4.3.7 Biofertilizer production in India during the period from 2008-09 to 2011-12
4.3.8 State wise production of various Biofertilisers during 2011-12 (in metric tonnes)
4.3.9 Drought tolerant varieties of field crops

4.4 Afforestation

4.4.1 State-Wise releases under centrally sponsored schemes for protection of environment (in Rs crores)
4.4.2 National afforestation programme (NAP)
4.4.3 State-wise details of the protected area network in India.
4.4.4 Progress of afforestation through successive plans

4.5 Quality Standards

4.5.1 National ambient air quality standards (NAAQS)
4.5.2 Criteria for direct disposal of hazardous waste into secured landfill
4.5.3 Primary water quality criteria
4.5.4 Biological water quality criteria (BWQC)
4.5.5 Exhaust emission standards for Indian Automobiles

Data Sources

Annual Reports, Ministry of New And Renewable Energy(MNRE)
Annual Reports ,Central Ground Water Board.
National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture.
National Bureau of Soil Survey and Land Use Planning (ICAR) Nagpur.
National Afforestation & Eco-Development Board, Ministry of Environment and Forests
Annual Reports, Ministry of Environment & Forests
CPCB-2010, Hazardous waste management series/2010-11
Central Pollution Control Board for quality standards

Table 4.1.1 :State-wise Cumulative Installations of Solar Photovoltaic Systems (upto March 2013)

S. No.	State/UT	Solar photovoltaic systems (numbers)				Power plant kWp (kilowatt peak)	
		Lanterns	Home lights	Street lights	Pumps	Stands alone power plant	Grid connected*
1	Andaman & Nicobar	6296	468	390	5	167	100
2	Andhra Pradesh	41360	8350	6454	613	871.595	100
3	Arunachal Pradesh	14433	18945	1071	18	17.1	25
4	Assam	1211	5890	98	45	910	0
5	Bihar	50117	6572	955	139	775.6	0
6	Chandigarh	1675	275	898	12	0	0
7	Chhattisgarh	3311	7254	2042	240	12186.72	0
8	Delhi	4807	0	301	90	332	2143
9	Goa	1093	393	707	15	1.72	5000
10	Gujarat	31603	9231	2004	85	374.6	0
11	Haryana	93853	56364	22018	469	864.25	0
12	Himachal Pradesh	23909	22586	8058	6	601.5	0
13	Jammu & Kashmir	44059	62133	5806	39	308.85	0
14	Jharkhand	23374	8658	620	0	480.9	0
15	Karnataka	7334	44439	2694	551	294.41	6000
16	Kerala	54367	32995	1735	810	214.39	25
17	Lakshadweep	5289	0	1725	0	1090	750
18	Madhya Pradesh	9444	3590	9198	87	1983	100
19	Maharashtra	68683	3442	8420	239	913.7	1000
20	Manipur	4787	3865	928	40	216	0
21	Meghalaya	24875	7840	1273	19	50.5	0
22	Mizoram	9589	6801	431	37	241	0
23	Nagaland	6766	1045	271	3	1050	0
24	Odisha	9882	5163	5834	56	84.515	0
25	Puducherry	1637	25	417	21	0	25
26	Punjab	17495	8620	5354	1857	281	1325
27	Rajasthan	4716	124402	6852	4501	4013	7450
28	Sikkim	23300	10059	504	0	150	5000
29	Tamil Nadu	16818	7885	6350	829	609.77	50
30	Tripura	64282	32723	1199	151	365	0
31	Uttar Pradesh	64023	91326	8568	26	280.03	375
32	Uttarakhand	62015	206245	124828	575	3470.46	50
33	West Bengal	17662	140034	8726	48	889	1150
34	Others	125797	24047	9150	0	8070	NA
	Total	**939862**	**961665**	**255879**	**11626**	**42157.61**	**30668**
	Source: Ministry of New & Renewable Energy				* India Energy Book 2012		
	Note: Data taken from www.data.gov.in						

TABLE 4.1.2 : State wise Details of Small Hydro Power Projects (upto 25 MW) Setup & Under Implementation (as on 31.03.2014)

Sr. No	States	Projects set-up		Project under Implementation	
		No	Capacity (MegaWatt)	No	Capacity (MegaWatt)
1	Andhra Pradesh	68	221.03	13	32.04
2	Arunachal Pradesh	149	103.91	44	22.23
3	Assam	6	34.11	3	12.00
4	Bihar	29	70.70	5	17.70
5	Chhattisgarh	9	52.00	4	115.25
6	Goa	1	0.05	-	-
7	Gujarat	5	15.60	-	-
8	Haryana	7	70.10	2	3.35
9	Himachal Pradesh	158	638.91	33	76.20
10	Jammu & Kashmir	37	147.53	7	17.65
11	Jharkhand	6	4.05	8	34.85
12	Karnataka	147	1031.66	23	173.09
13	Kerala	25	158.42	11	52.75
14	Madhya Pradesh	11	86.16	3	4.90
15	Maharashtra	58	327.43	9	43.70
16	Manipur	8	5.45	3	2.75
17	Meghalaya	4	31.03	3	1.70
18	Mizoram	18	36.47	1	0.50
19	Nagaland	11	29.67	3	3.20
20	Odisha	10	64.63	4	3.60
21	Punjab	47	156.20	11	19.45
22	Rajasthan	10	23.85	-	-
23	Sikkim	17	52.11	1	0.20
24	Tamil Nadu	21	123.05	-	-
25	Tripura	3	16.01	-	-
26	Uttar Pradesh	9	25.10	-	-
27	Uttarakhand	99	174.82	46	174.04
28	West Bengal	23	98.40	17	84.25
29	Andaman and Nicobar Islands	1	5.25	-	-
Total		**997**	**3803.678**	**254**	**895.4**

Source: Ministry of New And Renewable Energy

Table 4.1.2 : State wise details of small hydro power projects (upto 25 MW) Setup & Under Implementation (as on 31.03.2015)

Sr. No	States	Potential		Projects set-up		Project under Implementation	
		No	Capacity (MegaWatt)	No	Capacity (MegaWatt)	No	Capacity (MW)
1	Andhra Pradesh	387	978.4	69	223.23	12	29.84
2	Arunachal Pradesh	677	1341.38	152	104.61	41	21.53
3	Assam	119	238.69	6	34.11	3	12
4	Bihar	93	223.05	29	70.7	5	17.7
5	Chhattisgarh	200	1107.15	9	52	5	115.25
6	Goa	6	6.5	1	0.05	-	-
7	Gujarat	292	201.97	6	16.6	-	-
8	Haryana	33	110.05	8	71.5	1	1.95
9	Himachal Pradesh	531	2397.91	170	723.91	21	31.2
10	Jammu & Kashmir	245	1430.67	39	156.53	5	8.65
11	Jharkhand	103	208.95	6	4.05	8	34.85
12	Karnataka	834	4141.12	155	1129.73	15	75
13	Kerala	245	704.1	27	168.92	8	39.25
14	Madhya Pradesh	299	820.44	11	86.16	3	4.9
15	Maharashtra	274	794.33	59	335.43	8	35.7
16	Manipur	114	109.13	8	5.45	3	2.75
17	Meghalaya	97	230.05	4	31.03	3	1.7
18	Mizoram	72	168.9	18	36.47	1	0.5
19	Nagaland	99	196.98	11	29.67	3	3.2
20	Odisha	222	295.47	10	64.63	4	3.6
21	Punjab	259	441.38	48	157.4	10	18.25
22	Rajasthan	66	57.17	10	23.85	-	-
23	Sikkim	88	266.64	17	52.11	1	0.2
24	Tamil Nadu	197	659.51	21	123.05	-	-
25	Tripura	13	46.86	3	16.01	-	-
26	Uttar Pradesh	251	460.75	9	25.1	1	1.5
27	Utrakhand	448	1707.87	101	209.32	44	139.54
28	West Bengal	203	396.11	24	98.5	16	84.15
29	Andaman and Nicobar Islands	7	7.91	1	5.25	-	-
	Total	**6474**	**19749.44**	**1032**	**4055.355**	**221**	**683.21**

Source: Ministry of New And Renewable Energy

TABLE 4.1.3: Distribution of Family- Type biogas plants (number of installations)					
Sl. No.	State/UT	Estimated potential	Cumulative physical achievement as on (31-03-2014)	Achievements during (2014-15)	
				Target	Achs. (upto 1.12.2014)*
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	7327	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	Pondicherry	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	Uttarakhand	83000	17541	900	434
31	West Bengal	695000	366316	-	-
	Union Territory				
1	Chandigarh	2200	137	-	-
2	Andaman and Nicobar Islands	1400	97	-	-
3	Dadra and Nagar Haveli	2000	169	-	-
4	KVIC		-	62600	1605
	Total	**12339300**	**4753085**	**110000**	**45146***
Source : Annual Report 2014, Ministry of New and Renewable Energy					
	* Figures are being firmed -up				

Table 4.1.4: State- wise break-up of the energy parks and energy clubs as on 31.12.2014				
No.	State/UT	Energy Parks (No.)		Renewable Energy Clubs (No.)*
		District Level*	State Level	
1	Andhra Pradesh	27	-	40
2	Arunachal Pradesh	6	1	-
3	Assam	22	1	-
4	Bihar	11	-	6
5	Chhattisgarh	15	2	8
6	Delhi	8	1	-
7	Goa	2	-	1
8	Gujarat	14	1	27
9	Haryana	21	1	14
10	Himachal Pradesh	9	2	2
11	Jammu & Kashmir	15	2	3
12	Jharkhand	7	1	-
13	Karnataka	34	1	89
14	Kerala	16	1	-
15	Madhya Pradesh	27	-	31
16	Maharashtra	52	1	66
17	Manipur	10	-	-
18	Meghalaya	7	1	
19	Mizoram	7	1	
20	Nagaland	6	1	
21	Odisha	11	1	13
22	Punjab	20	1	15
23	Rajasthan	12	-	10
24	Sikkim	7	1	
25	Tamil Nadu	21	1	124
26	Tripura	9	1	8
27	Uttar Pradesh	56	1	64
28	Uttarakhand	11	1	
29	West Bengal	11	1	24
30	A&N Islands	5	1	
31	Chandigarh	3	1	4
32	Puducherry	2	1	5
	Total	**484**	**29**	**554**

Source : Annual Report , Ministry of New and Renewable Energy

* data up to 2012

Energy Park scheme

The Renewable Energy Park Scheme was started in 1994-95 under the Special Area Demonstration Programme (SADP). The main objective of the Renewable Energy Park Scheme is to create awareness, publicity and provide an opportunity to the students / teachers and rural and urban masses about the use and benefits of the renewable energy by demonstrating new and renewable energy systems and devices by demonstrating working systems, cut models, LED models, blow ups etc.

Two types of Renewable Energy Parks are being supported under this scheme namely District Level Renewable Energy Parks(DLEP) and State Level Renewable Energy Parks(SLEP). DLEPs are set up at Educational Institutions, Krishi Vigyan Kendras, Registered Consumer Forums, registered NGOs with facilities for Science and Environment Education and public places where there is large inflow of public. SLEP is set up in a State at a location where large flow of people and tourists takes place every day.

(i) State Level Energy Park

Two State level Energy Park would be considered for setting up in each State. The State level Energy Park would be established by the State Nodal Agency or departments either by the Agency themselves or through a Memorandum of Understanding with any reputed Government institution/organization.

(ii) District Level Energy Parks

The Ministry has so far sanctioned 484 District Level Energy Parks. The component of DLEPs from the existing scheme has been discontinued. The sanctioned parks are being completed.

Source : http://mnre.gov.in/schemes/support-programmes/special-area-demonstration-project-programme/

Renewable Energy Clubs

A scheme has been evolved to promote the study of renewable energy through the setting up of Renewable Energy Clubs (REC) in AICTE recognized/ approved Engineering Colleges/ Technology Institutions all over the country. The financial assistance of Rs.25000 per annum is provided by the Ministry for these RECs. 554 such Clubs have been set up so far.

Source: http://mnre.gov.in/file-manager/annual-report/2007-2008/EN/Chapter%209/chapter%209_1.htm

Table 4.1.5: Sourcewise and State wise estimated potential of Renewable Power in India in (MW) (as on 31.03.2014)							
States/ UTs	**Wind Power**	**Small Hydro Power**	**Biomass Power**	**Cogeneration bagasse**	**Waste to Energy**	**Estimated Potential**	**Distribution (%)**
Andhra Pradesh	14497	978	578	300	123	16476	11.16
Arunachal Pradesh	236	1341	8	0	0	1585	1.07
Assam	112	239	212	0	8	571	0.39
Bihar	144	223	619	300	73	1359	0.92
Chhattisgarh	314	1107	236	0	24	1681	1.14
Goa	0	7	26	0	0	33	0.02
Gujarat	35071	202	1221	350	112	36956	25.04
Haryana	93	110	1331	350	24	1910	1.29
Himachal Pradesh	64	2398	142	0	2	2606	1.77
Jammu & Kashmir	5685	1431	43	0	0	7159	4.85
Jharkhand	91	209	90	0	10	400	0.27
Karnataka	13593	4141	1131	450	0	19315	13.08
Kerala	837	704	1044	0	36	2621	1.78
Madhya Pradesh	2931	820	1364	0	78	5193	3.52
Maharashtra	5961	794	1887	1250	287	10179	6.90
Manipur	56	109	13	0	2	180	0.12
Meghalaya	82	230	11	0	2	325	0.22
Mizoram	0	169	1	0	2	172	0.12
Nagaland	16	197	10	0	0	223	0.15
Odisha	1384	295	246	0	22	1947	1.32
Punjab	0	441	3172	300	45	3958	2.68
Rajasthan	5050	57	1039	0	62	6208	4.21
Sikkim	98	267	2	0	0	367	0.25
Tamil Nadu	14152	660	1070	450	151	16483	11.17
Tripura	0	47	3	0	2	52	0.04
Uttar Pradesh	1260	461	1617	1250	176	4764	3.23
Uttarakhand	534	1708	24	0	5	2271	1.54
West Bengal	22	396	396	0	148	962	0.65
Andaman & Nicobar	365	8	0	0	0	373	0.25
Chandigarh	0	0	0	0	6	6	0.00
Dadar & Nagar Haveli	0	0	0	0	0	0	0.00
Daman & Diu	4	0	0	0	0	4	0.00
Delhi	0	0	0	0	131	131	0.09
Lakshadweep	0	0	0	0	0	0	0.00
Puducherry	120	0	0	0	3	123	0.08
Others*	0	0	0	0	1022	1022	0.69
All India Total	**102772**	**19749**	**17538**	**5000**	**2556**	**147615**	**100.00**
Distribution (%)	**69.62**	**13.38**	**11.88**	**3.39**	**1.73**	**100.00**	

Source: Ministry of New and Renewable Energy * Industrial waste

Table 4.2.1 :State-wise Installed Capacity of Grid Interactive Renewable Power

(as on 31st March)

States / UTs	Small Hydro Power (MW)		Wind Power (MW)		Bio-Power-BM Power/Cogen (MW)		Bio-Power-Waste to Energy (MW)		Solar Power (MWp)		Total Capacity (MW)	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Andhra Pradesh	221.03	223.23	746.20	1032.00	380.75	389.75	50.66	58.16	131.84	242.86	1530.48	1946.00
Arunachal Pradesh	103.91	104.61	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	103.93	104.64
Assam	34.11	34.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.11	34.11
Bihar	70.70	70.70	0.00	0.00	43.42	43.42	0.00	0.00	0.00	0.00	114.12	114.12
Chhattisgarh	52.00	52.00	0.00	0.00	264.90	264.90	0.00	0.00	7.10	7.60	324.00	324.50
Goa	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05
Gujarat	15.60	16.60	3454.30	3645.00	43.90	55.90	0.00	0.00	916.40	1000.05	4430.20	4717.55
Haryana	70.10	71.50	0.00	0.00	45.30	52.30	0.00	0.00	10.30	12.80	125.70	136.60
Himachal Pradesh	638.91	723.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	638.91	723.91
Jammu & Kashmir	147.53	156.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147.53	156.53
Jharkhand	4.05	4.05	0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00	20.05	20.05
Karnataka	1031.66	1129.73	2318.20	2638.00	603.28	664.28	1.00	1.00	31.00	77.22	3985.14	4510.23
Kerala	158.42	168.92	35.20	35.00	0.00	0.00	0.00	0.00	0.03	0.03	193.65	203.95
Madhya Pradesh	86.16	86.16	423.40	880.00	26.00	36.00	3.90	3.90	347.17	558.58	886.63	1564.64
Maharashtra	327.43	335.43	4100.40	4446.00	940.40	1033.40	12.72	12.72	249.25	360.75	5630.20	6188.30
Manipur	5.45	5.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.45	5.45
Meghalaya	31.03	31.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.03	31.03
Mizoram	36.47	36.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36.47	36.47
Nagaland	29.67	29.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.67	29.67
Odisha	64.63	64.63	0.00	0.00	20.00	20.00	0.00	0.00	30.50	31.76	115.13	116.39
Punjab	156.20	157.40	0.00	0.00	140.50	140.50	9.25	10.25	16.85	185.27	322.80	493.42
Rajasthan	23.85	23.85	2784.90	3309.00	101.30	111.30	0.00	0.00	730.10	942.10	3640.15	4386.25
Sikkim	52.11	52.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52.11	52.11
Tamil Nadu	123.05	123.05	7269.50	7455.00	571.30	662.30	8.05	8.05	98.36	142.58	8070.26	8390.98
Telangana	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	61.25	0.00	61.25
Tripura	16.01	16.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	16.01	21.01
Uttar Pradesh	25.10	25.10	0.00	0.00	776.50	888.50	5.00	5.00	21.08	71.26	827.68	989.86
Uttarakhand	174.82	209.32	0.00	0.00	30.00	30.00	0.00	0.00	5.05	5.00	209.87	244.32
West Bengal	98.40	98.50	0.00	0.00	26.00	26.00	0.00	0.00	7.05	7.21	131.45	131.71
Andaman & Nicobar	5.25	5.25	0.00	0.00	0.00	0.00	0.00	0.00	5.10	5.10	10.35	10.35
Chandigarh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	4.50	2.00	4.50
Dadar & Nagar Haveli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daman & Diu	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Delhi	0.00	0.00	0.00	0.00	0.00	0.00	16.00	16.00	5.15	5.47	21.15	21.47
Lakshawadeep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.75	0.75	0.75
Puducherry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03
Others	0.00	0.00	4.30	4.00	0.00	0.00	0.00	0.00	0.82	0.79	5.12	4.79
Total(MW)	**3803.70**	**4055.37**	**21136.40**	**23444.00**	**4013.55**	**4418.55**	**106.58**	**115.08**	**2631.95**	**3743.99**	**31692.18**	**35776.99**

Source: Ministry of New and Renewable Energy ; 0.0 : Not Available; MW: Mega-Watt; MWp: Mega-Watt Peak

Note: This table gives state-wise installed capacity of Grid Interactive Renewable Power for Solar, Wind, Small Hydro and Biomass.

Table 4.3.1: Categorization of blocks/mandals/talukas in India for ground water development (As on 31st March 2009)

State	Total No of Assessed Unit	Safe		Semi-critical		Critical		Over-exploited		Remarks
		Nos.	%	Nos.	%	Nos.	%	Nos.	%	
Andhra Pradesh	1108	867	78	93	8	26	2	84	8	38- Salinity Affected
Arunachal	16	16	100	0	0	0	0	0	0	
Assam	23	23	100	0	0	0	0	0	0	
Bihar	533	529	99	4	1	0	0	0	0	
Chhattisgarh	146	132	90	14	10	0	0	0	0	
Delhi	27	2	7	5	19	0	0	20	74	
Goa	11	11	100	0	0	0	0	0	0	
Gujarat	223	156	70	20	9	6	3	27	12	14-Salinity Affected
Haryana	116	18	16	9	8	21	18	68	59	
Himachal Pradesh	8	6	75	0	0	1	13	1	13	
Jammu & Kashmir	14	14	100	0	0	0	0	0	0	
Jharkhand	208	200	96	2	1	2	1	4	2	
Karnataka	270	154	57	34	13	11	4	71	26	
Kerala	152	126	83	22	14	3	2	1	1	
Madhya Pradesh	313	224	72	61	19	4	1	24	8	
Maharashtra	353	324	92	19	5	1	0	9	3	
Manipur	8	8	100	0	0	0	0	0	0	
Meghalaya	7	7	100	0	0	0	0	0	0	
Mizoram	22	22	100	0	0	0	0	0	0	
Nagaland	8	8	100	0	0	0	0	0	0	
Odisha	314	308	98	0	0	0	0	0	0	6 - Salinity Affected
Punjab	138	23	17	2	1	3	2	110	80	
Rajasthan	239	31	13	16	7	25	10	166	69	1 - Salinity Affected
Sikkim	4	4	100	0	0	0	0	0	0	
Tamil Nadu	386	136	35	67	17	33	9	139	36	11 - Salinity Affected
Tripura	39	39	100	0	0	0	0	0	0	
Uttar Pradesh	820	605	74	107	13	32	4	76	9	
Uttarakhand	17	11	65	5	29	1	6	0	0	
West Bengal	269	231	86	38	14	0	0	0	0	
Total States	**5792**	**4235**	**73**	**518**	**9**	**169**	**3**	**800**	**14**	
Andaman & Nicobar	33	33	100	0	0	0	0	0	0	
Chandigarh	1	1	100	0	0	0	0	0	0	
Dadra & Nagar Haveli	1	1	100	0	0	0	0	0	0	
Daman & Diu	2	0	0	1	50	0	0	1	50	
Lakshadweep	9	5	56	4	44	0	0	0	0	
Puducherry	4	2	50	0	0	0	0	1	25	1-Salinity Affected
Total Uts	**50**	**42**	**84**	**5**	**10**	**0**	**0**	**2**	**4**	
Grand Total	**5842**	**4277**	**73**	**523**	**9**	**169**	**3**	**802**	**14**	

Source: Central Ground Water Board, Annual Report 2013-14.

Blocks- Bihar, Chhattisgarh, Haryana, Jharkhand, Kerala, M.P., Manipur, Mizoram, Odisha, Punjab, Rajasthan, Tamil Nadu, Tripura, UP, UttaraKhand, WB, Taluks (Command/Non-Command) –Karnataka, Mandal - Andhra Pradesh

Taluks - Goa, Gujarat, Maharashtra, NCT Delhi

Districts (Valley) - Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim, Tripura

Islands - Lakshadweep, Andaman & Nicobar Islands

Region - Puducherry

Note: The assessment units are categorized for ground water development based on two criteria- a) stage of ground water development, and b) long term trend of pre and post monsoon water levels. The long term ground water level trends is computed generally for a period of 10 years. The significant rate of water level decline has been taken between 10 and 20 cm per year depending upon the local hydrogeological conditions. There are four categories, namely-' **Safe', 'Semi-critical', 'Critical' and 'Over exploited**' areas. The criteria for categorization are given below:

Criteria for categorization of assessment unit

Stage of ground water development	Significant long term		Category
	Pre-monsoon	Post-monsoon	
< = 90%	No	No	Safe
>70% and <=100%	No	Yes	Semi-critical
>70% and <=100%	Yes	No	Semi-critical
>90% and >= 100%	Yes	Yes	Critical
>100%	No	Yes	Over-exploited
>100%	Yes	No	Over-exploited
>100%	Yes	Yes	Over-exploited

Apart from the four categories mentioned above, blocks where the entire assessment area is having poor quality ground water are demarcated as **saline blocks.**

Table 4.3.2 :State wise area(in Hectares) under organic farming (Registered under accredited certification bodies) for the year 2010-11

State/UT	Certified cultivated organic Area	In-conversion cultivated Area	Total area cultivated under certification process	Wild Area	Total cultivated+Wild
Andhra Pradesh	6070.90	6279.72	12350.62	2000.00	14350.62
Arunachal	243.09	0.00	243.09	0.00	243.09
Assam	2001.75	45.33	2047.08	0.00	2047.08
Andaman	0.00	334.68	334.68	0.00	334.68
Bihar	0.00	1303.62	1303.62	0.00	1303.62
Chhattisgarh	321.99	126.93	448.92	8000	8448.92
Daman & Diu	0.00	0.00	0.00	0.00	0.00
Delhi	127.50	138.82	266.32	0.00	266.32
Goa	13044.65	259.05	13303.70	0.00	13303.70
Gujarat	42267.48	6251.43	48518.91	0.00	48518.91
Haryana	2343.05	12420.54	14763.59	0.00	14763.59
Himachal Pradesh	2265.46	1781.41	4046.87	627855.12	631901.99
J&K	640.50	135.97	776.47	0.00	776.47
Karnataka	9128.01	10400.63	19528.64	69200.00	88728.64
Kerala	3870.27	2727.37	6597.64	0.00	6597.64
Lakshadweep	0.00	12.13	12.13	0.00	12.13
Madhya Pradesh	270955.69	27407.17	298362.86	2568209.00	2866571.86
Jharkhand	0.00	0.00	0.00	24300.00	24300.00
Maharashtra	124547.03	50298.44	174845.47	2500.00	177345.47
Manipur	2336.72	455.30	2792.02	0.00	2792.02
Meghalaya	1564.05	855.62	2419.67	0.00	2419.67
Mizoram	4471.60	8072.53	12544.13	0.00	12544.13
Nagaland	654.00	949.54	1603.54	0.00	1603.54
Odisha	16883.73	6218.56	23102.29	1315.26	24417.54
Punjab	2118.21	3907.56	6025.77	0.00	6025.77
Rajasthan	57566.93	9145.26	66712.19	151000.00	217712.19
Sikkim	1391.03	27.30	1418.33	308.00	1726.33
Tamil Nadu	3244.61	829.98	4074.59	30803.50	34878.09
Tripura	203.56	144.83	348.39	0.00	348.39
Uttar Pradesh	17212.43	23800.40	41012.83	70632.00	111644.83
Uttarkhand	9513.76	2073.03	11586.78	93879.20	105465.98
West Bengal	5014.94	1110.78	6125.72	0.00	6125.72
Total	**600002.93**	**177513.91**	**777516.85**	**3650002.08**	**4427518.92**

Source: National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture(2010-11 & 2011-12)

Table 4.3.3: State wise area under organic certification (including wild harvest) 2012-13

State/UT	Area (hectares)		
	2010-11	2011-12	2012-13
Andhra Pradesh	6070.90	47456.77	5909.13
Arunachal Pradesh	243.09	520.43	231.49
Assam	2001.75	2048.27	2299.21
Andaman & Nicobar	0.00	0.00	321.28
Bihar	0.00	188.60	9351.95
Chhattisgarh	321.99	299970.60	1887.64
Delhi	127.50	100238.70	58.4
Goa	13044.65	153684.60	8290.6
Gujarat	42267.48	41978.94	45275.62
Haryana	2343.05	17442.36	7532.62
Himachal Pradesh	2265.46	933798.20	3965.38
J&K	640.50	26834.26	5121.14
Jharkhand	0.00	29794.42	254.94
Karnataka	9128.01	118739.70	27191.27
Kerala	3870.27	15790.49	10568.4
Lakshadweep	0.00	891.93	350.68
Madhya Pradesh	270955.69	432129.50	144239.75
Maharashtra	124547.03	245339.30	66504.92
Manipur	2336.72	1296.91	11.25
Meghalaya	1564.05	288.23	1780.49
Mizoram	4471.60	7023.97	1182
Nagaland	654.00	7762.60	2916.96
Odisha	16883.73	43868.18	18186.4
Punjab	2118.21	927.28	1601.47
Rajasthan	57566.93	222319.10	38289.04
Sikkim	1391.03	25716.55	43107.74
Tamil Nadu	3244.61	38554.33	3066.97
Tripura	203.56	4.05	209.72
Uttar Pradesh	17212.43	2593821.00	32889.85
Uttarakhand	9513.76	122880.60	20563.75
West Bengal	5014.94	19095.55	1279.41
Total	**600002.93**	**5550405.42**	**504439.47 (4706702 wild harvest)**

Source: National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture

Table 4.3.4 :Commodity-wise production details of top ten products (2012-13)

MT:Metric tonnes

Sr. No.	Product Name	Production 2010-11 (MT)	Production 2011-12 (MT)	Production 2012-13 (MT)
1	Cotton	552388.47	111382.54	111383.00
2	Cereals & Millets (excluding rice)	171684.66	40785.61	40786.00
3	Rice (Basmati & non Basmati)	176683.17	22673.7	22674.00
4	Pulses	42721.61	12956.69	12957.00
5	Fruits and Vegetables	335863.10	8227.74	8228.00
6	Tea	27684.26	5273.34	5273.00
7	Oil Seeds excluding Soyabean	360837.17	2849.80	2850.00
8	Coffee	13122.03	1376.54	1377.00
9	Dry Fruits	52369.09	521.46	522.00
10	Medicinal & Herbal Plants	1792014.86	189.27	189.00
11	Miscellaneous	221191.96	27.36	0.00
	Total	**3746560.38**	**206264.05**	**206239.00**

Source: National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture(2012-13)

Table 4.3.5 :Category wise production of certified organic products for the year 2010-2011

MT:Metric tonnes

Sr. No	PRODUCTS	TOTAL PRODUCTION (M.T.)
1	Cereals (except Rice)	171684.66
2	Coffee	13122.03
3	Cotton	552388.47
4	Dry Fruits	52369.09
5	Fresh Fruits & Vegetables	335863.11
6	Medicinal & Herbal Plants	1792014.86
7	Oil Seeds	360837.17
8	Pulses	42721.61
9	Rice	176683.17
10	Spices-Condiments	129878.46
11	Tea	27684.26
12	Misc	221191.96
	TOTAL	**3876438.85**
		3.88 million M.T.

Source: National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture(2010-11 & 2011-12)

Table 4.3.6 : State wise details of different organic manures produced/available (lakh mt) (2012-13)

Sl. No	State	Rural Compost	Urban Compost	Farmyard Manure	Vermicompost	Green Manuring	Other manures	Total Manure lakh MT
1	Andhra Pradesh	48.000	0.110	20.000	1.000	28.540	0.000	97.650
2	Arunachal Pradesh	0.080	0.000	0.205	0.045	0.050	0.050	0.430
3	Assam	0.790	0.010	876.000	1.608	2.500	0.000	880.908
4	Bihar	6.640	0.200	0.000	8.070	0.000	0.000	14.910
5	Chhattisgarh	46.700	3.640	42.000	3.030	3.550	4.370	103.290
6	Delhi	0.000	0.666	0.000	0.000	0.000	0.000	0.666
7	Goa	1.720	0.024	0.000	0.016	2.950	0.000	4.710
8	Gujarat	0.000	0.000	358.000	0.500	3.200	5.000	366.700
9	Haryana	10.050	0.000	7.850	0.500	0.000	0.000	18.400
10	Himachal Pradesh	23.000	0.050	12.000	5.500	0.000	0.000	40.550
11	Jammu & Kashmir	12.350	0.130	9.603	0.008	0.040	0.076	22.207
12	Jharkhand	5.000	0.000	18.000	0.000	0.000	0.000	23.000
13	Karnataka	698.130	103.060	612.360	5.020	128.810	13.260	1560.640
14	Kerala	0.550	0.610	8.600	1.550	0.570	0.065	11.945
15	Madhya Pradesh	45.000	3.500	85.500	2.000	0.000	0.000	136.000
16	Maharashtra	15.000	4.650	75.000	0.170	0.000	0.650	95.470
17	Manipur	0.000	0.000	0.500	0.000	0.000	0.000	0.500
18	Mizoram	0.000	0.000	0.045	0.036	0.000	0.000	0.081
19	Meghalaya	0.000	0.000	14.900	0.000	0.000	0.000	14.900
20	Nagaland	0.024	0.000	0.600	0.030	0.075	0.000	0.729
21	Odisha	19.870	0.017	0.000	0.000	0.000	0.000	19.887
22	Punjab	0.000	0.050	307.000	0.550	34.480	0.000	342.080
23	Rajasthan	25.600	18.470	326.120	1.330	6.640	2.660	380.820
24	Sikkim	0.130	0.000	0.000	0.020	0.000	0.000	0.150
25	Tamil Nadu	5.020	0.560	39.500	1.072	10.200	0.038	56.390
26	Tripura	0.000	0.000	0.000	0.000	0.000	0.000	0.000
27	Uttar Pradesh	0.000	0.000	0.000	0.036	0.050	0.000	0.086
28	Uttarakhand	0.000	0.000	0.220	0.165	0.000	0.000	0.385
29	West Bengal	78.700	7.300	36.500	21.450	15.890	3.000	162.840
	Total	**1039.354**	**143.047**	**2850.503**	**53.706**	**237.545**	**29.1691**	**4353.324**

Source: National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture

0 : means data not provided by the State Government

Table 4.3.7 : Biofertilizer production in India during the period from 2008-09 to 2012-13

Sl. No	State	Actual production of biofertilizers in Metric Tonnes				
		2008-09	2009-10	2010-11	2011-12	2012-13
1	Andhra Pradesh	168.14	1345.28	999.60	1126.35	1335.74
2	Arunachal Pradesh	-	-	-	-	0
3	Assam	129.36	121.04	130.00	68.33	89.00
4	Bihar	-	-	136.26	75.00	52.4
5	Chhattisgarh	-	-	-	276.34	501.63
6	Delhi	1165.10	1021.85	1205.00	1617.00	0.00
7	Goa	1149.70	1309.19	6318.00	2037.35	370.00
8	Gujarat	-	0.00	443.40	0.00	978.48
9	Haryana	14.25	6.20	6.53	914.41	5832.61
10	Himachal Pradesh	-	8.50	9.00	1.29	0.00
11	Jammu & Kashmir	15.00	15.00	0.00	8.38	0.00
12	Jharkhand	11921.06	3695.50	6930.00	5760.32	35.30
13	Karnataka	1187.00	1936.45	3257.00	904.17	7683.72
14	Kerala	848.45	1587.68	2455.57	2309.06	1045.64
15	Madhya Pradesh	1249.87	1861.33	2924.00	8743.69	1408.08
16	Maharashtra	-	-	-	-	5897.91
17	Manipur	2.00	2.50	2.00	-	0.00
18	Meghalaya	-	-	0.00	-	0.00
19	Mizoram	16.01	18.25	21.50	13.00	0.00
20	Nagaland	405.03	289.87	357.66	590.12	7.45
21	Odisha	1.14	301.23	2.50	692.22	407.10
22	Punjab	561.79	452.79	783.00	509.45	2311.33
23	Puducherry					621.00
24	Rajasthan	353.67	805.57	819.75	199.78	982.00
25	Sikkim	-	-	-	-	9.50
26	Tamil Nadu	4687.82	3732.59	8691.00	3373.81	11575.70
27	Tripura	14.68	278.40	850.00	1542.85	514.00
28	Uttar Pradesh	885.52	962.64	1217.45	8695.08	1310.02
29	Uttarakhand	48.23	32.00	45.00	263.01	2758.21
30	West Bengal	241.24	256.50	393.39	603.20	1110.00
	Total	**25065.04**	**20040.35**	**37997.61**	**40324.21**	**46836.82**

Source: National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture

Table 4.3.8 : State wise production of various Biofertilisers during 2012-13 in Metric Tonnes

Sl. No	State	Name of Biofertiliser										
		AZB	AZS	RZB	PSB	KMB	ZSB	VAM	ACT	Total	Other Inoculants*	Grand Total
1	Andhra Pradesh	201.85	342.47	88.75	610.72	22.00	13.00	28.95	28.00	1335.74	1.00	1336.74
2	Assam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Bihar	17.00	10.50	9.20	25.20	0.00	0.00	0.00	0.00	61.90	0.00	61.90
4	Chhattisgarh	38.54	0.00	82.96	380.13	0.00	0.00	0.00	0.00	501.63	0.00	501.63
5	Delhi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Goa	0.00	0.00	0.00	0.00	0.00	0.00	370.00	0.00	370.00	0.00	370.00
7	Gujarat	51.00	173.24	152.27	421.22	0.00	0.00	173.00	7.75	978.48	0.00	978.48
8	Haryana	458.69	4479.00	400.00	84.00	220.00	80.00	110.92	0.00	5832.61	0.00	5832.61
9	Himachal Pradesh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Karnataka	427.32	1221.83	848.32	3853.60	329.44	44.00	916.51	42.71	7683.73	5465.29	13149.02
11	Kerala	48.57	178.52	26.50	507.51	99.28	0.00	185.26	0.00	1045.64	1832.10	2877.74
12	Madhya Pradesh	267.49	51.18	568.00	1006.89	17.00	16.30	320.00	4.34	2251.20	359.76	2610.96
13	Mizoram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Maharashtra	1494.61	581.98	678.39	2643.43	96.63	128.32	147.94	126.61	5897.91	1.97	5899.88
15	Nagaland	2.60	1.07	0.08	3.70	0.00	0.00	0.00	0.00	7.45	0.00	7.45
16	Odisha	120.10	26.50	46.00	214.50	0.00	0.00	0.00	0.00	407.10	0.00	407.10
17	West Bengal	480.00	220.00	100.00	310.00	0.00	0.00	0.00	0.00	1110.00	0.00	1110.00
18	Jharkhand	11.65	0.00	8.96	4.69	0.00	0.00	0.00	10.00	35.30	0.00	35.30
19	Punjab	461.53	133.66	18.80	1677.22	10.30	0.02	9.80	0.00	2311.33	0.00	2311.33
20	Rajasthan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Tamil Nadu	372.07	2252.27	1059.38	5863.50	378.92	22.10	1161.01	466.46	11575.71	6192.19	17767.90
22	Tripura	180.00	160.00	0.00	174.00	0.00	0.00	0.00	0.00	514.00	0.00	514.00
23	Uttar Pradesh	320.82	0.00	294.37	694.83	0.00	0.00	0.00	0.00	1310.02	0.00	1310.02
24	Uttarakhand	1321.82	153.32	57.82	1135.76	0.00	0.00	89.49	0.00	2758.21	0.00	2758.21
25	Puducherry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total		**6275.66**	**9985.54**	**4439.80**	**19610.90**	**1173.57**	**303.74**	**3512.88**	**685.87**	**45987.96**	**13852.31**	**59840.27**

Source: National Center of Organic Farming, Department of Agriculture & Cooperation, Ministry of Agriculture

* : Others include compost enrichers (Trichoderma,Paceliomyces etc.) PGPRs, BGA Azolla

Note:

AZB Azotobacter RZB Rhizobium
AZS Azospirillum PSB Phosphate Solubilizing Biofertilizers
KMB Pottassium Mobilizing Bacteria
ZSB Zinc Solubizing Biofertilizers
VAM Vesicular - Arbuscular Mycorrhiza

Table 4.3.9 : Drought tolerant varieties of field crops		
Variety	**Traits**	**Zone**
Cereal Varieties		
Rice		
Sahabhagi Dhan	Drought tolerance	Upland rice areas
Wheat		
VL 892	Medium fertiltity and restricted irrigation condition	Hills of Himachal Pradesh and Uttarakhand
PBW 527	Drought tolerance	North west plains
HI 1531, HI 1500, HI 8627	Drought tolerance	Central Zone
HD 2888	Drought tolerance	Eastern India
Maize		
Pusa hybrid Makka 1	Drought tolerance	Rajasthan, Gujarat, Madhya Pradesh
HM 4	Drought tolerance	Punjab, Haryana, Uttar Pradesh, Maharashtra, Tamil Nadu and Goa
Pusa hybrid Makka 5	Drought tolerance	Whole of India
Sorghum		
CSH 19 R, CSV 18	Drought tolerance	All Rabi sorghum area
CSH 15 R	Drought tolerance	Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu
Pearl Millet		
HHB 67	Drought tolerance	All dry areas of Western Rajasthan and Gujarat
Barley		
RD 2660, K 603	Drought tolerance	North west plains region
Pulses		
Chickpea		
RSG 14, RSG88	Drought tolerance	North West Plain Zone
COI, ICCV 10	Drought tolerance	Southern Zone
Vijay, Vikas	Drought tolerance	Central Zone
Mothbean		
CZM 1,CZM 2, CZM 3	Drought tolerance	All India
Oilseeds		
Soyaean		
NRC-7, JS 71-05	Pod shattering and drought tolerance	All soyabean growing zones
Groundnut		
Ajeya, Girnal 1, TAG-24, G	Drought tolerance	Central and South Zone
TG 37 A, ICGS 1	Drought tolerance	Northern Plain
Commercial Crops		
Cotton		
LRA 5166	Tolerance to drought	Central Zone
KC 3	Tolerance to drought	South Zone
Sugercane		
Co 94008 (Shyama)	Tolerance to drought and salinity	Peninsular Zone
Co 98014 (Karan-1)	Tolerance to drought, water -logging	North West Zone
CoLk 94184 (Birendra)	Tolerance to drought and watrerlogging with good rationing	North central Zone
Variety/Hybrid		
Jute		
JBO 1 (Sudhangsu)	Drought tolerance	Tossa jute belt of West Bengal, Assam, Bihar and Odisha

Source: National Bureau of Soil Survey and Land Use Planning (ICAR) Nagpur,2009

TABLE 4.4.1 :State-Wise releases under centrally sponsored schemes for protection of Environment in (Rs Crore)

Sl.No	State /Scheme	2010-11	2011-12	2012-13
1	Conservation & Management of Mangroves & Coral Reefs	6.68	7.01	4.97
2	Conservation and Management of Wetlands	12.04	14.79	11.88
3	Biosphere Reserve Scheme	9.31	10.05	10.75
4	Biodiversirty Conservation and Rural Livelihood Improvement	0.45	2.13	1.2
5	National Lake Conservation Plan (NLCP)	49.96	79.9	52.3
6	National River Conservation Plan (NRCP)	656.94	187.4	268.6
7	National Ganga River Basin Authority	466.73	53.44	315.99
8	National Afforestation Programme	309.99	303	193.39
9	Green India Mission	0	49.95	0
10	Integrated Development of Wildlife Habitats	74.24	68.62	74.88
11	Project Elephant	21.94	20.92	17.94
12	Project Tiger	178.7	160.57	162.85
13	Intensification of Forest Management Scheme	56.7	63.28	48.64
14	National Green Corps Programme	26.62	26.87	25.17
15	National Environment Awareness Campaign	11.25	12.12	12.09

Source : Lok Sabha Unstared Question No 29, dt.05/08/2013. MOEF, Aug.2013

TABLE 4.4.2 :National afforestation programme (NAP)

(Hectares)

Sl No	State	Area (ha)												
		00-02	02-03*	03-04*	04-05*	05-06	07-08	08-09	09-10	11-12	12-13	13-14	14-15**	Total
1	Andhra Pradesh	2000	21090	13040	7780	2690	13859	8182	4182	5453	0	1605	810	80691
2	Chhattisgarh	1950	15670	19869	2800	2225	40990	14706	8450	8370	2934	5906	4699	128569
3	Gujarat	1500	12415	6600	4930	5000	32545	14620	4920	11150	2000	2735	5284	103699
4	Haryana	9400	3405	7250	1000	1050	8298	8260	5526	3145	1519	3035	1900	53788
5	Himachal Pradesh	2950	1520	20434	7474	0	10028	1222	1255	2566	1450	908	2237	52044
6	Jammu & Kashmir	4580	28204	15055	0	0	7735	6370	3550	4857	4486	2260	1606	78703
7	Karnataka	625	42770	6450	4790	2650	32905	3765	2200	9523	1880	3070	2900	113528
8	Madhya Pradesh	20300	32650	5700	14700	3170	28707	13367	6188	10219	5125	5110	4786	150022
9	Maharashtra	4003	17925	31580	8605	3175	41538	5182	7219	9854	2900	6850	6647	145478
10	Odisha	820	39636	6228	2313	6025	59140	7400	1745	7410	1975	4910	6535	144137
11	Punjab	650	0	3300	900	3385	7687	1640	547	625	0	1347	1628	21709
12	Rajasthan	1250	12550	6800	2500	5090	1000	9500	6800	3300	1250	2325	2550	54915
13	Tamil Nadu	2500	21400	19577	7450	1340	6230	5670	4025	2984	1800	2094	750	75820
14	Telangana									0	0	0	795	795
15	Uttar Pradesh	7344	33615	19028	2000	1017	39104	18355	9664	12435	4270	4890	8548	160270
16	Uttarakhand	815	4122	18186	10346	5665	18867	3510	4065	5058	2350	1241	1330	75555
17	Goa	0	0	1250	0	0	0	0	0	0	0	0	0	1250
18	Jharkhand	0	5700	25400	7500	1250	31990	14680	9980	4815	0	3975	3924	109214
19	Bihar	0	0	7750	2400	2165	9016	3675	3475	5647	2415	3885	1786	42214
20	Kerala	0	6600	5890	805	2955	10518	4118	1095	2947	1000	1620	1478	39026
21	West Bengal	0	9470	9286	3900	200	9984	4793	615	2360	710	970	2495	44783
22	Arunachal Pradesh	3846	11030	4600	0	1940	5705	1450	1750	0	0	0	1000	31321
23	Assam	0	0	19665	4350	2940	15660	6365	3625	0	0	3675		56280
24	Manipur	0	11674	5600	600	500	12295	2950	1525	4250	3970	2530	1835	47729
25	Nagaland	4130	19000	2398	0	0	10640	3500	4050	8000	2910	4000	2130	60758
26	Sikkim	1600	11783	1000	0	0	6045	3350	2225	3730	650	1095	1851	33329
27	Tripura	805	16400	0	2200	0	8350	335	1380	6220	4435	4547	1796	46468
28	Mizoram	0	26170	600	0	0	16150	4500	2700	2600	2500	3000	3135	61355
29	Meghalaya	0	0	0	7400	0	8075	1970	800	3930	3000	3000		28175
	TOTAL	**71068**	**404799**	**282536**	**106743**	**54432**	**493061**	**173435**	**103556**	**141448**	**55529**	**80583**	**74435**	**2041625**

Source: National Afforestation & Eco-Development Board, Ministry of Environment and Forests

*Projected coverage during 10th Plan

** till 02.02.15 (As a part of Lok Sabha Unstarred qustion No.170 on NAP)

Table 4.4.3 : State-wise details of the protected area network in India					
Sr. No	**State**	**No of National Parks**	**No of Wildlife Sanctuaries**	**No. Conservation Reserves**	**No of Community Reserves**
1	Andhra Pradesh	6	21	0	0
2	Arunachal Pradesh	2	11	0	0
3	Assam	5	18	0	0
4	Bihar	1	12	0	0
5	Chhattisgarh	3	11	0	0
6	Goa	1	6	0	0
7	Gujarat	4	23	1	0
8	Haryana	2	8	2	0
9	Himachal Pradesh	5	28	0	0
10	Jammu & Kashmir	4	15	34	0
11	Jharkhand	1	11	0	0
12	Karnataka	5	27	2	1
13	Kerala	6	17	0	1
14	Madhya Pradesh	9	25	0	0
15	Maharashtra	6	40	1	0
16	Manipur	1	1	0	0
17	Meghalaya	2	3	0	0
18	Mizoram	2	8	0	0
19	Nagaland	1	3	0	0
20	Odisha	2	18	0	0
21	Punjab	0	13	1	2
22	Rajasthan	5	25	3	0
23	Sikkim	1	7	0	0
24	Tamil Nadu	5	26	1	0
25	Tripura	2	4	0	0
26	Uttar Pradesh	1	24	0	0
27	Uttarakhand	6	7	2	0
28	West Bengal	6	15	0	0
29	A& N Islands	9	96	0	0
30	Chandigarh	0	2	0	0
31	D&N Haveli	0	1	0	0
32	Lakshadweep	0	1	0	0
33	Daman & Diu	0	1	0	0
34	Delhi	0	1	0	0
35	Puducherry	0	1	0	0
	Total	**103**	**530**	**47**	**4**

Source:Annual Report, Ministry of Environment & Forests

Table 4.4.4 : Progress of afforestation through successive plans					
					(one sq. km = 100 hectares)
Plan Period	Area Afforested In Plan Period ('000 hectares.)	Cumulative ('000 hectares.)	Afforestation Expenditure In Plan Period (Rs Crores)		Cumulative (Rs Crores)
1951-56	52	52	1.28		1.28
1956-61	311	363	6.86		8.14
1961-66	583	946	21.13		29.27
1966-69	453	1399	23.02		52.29
1969-74	714	2113	44.34		96.63
1974-79	1221	3334	107.28		203.91
1979-80	222	3556	37.10		241.01
1980-85	4650	8206	926.01		1167.02
1985-90	8863	17069	2426.63		3593.65
1990-91	1387	18456	627.79		4221.44
1991-92	1725	20181	705.72		4927.16
1992-97	7950	28131	3686.40		8613.56
1997-02	8050	36181	7350.50	*	15964.06
2002-03	405	36586	151.26		16115.32
2003-04	283	36869	207.98		16323.30
2004-05	107	36976	233.00		16556.30
2005-06	54	37030	248.12		16804.42
2006-07	0	37030	292.75		17097.17
2007-08	493	37523	392.95		17490.12
2008-09	173	37696	345.62		17835.74
2009-10	104	37800	318.17		18153.91
2010-11	57	37857	309.99		18463.90
2011-12	140	37997	303.00		18766.90
Source : Ministry of Environment & Forests					
* Figures of Allocation					

Table 4.5.1 : 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* 24 Hours**	50 80	20 80	1. Improved West and Gaeke 2. Ultraviolet Fluorescence
2	Nitrogen Oxides (NO_2) µg/m^3	Annual* 24 Hours**	40 80	30 80	1. Modified Jacob & Hochheiser 2. Chemiluminescence
3	Particulate Matter (Size <10µm) or µg.m^3	Annual* 24 Hours**	60 100	60 100	1. Gravimetric 2. TEOM 3. Beta attenuation
4	Particulate Matter (Size <2.5µm) or PM2.5 µg/m^3	Annual* 24 Hours**	40 60	40 60	1. Gravimetric 2. TEOM 3. Beta attenuation
5	Ozone (O_3),µg/m^3	8 hours** 1 hours **	100 180	100 180	1. UV photometric 2. Chemiluminescence 3. Chemical Method
6	Lead (Pb),µg/m^3	Annual* 24 Hours**	0.5 1	0.5 1	1. AAS/ICP Method after sampling using EPM 2000 or equivalent filter paper 2. ED-XRF using Teflon filter
7	Carbon Monoxide (CO), mg/m^3	8 hours** 1 Hour**	2 4	2 4	Non dispersive Infra Red (NDIR) Spectroscopy
8	Ammonia (NH3),µg/m^3	Annual* 24 Hours**	100 400	100 400	1. Chemiluminescence 2. Indophemol blue method
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 4.5.2 : 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 (for non- biodegradable waste) <5 Wt. % (for biodegradable waste)	Wt. %
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

Table 4.5.3 : Primary water quality criteria			
Sl. No.	**Designated Best Use**	**Class of Water**	**Criteria**
1	**2**	**3**	**4**
1	Drinking Water Source without Conventional Treatment but after Disinfection	A	1 Total Coliforms Organised MPN/100ml shall be 50 or less 2 pH between 6.5 & 8.5 3 Dissolved Oxygen 6mg/l or more 4 Biochemical Oxygen Demand 5 days $20^{o}C$ 2mg/l or less.
2	Outdoor bathing (organised)	B	1 Total Coliforms Organism MPN/100ml shall be 500 or less 2 pH between 6.5 & 8.5 3 Dissolved Oxygen 5mg/l or more 4 Biochemical Oxygen demand 5 days $20^{o}C$ 3mg/l or less.
3	Drinking Water Source after conventional treatment and disinfection	C	1 Total Coliforms Organism MPN/100ml shall be 5000 or less 2 pH between 6 & 9 3 Dissolved Oxygen 4mg/l or more 4 Biochemical Oxygen demand 5 days $20^{o}C$ 3mg/l or less.
4	Propagation of Wild Life and Fisheries	D	1 pH between 6.5 & 8.5 Fisheries 2 Dissolved Oxygen 4mg/l or more 3 Free Ammonia (as N) 1.2 mg/l or less
5	Irrigation, Industrial Cooling, Controlled Waste disposal	E	1 pH between 6.0 to 8.5 2 Electrical conductivity at $25^{o}C$ Micro mhos/cm Max 2250. 3 Sodium Absorption Ratio, Max 26 4 Boron, Max 2mg/l

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

Table 4.5.4: Biological water quality criteria (BWQC)						
Sl. No.	**Taxonomic Groups**	**Range of Saprobic Score (BMWP)**	**Range of Diversity Score**	**Water Quality Characteristics**	**Water Quality Class**	**Indicator Colour**
1	**2**	**3**	**4**	**5**	**6**	**7**
1	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Diptera	7 and more	0.2 - 1	Clean	A	Blue
2	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Planaria, Odonata, Diptera	6 - 7	0.5 - 1	Slight Pollution	B	Light Blue
3	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Odonata, Crustacea, Mollusca, Polychaeta, Coleoptera, Diptera, Hirudinea, Oligochaeta	3 - 6	0.3 - 0.9	Moderate Pollution	C	Green
4	Hemiptera, Mollusca, Coleoptera, Diptera, Oligochaeta	2 - 5	0.4 & less	Heavy Pollution	D	Orange
5	Diptera, Oligochaeta, No Animal	0 - 2	0 - 0.2	Severe Pollution	E	Red

Source : Central Pollution Control Board

Table 4.5.5: Exhaust emission 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

List of Abbreviations

CBHI	- Central Bureau of Health Intelligence
CEA	- Central Electricity Authority
CFC	- Chloro-Fluoro-Carbons
CH4	- Methane
CO	- Carbon Monoxide
CO2	- Carbon Dioxide
COCSSO	- Conference of Central and State Statistical Organizations
CPCB	- Central Pollution Control Board
CSO	- Central Statistics Office
CWC	- Central Water Commission
DAC	- Department of Agriculture & Cooperation
DES	- Directorate of Economics & Statistics
DPSIR	-Driving forces-Pressure-State-Impact-Response Framework
FDES	- Framework for the Development of Environment Statistics
FSI	- Forest Survey of India
GDP	- Gross Domestic Product
GHG	- Greenhouse Gases
GSI	- Geological Survey of India
HFC	- Hydro-fluoro-carbons
ICAR	- Indian Council for Agriculture Research
ICFRE	- Indian Council of Forest Research & Education
IMD	- India Meteorological Department
IPCC	- Inter Governmental Panel on Climate Change
MOEF	- Ministry of Environment and Forest
N2O	- Nitrous Oxide

NAPCC	- National Action Plan on Climate Change
NATCOM	- National Communication
NDMA	- National Disaster Management Authority
NIC	- National Informatics Centre
NRIS	- Natural Resource Information System
NRSA	- National Remote Sensing Agency
ODS	- Ozone Depleting Substances
PFC	- Per-fluro-carbons
SASE	- Snow and Avalanche Studies Establishment
SF6	- Sulphur-hexafluoride
TERI	- The Energy Resources Institute
UK	- United Kingdom
UNEP	- United Nations Environment Programme
UNFCCC	- United Nations Framework Convention on Climate Change
UNSD	- United Nations Statistics Division
USA	– United States of America
UV	- Ultra-Violet
WMO	- World Meteorological Organization