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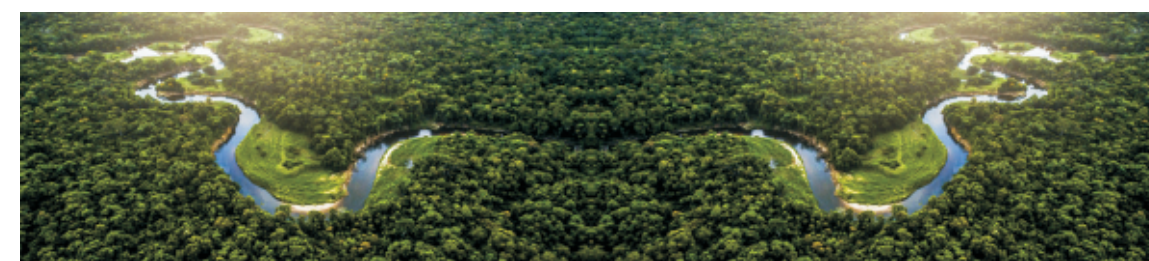
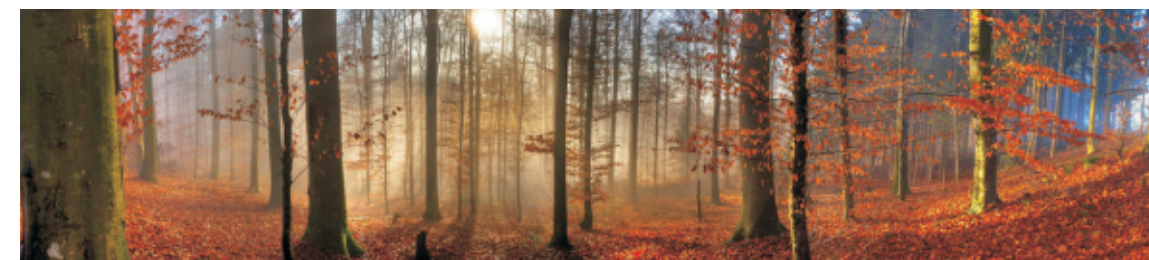


EnviStats India 2020 (Vol. II)

# EnviStats

## India 2020

Vol. II: Environment Accounts



GOVERNMENT OF INDIA  
MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION  
NATIONAL STATISTICAL OFFICE  
(SOCIAL STATISTICS DIVISION)

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# **EnviStats India 2020**

## **Vol. II - Environment Accounts**

**Government of India  
Ministry of Statistics and Programme Implementation  
National Statistical Office  
(Social Statistics Division)  
[www.mospi.gov.in](http://www.mospi.gov.in)**

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***Feedback and suggestions*** for the publication are welcomed by the EnviStats team at [ssd-mospi@gov.in](mailto:ssd-mospi@gov.in).

## Acknowledgements

The Social Statistics Division of the National Statistical Office gratefully acknowledges the contribution of all the members of the Inter-Ministerial Group on Environmental Economic Accounting, especially the source agencies listed below, for their support and guidance for this publication on Environmental Accounts:

1. Offices of the Department of Agriculture, Cooperation & Farmers Welfare, Soil and Land Use Survey of India and other Organisations of the Ministry of Agriculture & Farmers Welfare;
2. National Remote Sensing Centre, ISRO, Ministry of Space;
3. Department of Land Resources, Ministry of Rural Development;
4. Forest Survey of India, Zoological Survey of India, Botanical Survey of India, Wildlife Institute of India, National Biodiversity Authority, Wetland Division, Project Elephant Division, Statistical Division and other Divisions of Ministry of Environment, Forest & Climate Change; and
5. Wetlands International South Asia.

Acknowledgments are also due to United Nations Statistics Division (UNSD) and United Nations Environment Programme (UN Environment) for providing guidance on the implementation of the System of Environmental Economic Accounting in India, under the project on 'Natural Capital Accounting and Valuation of Ecosystem Services' piloted by the European Union in India. A special mention also needs to be made of the Victoria University of Wellington, who have been providing technical guidance to the NCAVES project countries.

The Division is also thankful to all the named and unnamed contributors of the material used for this publication and the permissions granted for copyright material. While every effort has been made, it has not always been possible to identify the sources of all the material used, or to trace all copyright holders. The Division shall ensure inclusion of the appropriate acknowledgements/references on reprinting, if any omissions are brought to its notice.

Generally, every day is a new challenge but the year 2020 has brought about unforeseen change. With each one of us trying to innovate and adapt to the new circumstances, the Division is thankful to unstinting cooperation from each of the agencies cited above that has helped the Division in exploring new areas and subjects and adhere to the planned schedule.



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## Acronyms and Abbreviations

<b>AGB</b>	Above ground biomass
<b>BGB</b>	Below ground biomass
<b>BSI</b>	Botanical Survey of India
<b>BZ</b>	Biogeographic Zone
<b>CBD</b>	Convention on Biological Diversity
<b>CITES</b>	Convention on International Trade in Endangered Species
<b>DEM</b>	Digital Elevation Model
<b>DOS</b>	Department of Space
<b>ENCS</b>	Effective Number of Crop Species
<b>ENS</b>	Effective Number of Species
<b>EP Act</b>	Environment (Protection) Act
<b>ES</b>	Ecosystem Service
<b>FAO</b>	Food and Agriculture Organization
<b>FC Act</b>	Forest (Conservation) Act
<b>FFV</b>	Forest Fringe Villages
<b>FSI</b>	Forest Survey of India
<b>GDP</b>	Gross Domestic Product
<b>GeoTIFF</b>	Geographic Tagged Image File Format
<b>GHSL</b>	Global Human Settlement Layer
<b>GIS</b>	Geographic Information System
<b>GloREDA</b>	Global Rainfall Erosivity Database
<b>Govt.</b>	Government
<b>ha</b>	Hectare
<b>HWSD</b>	Harmonised World Soils Database
<b>IPBES</b>	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
<b>ISFR</b>	India State of Forest Report
<b>ISRO</b>	Indian Space Research Organization
<b>IUCN</b>	International Union for Conservation of Nature
<b>JRC</b>	Joint Research Centre
<b>LCR</b>	Land consumption rate
<b>LD</b>	Land degradation
<b>LUCI</b>	Land Utilisation Capability Indicator
<b>LUE</b>	Land Use Efficiency
<b>LULC</b>	Land Use Land Cover
<b>LUS</b>	Land Use Statistics
<b>MEAs</b>	Multilateral Environmental Agreements
<b>Mha</b>	Million Hectares
<b>MIKE</b>	Monitoring of Illegal Killing of Elephants
<b>MoEFCC</b>	Ministry of Environment Forest and Climate Change

<b>NASA</b>	National Aeronautics and Space Administration
<b>NCA</b>	Natural capital accounting
<b>NRC</b>	Natural Resources Census
<b>NRR</b>	Natural Resources Repository
<b>NRSC</b>	National Remote Sensing Centre
<b>NSO</b>	National Statistical Office
<b>NTCA</b>	National Tiger Conservation Authority
<b>NTFP</b>	Non Timber Forest Products
<b>NWCP</b>	National Wetland Conservation Programme
<b>NWIA</b>	National Wetland Inventory and Assessment
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PGR</b>	Population growth rate
<b>REDD+</b>	Reducing emissions from deforestation and forest degradation
<b>RFA</b>	Recorded Forest Area
<b>RUSLE</b>	Revised Universal Soil Loss Equation
<b>SCC</b>	Social Cost of Carbon
<b>SDGs</b>	Sustainable Development Goals
<b>SECT</b>	SEEA Ecosystem Condition Typology
<b>SEEA</b>	System of Environmental-Economic Accounting
<b>SEEA CF</b>	SEEA-Central Framework
<b>SEEA-EEA</b>	SEEA - Ecosystem Experimental Accounting
<b>SEP</b>	Soil Erosion Prevention
<b>SFD</b>	State Forest Departments
<b>SNA</b>	System of National Accounts
<b>SRTM</b>	Shuttle Radar Topography Mission
<b>TOF</b>	Trees Outside Forest
<b>UNCCD</b>	United Nations Convention to Combat Desertification
<b>UNCEEA</b>	UN Committee of Experts on Environmental-Economic Accounting
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>UNFF</b>	United Nations Forum on Forests
<b>UNSC</b>	United Nations Statistical Commission
<b>WB</b>	World Bank
<b>WII</b>	Wildlife Institute of India
<b>WP Act</b>	Wildlife (Protection) Act
<b>ZSI</b>	Zoological Survey of India



## GLOSSARY

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### A

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#### **Abiotic**

Physical rather than biological; not derived from living organisms

#### **Above-Ground Biomass (AGB)**

Component of carbon pool consisting of all living vegetation above the soil inclusive of stems, stumps, branches, bark, seeds and foliage.

#### **Acidification of soil (E1/E2)**

Soil pH is one of the most-important soil property that affects the nutrient uptake by plants and there by influencing the crop productivity. Any soil processes or management practices which lead to build-up of hydrogen cations (also called protons) in the soil results in soil acidification. If the pH is 4.5 to 5.5 then they are called moderate and if the pH is < 4.5, then they are mapped under severe category.

#### **Agricultural Land**

Land primarily used for farming and for production of food, fibres and other commercial and horticultural crops.

#### **Aquaculture pond**

Water bodies used for the breeding and rearing of fresh-water or marine fish in captivity.

#### **Area under non-agricultural uses**

Land occupied by buildings, roads and railways or under water, e.g. rivers and canals as also other land put to uses other than agriculture.

#### **Ash pond**

Water body created for discharging effluents in industry, especially in thermal power plants

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### B

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#### **Backwater**

A creek, arm of the sea or series of connected lagoons, usually parallel to the coast, separated from the sea by a narrow strip of land but communicating with it through barred outlets.

#### **Barren and unculturable land**

Land which cannot be brought under cultivation except at an exorbitant cost, are classified as unculturable whether such land is in isolated blocks or within cultivated holdings. This includes all barren and unculturable land like mountains, deserts, etc.

#### **Barren Rocky/Stony Waste**

Rock exposures of varying lithology often barren and devoid of soil and vegetation cover.

#### **Below-Ground Biomass (BGB)**

Component of carbon pool consisting of the biomass contained within live roots.

**Biodiversity**

Variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, including diversity within species, between species and of ecosystems. It is also a measure of ecosystem health.

**Biogeographic zone**

Large distinctive units of similar ecology, biome representation, community, and species.

**Biomass**

Density of organic matter expressed as oven-dry tonnes per unit area.

**Biosphere Reserves**

Large areas of bio diversity where flora and fauna are protected, with a view to achieve a balance between conserving biodiversity, encouraging economic and social development and preserving cultural values.

**Biotic**

Relating to or resulting from living organisms

**Built-up land**

Area of human habitation developed for non-agricultural use and that has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands.

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**C**

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**Canopy**

Cover of branches and foliage formed by the crowns of trees.

**Canopy Cover**

Percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of plants.

**Canopy Density**

Percent area of land covered by the canopy of trees, expressed as a decimal coefficient, taking closed canopy as unity.

**Carbon Pool**

Components of an ecosystem that can either accumulate or release carbon.

**Carbon Sequestration**

Removal and storage of carbon from the atmosphere in carbon sinks (such as oceans, forest or soils) through physical or biological processes, such as photosynthesis.

**Catchment**

Area having a common outlet for its surface run-off.

**Climate**

Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is 3 decades, as defined by the World Meteorological Organization

(WMO). These quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

### **Climate Change**

Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

### **Coastal Sand**

Sands that are accumulated as a strip along the seacoast due to action of seawater. These are classified as wasteland if not being used for any purpose like recreation.

### **Coastal Wetland**

Include estuaries, lagoons, creek, backwater, bay, tidal flat/mudflat, sand/beach, rocky coast, mangrove, salt marsh/marsh vegetation and other hydrophytic vegetation and saltpans.

### **Concentration**

Amount of a chemical in a particular volume or weight of air, water, soil or other medium.

### **Conservation Reserves and Community Reserves**

Conservation Reserves and Community Reserves denote those protected areas of India which typically act as buffer zones to or connectors and migration corridors between established national parks, wildlife sanctuaries and reserved and protected forests of India. Such areas are designated as conservation areas if they are uninhabited and completely owned by the Government of India but used for subsistence by communities and community areas if part of the lands are privately owned.

### **Cooling pond**

An artificial lake used for the natural cooling of condenser-cooling water serving a conventional power station.

### **Coral Reef**

Consolidated living colonies of microscopic organisms found in warm tropical waters. The term coral reef, or organic reef is applied to the rock-like reefs built-up of living things, principally corals. They consist of accumulations of calcareous deposits of corals and coralline algae with the intervening space connected with sand, which consists largely of shells of foraminefera.

### **Creek**

A physiographic feature of salt marshes, especially low marshes. Creeks develop with minor irregularities sooner or later causing the water to be deflected into definite channels.

### **Cropland**

Areas with standing crop, including kharif, rabi and zaid crop lands along with areas under double or triple crops.

### **Crops**

Plants or agricultural produce grown for food or other economic purposes, such as for textiles or livestock fodder.

### **Crown Area**

Area of horizontal projection of a tree crown on the ground.

### **Culturable waste land**

Land available for cultivation, but not cultivated during the current year and the last five years or more in succession for one reason or other. Such lands may be either fallow or covered with shrubs, which are not put to any use. They may be assessed or un-assessed and may lie in isolated blocks or within cultivated holdings. Land once cultivated but not cultivated for five years in succession are included in this category at the end of the five years.

### **Current fallow**

Cropped area which is kept fallow during the current year. If a seeding area is not cropped against the same year, it may be treated as current fallow.

### **Current Shifting Cultivation**

Growing of crops for a few years on selected and clear plots, alternating with a lengthy period of vegetative fallow when the soil is rested. The land is cultivated for less than 33 percent of the time.

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## **D**

### **Dead Organic Matter (DOM)**

Component of carbon pool containing all non-living woody biomass and can be divided into wood (fallen trees, roots and stumps with diameter over 10cm) and litter (greater than 2mm and less than 10cm diameter) components.

### **Deciduous**

Perennial plants that are leafless for a certain period of the year. The leaf shedding usually takes place simultaneously in connection with the unfavourable season. Deciduous forests are predominantly composed of species, which shed their leaves once a year.

### **Degradation due to anthropogenic factors (G)**

Decreased biological productivity, diversity and resilience of the land due to human economic activities like mining, brick kiln activities, industries etc.

### **Degradation due to anthropogenic factors (G) - Brick kiln areas (G3)**

Areas that are degraded including brick kiln per se and area dug for making bricks.

### **Degradation due to anthropogenic factors (G) - Mining and dump areas (G2)**

Areas subjected to removal of different earth material (both surface and sub-surface) by manual and mechanized operations. It includes surface rocks and stone quarries, sand and gravel pits, mine dumps, etc.



## **Degradation due to anthropogenic factors (G) - Industrial effluent affected areas (G1)**

Areas where the human activity is observed in the form of industry along with other supporting establishments of maintenance. This includes areas with heavy metallurgical industry, thermal, cement, leather, petrochemical, engineering plants etc., and lands which have been deteriorated due to large scale industrial effluent discharge.

### **Degraded land under plantation crop**

Degraded lands that have been brought under plantation crops after reclamation, and are located outside the notified forest areas.

### **Degraded pastures/grazing land**

Lands in non-forest areas that are either under permanent pastures or meadows, which have degraded due to lack of proper soil and water conservation and drainage development measures.

### **Dense Forest**

Forests whose crown density is 40 percent or above.

### **Desertic sand**

Sandy areas confined to arid environment where the rainfall is scanty. These lands are characterized by accumulation of sand in the form of varying size of sand dunes and height that have developed as a result of transportation of soil through winds. There are two categories of desert sands based on their vertical approximate heights - Semi-stabilized to stabilized dunes with >40 m height; and Semi-stabilized to stabilized moderately high dunes with heights ranging between 15 and 40 m.

### **Desertification**

Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities.

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## **E**

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### **Ecosystem**

A dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit.

### **Ecosystem Assets**

Spatial areas comprising a combination of biotic and abiotic components and other elements which function together. Some examples are forests and wetlands.

### **Ecosystem Condition**

Overall quality of an ecosystem asset in terms of its characteristics. Measures of ecosystem condition are generally combined with measures of ecosystem extent to provide an overall measure of the state of an ecosystem asset.

### **Ecosystem Extent**

Size of an ecosystem asset, commonly in terms of spatial area.

### **Ecosystem services**

Benefits supplied by the functions of ecosystems and received by humanity.

**Endemic Species**

Refers to a species that is native to where it is found.

**Energy production**

Capture, extraction or manufacture of fuels or other energy products in forms which are ready for general consumption.

**Evapotranspiration**

Combined process of evaporation from the Earth's surface and transpiration from vegetation.

**Evergreen/Semi-Evergreen**

Perennial plants that are never entirely without green foliage or predominantly remain green throughout the year. Semi-evergreen is a forest type that includes a combination of evergreen and deciduous species with the former dominating the canopy cover.

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**F**

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**Fallow Land other than Current Fallow**

Lands, which were taken up for cultivation but are temporarily out of cultivation for a period of not less than one year and not more than five years.

**Flood irrigation**

Type of irrigation where farmers flow water down small trenches running through their crops. Also referred to as furrow irrigation.

**Flood plain**

Flat area adjacent to rivers that is periodically flooded.

**Forest**

Lands classed or administered as forests under any legal enactment dealing with forests, whether state-owned or private. It does not include land that is predominantly under agricultural or urban land use.

(In Land Use Statistics) Includes the area of crops raised in the forest and grazing lands or areas open for grazing within the forests are included under the forest area.

**Forest Area**

Area recorded as a forest in the Government records. Also referred to as 'recorded forest area'.

**Forest Cover**

All lands more than one hectare in area, with a tree canopy density of more than 10 percent irrespective of ownership and legal status. Such lands may not necessarily be a recorded forest area. It also includes orchards, bamboo and palm.

**Forest Inventory**

Measurement of certain parameters of forests to assess the growing stock and other characteristics of forests.

**Forest Plantation**

Areas of tree species of forestry importance, raised and managed especially in notified forest areas. The species mainly are teak, sal, eucalyptus, casuarinas, bamboo etc.

**Freshwater**

Naturally occurring water having a low concentration of salt.

**Frost heaving**

Process in glacial and periglacial environment where intense frost action and freezing of water evolves peculiar forms of rock, regolith and soil. The water crystallizes to ice below the surface horizon leading to micro-relief variations on the surface. This process affects the germination and root growth of several crops there by limiting the productivity of land.

**Frost shattering**

Type of land degradation/desertification typically seen in cold mountainous arid areas. In this, water enters cracks in rocks during the day and during the cold night it freezes. This exerts pressure on the rocks causing the cracks to widen and shattering the rocks into pieces.

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**G****Glacial Degradation**

Degradation attributable to perpetual snow covered areas. The types of degradation included are frost heaving and frost shattering.

**Glacier**

A multi-year surplus accumulation of snowfall in excess of snowmelt on land and resulting in a mass of ice at least 0.1 km<sup>2</sup> in area that shows some evidence of movement in response to gravity. A glacier may terminate on land or in water.

**Grass / grazing land**

Areas of natural grass along with other vegetation, predominantly grass-like plants (Monocots) and non-grass-like herbs (except Lantana species which are to be classified as scrub).

**Growing Stock**

Sum (by number or volume) of all the trees growing/living in the forest.

**Gullied and/or Ravinous Land**

Narrow channels formed when surface water flow increases in response to clearing and excessive use of land are called gullies. An intricate network of gullies is referred to as ravines.

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**H****High altitude lakes**

Lakes above a contour line of 3000 m above mean sea level.

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**I****Inland Wetlands**

Inland areas of land that are either temporarily or permanently covered by water. Includes ox-bow lakes, cut-off meanders, playas, marsh, etc. which are seasonal as well as permanent in nature. It also includes manmade wetlands like waterlogged areas (seasonal and perennial).

**Intertidal mud flat**

Unvegetated areas that are alternately exposed and inundated by the falling and rising of the tide. They may be mudflats or sand flats depending on the coarseness of the material of which they are made.

**Irrigated Area**

Area irrigated for cultivation through sources such as canals, tanks, tube-wells, other wells and other sources.

**Irrigation**

Process of purposely providing land with water by artificial means.

**Irrigation water**

Water artificially applied to land for agricultural purposes.

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**L**

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**Lagoon**

Coastal bodies of water, partly separated from the sea by barrier beaches. As a rule, lagoons are elongate and lie parallel to the shoreline.

**Lake/ pond**

Larger bodies of standing water occupying distinct basins. These wetlands occur in natural depressions and are normally fed by streams/rivers.

**Land affected by salinity/alkalinity**

Land that has excess soluble salts (saline) or high exchangeable sodium.

**Land cover**

Observed physical and biological cover of the Earth's surface and includes natural vegetation and abiotic (non-living) surfaces.

**Land under miscellaneous tree crops, etc.**

Cultivable land which is not included in 'Net area sown' but is put to some agricultural uses. Lands under Casurina trees, thatching grasses, bamboo bushes and other groves for fuel, etc. which are not included under 'Orchards' are classified under this category.

**Land with dense scrub**

Areas with scrubs dominating the landscape and having shallow and skeletal soils, at times chemically degraded, extremes of slopes, severely eroded and are subjected to excessive aridity. They have a tendency for intermixing with croplands.

**Land with open scrub**

Similar to land with dense scrub, except that it has sparse vegetative cover or is devoid of scrub and has a thin soil cover.

**Land-use**

Reflects both (a) the activities undertaken and (b) the institutional arrangements put in place for a given area for the purposes of economic production, or the maintenance and restoration of environmental functions.

**Litter**

Woody material of trees having diameter < 5cm which is not decomposed.



### **Littoral/Swamp/Mangrove Forest**

Areas on coastal tidal flats, estuaries salt marshes etc where the canopy cover/density is above 10% and tropical and subtropical vegetation species are densely colonized.

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## **M**

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### **Mangrove**

An association of halophytic trees, shrubs and other plants growing in brackish to saline tidal waters of tropical and sub-tropical coastlines.

### **Mining /Industrial wastelands**

Areas where waste debris is accumulated after extraction of minerals or areas of stockpile of storage dump of industrial raw material or slag/effluents or waste material or quarried/mixed debris from earth's surface.

### **Mining pools**

Water accumulated in abandoned quarries that had earlier been used for the extraction of stone, ore, coal, gravel or minerals.

### **Moderately Dense Forest**

Lands with forest cover having a canopy density between 40 to 70 percent.

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## **N**

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### **National Parks**

Represent Category II type of protected areas, i.e., protected areas managed mainly for ecosystem protection and recreation. These areas are protected from human exploitation, pollution and stand for conservation of wild nature.

### **Natural Capital Accounting (NCA)**

An umbrella term covering efforts to make use of an accounting framework to provide a systematic way to measure and report on stocks and flows of natural capital. NCA covers accounting for individual environmental assets or resources, both biotic and abiotic (such as water, minerals, energy, timber, fish), as well as accounting for ecosystem assets (e.g. forests; wetlands), biodiversity and ecosystem services, in both physical and monetary terms.

### **Net area irrigated**

Total of all the areas irrigated from different sources, counting each area irrigated only once even if it is irrigated more than once in the same year.

### **Net area sown**

Total area sown with crops and orchards, where area sown more than once in the same year is counted only once.

### **Non Forest Land**

Land without forest cover.

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## **O**

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### **Open Forest**

Lands with forest cover having a canopy density between 10 to 40 percent.

### **Other Degraded Land - Miscellaneous (H3)**

Primarily includes riverine sand areas, sea ingressión areas mainly with sand deposition excluding the sandy areas of desert region.

### **Other Degraded Land - Barren rocky / stony waste areas (H2)**

Rock exposures of varying lithology often barren and devoid of soil and vegetal cover. They occur in hills as openings or as isolated exposures on plateau and plains.

### **Other Degraded Land - Mass movement/ Mass wastage (H1)**

Landslide areas and areas with mass wastage in terms of foothill depositions, where the coarse material like sand and pebbles gets deposited because of erosion in upper catchment area.

### **Other Degraded Land (H)**

Refer to degraded lands covering mass movement/ mass wastage, barren rocky / stony waste areas.

### **Other fallow land**

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

### **Other wooded land**

Land not classified as 'Forest', spanning more than 0.5 hectares; with trees higher than 5 metres and a canopy cover of 5–10 per cent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 per cent. It does not include land that is predominantly under agricultural or urban land use.

### **Ox-bow lake/ Cut-off meander**

Crescent-shaped lakes resulting from a meandering stream eroding the outside shores of its broad bends and ending up as basins.

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## **P**

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### **Permanent pastures and other grazing lands**

All grazing lands including permanent pastures, meadows and village common grazing land.

### **Physiographic Zone**

Geographical areas that exhibit broad similarities in factors responsible for the growth of tree vegetation.

### **Plantations**

Areas under agricultural tree crops planted adopting agricultural management techniques. It includes agricultural plantation (like tea, coffee, rubber etc.) horticultural plantation (like coconut, areca nut, citrus fruits, orchards, fruits, ornamental shrubs and trees, vegetable gardens etc.) and agro-horticultural plantation.

### **Ponds**

A small, quiet body of standing water, usually shallow enough to permit the growth of rooted plants from one shore to another

### **Protected Areas**

Geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.

### **Protected Forest (PF)**

Area notified under the provisions of the Indian Forest Act or other State Forest Acts, having limited degree of protection. In protected forests, all activities are permitted unless prohibited.

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## **R**

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### **Rann Area**

An extensive salt marsh of western India between the Gulf of Kutch and the Indus River delta.

### **Recorded Forest Area (RFA)**

Same as 'forest area', i.e., geographic areas recorded as forests in Government records.

### **Reserved Forests (RF)**

An area so constituted under the provisions of the Indian Forest Act or other State Forest Acts, having full degree of protection. In reserved forests, all activities are prohibited unless permitted.

### **Reservoir/Barrage**

A pond or lake built for the storage of water, usually by the construction of a dam across a river or by dykes constructed for irrigation/water facilities.

### **River/Stream / Canals**

Rivers/streams are natural course of water flowing on the land surface along a definite channel/slope regularly or intermittently towards a sea or in to a lake or an inland basin in desert areas or a marsh or another river. Canals are artificial water course constructed for irrigation, navigation or to drain out excess water from agricultural lands.

### **River Basin**

The drainage area of a river and its tributaries and also the basic hydrological unit for water resources planning and management.

### **Riverine sand**

Sand accumulated in the flood plain of the river as sheets or sand bars. It also includes inland sand which was accumulated along the abandoned river courses or by reworking of sand deposits by wind action leading to long stretches of sand dunes or sand cover areas.

### **Riverine wetland**

Areas, especially in plains, where water accumulates leading to formation of marshes and swamp. A swamp is a wetland dominated by trees or shrubs, while a marsh is a frequently or continually inundated wetland characterised by emergent herbaceous vegetation adapted to saturated soil conditions.

## **Rural**

Lands used for human settlement of size comparatively less than the urban settlements of which the majority of population is involved in the primary activity of agriculture. In respect of land cover, these refer to built-up areas, smaller in size, mainly associated with agriculture and allied sectors and non-commercial activities.

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## **S**

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### **Saline / Salinity**

Presence of soluble salts in soils or waters.

### **Salinization / Alkalization - Rann**

Areas formed due to saline water intrusion in the coastal areas of arid and semi-arid regions which barely supports any grass.

### **Salinization / Alkalization - Saline/ Sodic/ Saline Sodic (D1-D9)**

Degradation of land due to accumulation of soluble salts, thereby affecting the crop growth. Based on the type of salt problem, it has been divided into saline, sodic and saline-sodic.

### **Salt Marsh**

Natural or semi-natural halophytic grassland and dwarf brushwood on the alluvial sediments bordering saline water bodies whose water level fluctuates either tidally or non-tidally.

### **Salt pan**

An undrained usually small and shallow rectangular, man-made depression or hollow in which saline water accumulates and evaporates leaving a salt deposit.

### **Salt-Affected Land**

Land that has excess salt in the soils with patchy growth of grasses.

### **Sand (Coastal / Desert / Riverine)**

Land with accumulation of sand, in coastal, riverine or inland areas. These lands are mostly found in deserts, riverbeds and along the shores.

### **Sand - Beach**

An unvegetated part of the shoreline formed of loose material, usually sand, that extends from the upper limit of ordinary high tides and wave wash to low water mark. Beach comprising rocky material is called rocky beach.

### **Sandy Area**

Areas occurring in coastal, riverine or inland regions. Desertic sands are characterized by accumulation of sand developed in situ or transported by wind. Coastal sands are those accumulated as a strip along the sea-coast. Riverine sands are accumulations in the flood plain as sheets which are the resultant phenomena of river flooding.

### **Scrub**

Degraded forest lands having canopy density less than 10 percent.

### **Scrub Forest**

Forest type consisting of two sub-classes viz., scrub dominated degraded forest land and agriculture land inside notified forest areas.

Scrub dominated: Land, as notified under the Forest Act and those lands with various types of forest cover with less than 20 % of vegetative cover, are classified as degraded forest. These lands are generally confined to the fringe areas of notified forest. Agricultural land inside notified forest land: This category refers to areas that have been notified under the Forest Act, in which agriculture is being practiced.

#### **Scrub Land**

Includes both land with dense scrub and land with open scrub.

#### **Shifting Cultivation Areas**

Growing of crops for a few years on selected and clear plots, alternating with a period of vegetative fallow when the soil is rested. Includes abandoned areas, that were earlier under shifting cultivation but subsequently left idle for more than one year but less than 5 years, thereby giving a scope for the regeneration of secondary vegetation such as bamboo or grasses.

#### **Snow and glaciers**

Areas under perpetual snow cover throughout the year.

#### **Soil Erosion**

Displacement of the upper layer of soil, caused by the dynamic activity of erosive agents, that is, water, ice (glaciers), snow, air (wind), plants, animals, and humans.

#### **Soil organic matter (SOM)**

Component of carbon pool that consists of organic soil carbon with biomass less than 2mm diameter.

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## **T**

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#### **Tanks/Ponds**

An artificial pond, pool or lake formed by building a mud wall across the valley of a small stream to retain the monsoon or to store water, including those constructed for industrial purposes.

#### **Threatened Species**

Any species which is vulnerable, endangered or critically endangered.

#### **Timber resources**

Defined by the volume of trees, living and dead, which can be used for timber or fuel.

#### **Tree**

A large woody perennial plant having a single well defined stem and a more or less definite crown. It also includes bamboos, palms, fruit trees, etc. and excludes non-perennial non-woody species like banana and tall shrubs or climbers.

#### **Tree Cover**

Tree patches outside the recorded forest area exclusive of forest cover and less than the minimum mappable area (1 ha) and up to 0.1 ha, comprising of block, linear and scattered trees. For the purpose of assessing growing stock and tree cover, only those trees having diameter at breast height (dbh) of 10cm or more are measured.

#### **Trees Outside Forests (TOF)**

Trees growing outside recorded forest areas.

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## U

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### **Unclassed Forests**

An area recorded as forest but not included in reserved or protected forest category.

### **Urban**

Urban areas are non-linear built up areas covered by impervious structures adjacent to or connected by streets. It includes residential areas, mixed built-up, recreational places, public / semi-public utilities, communications, public utilizes/facility, commercial areas, reclaimed areas, vegetated areas, transportation, industrial areas and their dumps, and ash/cooling ponds.

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## V

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### **Very Dense Forest**

Lands with forest cover having a canopy density of 70 percent and above.

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## W

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### **Wastelands**

Described as degraded lands which can be brought under vegetative cover with reasonable effort and which is currently underutilized and land which is deteriorating for lack of appropriate water and soil management or on account of natural causes.

### **Water body**

A mass of water distinct from other masses of water. This category comprises areas with surface water in the form of ponds, lakes, tanks and reservoirs.

### **Water Erosion - Sheet erosion (A1/A2/A3)**

A type of water erosion where the soil particles are removed from the whole soil surface in the form of thin layers. Depending on the magnitude of soil loss, it has 3 severity classes, A1, A2 and A3 with soil loss of 10-20, 20-40 and >40 tons/ha/year soil loss respectively.

### **Water Erosion - Rills (A4)**

When the surface runoff in the event of water erosion goes in the form of a concentric flow, tiny water channels are formed in the field. One important feature of rills is that they do not occur at the same place repeatedly. This is a temporary concentric flow of runoff, which could vanish after ploughing the land.

### **Water Erosion - Ravines (A6/A7)**

An intricate network of gullies developed along river courses.

### **Water erosion (A)**

Displacement of soil material by water resulting in either loss of topsoil or terrain deformation or both. This category includes processes such as splash erosion, sheet erosion, rill and gully erosion.

### **Water Erosion -Gullies (A5)**

Gullies are formed as a result of localized surface run-off affecting the unconsolidated material resulting in the formation of perceptible channels causing undulating terrain.

If rills are neglected and the erosion continues for a long time, it develops into gullies.

#### **Water Logging - Surface Ponding (C1/C2)**

Water logging caused by flooding of river water, submergence by rainwater and human intervention in natural drainage systems that adversely affect the natural drainage, where the water stagnates for quite a long time. Depending on the number of crops affected, it has been sub-divided into two severity classes, seasonal- affecting one crop and permanent - affecting more than one crop.

#### **Water Logging - Sub-surface Water Logging (C3)**

Cases of water logging where the water table is within 2 m from the surface. It adversely affects crop by virtue of saturating the root zone due to capillary rise. These areas are a potential threat to get surface ponded in due course of time, if the water accumulation continues.

#### **Water Logging (C)**

Excessive ponding / logging of water for quite some period leading to physical deterioration of land and affects the productivity of land or reduces the choice of taking crops.

#### **Water resources**

Freshwater and brackish water, regardless of their quality, in inland water bodies, including surface water, groundwater and soil water.

#### **Waterlogged (Man-made)**

Water-logging in areas adjacent to canals due to seepage especially when canals are unlined.

#### **Waterlogged / Marshy Land**

Waterlogged land is that low lying land where the water is at/or near the surface and the water stands for most part of the year.

#### **Watershed**

Geographic area through which water flows across the land and drains into a common body of water, whether a stream, river, lake or ocean.

#### **Weather**

Atmospheric condition at any given time or place. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness and precipitation. In most places, weather can change from hour-to-hour, day-to-day and season-to-season. Climate in a narrow sense is usually defined as the "average weather". A simple way of remembering the difference is that climate is what you expect (e.g. cold winters) and 'weather' is what you get (e.g. a blizzard).

#### **Weathering**

Breakdown of rocks through contact with atmospheric conditions such as heat, water, ice and pressure.

#### **Well**

A hand dug or drilled hole to access groundwater.



### **Wetlands**

Areas of land that are either temporarily or permanently covered by water. These are neither truly aquatic nor terrestrial; it is possible that wetlands can be both at the same time depending on seasonal variability. These could be natural or man-made and found both in the inland and coastal areas.

### **Wildlife Sanctuary**

A natural habitat, owned by the government or private agency, which safeguards particular species of birds and animals.

### **Wind erosion - Sheet erosion (B1/B2/B3)**

Uniform displacement of topsoil by wind action as thin layers / sheets.

### **Wind erosion - Un-stabilized dunes (B6)**

Erosion common to the arid areas where due to wind, the sand starts moving and engulfing the adjoining agricultural lands, engineering structures and demands immediate attention for their stabilization. The unstabilized sand dunes changes their location and shape from season to season and hence they are often called shifting dunes.

### **Wind erosion - Stabilized dunes (B4) / Partially stabilized dunes (B5)**

Depending on the rainfall and protection available from grazing, the bare sand dunes gradually establishes vegetal cover thus making them to get stabilized. In partially stabilized dunes, the erosion / deposition will still be active to some extent. When they establish a good vegetal cover either in the form of grasses, shrubs and scrubs, they get stabilized and erosion / deposition activity will become minimal.

### **Wind erosion (B)**

Uniform displacement of topsoil by wind action. It can result in loss of topsoil and the deposition of the eroded material elsewhere which leads to formation dune complexes.

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## **Z**

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### **Zoonotic Disease**

Diseases caused by germs that spread between animals and people. Also known as zoonoses, these may be bacterial, viral, or parasitic, or may involve unconventional agents.



# Introduction



# Understanding ecosystems through EnviStats India

*“Economic growth which strips out the planet's ecosystems is not sustainable”*

## Introduction

1. Life on this planet depends upon a large number of goods and services provided by nature. Ecosystems are natural capital assets supporting services which are highly valuable and necessary for human livelihoods. Ecosystems act as resource producers and processors. Apart from intrinsic value they have, ecosystems also contribute significantly to economic activities and in that sense provide economic value.

2. Natural capital accounting (NCA) is an umbrella term covering efforts to make use of an accounting framework to provide a systematic way to measure and report on stocks and flows of natural capital. NCA covers accounting for individual environmental assets or resources, both biotic and abiotic (such as water, minerals, energy, timber, fish), as well as accounting for ecosystem assets (e.g. forests; wetlands), biodiversity and ecosystem services, in both physical and monetary terms. Just like the compilation of national accounts of a country is guided by the System of National Accounts (SNA), for natural capital accounting, the System of Environmental-Economic Accounting (SEEA) is taken as a starting point<sup>1</sup>.

## Ecosystem Accounts in the System of Environmental-Economic Accounting framework

3. The System of Environmental-Economic Accounting (SEEA) provides a framework for measuring the link between the environment and the economy. The SEEA uses concepts, definitions, and classifications consistent with the System of National Accounts (SNA) to facilitate the integration of environmental and economic statistics, enabling the development of indicators to inform on economy-environment nexus. SEEA-Central Framework was adopted in February 2012 as an international statistical standard by the UN Statistical Commission.

4. The SEEA provides the internationally moderated framework for remedying the ‘information silo’ approach to statistics and for providing information that directly responds to the demand of integrated policy-making. The SEEA utilizes the principles of economic accounting, building on the existing System of National Accounts (SNA).

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<sup>1</sup> <https://seea.un.org/>

The SEEA accounts bring into direct focus the relationship between the environment and economy not revealed through traditional measures of economic activity, such as Gross Domestic Product (GDP) and national income. Some of its major strengths are in its approach to integrating statistics to allow for multiple purposes and multiple scales of analysis. Several key aggregates can be directly derived from the accounting tables, that can be of interest to policy analysis and goal-setting.

5. Supplementing the Central Framework, in March 2013, in order to provide the necessary guidance on a range of issues related to ecosystems, the United Nations Statistical Commission (UNSC) endorsed SEEA- Experimental Ecosystem Accounting (*SEEA EEA*) as the basis for ecosystem accounting<sup>2</sup>. The SEEA EEA was formally published in 2014 as a joint publication of the United Nations, European Commission, Food and Agriculture Organization of the United Nations (FAO), Organisation for Economic Co-operation and Development (OECD) and the World Bank (WB).

6. Given the level of interest, testing and experimentation, the UN Committee of Experts on Environmental-Economic Accounting (UNCREEA) determined in June 2017 that a revision of the SEEA EEA was required to reach agreement on the different aspects of ecosystem accounting. This revision process has now commenced and is based on the SEEA EEA endorsed in 2013, the experiences of the many initiatives on ecosystem accounting in practice, and on the Technical Recommendations in support of the SEEA EEA 2012<sup>3</sup>.

7. The SEEA EEA Revision was officially launched in March 2018 at the 49<sup>th</sup> session of the UNSC. A set of 26 discussion and background papers were drafted that involved over a 100 experts, which now serve as the bases for drafting of the chapters of the revised SEEA EEA. The first global consultation on the individual chapters of the revised SEEA EEA has been completed in August 2020. The final revised SEEA EEA is expected to be discussed for adoption by the United Nations Statistical Commission at its session in March 2021.

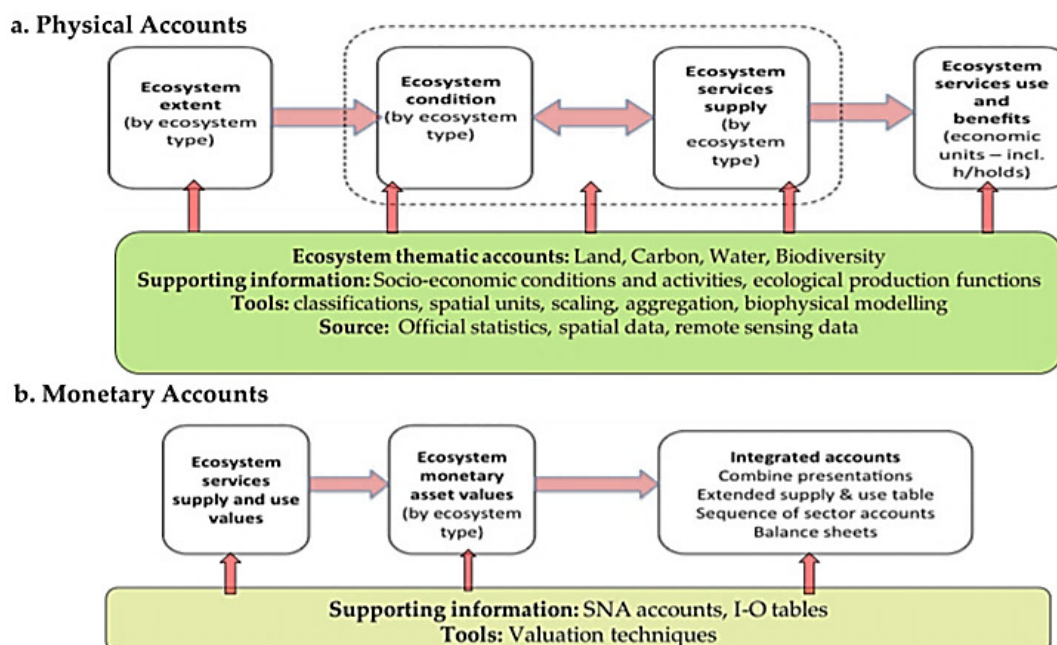
8. The SEEA EEA provides a common framework for integrating information on ecosystems (i.e. ecosystem extent, ecosystem condition, ecosystem services) as well as existing accounting information on economic and other human activity dependent on ecosystems and associated beneficiaries (households, businesses and governments). The broad steps in ecosystem accounting are shown in Figure 1 below.

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<sup>2</sup>[United Nations, European Commission, Food and Agricultural Organization of the United Nations, Organisation for Economic Co-operation and Development, The World Bank \(2014\) System of Environmental-Economic Accounting 2012 - Experimental Ecosystem Accounting. United Nations, New York](#)

<sup>3</sup>[Technical Recommendations in support of the System of Environmental Economic Accounting, 2012;](#) (white cover publication).

**Figure 1: Broad steps in Ecosystem Accounting**



Source: Technical recommendations in support of the SEEA EEA 2012

9. Understanding *ecosystem extent* is generally the starting point of ecosystem accounting. Ecosystem extent accounting provides the basis, the composition of and the changes in, ecosystem types within the country and providing the time variant changes in the extent helps reveal the degree of change in the ecosystems. Apart from these, it provides an underlying structure for the measurement of ecosystem condition and modelling of many ecosystem services, which is the essence for formulation of environmental policies and decision making.

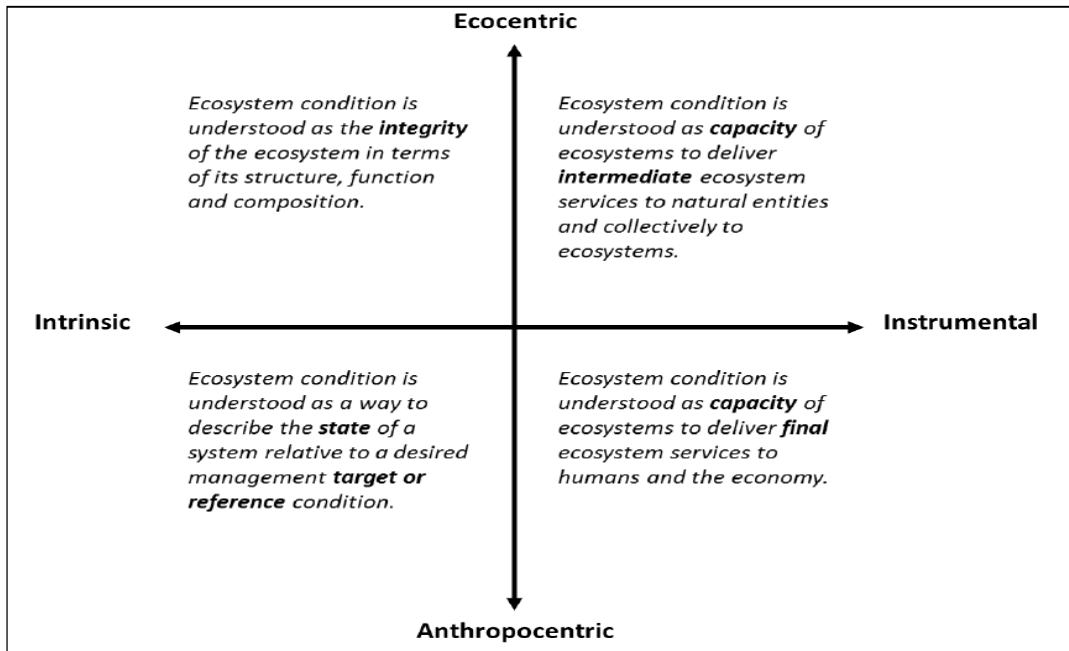
10. *Ecosystem assets* are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components. *Ecosystem condition* is defined as the overall quality of an ecosystem asset in terms of its characteristics<sup>2</sup>. It establishes the link between changes in ecosystem assets over time with the benefits derived from the stocks<sup>4</sup>.

11. The purpose of ecosystem condition accounts can be defined in terms of a two-dimensional values framework that incorporates intrinsic and instrumental values, and anthropogenic and ecocentric (centring on environmental conservation)

<sup>4</sup> Keith, H. M. (Version of 13 March, 2019). Discussion paper 2.1: Purpose and role of ecosystem condition accounts. Paper submitted to the SEEA EEA Technical Committee as input to the revision of the technical recommendations in support of the System on Environmental-Economic Accounting, 1-34.

approaches (Figure 2). Depending on the approach selected by the compilers, condition accounts can be compiled with reference to an initial, natural or undisturbed state from the past or with a target states or using comparisons across different locations.

**Figure 2: A general values framework representing the range from intrinsic to instrumental values and from ecocentric to anthropogenic world views (adapted from Turner, 2001<sup>5</sup>)**



12. Ecosystem condition along with extent gives an overall measure about the state of ecosystem asset. They describe the characteristics of each *ecosystem asset* using a variety of measured variables and derived indicators. This composite set of indicators is referred to as SEEA Ecosystem Condition Typology (SECT). Table 1 below gives a brief description of the SECT.

**Table 1: SEEA Ecosystem Condition Typology (SECT)**

SECT Superclass	SECT class
Abiotic ecosystem characteristics	1. Physical state characteristics (including soil structure, water availability)
	2. Chemical state characteristics (including soil nutrient levels, water quality, air pollutant concentrations)

<sup>5</sup> Turner RK 2001. The place of economic values in environmental valuation. In: Valuing environmental preferences: theory and practice of the contingent valuation method in the US, EU, and developing countries. Eds IJ Bateman and KG Willis. Oxford Scholarship Online doi:10.1093/0199248915.003.0002.

SECT Superclass	SECT class
Biotic ecosystem characteristics	3. Compositional state characteristics (including species-based indicators)
	4. Structural state characteristics (including vegetation, biomass, food chains)
	5. Functional state characteristics (including ecosystem processes, disturbance regimes)
Landscape level characteristics	6. Landscape and seascape characteristics (including landscape diversity, connectivity, fragmentation)

13. They are combined by ecosystem type within the accounting area as every ecosystem type has different characteristics. Characteristics relate to the operation of the ecosystem and its location and thus each ecosystem would require to be assessed with reference to a different set of representative variables and indicators that may be physical, chemical or biological.

14. A three-stage approach has been suggested in the SEEA for the compilation of ecosystem condition accounts. It is described briefly as follows:

- In stage 1, key characteristics are selected and data on relevant variables are collated;
- In stage 2, a general reference condition is determined and for each variable a corresponding reference level is established that allows a condition indicator to be derived; and
- In stage 3, condition indicators are normalized to support aggregation and the derivation of ecosystem condition indexes.

The three stages stated above are expected to allow integration of the different indicators and the movement from one stage to another would require a progressive building of dataset. Nevertheless, data from each stage will be of relevance to policy and decision making.

15. The flow of goods and services which occur naturally by ecological interactions between biotic and abiotic components in an ecosystem is often referred as ecosystem services. Ecosystem services are often taken for granted, but they provide much of the necessary foundation for the economy and society. These goods and services not only provide tangible and intangible benefits to human community but are also critical to the functioning of ecosystem. Both renewable and non-renewable natural resources and ecosystem services are a part of the real wealth of nations. They are the natural capital that underpins other forms of capital.



16. In SEEA Experimental Ecosystem Accounting, *ecosystem services are defined as the contributions of ecosystems to benefits used in economic and other human activity*. The three main ecosystem service categories are:

- Provisioning services are those ecosystem services representing the material contributions supplied by an ecosystem.
- Regulating and maintenance services are those ecosystem services resulting from the capacity of ecosystems to regulate and maintain climate, hydrological and biochemical cycles, Earth surface processes and a variety of biological and geological processes.
- Cultural services are the perceived or realized qualities of ecosystems whose existence and functioning enables a range of cultural benefits to be derived by individuals.

17. The supply of ecosystem services and the use of these services by economic units, including households, is one of the central features of ecosystem accounting. Ecosystem services are only recorded in case there are actual beneficiaries for the services, i.e. when there is a demand. This is similar to the system of national accounts, which is based on transactions or actual exchanges in the economy.

18. The valuation of ecosystem services and ecosystem assets is a complex undertaking, but it is essential to frame, prioritise and justify the sustainable development policies oriented towards the protection or restoration of ecosystem. Ecosystem services accounts are a very useful tool that provides pertinent information on the role of ecosystems in delivering services which, in turn, benefits the society.

19. Valuation of ecosystem services is an important aspect of managing the environment as an asset with benefits for everyone. Ecosystem services contribute to two types of benefits. In the context of ecosystem accounting, benefits that are produced by ecosystem services may either be SNA benefit, or they may be non-SNA benefits.

- The products produced by economic units (e.g., food, water, clothing, shelter, recreation) are referred to as *SNA benefits*, since the measurement boundary is defined by the production boundary used to measure GDP in the System of National Accounts (SNA).
- The benefits that accrue to individuals that are not produced by economic units (e.g., clean air) are referred to as *non-SNA benefits*, reflecting the fact that the receipt of these benefits by individuals is not the result of an economic production process defined within the SNA.

20. Some ecosystem services are already included in GDP (as they contribute to products, for example timber which already fall in the production boundary), but others (e.g. carbon retention) fall outside the SNA production boundary.

### **Role of NSO India**

21. With a view to make the environmental accounts fit for policy, NSO India ensures adherence to the following principles:

- i. Acknowledge and link the diverse stakeholders concerned - the producers and the policy makers, using the environmental accounts, and setting in place a mechanism for working together;
- ii. Adopt a comprehensive, multi/interdisciplinary approach to understand the linkages between the economic and environmental dimensions so that these could be appropriately factored into policy;
- iii. Assess, compile and streamline data from all available sources, while deploying objective and consistent methods;
- iv. Establish the methods and the systems that can provide relevant and timely information, at an appropriate scale and/or levels, for addressing the needs of decision makers;
- v. Enable and encourage public access and use of environment accounts and ensure clear communication of the results and their interpretation;
- vi. Ensure availability of latest information, by defining periodicity of releases and building increasingly rich time series of data; and
- vii. Set up processes for continuous improvement by networking across practitioners and users, through quality assessments and by testing new approaches.

22. With a view to fulfil the mandate as stated above, NSO India has constituted an Inter-Ministerial Group (IMG) on Environmental-Economic Accounting-India, comprising the Ministries dealing with the natural resources like Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Jal Shakti and Ministry of Earth Sciences; the National Remote Sensing Centre and the Comptroller and Auditor General (C&AG) of India. The IMG meets twice a year and is envisaged to provide methodological guidance and support for the compilation of Environmental Economic Accounts.

23. NSO India is also coordinating the EU-funded project on “Natural Capital Accounting and Valuation of Ecosystem Services”<sup>6</sup>, for understanding the linkages between SEEA and policy so that these accounts can be mainstreamed to enable data-driven decision and policy making at national, regional and local levels.

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<sup>6</sup> <https://seea.un.org/home/Natural-Capital-Accounting-Project>

## EnviStats India and Ecosystem Accounts

24. NSO India with the support of the IMG and the technical guidance provided under the EU-funded project, in 2018, released “*EnviStats India 2018 – A Supplement on Environment Accounts*”. This publication was the first in the series of annual publications of NSO India to ensure that accounts depicting the status of environment are made available in the public domain, to facilitate an understanding of the interdependence between the “factor nature” and the economy. In this publication, the asset accounts in physical terms of four natural resources – forest, land, minerals and water were presented. A brief description of the asset accounts is given in the following paragraphs:

**Land:** The chapter contained the national and state-wise land cover accounts in physical terms and the associated change matrices that have been compiled using the National Remote Sensing Centre’s Land Use Land Cover data for the years 2005-06 and 2011-12.

**Forest:** The chapter contained the asset account of forests and other wooded land compiled using the biennial publication of the Forest Survey of India, “India State of Forest Report”. In addition, the chapter also contains national and state-wise estimates of growing stock and carbon stock in the forests of India.

**Minerals:** The chapter included state-wise and mineral-wise reserves / resources for the years 2005, 2010 and 2015, mainly sourced from the National Mineral Inventory conducted by the Indian Bureau of Mines. The information in respect of coal, lignite, petroleum and natural gas was obtained from the concerned Ministries.

**Water:** In addition to the information on the status of water resources of the country compiled from the various publications of the Central Water Commission, the chapter also provides detailed information on groundwater, which is important in view of the predominant dependence on groundwater for irrigation and domestic use.

25. In the subsequent publication released in 2019, some layers on the quality characteristics were added, namely, soil nutrient index and water quality accounts in respect of surface, ground and sea water. In addition, to help understand the contribution of ecosystem services to the economy, values of two ecosystem services have been compiled for all the States of the country – cropland ecosystem services (provisioning of crops) and nature-based tourism.

26. Recognizing the fact that the relationship between the environment and economy is multi-layered, this year’s publication includes not just updates of some of the previously published accounts, like those of Land Cover, but also includes some

fresh ecosystem extent and condition accounts and estimates of ecosystem services. A brief overview of the contents is given in the following paragraphs.

### **Chapter 1 - Land - A Finite Resource**

27. The finiteness of land is a concern for India, even though the country has a land area of about 328 million hectares which is the seventh largest land area among the countries of the world. The population density has tripled in the past 50 years bringing to fore the urgent need for efficient land management. Recognizing the fact that understanding of the status of land and the changes in its utilisation can be aided by SEEA-based land accounts, this chapter gives the Land Cover Accounts, giving asset accounts for the years 2005-06, 2011-12 and 2015-16. In addition, to enable a better comprehension of the status of land in India, information has also been provided on degraded land and wastelands separately. At a macro level, the changes in land can help understand both the cause and response of regional environment change. The information at local levels can serve as reference and vital inputs for scenario analysis for the decision making of the local land use planning, urbanization management, and land use management.

### **Chapter 2 - Croplands - Beyond Bread and Butter**

28. Agriculture, with its allied sectors, is the largest source of livelihoods in India. 70 percent of its rural households still depend primarily on agriculture for their livelihood, with 82 percent of farmers being small and marginal. With such huge dependency on the agriculture sector, it is necessary for India to not only conserve and protect the croplands in the country and but also to use it sustainably.

29. To provide a bird's eye view of the croplands in India, this chapter gives State-wise extent and condition accounts of croplands in India. Under the condition accounts, two new indices - one of crop diversity and another on cropland fragmentation - have been presented as condition indicators. In order to depict the status of crop diversity across the States of India, 'effective number of crop species' has been compiled using the 'Land Use Statistics' released by the Ministry of Agriculture & Farmers Welfare. Gini index of land concentration has been compiled using the data available under the 'Agriculture Census' to understand the status of fragmentation. A very important ecosystem service provided by the croplands is the 'prevention of soil erosion'. Using soil erosion models, the estimates of 'soil regulation services' provided by croplands have been compiled as the difference between the current estimates of loss of soil and the probable loss of soil due to erosion in case the croplands.

### **Chapter 3 - Forests - the Climate Protectors**

30. Forests are the silent backbone of the human existence. Be it the tree wealth which is an important source of timber and other forest products for economic activity, or its capability to combat and adapt to climate change, forests give the society much more than they take. In this chapter, extent and condition account of forests have been given, along with flows of three forest ecosystem services, viz., Timber Provisioning Services, Non-Timber Forest Products (NTFP) Provisioning Services and Carbon Retention Services. While the former two services can be linked to economic or SNA benefits, the 'carbon retention services' helps understand the contribution of the forests in climate regulation and hence, the global well-being.

### **Chapter 4 - Wetland - Protecting Water and Life**

31. India has a wealth of wetland ecosystems that are distributed in different geographical regions. These wetlands support diverse and unique habitats and as they support a variety of plant and animal life, they provide numerous ecological goods and services. In this chapter, extent accounts of wetlands have been discussed using the indicators sourced from the National Wetland Atlas. Condition accounts have also been compiled for a sample of 111 wetlands across the country using the data made available through the first cycle of 'Wetland Health Cards Scheme' implemented by the Ministry of Environment, Forests & Climate Change. With the UN having declared the next decade, 2021-2030, as the decade of 'Ecosystem Restoration', monitoring the changes in the wetland ecosystem in a structured manner, will be a pre-requisite for framing the initiatives.

### **Chapter 5 - Biodiversity - the Panacea for Adversities**

32. India is recognized as one of the mega-diverse countries of the world. In this chapter, the taxonomic faunal and floral diversity across the some of the States of India have been discussed. To give an overview of the conservation measures being made in the country, the status of Protected areas notified under the Wild Life (Protection) Act, 1972 as also the status and conservation efforts in respect of Key Species - namely Elephant and Tiger have also been discussed in the chapter. The chapter also consists of statistics on Species Richness of Red List species, by taxonomic groups, as compiled using Spatial Datasets sourced from the International Union for Conservation of Nature (IUCN). It is envisaged that the assessment could lead to framing indicators that can be useful for the post-2020 biodiversity monitoring framework.

### **Chapter 6 - SEEA - Monitoring for Sustainability**

33. This chapter discusses the use of SEEA for reporting on the progress made under the various target of the SDGs and the other multilateral environmental agreements and for bringing coherence among the various reporting requirements. Using the example of SDG 11.3.1, it is demonstrated that from the extent of urban

ecosystems, the indicator SDG 11.3.1 can be calculated, by overlaying the information on population over the built-up area of urban ecosystems. Experimental estimates of SDG 11.3.1 for the million plus cities of India have been presented in this chapter.

34. EnviStats India envisages to provide a panoramic view of the complex interactions involving the ecosystems of the country and will continue to strive for expanding the coverage of the information, so as to guide the country for a “better environment, better tomorrow”.

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Land

**A Finite Resource**



# CHAPTER 1

## Land: A finite resource

### Introduction

1. Land is a ubiquitous but limited resource. It is subject to competing pressures from urbanisation, infrastructure, increased food, feed, fibres and fuel production and the provision of key ecosystem services. But it is also a shrinking resource. The ever-increasing population has resulted in a gradual decrease in per capita availability of land. Further, due to the rapid industrialization and population growth, land resources are under pressure from physical, human and global causes such as soil erosion, desertification, pollution, food shortage, land conflict, water shortage and climate change.
2. Land-use change has broad lines of impact, influencing economic growth, quality of life, management of environmental resources and national food supply. Given the finite supply of land resources, it is important that this land-use change is not indiscriminate. It is imperative that diversification and urbanization are planned in a manner that while responding to the market needs, it keeps sustainability at the core of these decisions. The challenge here is that given the variedness of its characteristics, different types of land and locations are not equally suitable for different purposes. Hence, the need arises for appropriate land use planning – including land monitoring and management – for sustainable development.
3. Information on the status of land and monitoring the changes therein will also help in addressing many of the SDGs like SDG 2 - ‘Zero Hunger’, SDG 11 - ‘Sustainable cities and Communities’ and SDG 15 - ‘Life on land’. Four of the targets – SDG 2.4, 11.3, 15.1 and 15.3 – explicitly refer to quality and utilization of land in a sustainable manner. The role of the policy makers is to keep a tab on the health of this precious resource so as to ensure unhindered basic ecological services, socio-economic and political security and resilience to climate change for the generations to come.
4. In this direction, this chapter discusses three main datasets on land that are available in India – the Land Use Land Cover, land degraded by various natural and anthropogenic processes and the wastelands in the country.

## Land Use Land Cover (LULC)

5. The two main characteristics on the basis of which land is classified are land use (LU) and land cover (LC). Land Cover can be defined as observed physical features on the Earth's Surface, which transforms to Land Use when a socio-economic function is added to it. Given the fact that increasing anthropogenic activities around the biosphere are causing large-scale alterations of the Earth's land surface, land-use and land-cover (LULC) change is an important indicator for monitoring environmental changes and a vital input for informed decision making in the context of land management.

6. In India, land-use and land-cover (LULC) statistics are maintained by National Remote Sensing Centre (NRSC), Department of Space (DOS) through a component on National Land Use/ Land Cover (LULC) mapping of the Natural Resources Census (NRC) Project of National Natural Resources Repository (NRR) Program. LULC datasets are made available on a periodic basis by NRSC on a 1:50,000 scale, where the LULC data is grouped as per the classes described in **Table 1**.

**Table 1: Grouping of Land Use and Land Cover (LULC) Classes**

Sl.	Level-I	Level-II
I.	Built-up	Urban
		Rural
		Mining
II.	Agriculture	Crop land
		Plantation
		Fallow
		Current Shifting Cultivation
III.	Forest	Evergreen /Semi-evergreen
		Deciduous
		Forest Plantation
		Scrub Forest
		Swamp / Mangroves
IV.	Grass/ Grazing	Grass/ Grazing
V.	Barren / unculturable/ Wasteland	Salt Affected Land
		Gullied / Ravinous Land
		Scrub land
		Sandy area
		Barren rocky

Sl.	Level-I	Level-II
		Rann
VI.	Wetlands / Water Bodies	Inland Wetland
		Coastal Wetland
		River / Stream / Canals
		Water bodies
VII.	Snow and Glacier	Snow

7. LULC datasets are also made available on a 1:250000 scale by NRSC on an annual basis at <https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php>.

### Land Accounts in SEEA-CF

8. Land is an environmental asset that outlines the space in which all the natural processes and human/economic activities are occurring. Land accounting inputs are of particular importance for starting environment accounts, because they provide the means to initiate the following tasks:

- Apply land cover types as proxy for ecosystem units (or assets);
- Apply land use to delimit areas where ecosystem services originate; and
- Help harmonize various inputs from scientific data to assess condition and services like water run-off, habitats and carbon storage.

9. Land accounts register both the state of land cover and use at a certain time, which can be termed as land stocks and include the extent (area), type (which can be further related to indicators on condition) other properties (e.g. ownership); and also the changes between at least two steps in time (or flows). It may be useful to distinguish in these accounts the 'naturally-driven' changes and those driven by human actions (anthropic).

10. The SEEA-Central Framework provides guidance on both land cover and land use accounts preparation separately, but the existing practical experience mostly shows evidence on combined applications on only land cover. Land use remains a more challenging subject to map, in part because of the overlapping nature of land use activities, and difficulties in summarizing dominant ones. A one-to-one concordance of LULC adopted in the India with LULC, SEEA-CF is given in **Table 2** below.

**Table 2: Comparison of Land Cover Classes under SEEA- CF vs. Classes in India**

LULC Classes in India	LULC under SEEA-CF
Urban Rural Mining	Artificial surface (including urban and associated areas)
Crop land Fallow Current Shifting Cultivation	Herbaceous crops Multiple or layered crops
Plantation	Woody crops
Evergreen /Semi-evergreen Deciduous Forest Plantation	Tree-covered areas
Scrub Forest	Shrub-covered areas
Swamp /Mangroves	Mangroves
Grass / Grazing	Grass land
Salt Affected Land Gullied / Ravinous Land Scrub land Sandy area Barren rocky Rann	Sparsely natural vegetated areas (partially) Terrestrial barren land
Inland Wetlands River / Stream /Canals Water bodies	Inland water bodies
Coastal Wetlands	Coastal water bodies and intertidal areas
Snow	Permanent snow and Glacier

### Asset Account for Land Cover

11. The framework suggested in the SEEA CF for preparation of asset accounts for land cover requires segregated information on natural and managed activities leading to the changes in land cover. As these are not readily available, the land cover accounts are presented in this publication at a more-aggregate level.

12. NRSC, under its Natural Resources Census (NRC) Project, has produced the LULC datasets for the years 2005-06, 2011-12 and 2015-16 and these have been

disseminated through the Bhuvan website<sup>1</sup>. Discussions on 2005-06 and 2011-12 have been presented in EnviStats India 2018 (Supplement on Environment Accounts)<sup>2</sup>. These LULC datasets are made available by NRSC on a 1:50,000 scale, where the LULC data is grouped as per the classes described in **Table 1**. The all-India change matrix of LULC from 2011-12 to 2015-16, as provided by NRSC, is given in **Statement 1.1** at the end of the chapter. Based on this change matrix, the asset account for land-use land-cover is given in **Table 3**. The state-wise asset account for land-use land-cover is given in the **Annexure-1.1** and the corresponding change matrix is given in **Annexure 1.2**.

**Table 3: Asset Account for Land Use Land Cover (LULC) in India**  
(Area in sq.km)

Level-1	Level-2	INDIA			
		Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
Agriculture	Crop land	15,53,007	41,056	90,107	15,03,956
	Current Shifting Cultivation	3,743	2,633	2,353	4,023
	Fallow	1,81,469	79,956	33,247	2,28,179
	Plantation	83,514	4,346	2,742	85,118
	<b>Sub Total 1</b>	<b>18,21,732</b>	<b>1,27,991</b>	<b>1,28,448</b>	<b>18,21,276</b>
Barren/ Unculturable/ Wastelands	Barren Rocky	1,73,986	3,540	72,371	1,05,154
	Gullied / Ravinous Land	7,511	2,898	468	9,941
	Rann	18,822	0	132	18,690
	Salt Affected Land	9,610	372	228	9,754
	Sandy Area	30,644	3,471	680	33,436
	Scrub Land	1,84,144	12,602	9,862	1,86,885
	<b>Sub Total 2</b>	<b>4,24,717</b>	<b>22,883</b>	<b>83,740</b>	<b>3,63,860</b>
Builtup	Mining	6,024	907	310	6,620
	Rural	74,653	658	233	75,079
	Urban	38,321	2,201	372	40,150
	<b>Sub Total 3</b>	<b>1,18,998</b>	<b>3,766</b>	<b>916</b>	<b>1,21,848</b>
Forest	Deciduous	4,44,433	3,753	11,300	4,36,886

<sup>1</sup> <https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php>

<sup>2</sup> <http://www.mospi.gov.in/publication/envistats-india-2018-supplement-environmental-accounts-0>

Level-1	Level-2	INDIA			
		Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
	Evergreen/ Semi evergreen	1,56,105	1,134	4,194	1,53,045
	Forest Plantation	23,895	330	871	23,355
	Scrub Forest	96,406	11,466	8,252	99,620
	Swamp / Mangroves	4,704	66	47	4,723
	<b>Sub Total 4</b>	<b>7,25,543</b>	<b>16,749</b>	<b>24,663</b>	<b>7,17,629</b>
Grass / Grazing	Grass / Grazing	25,397	1,049	2,894	23,551
	<b>Sub Total 5</b>	<b>25,397</b>	<b>1,049</b>	<b>2,894</b>	<b>23,551</b>
Snow and Glacier	Snow and Glacier	32,581	70,525	1,782	1,01,325
	<b>Sub Total 6</b>	<b>32,581</b>	<b>70,525</b>	<b>1,782</b>	<b>1,01,325</b>
Wet lands / Water bodies	Inland Wetland	8,175	458	1,027	7,606
	Coastal Wetland	10,719	189	121	10,787
	River/Stream/ Canals	61,032	2,130	2,333	60,829
	Water bodies	58,367	1,478	1,293	58,552
	<b>Sub Total 7</b>	<b>1,38,294</b>	<b>4,254</b>	<b>4,775</b>	<b>1,37,774</b>
<b>Grand Total</b>		<b>32,87,263</b>	<b>2,47,218</b>	<b>2,47,218</b>	<b>32,87,263</b>

*Note: Calculations made on the basis of the change matrices given by NRSC<sup>1</sup>.*

## Land Degradation (LD)

13. Land degradation is the loss of biodiversity and productivity that arises from the physical, chemical and biological degradation of the land. It affects the entire natural environment, resulting in losses of ecosystem services that have far reaching effects on human welfare and the global economy. It also has a close connection with other major global issues, particularly climate change and biodiversity.

14. Degraded land is a threat multiplier for communities, as it reduces people's ability to use their land and limits their access to resources. The main anthropogenic factors contributing to land degradation include deforestation and land clearing for economic use and to cope with increasing urbanization. In some instances, the economic demand for agricultural land has led not only to land clearing but also over-cultivation, over-grazing, insufficient crop rotations and the overuse of agrochemicals. These practices are focused on short-term production and profitability in order to meet the demand of growing populations. There is an urgent need to stop and reverse the process of land

degradation for ensuring food, water and environment security as well as to improve the living conditions of population residing in such areas.

15. Carbon sequestration is an important function of soil, as it can retain three times as much carbon as the atmosphere if soil quality can be managed. Practices that degrade land, however, contribute one-third of anthropogenic greenhouse gases, and conversely, reversing land degradation can help to slow the rate of climate change.

### Land Degradation Statistics in India

16. The spatial distribution of various types of land degradation is important for planning reclamation activities and increasing the agricultural production of the country. National level land degradation mapping is taken up by ISRO along with partner institutions, under Natural Resources Census (NRC) mission of DOS/ISRO, towards generating information on land degradation at 1:50,000 scale.

### Classification System of Land Degradation

17. Two cycles of land degradation mapping at 1:50,000 scale, for the timeframe 2005-06 and 2015-16, have been accomplished by NRSC. Land Degradation (LD) classification scheme of 2<sup>nd</sup> cycle was slightly modified based on the experiences gained from 1<sup>st</sup> cycle of Land Degradation mapping. The major classification scheme was the same as that used in the 1<sup>st</sup> cycle, but the land use and landform attributes in the classification scheme of 1<sup>st</sup> cycle were dropped in 2<sup>nd</sup> cycle. The classification system broadly consists of eight land degradation processes and 36 land degradation classes. The land degradation classification scheme of 2<sup>nd</sup> cycle, the results of which were published in **Status of Land Degradation in India 2015-16**<sup>3</sup>, is given in the **Table 4** below.

**Table 4: Classification Scheme for Land Degradation (LD)<sup>3</sup>**

LD Process	LD Code	LD Class
Water Erosion	A1	Sheet - Slight
	A2	Sheet - Moderate
	A3	Sheet - Severe
	A4	Rills
	A5	Gullies
	A6	Ravines - Shallow
	A7	Ravines - Moderately deep to deep

<sup>3</sup> [Status of Land Degradation in India-2015-16, National Remote Sensing Centre](#)



LD Process	LD Code	LD Class
Wind Erosion	B1	Sheet - Slight
	B2	Sheet - Moderate
	B3	Sheet - Severe
	B4	Stabilized dunes
	B5	Partially-stabilized dunes
	B6	Un-stabilized dunes
Water Logging	C1	Surface ponding -Seasonal
	C2	Surface ponding - Permanent
	C3	Sub - surface Waterlogging
Salinisation/ Alkalization	D1	Saline - Slight
	D2	Saline - Moderate
	D3	Saline - Severe
	D4	Sodic- Slight
	D5	Sodic - Moderate
	D6	Sodic - Severe
	D7	Saline Sodic - Slight
	D8	Saline Sodic - Moderate
	D9	Saline Sodic - Severe
	D10	Rann
Acidification	E1	Acidity - Moderate
	E2	Acidity - Severe
Glacial	F1	Frost heaving
	F2	Frost shattering
Anthropogenic	G1	Industrial-effluent affected areas
Anthropogenic	G2	Mining & dump areas
	G3	Brick kiln areas
Others	H1	Mass movement / Mass wastage
	H2	Barren rocky/ Stony waste
	H3	Miscellaneous-Riverine sands / Sea ingress areas
Normal	N	Normal

### Land Degradation (LD) Account

18. Based on the change matrices of the States for the year 2005-06 and 2015-16 as given in the NRSC report on land degradation cited above, the Opening Stock, Addition to Stock, Reduction in Stock and Closing Stock have been obtained for all the States. The

Land Degradation account for all the States is given at **Annexure 1.3**. However, the Land Degradation account for the country is given in **Table 5** below.

**Table 5: Land Degradation (LD) Account**

(Area in ha)

Sl. No.	Category	INDIA			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	90,21,278	4,73,271	2,50,540	92,44,009
2	A2	240,97,842	6,78,168	7,74,272	240,01,738
3	A3	142,08,316	4,07,557	5,51,819	140,64,054
4	A4	11,46,654	509	1,261	11,45,902
5	A5	18,21,440	367	3412	18,18,395
6	A6	4,19,647	0	207	4,19,440
7	A7	3,02,764	0	0	3,02,764
8	B1	55,55,372	1,098	482	55,55,988
9	B2	10,69,056	14,866	14,696	10,69,226
10	B3	10,50,201	28	3,,898	10,46,331
11	B4	21,62,867	4,39,199	11469	25,90,597
12	B5	41,30,564	1055	5,21,332	36,10,287
13	B6	4,31,766	166	24,615	4,07,317
14	C1	16,00,407	73,581	1,02,305	15,71,683
15	C2	1,20,917	15,971	19,369	1,17,519
16	C3	1,29,077	7794	4,278	1,32,593
17	D1	14,36,617	31,457	41,656	14,26,418
18	D2	17,34,701	0	0	17,34,701
19	D3	9,88,600	22,059	52,801	9,57,858
20	D4	2,93,163	15,125	23,992	2,84,296
21	D5	6,63,530	2,531	4,299	6,61,762
22	D6	3,52,963	1,170	4,058	3,50,075
23	D7	73,150	1,092	653	73,589
24	D8	4,07,522	5,129	2,309	4,10,342
25	D9	3,46,505	4,887	4,255	3,47,137
26	D10	2,22,537	722	4,829	2,18,430
27	E1	28,36,944	6,776	5,341	28,38,379
28	E2	2,08,581	1,350	6,832	2,03,099
29	F1	3,25,129	0	0	3,25,129
30	F2	25,58,729	0	0	25,58,729
31	G1	38,951	12,188	14	51,125

Sl. No.	Category	INDIA			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
32	G2	3,86,374	1,32,649	985	5,18,038
33	G3	63,367	30,160	7,900	85,627
34	H1	4,69,855	5,514	158	4,75,211
35	H2	101,40,204	0	25,697	10,11,4507
36	H3	4,82,606	9,700	17,951	4,74,355
37	N	4,41,735	5,32,680	4,41,735	5,32,680
<b>Total</b>		<b>917,39,931</b>	<b>29,28,819</b>	<b>29,29,420</b>	<b>917,39,330</b>
<b>Land Degradation Total</b>		<b>912,98,196</b>	<b>23,96,139</b>	<b>24,87,685</b>	<b>912,06,650</b>

*Note: Calculations made on the basis of the change matrices given by NRSC<sup>3</sup>.*

## Wastelands

19. Wastelands are degraded land which can be brought under vegetative cover, with reasonable effort, but which are currently under-utilized and deteriorating for lack of appropriate water and soil management or on account of natural causes. Wastelands include degraded forests, overgrazed pastures, drought-struck pastures, eroded valleys, hilly slopes, waterlogged marshy lands, barren land, etc. Increasing population is giving rise to a demand for land based products/services which include agricultural as well as non-agricultural purposes all over the world. In India, this demand for land has led to over-utilization of land resources regardless of their potential and limitations, resulting in the creation of vast stretches of wastelands. It has become imperative to identify lands suitable to create infrastructure, improve agriculture production, develop industrial zones etc. Thus, there is a persistent need to identify and reclaim those wastelands that have the potential for recuperation.

## Wastelands Statistics in India

20. India contains more than 17% of the world population, while its land is only 2% of the total geographical area of the world. Naturally, the pressure on the land is beyond its carrying capacity in several regions of the country. Therefore, many productive lands are suffering various degrees of degradation and are turning into wastelands. As of 2015-16, approximately 55.76 million hectares is lying as wasteland in India, which is a significant 16.96% share of the geographical area of the country.

## Classification System of Wastelands

21. The Department of Land Resources is the nodal agency in land resources management for striving to realize the previously stated objective same through various initiatives. Geospatial data generation of wastelands is one such enterprising step undertaken by the National Remote Sensing Centre (NRSC) at the behest of D/o Land Resources, primarily to showcase their spatial distribution and changes across the country. In this series of geospatial datasets on wastelands, the **Wastelands Atlas of India - 2019**<sup>4</sup> has been compiled using remote sensing satellite data at a 1: 50,000 scale by NRSC.

22. In order to facilitate comparison between the two temporal wastelands vector datasets with respect to different classes and their spatial statistics and to identify the type of change, the number of wastelands classes in 2015-16 was kept the same by NRSC as it was in 2008-09. Thus, the number of wastelands classes during both the mapping cycles remained 23. Nine non-wastelands classes have been shortlisted as the probable cases of change from wastelands to these classes for facilitating change analysis. The description of individual classes is given in the **Table 6** below.

**Table 6: Wastelands Classification System<sup>4</sup>**

Type of land	Wasteland 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 (Medium)	7
Land affected by salinity/alkalinity (Strong)	8
Shifting Cultivation-Current Jhum	9
Shifting Cultivation-Abandoned Jhum	10
Under - utilised/degraded forest (Scrub domain)	11
Under - utilised/degraded forest (Agriculture)	12
Degraded pastures/grazing land	13
Degraded land under plantation crop	14
Sands Riverine	15

<sup>4</sup> [Wastelands Atlas of India-2019, National Remote Sensing Centre](#)

Type of land	Wasteland Code
Sands Coastal	16
Sands-Desertic	17
Sands-Semi Stab-Stab>40m	18
Sands-Semi Stab-Stab 15-40m	19
Mining Wastelands	20
Industrial Wastelands	21
Barren Rocky/Stony waste	22
Snow covered/Glacial area	23
<b>Non-Wasteland categories</b>	
Built up	24
Industrial Area	25
Cropland	26
Fallow Land	27
Plantation	28
Forest-Dense/Open	29
Forest Plantation	30
Grasslands	31
Waterbodies	32

### Wastelands Account

23. Based on the *change matrices* of the States/UTs for the year 2008-09 and 2015-16 as given in the Wasteland Atlas of India, 2019<sup>4</sup>, the Opening Stock, Addition to Stock, Reduction in Stock and Closing Stock have been obtained for all the respective States/UTs. The Wastelands account for all the States/UTs are given at **Annexure 1.4**. The Wastelands account at the national level is given in **Table 7** below.

**Table 7: Wastelands Account for India**

(Area in sq.km)

WL Categories	INDIA			
	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	6,586	97	199	6,484
2	3,117	19	28	3,109
3	80,646	4,343	11,017	73,972
4	97,320	9,400	7,118	99,602

WL Categories	INDIA			
	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
5	1,785	116	274	1,627
6	6,265	391	1,457	5,199
7	5,169	142	587	4,723
8	1,634	68	116	1,586
9	4,397	2,506	3,032	3,871
10	4,051	2,749	2,225	4,575
11	86,954	1,091	1,634	86,411
12	20,821	1,129	260	21,691
13	6,867	4	421	6,450
14	252	15	18	249
15	3,165	105	149	3,121
16	710	28	66	671
17	8,324	583	715	8,192
18	9,488	0	142	9,345
19	13,045	11	1,255	11,801
20	1,819	453	16	2,256
21	205	114	1	317
22	92,166	6,629	4,311	94,484
23	1,11,287	4,401	7,760	1,07,928
999	6,131	14,536	6,131	14,536
<b>Grand Total</b>	<b>5,72,202</b>	<b>48,932</b>	<b>48,932</b>	<b>5,72,202</b>
<b>Total Wasteland</b>	<b>5,66,070</b>	<b>34,396</b>	<b>42,801</b>	<b>5,57,666</b>

*Note: Calculations made on the basis of the change matrices given in the Atlas<sup>4</sup>.*

## Conclusion

24. Given the finiteness of land, an approach to sustainable land management is the need of the times, which harmonizes the complementary goals of providing environmental, economic, and social opportunities for the benefit of present and future generations, while maintaining and enhancing the quality of the land (soil, water and air) resource. In other words, the challenge is to ensure that the changing human needs (agriculture, forestry, conservation) are met, while ensuring long-term socioeconomic and ecological functions of the land.



25. Land management decisions are pivotal to ensure a sustainable growth in the economy. The concept of spatial planning has evolved which looks at the entire region in a holistic way, be it for regulating the built-up area or infrastructure development or managing eco-sensitive areas like river basins, watershed areas, wetlands, flood-prone areas, wildlife areas, mining areas, coastal areas, peri-urban areas, and areas having tourism potential. Especially in the face of climate change and variability, the various indicators of human footprint on land, like the use of land and its condition need to be assessed on a regular basis for scientific and effective land use planning, management and ecological restoration. To facilitate this, NSO India, in collaboration with all the other relevant agencies and using the available national data sources, envisages to make available to users, regularly updated information on land for the benefit of all the stakeholders.

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Statement 1.1: Change matrix of Land Use - Land Cover (LULC) from 2011-12 to 2015-16

(Area in sq.km.)

LULC_CLASSES		ALL INDIA							
		2015-16							
		1: Agriculture	2: Barren/ Unculturable/ Wastelands	3: Builtup	4: Forest	5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies	Grand Total
2011-12	1: Agriculture	1809033	5103	2648	2299	94	8	2547	1821732
	2: Barren/ Unculturable/ Wastelands	4237	348460	589	2285	61	68471	614	424717
	3: Builtup	238	442	118239	48	2	0	29	118998
	4: Forest	5085	6838	205	712342	207	637	230	725543
	5: Grass / Grazing	147	408	118	368	22502	1333	521	25397
	6: Snow and Glacier	0	1643	0	131	7	30799	1	32581
	7: Wetlands / Water bodies	2536	966	49	155	679	77	133833	138294
	Grand Total	1821276	363860	121848	717629	23551	101325	137774	3287263

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.





## Croplands

### Beyond Bread and Butter



## Chapter 2

# Croplands – Beyond Bread and Butter

### Introduction

1. Agricultural land/ Cropland is the land area under temporary crops such as cereals, temporary meadows for mowing, under market or kitchen gardens, and land temporarily fallow and also land under permanent crops that is land under crops that occupy them for long periods and need not be replanted after each harvest. In other words, it is a main food production area. Croplands are important ecosystems as they contribute to several ecosystem services like food production, air regulation, soil and water conservation, environmental decontamination, etc.

2. In terms of the SDGs, reaching the SDG targets simply will not be possible without a strong and sustainable agricultural sector. Along with its direct impact on hunger and malnutrition, management of our food system is also linked to other development challenges being addressed in the SDGs. Given the fact that rural people represent the largest segment of the world's extreme poor by far – more than 70% of the total, agriculture is an engine of pro-poor economic growth in rural areas. Studies have shown that efficient management of croplands is critical for ensuring growth in agriculture, which would be at least twice as effective in reducing poverty and hunger than from any other sector<sup>1</sup>. Similarly, with agriculture alone requiring more water than what can be sustained to feed the world even before domestic and industrial needs are met<sup>2</sup>, Goal 6 of ensuring water availability for all requires making the right choices in view of the status of croplands. Croplands are also critical for helping the world tackle climate change, since agriculture's carbon mitigation potential could reach as much as 7.5% of total global emissions, depending on the adoption of agricultural productivity measures.

3. Croplands are a critical, terrestrial man-made ecosystem and it is vital that while taking measures to improve the efficiency of farmland so as to meet the growing consumption demand, adequate care is taken to ensure that the croplands are in good condition in that they support biodiversity and the abiotic resources (soil-air-water) are not depleted and are capable of providing a balanced supply of ecosystem services.

4. Given the linkages of the croplands with the local and global environment, climate regulation, food, energy and others, it is important to monitor the status of croplands. In

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<sup>1</sup> FAO 2009, "How to Feed the World in 2050", Food and Agriculture Organization of the UN, Rome.

<sup>2</sup> [https://farmingfirst.org/sdg-toolkit#section\\_2](https://farmingfirst.org/sdg-toolkit#section_2)

this background, extent and condition accounts have been compiled, drawing from the SEEA framework, for the States of India, along with the physical flows of soil regulation services provided by the croplands. The format of the accounts is given in **Table 1** below.

**Table 1: Format for Cropland Ecosystem Accounts**

Extent Accounts for Croplands
1. Net area Sown
2. Total Cropped Area
3. Area sown more than once
4. Cultivable land
5. Cultivated land
6. Un-cultivable land
7. Un-cultivated land
Condition Accounts for Croplands
1. Depicting intensification and irrigation
2. Depicting fragmentation: Gini Coefficient of Land Concentration
3. Depicting crop diversification: Effective Number of Crop Species
Flows of Ecosystem services: Soil Regulation Services provided by croplands

## Data Sources and Methods

### Extent Account

5. India's cropland spans an area of about 156 million hectares. Land Use Statistics (LUS) is a comprehensive and systematic account of land use in India based on the nine-fold land use classification on land utilization.

### Land Use Statistics in India

6. The land use statistics in India were developed as a source of information for planning of agricultural production. Out of a geographical area of 328.73 million hectares, statistics are available for 305 million hectares, with coverage of more than 93%. The reporting area is classified into the following nine categories:

- i. Forests
- ii. Net area sown
- iii. Area under non-agricultural uses
- iv. Barren and unculturable land
- v. Permanent pastures and other grazing lands
- vi. Land under miscellaneous tree crops, etc.
- vii. Culturable waste land
- viii. Current fallow

- ix. Fallow Land other than Current Fallow
7. Land Use Statistics, besides giving the cropped area under both food and non-food crops, also gives the following statistics.
- i. Total Cropped Area: The total area sown once and/or more than once in a particular year - the area is counted as many times as there are sowings in a year.
  - ii. Area sown more than once: Areas on which crops are cultivated more than once during the agricultural year
  - iii. Irrigated Area: Areas irrigated for cultivation through such sources as canals (Government and Private), tanks, tube-wells, other wells and other sources. It is divided into two categories:
    - a. Net Irrigated Area: This is the area irrigated through any source once in a year for a particular crop.
    - b. Total Net Un-Irrigated Area: This is the area arrived at by deducting the net irrigated area from the net sown area.
  - iv. Total Irrigated Area: This is the total area under crops, irrigated once and/or more than once in a year. It is counted as many times as the number of times the areas are cropped and irrigated in a year
  - v. Total Un-Irrigated Area: This is the area arrived at by deducting the total irrigated area from the total cropped area.
  - vi. Cropping Intensity: This is the ratio of Total Cropped Area to Net Area Sown.
  - vii. Total cultivable land: This consists of net area sown, current fallows, fallow lands other than current fallows, culturable waste land and land under miscellaneous tree crops.
  - viii. Total Un-Cultivable Land: This is the area arrived at by deducting the total cultivable area from the total reported area.
  - ix. Total Cultivated Land: This consists of net area sown and current fallows.
  - x. Total Un-Cultivated Land: This is the area arrived at by deducting the total cultivated area from the total reported area

### **Crop Diversification**

8. Crop diversification is referred to as cultivating more than one variety of crop, either of the same species or different species in a given area. It is one of the cost-effective ways to provide an insurance or a buffer against environmental fluctuations as each species respond differently to changes. Several studies have shown that crop diversification not just increases resilience, which is the ability of an ecosystem to return to its original productive state after being disturbed, but also increases the level of yield.



Crop diversification also reduces the risk associated with food insecurity. There is revived concern in the present times related to crop diversity, mostly due to the rising concerns related to biodiversity loss, environment and human health.

9. Crop diversification is vital for economic growth and is an inevitable step to safeguard productivity, profitability and sustainability. One of the indices to depict crop-diversification is that of 'Effective Number of Crop Species' (ENCS) which can be computed as:

$$\text{ENCS} = e^{-H'}$$

where  $H'$  is the Shannon Diversity Index and is computed as follows:

$$H' = \sum p_i \ln p_i$$

with  $p_i$  representing the proportion of the harvested area for  $i^{\text{th}}$  crop (or crop group).

The value of ENCS signifies the estimate of the number of crops dominating production in a particular region. Thus, low value of ENCS means low crop diversity and high value corresponds to high crop diversity.

ENCS for the States/Districts of India have been compiled using the crop area statistics as available in the Land Use Statistics.

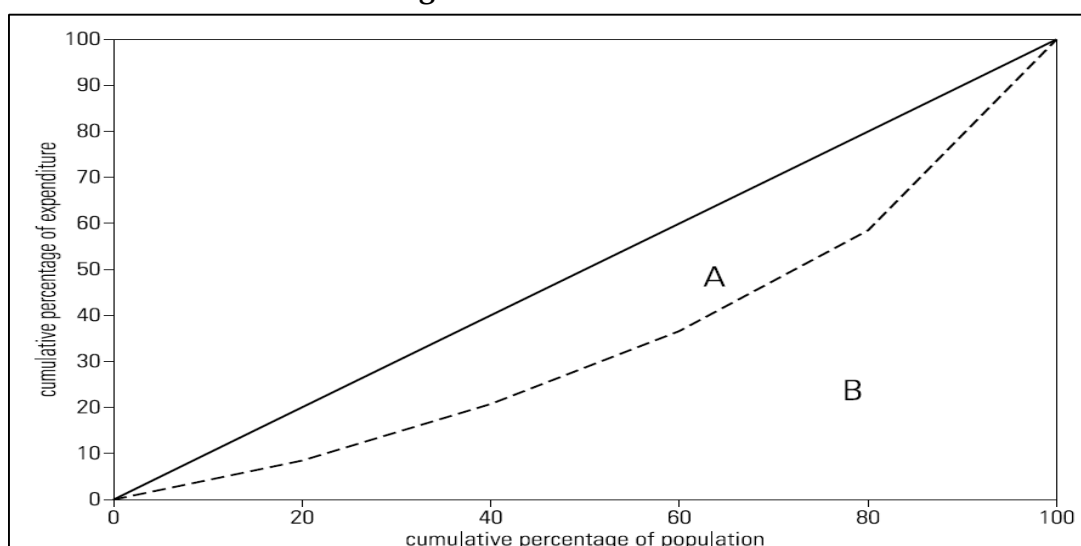
### Fragmentation of Cropland

10. The Gini Index, a common indicator of inequality, is based on the Lorenz curve which is a cumulative frequency curve that compares the present distribution with the uniform distribution that represents equality. **Figure 1** gives the Lorenz curve for expenditure and here, Gini coefficient is  $A/(A+B)$  where the diagonal represents perfect equality. Formally, let  $x_i$  be a point on the x-axis, and  $y_i$  a point on the y-axis. Then,

$$\text{Gini} = 1 - \sum_{i=1}^N (x_i - x_{i-1}) * (y_i + y_{i-1})$$

The Gini coefficient when equal to zero means perfect equality and when equalling one means complete inequality.

*Figure 1: Lorenz Curve*



11. FAO collates and releases estimates of the Gini Index of Land Concentration using information from the Agriculture Censuses conducted by different countries. The Gini Index of Land concentration can be compiled by taking the cumulative percentage of holdings (from small to large) on the horizontal axis and the cumulative percentage of area of holdings on the vertical axis. Using the same method<sup>3</sup>, these indices have been compiled for the States of India by using the reports of Agriculture Census conducted during 2005-06, 2010-11 and 2015-16.

12. The Agriculture Census in India is conducted at five yearly intervals to collect data on structural aspects of operational holdings in the country. The first comprehensive Agriculture Census in the country was conducted with reference year 1970-71. So far, ten Agriculture Censuses have been conducted in the country, with the latest census being for the reference year 2015-16. The Agriculture Census programme is carried out in three phases, with the operational holding as statistical unit at micro-level for data collection. During Phase-I of the Agriculture Census, data on primary characteristics like number and area of operational holdings by different size classes, ownership characteristics like gender, social groups and type of ownership are collected. During Phase-II of the Census, survey is conducted in selected 20 percent villages for collecting detailed data on characteristics of operational holdings such as land use, irrigation status, tenancy particulars, cropping pattern etc. Phase - III of the Census, popularly known as Input

<sup>3</sup> <http://www.fao.org/3/a-am352e.pdf%20>

Survey, relates to collection of data on the pattern of input use by operational holdings and is conducted in 7 percent of villages in each of the State/UTs<sup>4</sup>.

### **Soil Regulation Services provided by Croplands**

13. The loss of soil from land surfaces by erosion is widespread and reduces the productivity of all ecosystem. Soil erosion and associated damage to agricultural land over many years have resulted in losses in cropland due to abandonment and reduced productivity of the remaining land. This loss of cropland often results in the creation of new cropland out of forests and pastureland and the need to enrich these new croplands with inputs of nitrogen and phosphate fertilizers. In addition, soil erosion reduces the valuable diversity of plants, animals and soil microorganisms.

14. Erosion occurs when soil is left exposed to rain drop or wind energy. In the case of water erosion, the impact of soil erosion is intensified on all sloping land, where with each degree of slope, more of the surface soil is carried away as the water moves downhill into valleys and streams.

15. The main factors influencing the amount of loss due to soil erosion are:

- i. Soil structure: Soils with a medium to fine texture, a low level of organic matter content, and weak structural development are most easily eroded. Typically, these soils have low water infiltration rates and therefore are subject to high rates of water erosion and are easily displaced by wind energy.
- ii. Status of vegetative cover: Land areas covered by plant biomass, living or dead, are more resistant to wind and water soil erosion and experience relatively little erosion because rain drop and wind energy are dissipated by the biomass layer and the topsoil is held together by the biomass.
- iii. Land Topography: The topography of a given landscape, its rainfall and/or wind exposure all combine to influence the land's susceptibility to soil erosion.

16. Soil erosion reduces the general productivity of terrestrial ecosystems. It increases water runoff, thereby decreasing water infiltration and the water-storage capacity of the soil. In addition, during the erosion process, organic matter and essential plant nutrients are removed from the soil and soil depth is reduced. These changes not only inhibit vegetative growth but reduce the presence of valuable biota and the overall biodiversity of the soil. These factors interact, making it almost impossible to separate the specific impacts of one factor from another. For example, erosion, by diminishing soil organic

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<sup>4</sup> <http://agcensus.nic.in/>

matter, reduces the overall soil biomass and biological activity. This adversely affects the diversity of plants, animals, and microbes present in the soil ecosystem since vegetation is the main component of ecosystem biomass and provides the vital resources required both by animals and microbes for their survival.

17. An important ecosystem service produced by croplands is the 'soil erosion prevention service', thereby, mitigating several of the negative impacts of soil erosion.

18. To begin an assessment of the 'soil erosion prevention services' provided by croplands, the first step is to evaluate the erosion that would occur when vegetation is absent and therefore no ecosystem service is provided. The potential soil erosion in a given place and time is related to rainfall erosivity (that is, the erosive potential of rainfall), soil erodibility (as a characteristic of the soil type) and local topography. Although external drivers can have an effect on these variables (for example, climate change), they are less prone to be changed directly by human action. The actual ecosystem service can then be determined by the difference between the potential soil erosion and the impact mitigated by the ecosystem.

### **Revised Universal Soil Loss Equation (RUSLE)**

19. Owing to the impacts of soil erosion on decline in productivity of arable and non-arable lands, estimation of soil erosion is of utmost importance. Using soil erosion models is seen as a useful first step in identifying the critical areas most vulnerable to soil loss, understanding the spatial distribution of soil loss, and studying the drivers and patterns. The empirical soil loss model called Revised Universal Soil Loss Equation (RUSLE)<sup>5,6</sup> designed to predict long-term annual averages of soil loss, has been widely-used and applied around the world due to its relative simplicity and low data requirements compared to more complex soil erosion models<sup>7</sup>. It is a multiplicative model that uses information about rainfall, topography, soil, land use and cover, and support practices to estimate terrestrial rill/inter-rill erosion by the equation below:

$$A = R \times K \times LS \times S \times C \times P$$

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<sup>5</sup> Renard, K. G. (1997). [\*Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation \(RUSLE\)\*](#). United States Government Printing.

<sup>6</sup> Wischmeier, W. H., & Smith, D. D. (1978). [\*Predicting rainfall erosion losses: a guide to conservation planning\*](#) (No. 537). Department of Agriculture, Science and Education Administration.

<sup>7</sup> Benavidez, R., Jackson, B., Maxwell, D., & Norton, K. (2018). [\*A review of the \(Revised\) Universal Soil Loss Equation \(\(R\) USLE\): with a view to increasing its global applicability and improving soil loss estimates\*](#). *Hydrology and Earth System Sciences*, 22(11), 6059-6086.

In the equation given above -

- A** Mean annual soil loss (metric tons ha<sup>-1</sup> year<sup>-1</sup>)
- R** Rainfall erosivity factor (megajoules millimetre hectare<sup>-1</sup> hour<sup>-1</sup> year<sup>-1</sup>)
- K** Soil erodibility factor (metric tons hectare hour hectare<sup>-1</sup> megajoules<sup>-1</sup> millimetre<sup>-1</sup>)
- LS** Slope-length factor (unit less)
- S** Slope-steepness factor (unit less)
- C** Cover and management factor (unit less)
- P** Support practice factor (unit less)

### Data Processing and Factor Generation

20. The methodology used in the present report is the implementation of RUSLE equation in a GIS environment for the estimation of different factors and annual soil loss of the croplands in India. To run RUSLE in GIS software (e.g. ArcGIS, QGIS) the raster layers of land structure, land cover, rainfall and soil data are utilized. In this report, some of the global and local datasets have been used to produce soil loss estimates for croplands.

21. The GeoTIFF rasters of the *LS* factor and *K* factor have been prepared with the RUSLE tool in the LUCI for SEEA toolbox<sup>8</sup>, which processed these along with the global *R* factor layer produced by Panagos et al. (2017). LUCI is an ecosystem services modelling tool which illustrates the impacts of land use on various ecosystem services. It runs at fine spatial scales and compares the current services provided by the landscape with estimates of their potential capability. LUCI requires three datasets – Digital Elevation Model (DEM), Land cover data and soil data - to run and it can be enhanced with local data. Ecosystem services like agricultural production, erosion risk and sediment delivery, carbon sequestration, flood mitigation and habitat provision are included in LUCI tool.

22. For *C*-factor parameterization, NRSC land cover datasets have been utilized. **Experimental estimates of soil erosion prevention services** have been compiled for the years 2005-06, 2011-12 and 2015-16 for the States of India. The summary of datasets used in estimation of soil erosion is in **Table 2**.

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<sup>8</sup> [Freely accessible through GitHub](#)

**Table 2: Summary of the Data Sources used for RUSLE**

Input	Dataset	Source	Resolution
Digital Elevation Model	Shuttle Radar Topography Mission 3 Arc-Seconds Global Dataset <sup>9</sup> (SRTM)	NASA	~ 95 metres
Soil data	Harmonised World Soils Database v1.2 <sup>10</sup> (HWSD)	FAO	30 arc-second (~1km at equator)
Rainfall erosivity	Global Rainfall Erosivity Database (GloREDA) <sup>11</sup>	Panagos et al. (2017)	30 arc-second (~1km at equator)
Land cover data	Land Use Land Cover Datasets <sup>12</sup>	NRSC, India	~20-25meters

In order to make uniform spatial analysis environment, the cell size of the generated raster layer is fixed as  $\sim 95m \times 95m$ .

23. A brief description of each of the factors used in this model for the RUSLE equation is given in the following paragraphs.

#### **Rainfall Erosivity factor (*R*)**

24. The rainfall erosivity factor (*R*) indicates the effect of rainfall intensity on soil erosion. It accounts for the combined effect of rainfall duration, magnitude and intensity<sup>13</sup>. For a storm, this is defined as a product of the storm's total kinetic energy (*E*) and its maximum 30-min rainfall intensity (*I*<sub>30</sub>)<sup>5</sup>. In this report, the *R* factor was extracted from the global *R* factor raster layer produced by Panagos et al. (2017)<sup>13</sup> using a relationship between calculated *R* factor, rainfall and other climate covariates.

#### **Soil Erodibility factor (*K*)**

25. The *K* factor represents the influence of different soil properties on the slope's susceptibility to erosion<sup>5</sup>. It is defined as the "mean annual soil loss per unit of rainfall erosivity for a standard condition of bare soil, recently tilled up-and-down slope with no conservation practice"<sup>14</sup>. Higher *K*-factor values indicate the soil's higher susceptibility

<sup>9</sup><https://earthexplorer.usgs.gov/> (Accessed September 23 2019)

<sup>10</sup><http://webarchive.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/> (Accessed September 23 2019)

<sup>11</sup><https://esdac.jrc.ec.europa.eu/content/global-rainfall-erosivity> (Accessed May 18 2019)

<sup>12</sup> Remote Sensing Applications Area, National Remote Sensing Centre, ISRO

<sup>13</sup> Panagos, et.al 2017. [Global rainfall erosivity assessment based on high-temporal resolution rainfall records](#). *Scientific Reports* 7: 4175. DOI: 10.1038/s41598-017-04282-8.

<sup>14</sup> Morgan, R. (2005). [Soil erosion and conservation](#). National Soil Resources Institute. Cranfield University,125.



to soil erosion. The soil erodibility factors are estimated using HWSD data and the parameterisation is based on the soil texture class and organic matter content<sup>15</sup>.

### **Slope-length and Slope-steepness factor (*LS*)**

26. The *LS* factor, also referred as topographic erosivity factor consists of slope gradient and length of slope which significantly influences the soil erosion. The *LS*-factor dataset was generated using DEM from NASA following the equation that uses slope length steepness only as shown below<sup>14</sup>

$$LS = \left(\frac{l}{22}\right)^{0.5} \times (0.065 + 0.045s + 0.0065s^2)$$

where:

*l* Slope length or cell size (m)

*s* Slope steepness (%)

This method is widely used, being relatively simple and not computationally expensive and is therefore suitable for very large study areas (e.g. states or countries).

### **Cover and management factor (*C*)**

27. The cover and management factor (*C*) is defined as the ratio of soil loss from a field with a particular cover and management to that of a field under 'clean-tilled continuous fallow'<sup>6</sup>. The *C*-factors range between 0 and 1, with areas of tree cover and open water receiving values close to 0 while land classified as bare areas receiving values close to 1. The *C* factor parameterization requires the extensive knowledge of land cover characteristics of the study area. For this particular study, *C* factor has been fixed as 0.23 drawing from previous studies in India<sup>16,17,18</sup> that have reported *C*-factor for croplands.

### **Support practice factor (*P*)**

28. The support practice factor (*P*-factor) is the soil-loss ratio with a specific support practice to the corresponding soil loss with up and down slope tillage<sup>5</sup>. The values of *P*-factor range from 0 to 1, areas with no conservation practices receives value 1. In many studies, this factor is ignored due the difficulty of accurately mapping support practice factors. In the present report, *P* factor for croplands is taken as 1.

<sup>15</sup> Stewart, B., Woolhiser, D., Wischmeier, W., Caro, J., & Frere M.H. (1975). [Control of water pollution from cropland.](#)

<sup>16</sup> Mahapatra, S. K., Reddy, G. O., Nagdev, R., Yadav, R. P., Singh, S. K., & Sharda, V. N. (2018). [Assessment of soil erosion in the fragile Himalayan ecosystem of Uttarakhand, India using USLE and GIS for sustainable productivity.](#) *Current Science*, 115(1), 108.

<sup>17</sup> Singh, G., & Panda, R. K. (2017). [Grid-cell based assessment of soil erosion potential for identification of critical erosion prone areas using USLE, GIS and remote sensing: A case study in the Kapgari watershed, India.](#) *International Soil and Water Conservation Research*, 5(3), 202-211.

<sup>18</sup> Patil, R. J., Sharma, S. K., Tignath, S., & Sharma, A. P. M. (2017). [Use of remote sensing, GIS and C++ for soil erosion assessment in the Shakkar River basin, India.](#) *Hydrological sciences journal*, 62(2), 217-231.

## Results

29. Accounts using the datasets and methods prescribed in the previous paragraphs have been compiled at state and national level for India for three years – 2005-06, 2010-11 and 2015-16, synchronous with the Agriculture Census. **Table 3** below gives the cropland ecosystem account at the national level.

**Table 3: Cropland Ecosystem Account for India**

Indicator	Unit	Value		
		2005-06	2010-11	2015-16
<b>Extent</b>				
<i>Net area Sown</i>	'000 Hectares	1,41,162	1,41,563	1,39,506
<i>Total Cropped Area</i>	'000 Hectares	1,92,737	1,97,683	1,97,054
<i>Total Cultivable Land</i>	'000 Hectares	1,82,686	1,82,010	1,81,603
<i>Cultivated land</i>	'000 Hectares	1,55,375	1,55,840	1,54,916
<i>Un-cultivable land</i>	'000 Hectares	1,24,198	1,25,473	1,26,149
<i>Un-cultivated land</i>	'000 Hectares	1,51,510	1,51,643	1,52,835
<b>Intensification</b>				
<i>Area sown more than once</i>	'000 Hectares	51,575	56,120	57,548
<i>Cropping Intensity</i>	%	136.5	139.6	141.3
<b>Fragmentation of Operational holdings</b>				
<i>Gini Index of Land Concentration</i>		0.59	0.58	0.57
<b>Number in '000</b>		1,29,222	1,38,348	1,46,454
<b>Area in '000 Hectares</b>		1,58,323	1,59,592	1,57,817
<i>Percentage distribution of area operated by operational holdings</i>				
<i>Marginal</i>	%	20.2	22.5	24.0
<i>Small</i>	%	20.9	22.1	22.9
<i>Semi-medium</i>	%	23.9	23.6	23.8
<i>Medium</i>	%	23.1	21.2	20.2
<i>Large</i>	%	11.8	10.6	9.1
<b>Status of Irrigation</b>				
<i>Percentage of Gross Irrigated Area to Total Cropped Area</i>	%	43.7	45.0	49.0
<i>Area Irrigated more than once</i>	'000 Hectares	23442	25275	29321
<b>Crop Diversity</b>				
<i>Effective Number of Crop Species</i>	Number	18.7	18.6	18.1

30. During the period of 2005-06 to 2015-16, the Gini Index of Land Concentration which is a measure of fragmentation, has decreased marginally from 0.59 to 0.57. As described earlier, Gini coefficient when equal to zero means perfect equality and when equals one means perfect inequality. The level of inequality is also reflected in the fact that small and marginal holdings taken together (0.00-2.00 ha.) constituted 86.08% of the total holdings in 2015-16 against 85.01% in 2010-11<sup>19</sup> while their share in the operated area stood at 46.9% in 2015-16 as against 44.6% in 2010-11. Further, the average size of operational holding has declined to 1.08 ha in 2015-16 as compared to 1.15 in 2010-11. This is likely to reduce further by 2020-21<sup>20</sup>. With higher fragmentation, it becomes difficult to employ effective and efficient irrigation and optimum usage of fertilizers which might be a reason for lower yields and also lead to problems like soil erosion, salinity, etc., and hence, a decline in the overall condition of the croplands. In some states, governments have enacted land consolidation policies to tackle the challenge of the low average size of holdings. These measures need to be expanded further so that farmers can voluntarily come together and pool land to reap the economies of scale.

31. More than 100 food and non-food crops are grown in India, representing a range of crop groups - cereals, pulses, fruits, vegetables, spices, oil seeds, fibres, drugs and narcotics, to name a few. However, the effective number of crop species (ENCS) in the country is just around 18. At the state level, several variations are observed (**Annexure 2.1**). Among the States having a 'net area sown' of more than 1000 hectares, the States of Assam, Bihar, Chhattisgarh, Haryana, Jharkhand, Odisha, Punjab, West Bengal have an 'effective number of crop species' of about 7, while the States of Andhra Pradesh, Gujarat, Karnataka, Maharashtra and Tamil Nadu have a number of more than 14 species. Crop diversification reduces the need for and associated risk of application of harmful chemicals like pesticides and herbicides, due to the presence of variety of crops that are resistant to pests, weeds and diseases. Government is already promoting crop-diversification under its schemes for 'doubling farmers' income'. As these schemes take root, crop diversification may prove to one of the cost-effective solutions for the downgrading ecological situation, depleting groundwater levels and declining fertility of soil, as also to reduce ambiguities in agriculture and to increase resilience against environmental fluctuations.

*Cropland Ecosystem Accounts for the States of India can be seen at Annexure-2.1.*

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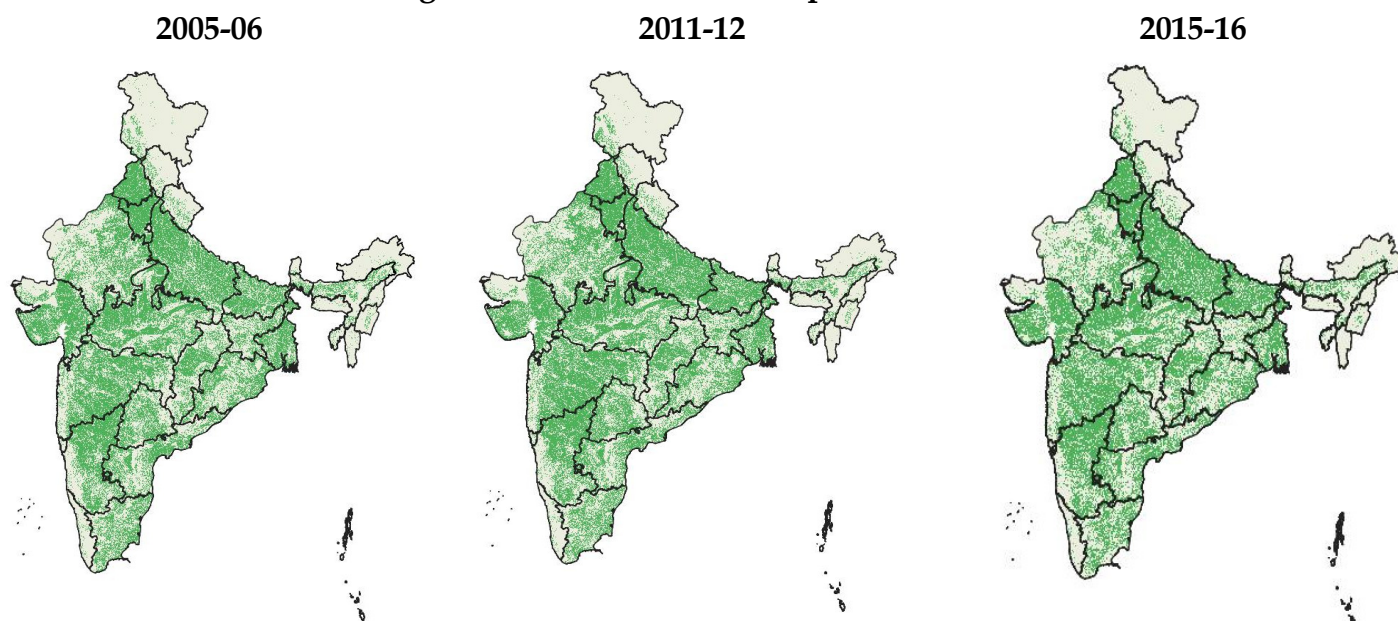
<sup>19</sup> [Agriculture Census, 2015-16: All India Report on Number and Area of Operational Holdings, 2019](#)

<sup>20</sup> State of Indian Agriculture 2015-16, Department of Agriculture, Cooperation & Farmers Welfare, Directorate of Economics and Statistics, Ministry of Agriculture & Farmers Welfare

32. **Experimental estimates of *Soil Erosion Prevention services*** provided by croplands have been compiled for three years-2005-06, 2011-12 and 2015-16. To assess the regulating Ecosystem Services provided by croplands to mitigate the soil loss, first the soil erosion owing to the local climate, topography and soil characteristics with no vegetation present are estimated; i.e. the erosion that would occur in the absence of the associated ecosystem services provided by the cropland vegetation. Thereafter, soil loss is estimated in the presence of the croplands and the difference of these is the estimate of 'Soil Erosion Prevention Services' provided by croplands.

33. **Figure 2** shows the distribution of croplands in India for years 2005-06, 2011-12 and 2015-16, while **Table 4** quantifies the soil erosion prevention service provided by croplands. Estimates for the smaller States and Union Territories have not been compiled since the global datasets may not be able to capture enough details for these areas.

**Figure 2: Distribution of Croplands in India**



Source: LULC, NRSC, ISRO, India

**Table 4: Experimental Estimates of Soil Erosion Prevention Services Provided by Croplands**

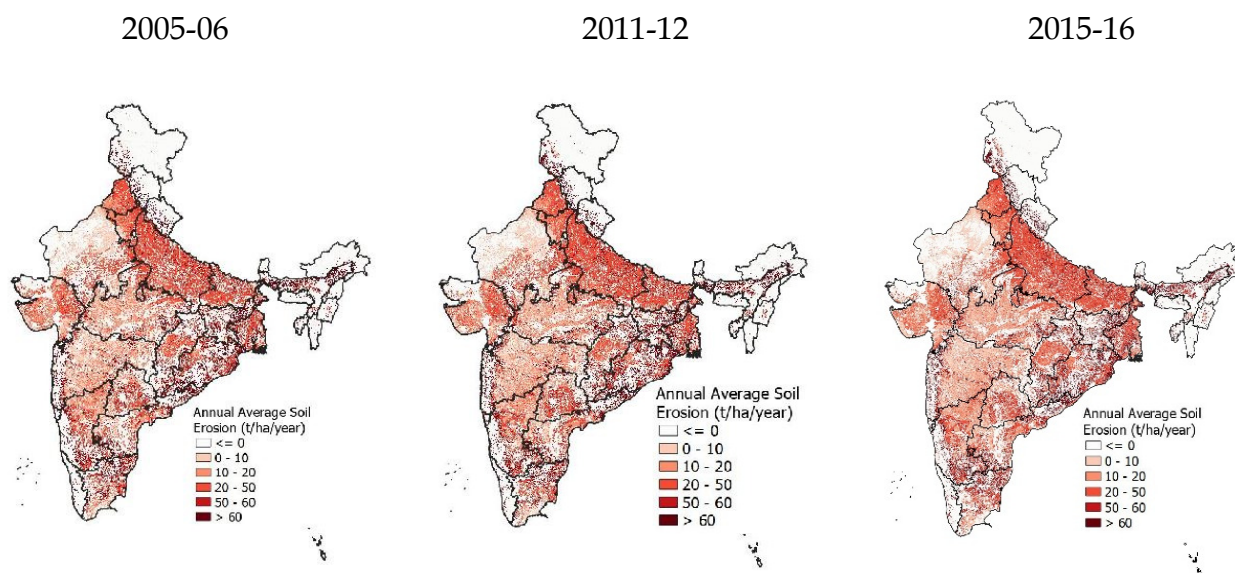
Sl. No.	State	Mean Soil Erosion Prevention (tons/ha/year)		
		2005-06	2011-12	2015-16
1	Andhra Pradesh	27.9	30.1	30.8
2	Arunachal Pradesh	24.0	26.3	29.7
3	Assam	28.8	27.7	27.7
4	Bihar	23.5	25.5	26.5
5	Chhattisgarh	21.3	22.6	23.5
6	Gujarat	15.0	14.5	14.3
7	Haryana	22.5	21.1	21.6
8	Himachal Pradesh	162.5	154.8	152.2
9	Jammu & Kashmir	21.0	23.0	24.4
10	Jharkhand	29.9	31.4	25.2
11	Karnataka	24.2	24.2	24.1
12	Kerala	14.5	17.9	18.5
13	Madhya Pradesh	16.6	16.8	16.8
14	Maharashtra	22.1	22.4	21.8
15	Manipur	100.0	108.6	89.3
16	Meghalaya	31.8	32.0	37.2
17	Mizoram	161.8	149.5	157.7
18	Nagaland	34.3	34.6	34.8
19	Odisha	49.9	48.1	48.6
20	Punjab	25.0	24.5	24.7
21	Rajasthan	7.2	8.3	7.1
22	Tamil Nadu	31.5	33.3	33.5
23	Telangana	18.3	19.1	19.9
24	Tripura	23.0	22.6	22.3
25	Uttar Pradesh	26.1	28.0	27.7
26	Uttarakhand	168.1	163.5	164.9
27	West Bengal	46.8	46.9	47.5

34. **Table 4** presents the assessment of the annual average amount of soil loss prevented by croplands. Croplands help in soil erosion prevention by protecting soil loss from wind and water erosion to a great extent. The results show that the amount of soil loss that could be prevented when land cover is croplands instead of bare soil. The values are observed to be high for hilly states like Uttarakhand, Himachal Pradesh and some of the north eastern states which may be attributed to steep slope.



35. **Figure 3** below shows the spatial and temporal distribution of soil erosion prevention services provided by croplands in India.

**Figure 3:** Spatial Distribution of Soil Erosion Impact Mitigated by Croplands



36. The estimates of '*soil erosion prevention services*' given here are preliminary and further improvements in parameterization with expert knowledge and local datasets will enhance these estimates. Also, the future work can involve improving *C* factor parameterization for the specific crops and vegetation species present on the agricultural land if such detailed data are available. Another limitation is that this report focuses over mainland India, excluding the Islands due to the coarseness of resolution and difference in the extent of global data for such small areas.

## Way Forward

37. India has a high dependence on croplands with a majority of its households being dependent on agriculture for their livelihood. In view of the priority attached to the sector, the Ministry of Agriculture has taken several steps to ensure a sustainable development of the sector, while ensuring sustainable use of natural resources. For instance, under the 'Soil Health Card Scheme', the current status of the soil health and the changes due to land management practices are assessed. A printed Soil Health Card is given to the farmer, containing the present levels of macro and micro-nutrients, along with recommendations on fertilizers and soil management practices, so as to enable the farmer to get optimal yields. Similarly, under the 'More Crop Per Drop Scheme', activities focusing on micro level storage structures and precision irrigation systems are taken up



to ensure efficient water conveyance and management, especially in water scarce, water stressed and critical ground water blocks/districts.

38. In addition, there are several organizations looking at different aspects of agriculture in the country. For instance, in the case of soil, the Soil and Land Use Survey of India (SLUSI) and the National Bureau of Soil Survey and Land Use Planning (NBSSLUP) are actively conducting research and building the information base required for policymakers. A few important highlights of these two organisations are given in the following paragraphs.

39. The Soil & Land Use Survey of India (SLUSI) is an apex organization in the country which deals with Soil Survey and Land Resource Mapping. SLUSI is primarily engaged in conducting soil survey of different intensities in order to provide scientific database for developmental programmes encompassing soil and water conservation planning, watershed development, scientific land use planning etc. Detailed Soil Survey of SLUSI deals with systematic detailed study of soils comprising morphological examination of soils in the field, analysis of soil samples in the soil laboratory and preparation of maps in the Remote Sensing & GIS Lab. In general, in the Detailed Soil Survey<sup>21</sup>, very high and high priority sub-watersheds area and rainfed are taken up, so as to generate detailed data base on soils which are pre-requisites for formulation of village level plan. The data generated out of soil survey could be interpreted to derive base information on the use potential of land or various utilitarian purposes.

40. The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP)<sup>22</sup>, which is one among the chain of Indian Council of Agricultural Research (ICAR) Institutes in India, conducts and promotes research in the National Agriculture Research System in the areas of Soil Survey, Pedology, Geomorphology, Remote Sensing, Geographic Information System, Cartography, Land Evaluation and Land Use Planning.

41. There are several other significant organisations which support the development of agriculture in the country. Together, these organizations produce several insights into the status of croplands in India. However, sustainability in agriculture is a complex idea with many facets, including the economic (a sustainable farm should be a profitable business that contributes to a robust economy), the social (it should deal fairly with its workers and have a mutually beneficial relationship with the surrounding community),

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<sup>21</sup> <https://slusi.dacnet.nic.in/dss/aboutdss.html>

<sup>22</sup> <https://www.nbsslup.in/our-mission.html>

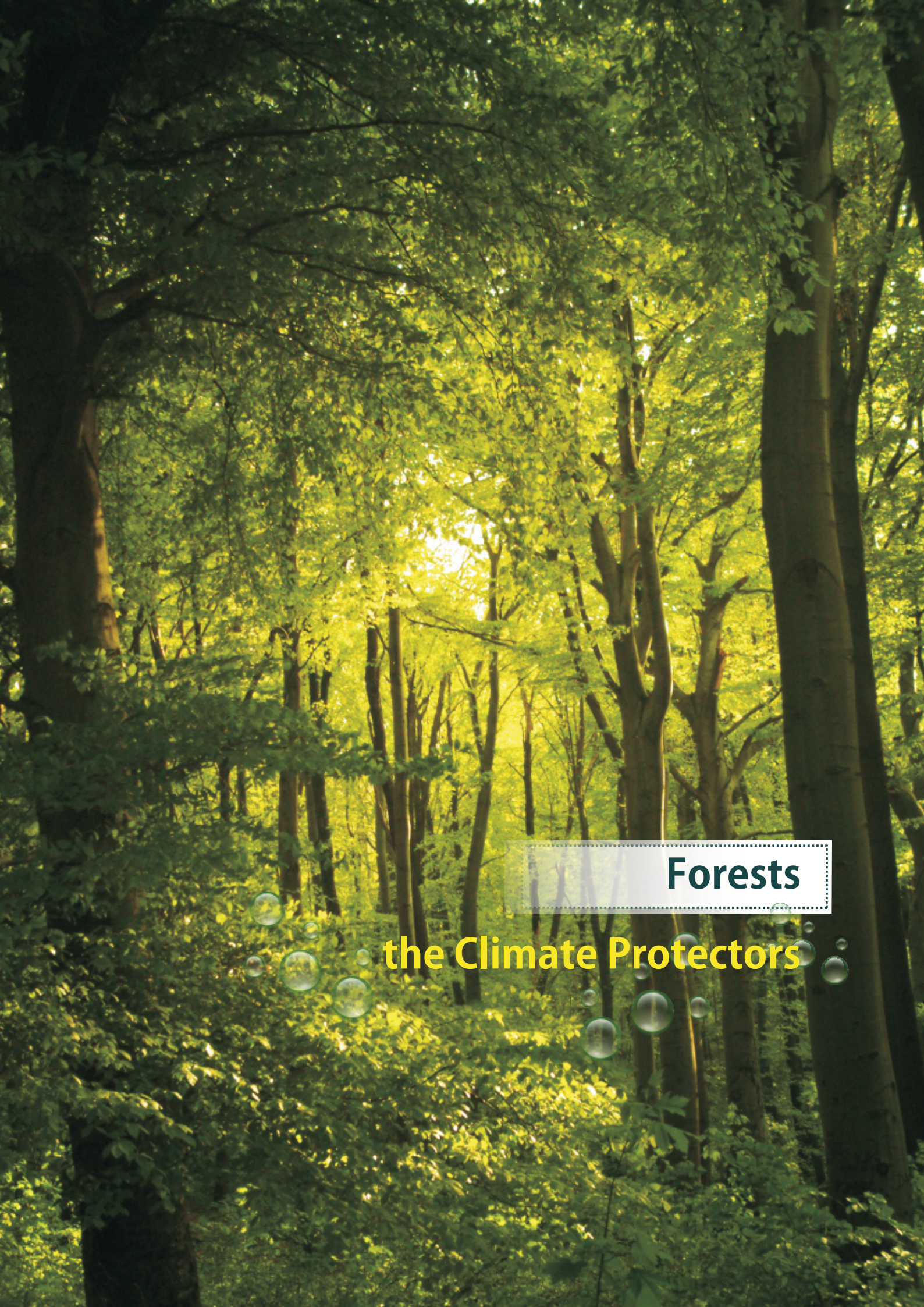
and the environmental. Environmental sustainability in agriculture means good stewardship of the natural systems and resources that farms rely on. Among other things, this involves:

- Building and maintaining healthy soil
- Managing water wisely
- Minimizing air, water, and climate pollution
- Promoting biodiversity

42. The cropland ecosystem accounts, as prescribed by the System of Environmental-Economic Accounts (SEEA) is an integrated approach to bringing together a wide range of cropland related statistics across domains – like soil condition, fragmentation, productivity and biodiversity - into one coherent information system that can inform on each of the aspects given above. Improved croplands can also help in an increased supply of ecosystem services like a clean and well-regulated water supply, biodiversity, natural habitats for conservation and recreation, climate stabilization, and aesthetic and cultural amenities. An assessment of these ecosystem services can further highlight the inter-linkages between the condition of croplands and the economy, thereby enabling interventions that can help achieve sustainable agriculture and conserve the resource base for future generation.

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**Forests**

**the Climate Protectors**



## Chapter 3

### Forests - the Climate Protectors

#### Introduction - Forest as an ecosystem

1. The term 'Forest', as defined in the online version of Oxford dictionary, is a large area covered chiefly with trees and undergrowth. FAO in its Forest Resources Assessment, defines forest as "Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use."

2. Forests are one of the multifunctional ecosystems which provide several services on all spatial and temporal levels. The services provided by forests cover a wide spectrum of ecological, economic, social and cultural considerations and processes providing a multitude of benefits at local, national and global levels. Without the ecosystem services emanating from forests, life on earth would not be possible. Forests are vital to the global economy and ecosystem for an ample number of reasons. Not only do they provide a production function in the form of a wealth of resources, but they also play a significant role in terms of regulatory functions such as carbon sequestration and hydrological cycling. Another critical role played by forests is that of habitat provision, an essential function for more than half of the world's species which live there.

3. Forest ecosystems conserve soil and stabilize flows and runoff which in turn prevents land degradation and desertification, and diminishes the risks of natural disasters such as droughts, floods, and landslides. In essence, forests are important since they help in maintaining and upgrading the environmental quality which is much beyond quantification (Figure 1).

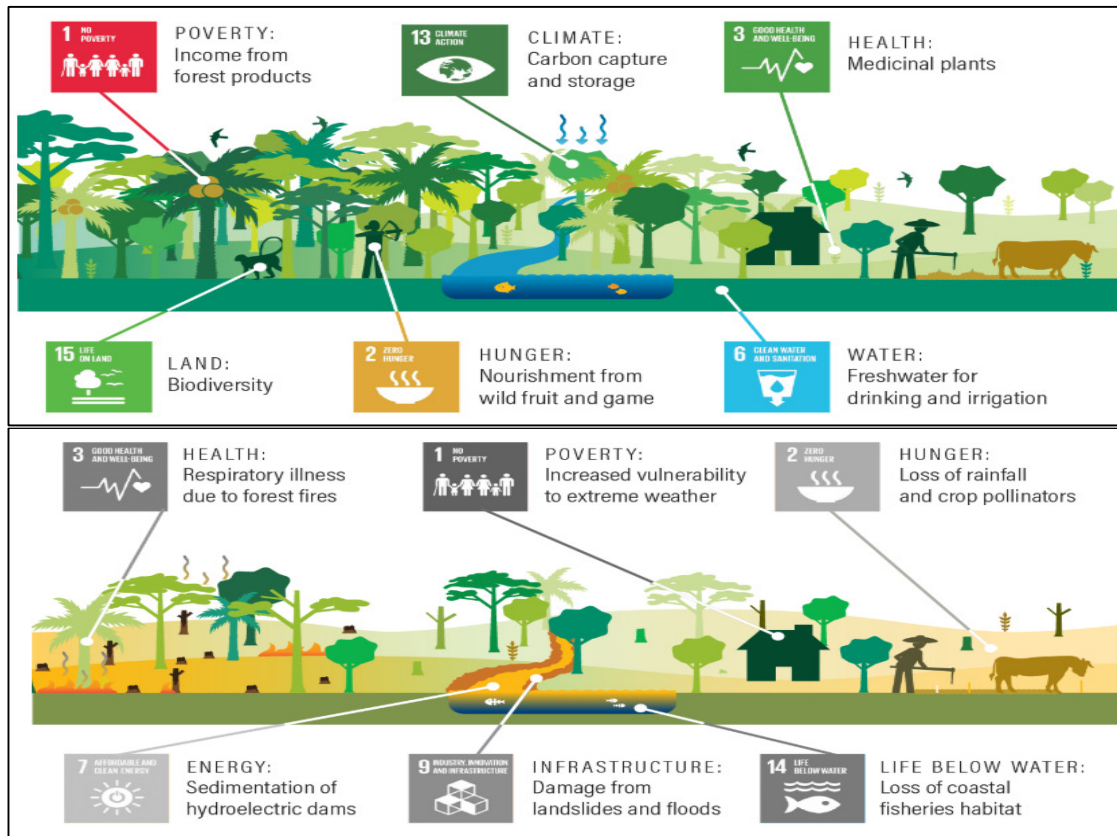
**Figure 1: Ecosystem services provided by forests<sup>1</sup>**



1 Jenkins, M. and Schaap B., (2018), Forest Ecosystem Services, Background study prepared for the thirteenth session of the United Nations Forum on Forests, can be accessed at: [https://www.un.org/esa/forests/wp-content/uploads/2018/05/UNFF13\\_BkgdStudy\\_ForestsEcoServices.pdf](https://www.un.org/esa/forests/wp-content/uploads/2018/05/UNFF13_BkgdStudy_ForestsEcoServices.pdf)

4. In the “2030 Agenda for Sustainable Development” adopted by 196 countries including India, which lists the Sustainable Development Goals (SDGs), 17 goals and 169 targets to be achieved over the next 15 years have been spelled out. Owing to the importance of forests, out of these global goals and targets, 21 targets spread over 8 Goals are directly or indirectly related to forestry activities (shown in Figure 2).

**Figure 2: Forest and SDGs<sup>2</sup>**



5. Forests are linked to the other SDGs as well – forest-based ecosystem services play an underpinning role in sustainable agricultural production and food security. Forests regulate hydrological services including the quantity, quality, and timing of water available for irrigation. Forest-based bats and bees pollinate crops. Forests mitigate impacts of climate change and also extreme weather events at the landscape scale.

### Forest in India

6. In India, the term ‘Forest Cover’ refers to “All lands, more than one hectare in area, with a tree canopy density of more than 10% irrespective of ownership and legal

<sup>2</sup> <https://www.wri.org/blog/2017/09/forests-and-sdgs-taking-second-look>

status. Such lands may not necessarily be recorded forest area. It also includes orchards, bamboo and palm” (FSI, 2019)<sup>3</sup>. It is assessed through remote sensing. In addition, the term ‘Recorded Forest Area’ or ‘Forest Area’ refers to all the geographical areas recorded as ‘Forests’ in government records.

7. In the Indian context, the evaluation of forest cover is undertaken by Forest Survey of India (FSI), with national assessments starting in the year 1987 using remote sensing techniques. The assessment of forest cover mapping is a biennial cycle at the national level which is published as India State of Forest Report (ISFR). Forests play a vital role in sustainable development, especially due to their role in providing livelihood to a significant portion of the population and hence in income generation. Nearly 25% (one fourth) of India’s total land area is now under forest and tree cover. As per latest India State of Forest Report (ISFR 2019) by Forest Survey of India (FSI), the total forest and tree cover is 24.56 % of the geographical area of the country. Out of this, total forest cover alone is 7,12,249 sq. km contributing to 21.67% and tree cover is estimated as 95027 sq. km which is 2.89 % of the geographical area of India<sup>5</sup>.

8. In India, forest cover has been classified in terms of the following tree canopy density as follows:

Very Dense Forest(VDF)	• All lands with tree canopy density of 70% and above
Moderately Dense Forest(MDF)	• All lands with tree canopy density of 40% and more but less than 70%
Open Forest (OF)	• All lands with tree canopy density of 10% and more but less than 40%
Scrub	• Forest lands with canopy density less than 10%
Non-forest	• Lands not included in any of the above classes. (includes water)

9. As per Champion and Seth (1968)<sup>4</sup> classification, India’s forests are classified into four major groups, namely, tropical, sub-tropical, temperate and alpine. These four groups are further classified into 16 type groups (Table 1) and map depicting different forest type groups of India is presented in Figure 3. The landscape of Indian forests ranges from Tropical Wet Evergreen Forests in the Andaman & Nicobar

<sup>3</sup> [India State of Forest Report 2019, Forest Survey of India.](#)

<sup>4</sup> Champion, H. G. and Seth, S. K. (1968). A Revised Survey of Forest Types of India, Govt. of India Press, New Delhi, p. 404.



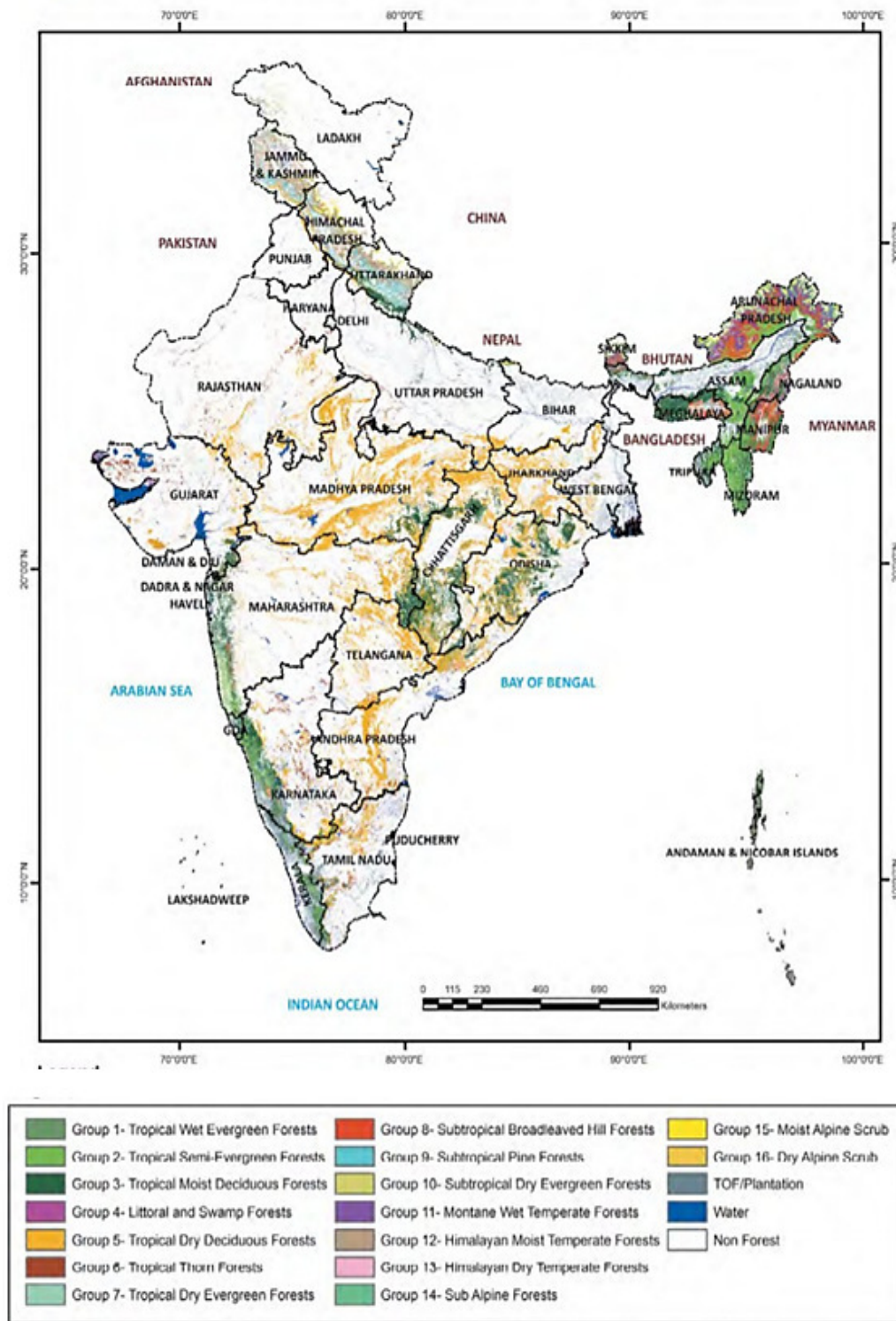
Islands, the Western Ghats, and the north-eastern States, to Dry Alpine Scrub high in the Himalayas in the north. The country has Semi-Evergreen Forests, Deciduous Forests, Thorn Forests, and Subtropical Pine Forests in the lower montane zone and Temperate Montane Forests in the higher zones. At the other extreme, tropical dry deciduous and thorn forests predominate in the semi-arid areas of Rajasthan and Gujarat.

**Table 1: Area under different Forest Type Groups of India**

Forest Type	Group	Area in sq. km	% of Grand Total
<b>Tropical</b>	Group1 Tropical Wet Evergreen Forests	20,054	2.61
	Group2 Tropical Semi Evergreen Forests	71,171	9.27
	Group3 Tropical Moist Deciduous Forests	1,35,492	17.65
	Group4 Littoral & Swamp Forests	5,596	0.73
	Group5 Tropical Dry Deciduous Forests	3,13,617	40.86
	Group6 Tropical Thorn Forests	20,877	2.72
	Group7 Tropical Dry Evergreen Forests	937	0.12
<b>Sub-Tropical</b>	Group8 Subtropical Broadleaved Hill Forests	32,706	4.26
	Group9 Subtropical Pine Forests	18,102	2.36
	Group10 Subtropical Dry evergreen Forests	180	0.02
<b>Temperate</b>	Group11 Montane Wet Temperate Forests	20,435	2.66
	Group12 Himalayan Moist Temperate Forests	25,743	3.35
	Group13 Himalayan Dry Temperate Forests	5,627	0.73
<b>Alpine</b>	Group14 Sub Alpine Forests	14,995	1.96
	Group15 Moist Alpine Scrub	959	0.13
	Group16 Dry Alpine Scrub	2,922	0.38
<b>17</b>	Plantation/TOF	64,839	8.45
	Total (Forest Cover + Scrub)	<b>7,54,252</b>	<b>98.26</b>
<b>18</b>	Grass land in different forest type groups (without forest cover)	13,329	1.74
	Grand Total	<b>7,67,581</b>	<b>100.00</b>

*Source: India State of Forest Report (ISFR), 2019, Forest Survey of India (FSI)*

**Figure 3: Forest Type Group Map of India**  
 (Depicting Type Groups as per Champion & Seth's Classification, 1968<sup>4</sup>)



Source: India State of Forest Report 2019, Forest Survey of India

## Extent and Condition Account for Forest Ecosystem

10. Ecosystem assets are measured in terms of ecosystem extent, ecosystem condition and ecosystem services flow. Forest provides various forms of ecosystem services. The ability of the forest to provide these services is dependent on the health or condition of the forest. In other words, the condition of forest influences the extent to which these services can be provided by the forest, although it is not necessarily the case that ecosystems with relatively lower condition will generate fewer ecosystem services. However, there is likely to be a close relationship between reductions in condition on the one hand, and the capacity of an ecosystem to generate ecosystem services sustainably on the other. Thus, the prevailing cross sectoral linkages present in the forest ecosystem and the importance of services provided by the forest highlight the importance of monitoring not just the quantity but the quality of the forest ecosystem is important.

11. The System of Environmental Economic Accounting (SEEA) prescribes the compilation of extent and condition accounts to comprehend the quality and quantity of the forest, with 'ecosystem condition' representing both quality and biophysical state measures that are required to understand the capacity of the ecosystem to generate services.

12. A format for ecosystem extent and condition account is given in **Table 2** which has been prepared based on a review of available datasets for selected variables in required format.

**Table 2: Format for Extent and Condition Account of Forest**

Indicator
Extent
Recorded Forest Area, by type of Protection - Reserved, Protected or Unclassed
Condition Accounts
Volume of Growing Stock
Carbon Stock, by type of carbon pool - Above Ground Biomass (AGB), Below Ground Biomass (BGB), Soil Organic Carbon (SOC), Dead Wood and Litter
Carbon Stock per hectare, by type of carbon pool
Number and Area of Wetlands Within RFA
Biodiversity Assessment
Total Number of species of Herbs, Shrubs and Trees
Shannon-Wiener Index of Herbs, Shrubs and Trees
Effective Number of Species (ENS) of Herbs, Shrubs and Trees
Average Patch Size, Number of patches in different patch size classes, Proportion of small patches (of less than 1 sq. km)

13. Some of the important indicators for the extent and condition of forest ecosystem contained in the format above are the Carbon stock, forest fragmentation and Effective number of species (ENS) which is calculated from Shannon-Wiener Index of biodiversity evaluated for different forest types. These concepts are explained in the following paragraphs.

14. **Carbon Stock:** Forests are both a source and sink for carbon as a growing forest captures carbon from the atmosphere whereas a mature forest is a store house of carbon. Healthy and growing forests sequester and store more carbon than any other terrestrial ecosystem and act as natural ‘brakes’ on climate change.

15. Carbon stocks are classified into: geocarbon (carbon stored in the geosphere) and biocarbon (carbon stored in the biosphere, in living and dead biomass and in soils). Based on the availability of data, only the biocarbon component has been considered in this report. The total biocarbon stocked in the forests is divided into five pools by Good Practice Guidance (GPG)<sup>5</sup> of the Intergovernmental Panel for Climate Change (IPCC). The living portion of biomass carbon is classified as ‘above ground biomass (AGB)’ and ‘below ground biomass (BGB)’ and stores significant amount of carbon. The ‘dead organic matter (DOM)’ is classified as ‘dead wood’ and ‘litter’. The fifth pool is ‘soil organic matter’ which contains substantial amount of organic carbon. Description about the classification of different carbon pools is presented in **Table 3**.

**Table 3: Classification of carbon stock in forests under different carbon pools**

Pools		Description
Living Biomass	Above ground biomass (AGB)	All living biomass above the soil including stem, stump, branches, bark, seeds and foliage.
	Below ground biomass (BGB)	All living biomass of live roots. Fine roots of less than 2mm diameter (country specific) are often excluded because these often cannot be distinguished empirically from soil organic matter or litter.
Dead Organic Matter	Dead wood	Includes all non-living woody biomass not contained in the litter, either standing or lying on the ground. Dead wood also includes dead roots and stumps larger than or equal to 10cm in diameter or any other diameter used by the country.
	Litter	Includes all non-living biomass with a diameter less than a minimum diameter chosen by the country (for FSI 5 cm), lying dead, in various states of decomposition above the mineral or organic soil.
Soil	Soil organic matter	Includes organic carbon in mineral and organic soils (including peat) to a specific depth chosen by the country (for FSI 30 cm) and applied consistently through the time series.

<sup>5</sup> [https://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf\\_files/Chp3/Chp3\\_1\\_Introduction.pdf](https://www.ipcc-nggip.iges.or.jp/public/gpplulucf/gpplulucf_files/Chp3/Chp3_1_Introduction.pdf)

16. **Forest Fragmentation:** Forest fragmentation is the breaking of a large, contiguous forested area into smaller parts of forests which are mostly separated by roads, utility corridors, agriculture, other subdivisions, or human developments. With time these patches that separate the different pieces of forest tend to multiply and expand, which affects the health, value and functioning of the forest and forest ecosystem and the ecosystems within forests. Fragmentation generally leads to loss of biodiversity, increases in invasive plants, pests, and pathogens, and reduction in water quality.

17. **Growing Stock:** This is the volume of all living trees more than 10 cm in diameter at breast height (or above buttress if these are higher) measured over bark from ground or stump height to a top stem diameter of 10 cm, excluding or including branches to a minimum diameter of 5 cm. The term excludes smaller branches, twigs, foliage, flowers, seeds, stump and roots.

18. **Biological Diversity and Shannon-Weiner Index of Biodiversity:** Biodiversity within a forest is an essential indicator of forest ecosystem condition as it provides an indicator to represent the state of conservation of forest ecosystems and it can help to evaluate and monitor sustainability of the biological resources as well as be of high assistance in comparative evaluation of stability, productivity and ecosystem functions of forests.

19. **Species diversity** is defined as the number of species and abundance of each species that live in a particular location. **Species richness** (number of different species) is a common way of measuring biodiversity. **Species abundance** is the total number of individuals of a species in the area, community, or population. There are numerous reasons why species diversity is essential. **Species density** considers the number of species in a sampled area. Several indices of species diversity and evenness have been conceptualized, one of which is the Shannon-Wiener index (often denoted as H').

20. The ***Shannon-Weiner Index of Biodiversity*** is a commonly used indicator for comparing diversity between various habitats. It quantifies diversity of the species by measuring both species abundance and species richness. Shannon-Wiener index is calculated by the following formula: -

$$H' = -\sum p_i \ln p_i$$

where,  $p_i$  is the proportion of individuals found in species 'i'



21. For a well-sampled community, this proportion can be estimated as

$$p_i = n_i/N,$$

where  $n_i$  is the number of individuals or the population of species 'i' and N is the total number of individuals or total population across species in the community. By definition,  $p_i$  will all be between zero and one, the natural log makes all the terms of the summation negative, which is why the inverse of the sum is taken.

22. The Shannon-Wiener Index assumes that all species are represented in a sample and that they are randomly sampled. A high value of  $H'$  would be a representative of a diverse and equally distributed community and lower values represent less diverse community. A community with only one species would have an  $H'$  value of 0 because  $p_i$  would equal 1 and be multiplied by  $\ln p_i$  which would equal zero. Values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4.

23. The Shannon index increases as both the richness and the evenness of the community increase. That is, the more equal the proportions for each of the groups, the more homogeneous or even, they are. From the resultant Shannon index value, an *effective number of species (ENS)* can be subsequently computed using the following formula<sup>6</sup>:

$$ENS = e^{H'}$$

where  $H'$  is the Shannon Weiner Index.

24. In India, the Forest Survey of India (FSI) is mandated with the Forest Resource Assessment, which it undertakes on a biennial basis. The report of the assessment is published as the India State of Forest Report. All the indicators explained above have been sourced from the India State of Forest Report. FSI has presented an assessment of plant biodiversity in all the forest type groups for the first time in the ISFR report for the year 2019 (assessment year 2017-18).

25. The extent and condition accounts for the forests of India for the year 2017-18 are given in **Table 4** below. Some indicators, including those for biodiversity assessment, have not been shown in this table, as these have been compiled at the State level only.

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6 Aguilar J, Gramig GG, Hendrickson JR, Archer DW, Forcella F, Liebig MA (2015) Crop Species Diversity Changes in the United States: 1978–2012. PLoS ONE 10(8): e0136580. doi:10.1371/journal.pone.0136580

**Table 4: Forest Condition Accounts for the year 2017-18**

Indicator	Unit	Value
<b>Extent</b>		
<i>Recorded Forest Area (RFA)</i>	sq km	7,67,419
<i>Geographical Area(GA)*</i>	sq km	32,87,469
	% of GA	23.34
<b>Type of Protection</b>		
<i>Reserved Forests (RF)</i>	sq km	4,34,853
<i>Protected Forest (PF)</i>	sq km	2,18,924
<i>Unclassed Forests</i>	sq km	1,13,642
<b>Growing Stock</b>		
<i>Volume of Growing Stock</i>	million cum	4,273.47
<i>Growing Stock in Forest</i>	cum/ha	55.69
<b>Carbon Stock</b>	'000 tonnes	71,24,676
<b>Wetlands Within RFA</b>	Number	62,466
	Area (in ha)	27,93,141
	% of RFA	3.83
<b>Forest Fragmentation**</b>		
<b>Average Patch Size</b>	Sq km	0.95
<b>Proportion of small patches (≥0.01sq km to ≤1 sq km)</b>	%	97.45

\* As reported in the India State of Forest Report, 2017 and 2019.

\*\* Information on Fragmentation pertains to the year 2015-16.

*Extent and condition accounts of the States of India are given in Annexure 3.1.*

## Forest Ecosystem Services

26. The forest products are classified into two broad groups in the national accounts, namely,

- (i) Major products comprising **Industrial Wood** (timber, round wood, match and pulpwood) and **fuel wood** (firewood and charcoal wood), and
- (ii) **Non Timber Forest Products** (NTFPs) comprising a large number of wild growing forest material such as bamboo, fodder, lac, sandalwood, honey, resin, gum, tendu leaves (*Diospyros Melanoxylon*), cork, balsams, eelgrass, acorns, horse chestnuts, mosses, lichens etc.

27. Apart from these, as explained in the earlier sections on the carbon, trees absorb carbon dioxide and release oxygen through the process of photosynthesis, transferring the carbon to their trunks, limbs, roots, and leaves as they grow. When leaves or branches fall and decompose, or when trees die, the stored carbon is released by

respiration and/or combustion back to the atmosphere or transferred to the soil. It is because of these processes, forests and forested landscapes are able to store considerable carbon and their growth can provide a carbon sink. This particular ecosystem service provided by the forests is referred to as the 'carbon retention service'.

28. The three ecosystem services- timber provisioning, non-timber forest products (NTFP) provisioning and carbon retention services from forests in India are described in the following sections.

### **Timber and Non-Timber Forests Products (NTFP) Provisioning Services**

29. Timber includes rose wood, teak wood, jungle wood, etc. The source of production of timber is either from forests or from trees outside forests (TOF). FAO has defined TOF as "*Trees on land not defined as forests and other wooded land*". In India, FSI has defined TOF as "*all trees growing outside government recorded forest areas (RFAs) irrespective of patch size*". Besides constituting a major source for production of industrial wood in India, its benefits are multidimensional.

30. Non-timber forest products (NTFPs) constitute an important source of livelihood for millions of people from forest fringe communities across the world. NTFPs include plants used for food, beverages, forage, fuel, medicine, fibres and biochemicals; animals, birds and fish for food, fur and feathers; as well as their products such as honey, lac and silk. Another term, Non-wood Forest Products differs from the NTFP in that it excludes all wood (including fuelwood) while NTFP includes wood for uses other than for timber. As per FAO, there are at least 150 NTFPs that contribute substantially to international trade, including honey, gum arabic, rattan and bamboo shoots, cork, forest nuts and mushrooms, oleoresins, essential oils, and plant or animal parts for pharmaceutical products.

31. In India, NTFPs are associated with the socio-economic and cultural life of forest dependent communities inhabiting wide variety of ecological and geo-climatic conditions throughout the country. In India, the rural population is about 68% of the country's total population and there are about 6,50,000 villages in the country, out of which nearly 1,70,000 villages are located in the proximity of forest areas, and so, often termed as Forest Fringe Villages (FFVs)<sup>3</sup>. Populations residing in these Forest Fringe Villages are dependent on the forests for meeting the needs of fuelwood, fodder, small timber, bamboo and NTFPs (ISFR 2019). NTFP extraction has a multiplier effect in the economy by generating employment not only for the inhabitants of these Forest Fringe Villages, but also for others involved in downstream processing and trading activities.

### Monetary Values of Timber and NTFP Provisioning Services

32. The estimation of Gross Value Added from the “Forestry and Logging” sector in India is carried out by the production approach. It aims at estimating the value of output at factor cost in the first instance and then deducting the value of various inputs at purchaser's prices. The state wise estimates of value of timber provisioning service are based on these exchange values that are adopted in compilation of National Accounts Statistics<sup>7</sup>.

33. For the compilation of national accounts, the data on production and prices of industrial wood/timber are supplied by State Forest Departments (SFDs). Estimates of value of output at current prices are compiled by multiplying the category-wise production figures with their respective average annual prices, both of which are supplied by the SFDs. In addition to the production of industrial wood from these Government forests, there would be

- (i) authorized (but unrecorded) removals of timber from forests; and
- (ii) unrecorded production of industrial wood from private owned forests and non-traditional forest areas (e.g. trees in village common fields, ridges, canal sides, road sides, fruit trees no longer productive etc.).

34. The value of unrecorded, but authorised, production from forest is taken as 10% of the value of recorded production. The estimates of industrial wood from trees outside forests (TOF) (i.e. private owned forests and non-traditional forest areas like village commons, field ridges, canal sides, road sides, fruit trees no longer productive etc.) are provided by Forest Survey of India. Prices for the same are also provided by the SFDs.

35. The valuation of NTFP Provisioning Services is also based on the concept of *exchange value*. The state wise estimates of value of output of non-timber forest products, and separate estimates of fuelwood are available in India's National Accounts Statistics. The items of NTFP vary from state to state. Information is built up on the basis of royalty received (in value terms) from those authorized to extract these from the forests. Value of Fodder from forest, as estimated using the ‘per animal consumption’ norms, is also a component of the estimate of NTFPs, as available in the National Accounts Statistics.

36. **Forest Rent** as a percentage of GDP is taken from World Bank's databank<sup>8</sup>. Forest Rent as percentage of the gross value of output of Timber/NTFP can then be

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<sup>7</sup> [State-wise and item-wise value of output from agriculture, forestry and fishing with Base Year: 2011-2012, MoSPI](#)

<sup>8</sup> <https://databank.worldbank.org/home.aspx>; Forest Rents to GDP for India, as downloaded on September 17, 2020

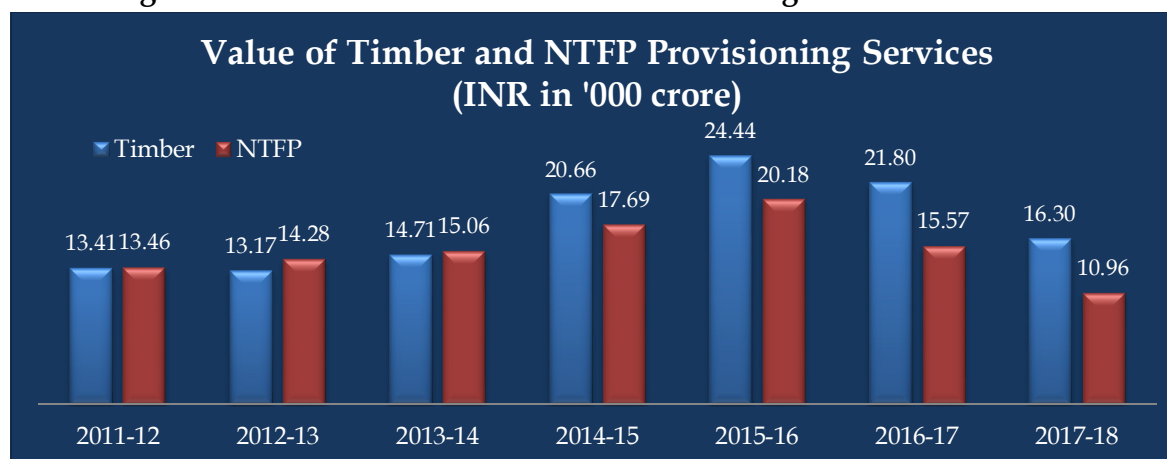
estimated using the ratios between GVO-Forestry, GVA-Forestry and GDP. This value can be said to be an approximation of the share of 'resource rent' and therefore, has been used to estimate the value of timber and NTFP provisioning service.

**Table 5: Method of estimation of value of Timber & NTFP provisioning services**

Step	Item	Method of estimation
1	Value of output of Industrial wood and Non-Timber Forest Products (NTFP)	Estimates taken from the National Accounts <sup>12</sup>
2	Forest rent / GVO of forestry	Estimated using the following factors: $(\text{Forest rent}/\text{GDP}) * (\text{GDP}/\text{GVA of forestry}) * (\text{GVA} / \text{GVO of forestry})$ .
3	Value of timber and NTFP provisioning service	Value of service = (Forest rent / GVO of forestry) * Value of output of timber and NTFP

37. The changes in values of both timber and NTFP provisioning service in India during the period 2011-12 to 2017-18 has been depicted in **Figure 4**.

**Figure 4: Value of Timber and NTFP Provisioning Services in India**



*State wise estimates of value of timber and NTFP provisioning services are given Statements 3.1 and 3.2 at the end of the chapter.*

### Carbon Retention Service

38. Forests play an important role in mitigation and adaptation to climate change. The diversity of forests in India makes it resilient to climate change and an efficient sink of carbon. India is committed at the highest level to meet its commitments under the Nationally Determined Contributions (NDC) made to the international community under the Paris Agreement (2015). As one of the three NDCs, India has committed to create additional carbon sink of 2.5 to 3.0 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030.



39. Apart from potential carbon that could sequester in forests, the existing carbon stored in forests has an economic value too as the forests lock up the carbon from getting released into the atmosphere and avoid escalation of the climate change concerns. The social cost of carbon (SCC) represents the economic cost associated with climate damage (or benefit) resulting from the emission of an additional ton of CO<sub>2</sub><sup>9</sup>. Hence the social cost of carbon is often used as a carbon price estimate.

40. With a view to understand the carbon retention service provided by the forests of India which also contribute to the global climate regulation, estimates for economic value of carbon retention during the assessment year 2015-16 and 2017-18 were compiled using the social cost of carbon (SCC) approach. The step-wise methodology used for valuation of carbon retention service is explained in **Table 6** below.

**Table 6: Method of estimation of economic value of Carbon Retention Service**

Steps	Method of Estimation	Data Sources/Assumptions
1	Total Carbon Stock= Above ground biomass + Below ground biomass + Dead wood + Litter + Soil Organic Carbon	India State of Forest Report, Forest Survey of India
2	Carbon stock (CO <sub>2</sub> eq.) = Carbon content * 3.67	Based on default IPCC conventions <sup>10</sup>
3	Value of carbon stock (CO <sub>2</sub> eq.) in US\$ = Carbon dioxide * Social Cost of tonne of CO <sub>2</sub>	Using India's country-level social cost of carbon (CSCC) emission as mentioned in Ricke et al article <sup>9</sup> .
4	Value of carbon stock (CO <sub>2</sub> eq.) in INR = Value of carbon stock in US\$ * Exchange rate	Using the exchange rate of Indian Rupee vis-à-vis the US Dollar (in Financial Year-Annual Average) <sup>11</sup> .
5	Value of Carbon Retention service = Value of carbon stock (CO <sub>2</sub> eq.) (as obtained in step 4) * Rate of return	A 3% rate of return has been assumed, which is equivalent to the discount rate taken for calculating SCC <sup>12</sup> .

41. The calculation of state wise value of Carbon Retention service during the year 2015-16 is based on estimates of carbon stock from ISFR 2017, while that for the year

9 [Ricke, K., Drouet, L., Caldeira, K., & Tavoni, M. \(2018\). Country-level social cost of carbon. \*Nature Climate Change\*, 8\(10\), 895-900.](#)

10 Penman, J., M. Gytarsky, T. Hiraishi, T. Krug, D. Kruger, R. Pipatti, et al. 2003. Good practice guidance for land use, land-use change and forestry. Institute for Global Environmental Strategies, Hayama, Japan

11 [Handbook of Statistics on Indian Economy, Reserve Bank of India](#)

12 [Valuing Climate Damages: Updating Estimation of the Social Cost of Carbon Dioxide \(2017\)](#)

2017-18 is based on ISFR 2019. The corresponding exchange rates were 66 INR per US\$ and 65 INR per US\$. India's country-level social cost of a tonne of CO<sub>2</sub> is US\$ 86 as per Nature Climate Change article for the year 2017-18. India's country-level social cost of a tonne of CO<sub>2</sub> for the year 2015-16 has been estimated at US\$80 using the GDP deflator.

42. The value of carbon retention service computed for the year 2017-18 is estimated as INR 438.49 thousand crore as compared to the value computed for the year 2015-16, which is estimated as INR 411.70 thousand crore.

*The detailed calculations of state wise estimates of value of carbon retention service for the year 2015-16 and 2017-18 are given in Statements 3.3 and 3.4 respectively at the end of the chapter.*

### Summary of Forest Ecosystem Services

43. During the year 2017-18, it is observed that value of timber provisioning services is about 0.10% of India's GDP, while that of NTFP provisioning service is 0.06% of India's GDP. The value of the carbon retention service obtained using a social cost of carbon approach during the year 2017-18 is equivalent to 2.58% of India's GDP, which is almost double the share of forestry sector in India's GDP. The national level estimates of economic value of these ecosystem services obtained have been summarised in **Table 7** below.

**Table 7: Summary of selected ecosystem services from forests in India**

Ecosystem services	Assessment period	Values (in '000 crore INR)	% of GDP
<b>Timber provisioning</b>	2017-18	16.30	0.10
<b>Non-timber forest resources</b>	2017-18	10.96	0.06
<b>Carbon retention</b>	2017-18	438.49	2.58
<b>Total value of Forest Ecosystem services</b>		<b>465.75</b>	<b>2.74</b>

44. **Table 8** below gives the economic values per hectare of the three forest ecosystem services for the States of India. The highest economic value per hectare from forest ecosystem services during the year 2017-18 was observed in Andaman & Nicobar Islands, followed by Arunachal Pradesh and Nagaland.

**Table 8: State-wise Value of Forest Ecosystem Services per hectare, 2017-18**

S. No.	States/ Union Territories	Geographic Area	Timber Provisioning Service	NTFP Provisioning Service	Carbon Retention Service	Total Value of Forest Ecosystem Services
		(in hectare)	(INR/ha/yr)			
1	Andhra Pradesh	162,96,800	232	224	8291	8746
2	Arunachal Pradesh	83,74,300	435	77	77266	77778
3	Assam	78,43,800	141	329	21197	21667
4	Bihar	94,16,300	292	704	3610	4607
5	Chhattisgarh	135,19,200	605	375	21863	22844
6	Goa	3,70,200	1223	120	42125	43467
7	Gujarat	196,24,400	927	348	3363	4639
8	Haryana	44,21,200	1130	3	1457	2591
9	Himachal Pradesh	55,67,300	771	673	27898	29341
10	Jammu & Kashmir	222,23,600	64	58	10806	10928
11	Jharkhand	79,71,600	949	346	13744	15039
12	Karnataka	191,79,100	232	347	12315	12894
13	Kerala	38,85,200	1834	1347	33735	36916
14	Madhya Pradesh	308,25,200	315	313	11755	12383
15	Maharashtra	307,71,300	792	349	8811	9951
16	Manipur	22,32,700	300	128	49266	49694
17	Meghalaya	22,42,900	576	159	49658	50393
18	Mizoram	21,08,100	1338	112	45706	47156
19	Nagaland	16,57,900	1067	232	50311	51610
20	Odisha	155,70,700	317	488	17087	17893
21	Punjab	50,36,200	1389	219	1631	3239
22	Rajasthan	342,23,900	458	377	1949	2784
23	Sikkim	7,09,600	111	37	49594	49742
24	Tamil Nadu	130,06,000	202	339	10258	10799
25	Telangana	112,07,700	166	227	8338	8732
26	Tripura	10,48,600	681	1694	44640	47015
27	Uttar Pradesh	240,92,800	584	282	2955	3821
28	Uttarakhand	53,48,300	502	279	42683	43464
29	West Bengal	88,75,200	497	458	10243	11198
30	Andaman & Nicobar Islands	8,24,900	47	40	84060	84147
31	Chandigarh	11,400	588	455	10204	11247
32	Dadra & Nagar Haveli	49,100	1102	569	22563	24234
33	Daman & Diu	11,100	1564	409	8428	10402
34	Delhi	1,48,300	991	64	5130	6184
35	Lakshadweep	3,000	788	1498	48416	50702
36	Puducherry	49,000	1030	525	5062	6617

## Way Forward

45. In this chapter, ecosystem extent and condition accounts based on the SEEA framework, as well as estimates of flows of forest ecosystem services, have been presented for India. Values of *three selected ecosystem services*: timber provisioning, non-timber forest resources and carbon retention provided by the forests of India have been compiled using data sources and appropriate valuation approaches that are conceptually valid and that produce values consistent with the System of National Accounts to facilitate the integration of environmental and economic statistics. There are still several important indicators of condition and ecosystem services provided by forests which have not been included in this assessment, but are nevertheless, very important. Proper sustainable management of forests is possible only when a holistic assessment is made to understand the real worth of the forests.

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### Statement 3.1: State wise estimates of value of timber provisioning services

(INR in lakh)

States/ Union Territories	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Andhra Pradesh	6417	5852	7503	21831	28689	58210	37729
Arunachal Pradesh	28682	28608	38910	49658	67164	52803	36469
Assam	13819	14816	20154	19513	22640	11762	11086
Bihar	28847	28010	27292	29894	35216	39767	27490
Chhattisgarh	46226	41096	69051	85039	117745	141412	81853
Goa	2199	2164	2221	3388	5383	24718	4526
Gujarat	65261	77697	55612	65388	161623	178472	181930
Haryana	77052	78165	71559	79504	95965	61661	49978
Himachal Pradesh	49379	45159	40807	63347	65373	82549	42901
Jammu & Kashmir	11352	12997	11276	13516	15654	10863	14126
Jharkhand	35542	35289	58295	225870	113797	100346	75677
Karnataka	39729	27824	31852	35274	79405	81713	44478
Kerala	32797	26138	31581	72283	168052	122242	71261
Madhya Pradesh	97596	93945	117745	151115	178614	137403	97185
Maharashtra	153564	149911	170431	213679	225546	224792	243743
Manipur	6862	6491	5775	6823	7017	7597	6708
Meghalaya	8166	6808	14933	16816	19543	19159	12915
Mizoram	6077	6045	7320	52150	62408	40832	28216
Nagaland	14291	13585	14708	19084	21558	21395	17684
Odisha	28207	30141	48359	64534	70586	70445	49422
Punjab	138425	137766	124248	171350	189030	101509	69947
Rajasthan	165377	164508	209804	253649	284586	236522	156879
Sikkim	427	387	735	567	908	1141	789
Tamil Nadu	17379	13408	13805	17476	21266	16357	26233
Telangana	8056	5012	9635	16437	18914	27002	18660
Tripura	12482	11379	11252	13474	15036	10417	7143
Uttar Pradesh	160236	162582	147033	195832	231700	194236	140659
Uttarakhand	31556	35786	43578	46107	49694	35538	26856
West Bengal	54372	55180	63891	59682	67516	64293	44100
Andaman & Nicobar Islands	480	364	410	534	599	678	385
Chandigarh	0	0	40	52	58	97	67
Dadra & Nagar Haveli	244	221	189	493	585	783	541
Daman & Diu	0	0	51	143	170	251	174
Delhi	0	0	516	1448	1525	2126	1469
Lakshadweep	0	0	26	73	87	34	24
Puducherry	174	158	145	380	451	730	505
India	1341273	1317494	1470742	2066401	2444105	2179856	1629806



### Statement 3.2: State wise estimates of value of NTFP provisioning services

(INR in lakh)

State/ UT	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Andhra Pradesh	47212	45892	46697	51338	57032	46137	36449
Arunachal Pradesh	7056	8396	8913	11100	12174	9430	6426
Assam	36143	35774	40535	48427	55077	38514	25774
Bihar	61647	63479	67149	87119	105657	87891	66306
Chhattisgarh	45789	60292	60926	77071	82449	60496	50710
Goa	366	377	795	880	934	689	445
Gujarat	66738	77807	81599	102323	124747	99953	68390
Haryana	6812	8036	5291	4942	4560	1816	140
Himachal Pradesh	38777	42498	48025	59524	75235	56753	37447
Jammu & Kashmir	17698	17308	16386	20930	23621	18473	12920
Jharkhand	41724	44883	45479	54608	60253	49837	27619
Karnataka	88222	93326	93761	109033	124113	93782	66489
Kerala	45915	45955	62406	72311	95656	71993	52344
Madhya Pradesh	105073	116960	123892	147104	171515	136130	96556
Maharashtra	173245	180560	191303	196907	193643	138349	107304
Manipur	2206	2261	2198	2634	2776	2387	2850
Meghalaya	3893	4190	4491	5799	6279	5141	3567
Mizoram	2216	2144	2713	3360	3974	3625	2360
Nagaland	2895	3129	3110	4321	5254	5848	3850
Odisha	95583	95342	101584	124822	153284	113924	76062
Punjab	16115	15881	15012	18455	23884	17880	11035
Rajasthan	140571	164003	174679	218793	239691	183372	128981
Sikkim	424	438	431	492	545	410	261
Tamil Nadu	59388	54912	60450	68614	86055	65991	44125
Telangana	33377	33941	34284	37475	42129	34167	25482
Tripura	11218	12532	14977	18692	22410	23258	17758
Uttar Pradesh	109567	111008	105374	122029	134333	102494	67945
Uttarakhand	27717	27834	28490	29138	31905	24915	14898
West Bengal	56435	57669	63719	68589	76464	61358	40644
Andaman & Nicobar Islands	394	426	469	548	632	496	332
Chandigarh	63	67	69	85	98	77	52
Dadra & Nagar Haveli	361	395	405	482	551	424	279
Daman & Diu	35	42	46	60	74	62	45
Delhi	218	198	172	201	209	150	95
Lakshadweep	55	62	64	76	86	68	45
Puducherry	542	529	498	542	576	416	257
India	1345690	1428544	1506389	1768822	2017876	1556704	1095946

Statements 3.3: State wise estimates of value of carbon retention service for the year 2015-16

States/ Union Territories	Above ground biomass (AGB)	Below ground biomass (BGB)	Dead wood	Litter	Soil Organic Carbon (SOCC)	Total carbon stock	CO <sub>2</sub> Stock	Value of CO <sub>2</sub> Stock*	Value of CO <sub>2</sub> Stock**	Value of Carbon Retention Service***
	(in '000 tonnes)							(in '000 US\$)	(INR in lakh)	(INR in lakh)
	(1)	(2)	(3)	(4)	(5)	(6)=(1)+(2)+(3)+(4)+(5)	(7)= (6) * 3.67	(8)=(80 * (7))	(9)=66 * (8)	(10)=(9)* (3/100)
Andhra Pradesh	100539	38585	568	4527	118471	262690	964072	77125784	50903017	1527091
Arunachal Pradesh	243462	53378	4305	16231	677163	994539	3649958	291996650	192717789	5781534
Assam	47343	10824	1093	5240	112352	176852	649047	51923747	34269673	1028090
Bihar	19063	6707	138	625	28864	55397	203307	16264559	10734609	322038
Chhattisgarh	206678	68159	2588	7628	275927	560980	2058797	164703728	108704460	3261134
Goa	5153	1512	250	417	11684	19016	69789	5583098	3684844	110545
Gujarat	32668	11719	322	993	64995	110697	406258	32500639	21450422	643513
Haryana	3736	1269	20	74	7312	12411	45548	3643870	2404954	72149
Himachal Pradesh	70655	18691	739	2511	83186	175782	645120	51609595	34062333	1021870
Jammu & Kashmir	112919	30083	1004	3529	128391	275926	1012648	81011874	53467837	1604035
Jharkhand	86006	33173	438	1298	101967	222882	817977	65438155	43189182	1295675
Karnataka	128098	35045	2545	19745	289652	475085	1743562	139484956	92060071	2761802
Kerala	74166	19245	1058	7436	153976	255881	939083	75126662	49583597	1487508
Madhya Pradesh	266040	101516	1654	7741	318713	695664	2553087	204246950	134802987	4044090
Maharashtra	142651	48947	1986	9385	290052	493021	1809387	144750966	95535637	2866069
Manipur	27253	8821	530	3909	102578	143091	525144	42011518	27727602	831828
Meghalaya	25168	6835	881	5184	117772	155840	571933	45754624	30198052	905942
Mizoram	15359	3173	633	2652	73224	95041	348800	27904038	18416665	552500
Nagaland	16151	4150	666	2432	101661	125060	458970	36717616	24233627	727009

States/ Union Territories	Above ground biomass (AGB)	Below ground biomass (BGB)	Dead wood	Litter	Soil Organic Carbon (SOCC)	Total carbon stock	CO <sub>2</sub> Stock	Value of CO <sub>2</sub> Stock*	Value of CO <sub>2</sub> Stock**	Value of Carbon Retention Service***
	(in '000 tonnes)							(in '000 US\$)	(INR in lakh)	(INR in lakh)
	(1)	(2)	(3)	(4)	(5)	(6)=(1)+(2)+(3)+(4)+(5)	(7)= (6) * 3.67	(8)=(80 * (7))	(9)=66 * (8)	(10)=(9)* (3/100)
Odisha	152525	50407	2108	9087	238776	452903	1662154	132972321	87761732	2632852
Punjab	5095	1883	26	63	8971	16038	58859	4708757	3107779	93233
Rajasthan	32558	12736	216	721	43429	89660	329052	26324176	17373956	521219
Sikkim	13379	3735	211	585	30624	48534	178120	14249582	9404724	282142
Tamil Nadu	84067	29252	1006	5579	109434	229338	841670	67333637	44440200	1333206
Telangana	72498	28388	333	3117	80639	184975	678858	54308660	35843716	1075311
Tripura	15674	3224	556	1613	42341	63408	232707	18616589	12286949	368608
Uttar Pradesh	47752	14264	444	1824	60850	125134	459242	36739342	24247966	727439
Uttarakhand	105173	26961	1316	5665	145549	284664	1044717	83577350	55161051	1654832
West Bengal	45382	13916	434	2585	100884	163201	598948	47915814	31624437	948733
Andaman & Nicobar Islands	39426	11901	2048	3702	57996	115073	422318	33785433	22298386	668952
Chandigarh	61	19	0	2	122	204	749	59894	39530	1186
Dadra & Nagar Haveli	447	106	10	35	827	1425	5230	418380	276131	8284
Daman & Diu	11	2	0	2	76	91	334	26718	17634	529
Delhi	230	52	2	11	653	948	3479	278333	183700	5511
Lakshadweep	55	0	1	5	100	161	591	47270	31198	936
Puducherry	108	23	1	8	311	451	1655	132414	87393	2622
India	2237549	698701	30130	136161	3979522	7082063	25991171	2079293697	1372333840	41170015

Notes: India's country-level social cost of a tCO<sub>2</sub> = US\$ 80 in the year 2015-16 and the average annual exchange rate of US\$ to INR for the year was 66. A rate of 3% return has been assumed for estimating the value of carbon retention service

Statements 3.4: State wise estimates of value of carbon retention service for the year 2017-18

States/ Union Territories	Above ground biomass (AGB)	Below ground biomass (BGB)	Dead wood	Litter	Soil Organic Carbon	Total carbon stock	CO <sub>2</sub> Stock	Value of CO <sub>2</sub> Stock*	Value of CO <sub>2</sub> Stock**	Value of Carbon Retention Service***
	(in '000 tonnes)						(in '000 US\$)	(INR in lakh)	(INR in lakh)	
	(1)	(2)	(3)	(4)	(5)	(6)=(1)+(2)+(3)+(4)+(5)	(7)=(6)*3.67	(8)=86 *(7)	(9)=65 *(8)	(10)=(9)* (3/100)
Andhra Pradesh	60972	24206	629	3074	130647	219528	805668	69287427	45036828	1351105
Arunachal Pradesh	330856	100379	7816	15436	596836	1051323	3858355	331818565	215682067	6470462
Assam	85844	21148	1102	7223	154832	270149	991447	85264427	55421878	1662656
Bihar	15007	5428	127	746	33931	55239	202727	17434533	11332447	339973
Chhattisgarh	145912	46908	1858	9969	275603	480250	1762518	151576505	98524728	2955742
Goa	9010	2617	172	665	12874	25338	92990	7997180	5198167	155945
Gujarat	27737	9636	315	1556	68003	107247	393596	33849298	22002044	660061
Haryana	2455	929	18	137	6927	10466	38410	3303279	2147131	64414
Himachal Pradesh	110045	30745	2559	2711	106300	252360	926161	79649863	51772411	1553172
Jammu & Kashmir	170222	47806	3813	3706	164648	390195	1432016	123153346	80049675	2401490
Jharkhand	48994	19899	423	2826	105870	178012	653304	56184147	36519696	1095591
Karnataka	128882	38742	1993	8931	205215	383763	1408410	121123278	78730131	2361904
Kerala	67979	19070	1017	5001	119889	212956	781549	67213173	43688562	1310657
Madhya Pradesh	165067	64630	1535	8156	349339	588727	2160628	185814016	120779110	3623373
Maharashtra	131249	40380	1586	10687	256606	440508	1616664	139033135	90371538	2711146
Manipur	44723	13317	508	3924	116251	178723	655913	56408553	36665560	1099967
Meghalaya	52302	14963	731	4328	108642	180966	664145	57116489	37125718	1113772
Mizoram	44973	9925	451	4516	96689	156554	574553	49411573	32117523	963526
Nagaland	35850	9612	522	2897	86646	135527	497384	42775032	27803771	834113

States/ Union Territories	Above ground biomass (AGB)	Below ground biomass (BGB)	Dead wood	Litter	Soil Organic Carbon	Total carbon stock	CO <sub>2</sub> Stock	Value of CO <sub>2</sub> Stock*	Value of CO <sub>2</sub> Stock**	Value of Carbon Retention Service***
	(in '000 tonnes)							(in '000 US\$)	(INR in lakh)	(INR in lakh)
	(1)	(2)	(3)	(4)	(5)	(6)=(1)+(2)+(3)+(4)+(5)	(7)=(6)*3.67	(8)=86*(7)	(9)=65*(8)	(10)=(9)*(3/100)
Odisha	126656	39066	1647	9062	255857	432288	1586497	136438739	88685180	2660555
Punjab	3529	1367	25	125	8298	13344	48972	4211633	2737562	82127
Rajasthan	26155	10865	191	928	70224	108363	397692	34201530	22230995	666930
Sikkim	17645	5372	505	664	32994	57180	209851	18047152	11730649	351919
Tamil Nadu	62092	21433	776	4107	128374	216782	795590	68420735	44473478	1334204
Telangana	41389	17227	333	2031	90862	151842	557260	47924372	31150842	934525
Tripura	25061	5513	297	2169	43017	76057	279129	24005110	15603322	468100
Uttar Pradesh	32498	10374	372	1893	70553	115690	424582	36514078	23734151	712025
Uttarakhand	152540	40975	2948	4904	169545	370912	1361247	117067245	76093710	2282811
West Bengal	40388	12193	447	2533	92144	147705	542077	46618652	30302124	909064
Andaman & Nicobar Islands	49468	15823	1116	2912	43347	112666	413484	35559643	23113768	693413
Chandigarh	57	18	0	3	111	189	694	59652	38774	1163
Dadra & Nagar Haveli	500	113	7	47	1133	1800	6606	568116	369275	11078
Daman & Diu	35	10	0	2	105	152	558	47974	31183	935
Delhi	277	98	2	21	838	1236	4536	390106	253569	7607
Lakshadweep	67	15	0	5	149	236	866	74486	48416	1452
Puducherry	97	22	1	7	276	403	1479	127195	82677	2480
India	2256533	700824	35842	127902	4003575	7124676	26147561	2248690239	1461648655	43849460

Notes: India's country-level social cost of a t CO<sub>2</sub> = US\$ 86 in the year 2017-18 and the average annual exchange rate of US\$ to INR for the year was 65. A rate of 3% return has been assumed for estimating the value of carbon retention service.



An aerial photograph of a wetland landscape. A winding waterway, possibly a river or canal, flows through a vast expanse of green, marshy land. The water is a deep blue, reflecting the sky. The vegetation is dense and green, with some sandy areas visible along the banks. The sky is a clear, light blue with a few wispy white clouds. The overall scene is peaceful and natural.

**Wetland**

**Protecting Water and Life**

## Chapter 4

### Wetlands – Protecting Water and Life

#### Introduction

1. It is increasingly being realised that the planet Earth is facing grave environmental problems, with fast depleting natural resources threatening the very existence of many ecosystems. One of the important ecosystem under consideration is Wetlands. Wetlands are areas of land that are either seasonally or permanently covered by water, or nearly saturated by water. This means that a wetland is neither truly aquatic nor terrestrial; although in some cases, wetlands can switch between being aquatic or terrestrial for periods of time depending on seasonal variability. Thus, wetlands exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry, dominant plants and soil or sediment characteristics. Because of their transitional nature, the boundaries of wetlands are often difficult to define. Wetlands do, however, share a few attributes common to all forms. Of these, hydrological structure (the dynamics of water supply, throughput, storage and loss) is most fundamental to the nature of a wetland system. The presence of water for a significant period of time is principally responsible for the development of a wetland.

2. One of the first widely used classifications systems, devised by Cowardin et al (1979), associated the wetlands with their hydrological, ecological and geological aspects, such as: marine (coastal wetlands including rock shores and coral reefs, estuarine (including deltas, tidal marshes, and mangrove swamps), lacustrine (lakes), riverine (along rivers and streams), palustrine ('marshy'- marshes, swamps and bogs). Given these characteristics, wetlands support a large variety of plant and animal species adapted to fluctuating water levels, making the wetlands of critical ecological significance. Utility wise, wetlands directly and indirectly support millions of people in providing services such as food, fibre and raw materials, storm and flood control, clean water supply, scenic beauty and educational and recreational benefits. Although there are many classification systems for wetlands in the world, the Ramsar classification system is the most preferred one.

3. The 1971 Ramsar Convention on Wetlands of International Importance is the oldest conservation convention. It owes its name to its place of adoption in Iran. It came into being due to serious decline in populations of waterfowl (mainly ducks) and conservation of habitats of migratory waterfowl. This Convention provides a framework for the conservation and 'wise use' of wetland biomes. The Ramsar Convention is the first modern global intergovernmental treaty on conservation and wise use of natural resources ([www.ramsar.org](http://www.ramsar.org)). The Ramsar Convention entered into force in 1975. Under the text of the Convention (Article 1.1) wetlands are defined as:

*“areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters”.*

4. In addition, the Convention (Article 2.1) provides that wetlands:  
*“may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands”.*

5. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover 7% of the earth’s surface and deliver 45% of the world’s natural productivity and ecosystem services of which the benefits are estimated at \$20 trillion a year<sup>1</sup>.

### **Wetlands in India**

6. India’s vast geographical extent supports a large and diverse number of wetland classes, some of which are unique. Wetlands in India, estimated to occupy less than 5 per cent of geographical area of the country, support about a fifth of the known biodiversity. Like any other place in the world, there is a looming threat to the aquatic biodiversity of the Indian wetlands as they are under a regime of increasing human pressures. To offset the pressure, the Government of India has initiated several steps in terms of policies, programmes and plans for the preservation and conservation of these ecosystems. India is a signatory to the Ramsar Convention for management of wetlands, thus, extending the scope of conserving the biodiversity and wise use to a wide variety of habitats, including rivers and lakes, coastal lagoons, mangroves, peatlands, coral reefs, as well as numerous human-made wetlands. The government has identified a number of wetlands for conservation and management under the National Wetland Conservation Programme and helps the local governments implement the Management Action Plan for these wetlands.

7. Wetlands of India have been classified into 19 classes. River/stream reservoir/barrage, inter-tidal mud-flat and natural lake/pond are some of the major wetland types of India. Lagoon, mangrove, coral, riverine wetland and high altitude lake (>3,000 m elevation) are some of the unique wetland types of the country. Each wetland type also exhibits a wide diversity in terms of shape, size, water quality, aquatic vegetation etc. The classes of wetlands are listed below:

- |                                  |                            |
|----------------------------------|----------------------------|
| i. Lake/ pond                    | vi. River/ Stream          |
| ii. Ox-bow lake/ Cut-off meander | vii. Reservoir/ Barrage    |
| iii. High altitude wetland       | viii. Tank/ Pond           |
| iv. Riverine wetland             | ix. Waterlogged (Man-made) |
| v. Waterlogged (Natural)         | x. Salt pan                |

<sup>1</sup> <https://www.millenniumassessment.org/en/index.html>

- |                          |                       |
|--------------------------|-----------------------|
| xi. Lagoon               | xvi. Mangrove         |
| xii. Creek               | xvii. Coral Reef      |
| xiii. Sand/ Beach        | xviii. Salt pan       |
| xiv. Intertidal mud flat | xix. Aquaculture pond |
| xv. Salt Marsh           |                       |

### Extent of Wetlands in India

8. Recognizing the fact that an updated geospatial data base of these natural resources is the pre-requisite for management and conservation planning, National Wetland Inventory and Assessment (NWIA) project was formulated as a joint programme of Ministry of Environment & Forests, Government of India, and Space Applications Centre, ISRO, Ahmedabad.

9. Under the NWIA Project, the entire country, including the island territories, was considered for inventory and assessment of wetlands. Mapping was carried out on 1:50,000 scale. Area estimates of various wetland categories for India were compiled using GIS layers of wetland boundary, water-spread, aquatic vegetation and turbidity. A total of 2,01,503 wetlands have been mapped at 1:50,000 scale in the country. In addition, 5,55,557 wetlands of less than 2.25 hectares have also been identified. The total wetland area is estimated to be 15.26 million hectares (Mha), which is around 4.63 percent of the geographic area of the country.

10. Wetlands were categorised in to 2 major categories, 4 sub-categories and 19 classes. The area of inland wetlands was estimated as 10.56 Mha and the area of coastal wetlands as 4.14 Mha. Category-wise distribution of wetlands in the country are shown in **Table 1**. An analysis of wetland status in terms of open water shows that out of the total wetland area, the extent of open water is 58.5 per cent in post-monsoon and 39.4 per cent in pre-monsoon. There is a significant reduction in the extent of open water (about 32.5%) from post-monsoon to pre-monsoon conditions (8.60 Mha to 5.80 Mha). It is reflected in all the inland wetland types. The aquatic vegetation in India accounts for about 9 and 14 per cent of total wetland area in post-monsoon (1.32 Mha) and pre-monsoon (2.06 Mha) respectively.



**Table 1: Area of Wetlands in India, 2006-07**

(Area in Hectare)

S. No.	Wetland Category	Number of Wetlands	Total wetland Area	% of Wetland Area	Open Water	
					Post-monsoon Area	Pre-monsoon Area
1a	Inland Wetlands - Natural	45,658	6,62,3067	43.4	41,00,766	31,15,701
1b	Inland Wetlands - Man-made	1,42,812	39,41,832	25.83	32,67,602	16,54,170
1	<b>Total - Inland</b>	<b>1,88,470</b>	<b>1,05,64,899</b>	<b>69.23</b>	<b>73,68,368</b>	<b>47,69,871</b>
2a	Coastal Wetlands - Natural	10,204	37,03,971	24.27	9,30,663	7,50,339
2b	Coastal Wetlands - Man-made	2,829	4,36,145	2.86	3,01,767	2,81,010
2	<b>Total - Coastal</b>	<b>13,033</b>	<b>41,40,116</b>	<b>27.13</b>	<b>12,32,430</b>	<b>10,31,349</b>
	<b>Sub-Total</b>	<b>2,01,503</b>	<b>1,47,05,015</b>	<b>96.36</b>	<b>86,00,798</b>	<b>58,01,220</b>
3	Wetlands (<2.25 ha)	5,55,557	5,55,557	3.64	-	-
	<b>Total</b>	<b>7,57,060</b>	<b>1,52,60,572</b>	<b>100</b>	<b>86,00,798</b>	<b>58,01,220</b>

<b>Area under Aquatic Vegetation</b>	13,22,837	20,65,096
<b>Area under turbidity levels</b>		
Low	32,06,003	18,88,493
Moderate	41,68,401	29,67,523
High	12,26,394	9,45,204

*State-wise details on extent of Wetlands is given in Statement 4.1.*

*State-wise and Class-wise details on extent of Wetlands are given in Annexure-4.1.*

### **Assessment of Condition of Select Wetlands in India**

11. The Ministry of Environment, Forest and Climate Change (MoEFCC) aims to conserve a network of healthy wetlands which sustain rich biodiversity and provide wide ranging ecosystem services for societal well-being. 'Wetlands rejuvenation' is a transformative idea of the Government of India, under which systematic rejuvenation is being initiated of selected wetlands on the basis of well-defined and targeted management plans and with active stakeholder collaboration. The State Wetlands Authorities and wetlands managers are at the forefront of implementation of this programme, with the Ministry providing an enabling environment in the form of programmatic framework, capacity development, and financing (on convergence basis).



12. The programme is structured around a four pronged approach:
  - i. Developing baseline information
  - ii. Rapid assessment of wetlands condition
  - iii. Enabling stakeholder platforms
  - iv. Management planning
  
13. Technical handholding for the programme is done by six knowledge partners:
  - i. Wetlands International South Asia
  - ii. Salim Ali Center for Ornithology and Natural History
  - iii. World Wide Fund for Nature India
  - iv. Chilika Development Authority
  - v. The Environmental Planning and Coordination Organization
  - vi. Gujarat Ecological Education and Research Foundation
  
14. In the first cycle of the programme, during 2019-20, 130 wetlands were selected in consultation with State Governments. MoEFCC rolled out an ecosystem health report card system for these selected wetlands to enrich management planning processes for ecological rehabilitation. The entire process was implemented under the guidance of MoEFCC by the State Governments in collaboration with knowledge partners. The report card is designed as a scoring tool for assessing ecosystem health in terms of a set of indicators with reference to their desired values. The purpose of the tool is to communicate complex and large amount of ecosystem information to a broad audience in a simple manner.

### **The Scoring method**

15. The scoring method follows a three stage approach for Ecosystem Health and Ecosystem Threats. Additionally, information was also collected on Ecosystem Services and Rights and Privileges. For Ecosystem Health and Ecosystem Threats, scores provided to each of the categories were then aggregated to provide a score for the wetland. The selection of indicators & approach for assessment of health of wetlands, seems to borrow (although not strictly) from the discussion papers on the compilation of ecosystem condition accounts proposed for the revised SEEA-EEA<sup>2</sup>.

### **Ecosystem Health**

16. For ecosystem health assessment, a set of nine indicators (**Table 2**) under four categories were selected, primarily on the basis of their relevance to management and ease of reporting.

---

<sup>2</sup>[https://seea.un.org/sites/seea.un.org/files/documents/EEA/ec\\_discussionpaper\\_23\\_typology-v22-clean.pdf](https://seea.un.org/sites/seea.un.org/files/documents/EEA/ec_discussionpaper_23_typology-v22-clean.pdf)

**Table 2: Ecosystem Health Indicators**

Category	Indicator	Desired Value
Conversion to non-wetlands use	% wetland area converted to non-wetland use since the year 2000	No conversion to non-wetland use
Hydrological regimes	Ratio of natural inlets choked and diverted to total number of natural inlets	<0.2
	Ratio of natural outlets choked & diverted to total number of natural outlets	<0.2
	% of water quality samples conforming to desired Biological Oxygen Demand / Dissolved Oxygen levels*	Dissolved Oxygen $\geq$ 6 mg/l Biological Oxygen Demand: Between 3 - 6 mg/l *For urban wetlands: Chemical Oxygen Demand: < 50 mg/l
Biodiversity	% wetland area covered by invasive macrophytes	< 10%
	Annual January water bird count as a proportion to maximum count observed count in last 10 years (only for protected areas of high ornithological value)	0.7 and above
Governance	Status of wetland mapping	Wetlands map prepared and approved by State Wetlands Authority
	Status of wetland management action plan	Management Action Plan prepared and approved by State Wetlands Authority
	Status of notification	Wetland notified under extant regulation

17. The proposed SEEA Ecosystem Condition Typology (SECT), as framed in the discussion paper cited above, prescribes selection of indicators across several classes including the abiotic & biotic ecosystem characteristics and landscape level characteristics. The indicators selected for preparation of the wetland health card, as shown in **Table 2** above, can easily be mapped to the classes of the SECT. For example, indicators on the natural inlets or outlets and those on water quality can be mapped to abiotic ecosystem characteristics. Similarly, indicators on invasive macrophytes and

water bird count can be mapped to biotic ecosystem characteristics. Indicator on conversion of wetland may be classified under Landscape level characteristics.

18. For each indicator, a score was assigned based on the extent to which the desired values were met (A for total conformity and E for maximum deviation). An ecosystem health score was computed by using a weighted average (A=1, B=0.8, C=0.6, D=0.4 and E=0.2). These were converted into ecosystem health ranks as shown in the following **Table 3**.

**Table 3: Ecosystem Health Scores and Ranks**

Ecosystem Health Score	Ecosystem Health Rank	Health Category
Between 0.96 - 1	A+	Very good
Between 0.91 - 0.95	A-	Very good
Between 0.86 - 0.90	B+	Good
Between 0.81 - 0.85	B-	Good
Between 0.76 - 0.80	C+	Moderate
Between 0.71 - 0.75	C-	Moderate
Between 0.61 - 0.70	D	Low
0.60 and below	E	Very Low

### Ecosystem Threats

19. The data on threats for each wetland were organized into the following four categories:

- Physical regime change (adverse change in water quality and quantity, sediments and salinity)
- Extraction (water, biota, soil and minerals)
- Introduction (pollutants, invasive species)
- Structural modification of habitat (drainage, conversion into non-wetland use or encroachment)

20. Each threat was scored between 3 to 1, from high to low (no value when not applicable). The total threat score was normalized by dividing by the maximum score value across all wetlands. The scores were then converted into ranks (**Table 4**). An increase in threat score is an indicator of increasing threats.

**Table 4: Threat Scores and Rank**

Threat Score	Threat Rank	Threat Category
Between 0.91 - 1	A+	Very high
Between 0.81 - 0.9	A-	Very high

Threat Score	Threat Rank	Threat Category
Between 0.71 - 0.80	B+	High
Between 0.61 - 0.70	B-	High
Between 0.51 - 0.60	C+	Moderate
Between 0.41 - 0.50	C-	Moderate
Between 0.31 - 0.40	D	Low
0.30 and below	E	Very Low

### Ecosystem Services

21. Data on ecosystem services was reported in binary form (Yes or No) and information was obtained on following categories:

**Table 5: Ecosystem Services Categories**

Provisioning services	Source of drinking water for people living in and around Source of water for agriculture Fisheries Source food plants Source of medicinal plants Water for animals Inland transportation Source of soil and other material (such as salt)
Regulating services	Buffer from extreme events as floods and storms Groundwater recharge Water purification Sediment and nutrient sink
Cultural services	Recreation and tourism Significant religious and cultural values
Habitat services	Supports noteworthy plant species Supports noteworthy animal species Site of high congregation of migratory water birds Supports life cycle of fish and amphibians

22. For each wetland, an ecosystem services score (provisioning, regulating, cultural and habitat) has been derived by calculating the ratio of ecosystem services observed in a wetland to the total number of ecosystem services for a particular category.

### Rights and Privileges

23. Data on rights and privileges is also reported in binary form (Yes or No) and has been aggregated for each site in terms of frequencies.

## Description of sample

24. For the first cycle of assessments of wetlands under the “Wetland Health Scheme”, data on 116 wetlands was received from 30 States and Union Territories (Table 6). The wetlands covered nine of the ten biogeographic zones (only islands were missed) and ranged in area from 0.4 ha (Khajjiar, Himachal Pradesh) to 0.75 Mha (Great Rann of Kutch, Gujarat). The assessment covered 22 of the wetlands declared as Ramsar Sites.

**Table 6: Distribution of wetlands included under different biogeographic zones (BGZ) and area categories**

BGZ	<= 10 ha	10- 100 ha	100- 1,000 ha	1,000 - 5,000 ha	5,000 - 10,000 ha	10,000- 50,000 ha	50000- 1,00,000 ha	>1,00,000 ha	Grand Total
Arid	1	1	8		1	2		2	15
Coastal			10	2	1	3			16
Deccan Peninsula	4	11	8	2	2	2	1		30
Himalayas	1	3	3	2		3			12
North East	1	1	2	3		1	1	1	10
Northern plains		2	5	6	1	1		1	16
Semi-Arid	3	2	6	1		1			13
Trans Himalayas	1		1						2
Western Ghats			1					1	2
<b>Grand Total</b>	<b>11</b>	<b>20</b>	<b>44</b>	<b>16</b>	<b>5</b>	<b>13</b>	<b>2</b>	<b>5</b>	<b>116</b>

## Results

25. The ecosystem health assessment undertaken by MoEFCC is significant in terms of pan-India efforts to understand the status of wetland condition, drivers of change and management. Despite including a small subset of extensive wetland regime in the country (116 out of 0.77 million) and a narrow range of ecosystem health indicators, the assessment throws up several insights into management needs of wetlands. The distribution of wetlands, in terms of the aggregate scores for ecosystem health and the threat status, can be seen in Table 7. Further, the detailed assessment may be seen at Annexure 4.2.



**Table 7: Distribution of wetlands in terms of the aggregate scores for ecosystem health and the threat status**

Category	Very High (A+ & A-)	High (B+ & B-)	Moderate (C+ & C-)	Low D	Very Low E	Total
Ecosystem health	21	33	26	23	8	111
Threat status	11	17	25	15	43	111

Note: Five wetlands have not been classified because of unavailability of requisite data.

26. Table 8 shows the state-wise distribution of the selected wetlands in the different aggregate score classes in respect of Ecosystem Health.

**Table 8: Number of wetlands in different 'Ecosystem Health' score classes**

State / UT	Very High (A+ & A-)	High (B+ & B-)	Moderate (C+ & C-)	Low D	Very Low E	Total
Andhra Pradesh	2	0	1	1		4
Arunachal Pradesh	0	0	2			2
Assam	0	0	0	1	1	2
Bihar	0	2	1			3
Chhattisgarh	0	1	0		2	3
Delhi	0	0	0	5		5
Gujarat	8	0	1			9
Gujarat	0	0	0			0
Haryana	0	0	1			1
Himachal	3	2	0			5
INTERSTATE	0	0	0		1	1
Jammu	0	1	0			1
Jharkhand	0	0	0	5		5
Karnataka	0	5	3	1	2	11
Kashmir	0	2	0			2
Kerala	2	1	0		1	4
Ladakh	0	0	0			0
Madhya Pradesh	0	2	0			2
Maharashtra	1	2	3	1		7
Manipur	0	0	1	1		2
Meghalaya	0	0	1			1
Mizoram	0	1	0			1
Nagaland	0	1	0			1
Odisha	0	2	0	1		3
Punjab	1	0	3			4
Rajasthan	1	0	2	3		6
Sikkim	0	2	1			3
Tamil Nadu	0	2	0		1	3
Telangana	0	0	1	1		2

State / UT	Very High (A+ & A-)	High (B+ & B-)	Moderate (C+ & C-)	Low D	Very Low E	Total
Tripura	0	0	1			1
Uttar Pradesh	1	6	4	2		13
Uttarakhand	1	1	0			2
West Bengal	1	1	0			2
<b>All India</b>	<b>21</b>	<b>34</b>	<b>26</b>	<b>22</b>	<b>8</b>	<b>111</b>

Note: Five wetlands have not been classified because of unavailability of requisite data. Pulicat wetland is shown as INTERSTATE.

27. The assessment is not intended to create a comprehensive picture of wetlands in the country. The results are derived from a select set of wetlands only, which is *not representative of the entire wetlands* distribution. Being a pilot study, the focus was on demonstrating application of a concept and building capacity of wetlands managers in this aspect.

28. Being selective in nature, the ecosystem health indicators present a partial view of the wetlands' condition. The coverage of indicators may need to be broadened in the next iterations, particularly including aspects of wetland catchments, inundation regime, ecological productivity, status of species of high conservation value, sustainability of resource use (such as harvest of fish, aquatic vegetation), and institutional aspects (such as involvement of stakeholders in management planning process, the quality of monitoring and evaluation etc.).

29. It cannot be emphasized enough that the uniqueness of each wetland needs to be understood for the rejuvenation programme to be effective. Nevertheless, the patterns in the scores in different categories may help define sectoral convergence needs and priorities. For example, in order to secure the buffering functions of wetlands, it is pertinent that district and state disaster management plans understand the importance of the rights and privileges, as also the threats, and integrate these values of wetlands into their programmatic design so as to ensure that the proposed interventions in the disaster management sector do not adversely impact the wetlands.

### Ramsar Sites (Wetlands) in India

30. Wetland ecosystems are vital for sustenance and growth of all life forms and are of immense ecological, socio-economic as well as cultural importance. However, wetlands remain the most threatened of all natural resources and are disappearing three times faster than forests<sup>3</sup>.

<sup>3</sup> [http://moef.gov.in/wp-content/uploads/2019/09/Ramsar-Factsheets\\_2020-Final-8-May-2020.pdf](http://moef.gov.in/wp-content/uploads/2019/09/Ramsar-Factsheets_2020-Final-8-May-2020.pdf)

31. The Ramsar Convention, in line with its mission to conserve and promote wise use of all wetlands, designates suitable wetlands for the list of Wetlands of International Importance (the “Ramsar List”), so as to bring focus on their effective management. After India became a party to the Ramsar Convention on Wetlands of International Importance in 1982 as an endorsement of its resolution to conserve the wetlands of the country, it has designated 37 Ramsar sites of international importance covering an area of 1067939 hectares as on August 31, 2020. State-wise details of 37 Ramsar Sites of India, which are being managed as per the Ramsar mandate, are given in Table 9.

**Table 9: State-wise Details of Ramsar Sites (Wetlands) as on August 31, 2020**

(Area in hectares)

N o.	State/UT	Ramsar Wetland	Ramsar Area of State/UT	Wetland Area of State/UT	% Area of Ramsar Sites in State
1.	Andhra Pradesh	Kolleru Lake	90,100	14,47,133	6.23
2.	Assam	Deepor Beel	4,000	7,64,372	0.52
3.	Gujarat	Nalsarovar Bird Sanctuary	12,000	34,74,950	0.35
4.	Himachal Pradesh	Chandertal Wetland, Pong Dam Lake, Renuka Wetland	15,731	98,496	15.97
5.	Jammu and Kashmir	Hokera Wetland, Surinsar-Mansar Lakes, Wular Lake	20,625	1,77,926	11.59
6.	Kerala	Asthamudi Wetland, Sasthamkotta Lake, Vembanad Kol Wetland	1,57,763	1,60,590	98.24
7.	Ladakh	Tsomoriri Lake	12,000	2,13,575	5.62
8.	Madhya Pradesh	Bhoj Wetlands	3201	8,18,166	0.39
9.	Maharashtra	Nandur Madhameshwar	1437	10,14,522	0.14
10.	Manipur	Loktak Lake	26,600	63,616	41.81
11.	Odisha	Bhitarkanika Mangroves, Chilka Lake	1,81,500	6,90,904	26.27
12.	Punjab	Beas Conservation Reserve, Harike Lake, Kanjli Lake Keshopur - Mian Community Reserve, Nangal Wildlife Sanctuary, Ropar Lake	12,537	86,283	14.53
13.	Rajasthan	Keoladeo Ghana National Park, Sambhar Lake	26,873	7,82,314	3.44

N o.	State/UT	Ramsar Wetland	Ramsar Area of State/UT	Wetland Area of State/UT	% Area of Ramsar Sites in State
14.	Tamil Nadu	Point Calimere	38,500	9,02,534	4.27
15.	Tripura	Rudrasagar Lake	240	17,542	1.37
16.	Uttar Pradesh	Nawabganj Bird Sanctuary, Parvati Arga Sanctuary, Saman Bird Sanctuary, Samaspur Bird Sanctuary, Sandi Bird Sanctuary, Sarsai Nawar Jheel, Upper Ganga River	29,332	12,42,530	2.36
17.	West Bengal	East Calcutta Wetlands, Sunderbans Wetland	4,35,500	11,07,907	39.31
	Total		<b>10,67,939</b>		

*Note: Area of wetlands in States derived from National Wetland Atlas 2011; For the UT of Jammu & Kashmir, area derived from state wetland area of Jammu & Kashmir minus the wetland area of Kargil and Leh districts which form the wetland area of the UT of Ladakh]*

## Conclusions

32. Wetland ecosystems are complex ecosystems which offer a wide range of services including fresh water supply, food, fibre and raw materials besides playing a role in food control, water quality improvement, groundwater recharge, recreation and climate change mitigation. Their complexity, which make them difficult to be assessed with reference to any scale or levels, along with the importance of the many ecosystem services they provide, highlights the need for development programmes to take more cognizance of these rich and invaluable ecosystems. The SEEA framework defines a coherent system to help integrate these concerns, which in turn, is envisaged to provide a tool for enhanced decision-making capabilities.

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Statement 4.1: State-wise wetland distribution in India (Area in ha)

State/UT	Wetland area	% of total wetland area	Year 2006-07									
			Open water		Aquatic Vegetation		Turbidity (Post-monsoon)			Turbidity (Pre-monsoon)		
			Post-monsoon	Pre-monsoon	Post-monsoon	Pre-monsoon	Low	Moderate	High	Low	Moderate	High
Andhra Pradesh	14,47,133	9.48	8,87,143	6,10,668	1,26,187	2,68,267	2,95,604	5,31,282	60,257	2,27,855	3,50,782	32,031
Arunachal Pradesh	1,55,728	1.02	66,222	57,516	6,002	5,924	56,471	7,984	1,767	45,810	9,541	2,165
Assam	7,64,372	5.01	4,23,068	3,90,152	36,817	76,036	64,137	3,58,429	502	22,834	3,66,654	664
Bihar	4,03,209	2.64	2,24,655	1,48,382	25,179	17,360	1,32,318	75,292	17,045	316	1,46,269	1,797
Chhattisgarh	3,37,966	2.21	2,43,814	1,73,678	2,123	19,600	28,985	1,83,025	31,804	79,103	85,841	8,734
Delhi	2,771	0.02	1,282	1,526	700	835	1,239	43	-	1,461	65	-
Goa	21,337	0.14	18,899	18,899	1,752	1,752	2,363	10,280	6,256	2,363	10,280	6,256
Gujarat	34,74,950	22.77	11,50,755	7,32,481	1,52,318	2,05,159	3,31,081	1,36,136	6,83,538	1,45,292	83,970	5,03,219
Haryana	42,478	0.28	14,216	18,912	2,245	1,497	6,953	3,295	3,968	6,423	9,481	3,008
Himachal Pradesh	98,496	0.65	69,107	49,245	-	5,294	46,871	22,236	-	33,949	15,296	-
Jammu & Kashmir	3,91,501	2.57	3,01,818	3,14,209	19,826	15,434	3,00,480	1,295	43	3,06,201	1,644	6,364
Jharkhand	1,70,051	1.11	1,52,879	1,03,225	3,437	7,244	21,014	88,410	43,455	12,774	64,127	26,324
Karnataka	6,43,576	4.22	4,27,921	2,62,991	80,818	1,07,259	65,547	3,26,173	36,201	60,149	1,78,414	24,428
Kerala	1,60,590	1.05	1,38,962	1,30,468	13,364	8,925	1,02,026	36,501	435	94,722	35,119	627
Madhya Pradesh	8,18,166	5.36	5,71,961	2,45,289	13,379	62,751	2,827	5,32,712	36,422	713	2,13,784	30,792
Maharashtra	10,14,522	6.65	7,96,834	3,70,357	47,551	84,702	6,33,128	1,39,816	23,890	2,02,581	1,59,856	7,920
Manipur	63,616	0.42	45,304	39,391	16,756	23,500	17,866	26,911	527	17,261	21,841	289
Meghalaya	29,987	0.20	27,912	27,420	819	852	24,919	1,928	1,065	24,692	1,168	1,560



State/UT	Wetland area	% of total wetland area	Open water		Aquatic Vegetation		Turbidity (Post-monsoon)			Turbidity (Pre-monsoon)		
			Post-monsoon	Pre-monsoon	Post-monsoon	Pre-monsoon	Low	Moderate	High	Low	Moderate	High
Mizoram	13,988	0.09	13,799	13,778	37	42	13,755	44	-	13,722	56	-
Nagaland	21,544	0.14	20,938	20,650	7	604	2,243	8,071	10,624	1,065	7,926	11,659
Orissa	6,90,904	4.53	5,08,282	4,19,310	62,733	1,42,584	1,16,369	3,78,117	13,796	1,38,906	2,64,017	16,387
Punjab	86,283	0.57	36,344	24,386	15,920	17,160	30,906	5,117	321	20,504	3,573	309
Rajasthan	7,82,314	5.13	3,68,129	1,58,696	4,102	5,166	2,94,322	40,945	32,862	1,07,553	7,390	43,753
Sikkim	7,477	0.05	7,189	5,035	7	7	2,380	4,809	-	885	4,150	-
Tamil Nadu	9,02,534	5.91	6,57,861	2,96,268	1,67,273	5,31,600	3,14,273	2,47,677	95,911	70,189	1,59,206	66,873
Tripura	17,542	0.11	9,847	7,023	1,779	5,232	2,672	7,148	27	641	6,329	53
Uttar Pradesh	12,42,530	8.14	6,90,216	4,94,994	2,19,289	1,29,228	2,12,518	4,15,651	62,047	1,90,992	2,16,623	87,379
Uttarakhand	1,03,882	0.68	54,221	46,244	5,288	11,697	22,893	31,328	-	11,235	35,009	-
West Bengal	11,07,907	7.26	6,32,450	5,83,620	2,28,174	2,39,058	32,402	5,37,144	62,904	21,196	5,00,546	61,878
Andaman & Nicobar Islands*	1,52,809	1.00	8,341	8,580	68,269	68,352	965	6,749	627	1,898	6,006	676
Chandigarh*	350	0.00	242	225	10	19	65	177	-	70	155	-
Dadra & Nagar Haveli*	2,070	0.01	1,915	1,131	-	145	1,286	629	-	812	319	-
Daman & Diu*	2,068	0.01	570	262	54	58	265	299	6	137	118	7
Lakshadweep*	79,586	0.52	23,674	23,674	-	-	23,674	-	-	23,674	-	-
Puducherry*	6,335	0.04	4,028	2,535	622	1,753	1,186	2,748	94	515	1,968	52
<b>Total</b>	<b>152,60,572</b>	<b>100.00</b>	<b>86,00,798</b>	<b>58,01,220</b>	<b>13,22,837</b>	<b>20,65,096</b>	<b>32,06,003</b>	<b>41,68,401</b>	<b>12,26,394</b>	<b>18,88,493</b>	<b>29,67,523</b>	<b>9,45,204</b>

Data Source: [National Wetland Atlas](#)

\*- Union Territories





**Biodiversity**

**the Panacea for Adversities**



## Chapter 5

# Biodiversity – the panacea to adversities

*CBD Biodiversity Vision 2050: “By 2050, biodiversity is valued, conserved, restored and widely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people.”*

### Introduction

1. The term biodiversity derived from “biological diversity” refers to the variety of life on Earth at all its levels, from genes to ecosystems. This includes diversity within species, between species and of ecosystems. Biodiversity includes all ecosystems— managed (plantations, farms, croplands, aquaculture sites, urban parks) and unmanaged (forest, nature preserves, or national parks) and represents the wealth of biological resources available to humankind. The biodiversity of any given region is not evenly distributed. It varies globally and within regions. The various factors that influence biodiversity of a region include temperature, altitude, precipitation, soils and pressures from human activities.

2. Biodiversity underpins many of the basic goods and services necessary for human society to exist and secure economic and social development. Its importance can be assessed by the fact that the UN has designated 2011–2020 as the United Nations Decade on Biodiversity<sup>1</sup> emphasizing “Living in harmony with nature”. Ecosystems are the fundamental source of human existence as they provide fresh air, clean water, food, resources and medicine. The diversity of life on earth is essential for healthy functioning of ecosystems and it is biodiversity that boosts ecosystem productivity. In biodiversity, each organism, no matter how small or how big, has a role to play. Insects and bats, for example, play an essential role in pollinating plants and a great portion of the food we eat depends on animal pollinators. In a nutshell, the multifold values of biodiversity include – environmental values, social value, ecosystem services value, economic value, aesthetic value, productive use value and consumption value<sup>2</sup>.

3. Biodiversity is what allows ecosystems to work and flourish. Over millions of years, many different species of plants and animals have come together to live in the same habitats. Over time, they balance each other and hold the ecosystem together. As species

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<sup>1</sup> <https://www.cbd.int/2011-2020/>

<sup>2</sup> [Implementation of India's Biodiversity Action Plan. New Delhi: MoEFCC; 2019](#)

are lost, so are the ecosystem functions they perform. This may lead to ‘tipping points’ being reached, beyond which the structure and processes of an ecosystem abruptly, and possibly irreversibly, break down. In the last 50 years, the human population has doubled; the global economy has almost quadrupled and global trade has increased by approximately ten times. This period is also now being recognized as one of irreversible reduction of biodiversity due to displacement or extinction of species. The 2020 Global Living Planet Index<sup>3</sup> shows an average 68% fall in monitored populations of mammals, birds, amphibians, reptiles and fish between 1970 and 2016.

4. The three greatest proximate threats to biodiversity are habitat loss, overharvesting, and introduction of exotic or invasive species. The first two of these are a direct result of human population growth and resource use. The third results from increased mobility and trade. Invasive species can threaten other species through competition for resources, predation or disease. A fourth cause of extinction is climate change, which is becoming significant. Global climate change is also a consequence of human population needs for energy and the use of fossil fuels to meet those needs.

5. Deforestation and loss of biodiversity are also linked to several zoonotic diseases which can be transmitted from animals to people, an example being the current CoVID-19 pandemic. It has now been recognized that reduced biodiversity favours particular hosts, vectors and/or pathogens. Ecosystem integrity can help regulate diseases by supporting a diversity of species so that it is more difficult for one pathogen to spill over, amplify or dominate. Addressing zoonotic disease emergence requires addressing its root cause—primarily, the impact of human activities. As the global population approaches 10 billion, it is time to reimagine our relationship with nature and put nature at the heart of decision-making. Even though the biodiversity of many habitats has become threatened, there are many things that can be done to reduce this danger.

6. Living in harmony with nature has been an integral part of Indian culture. This has been abundantly reflected in a variety of traditional practices, religious beliefs, rituals, folklore, arts and crafts, and in the daily lives of the Indian people from time immemorial. Endorsing this tradition, Article 48 of the Constitution of India mandates that “the State shall endeavor to protect and improve the environment and to safeguard the forests and the wildlife of the country”, while Article 51 A (g) makes it a “duty of every citizen to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures.”

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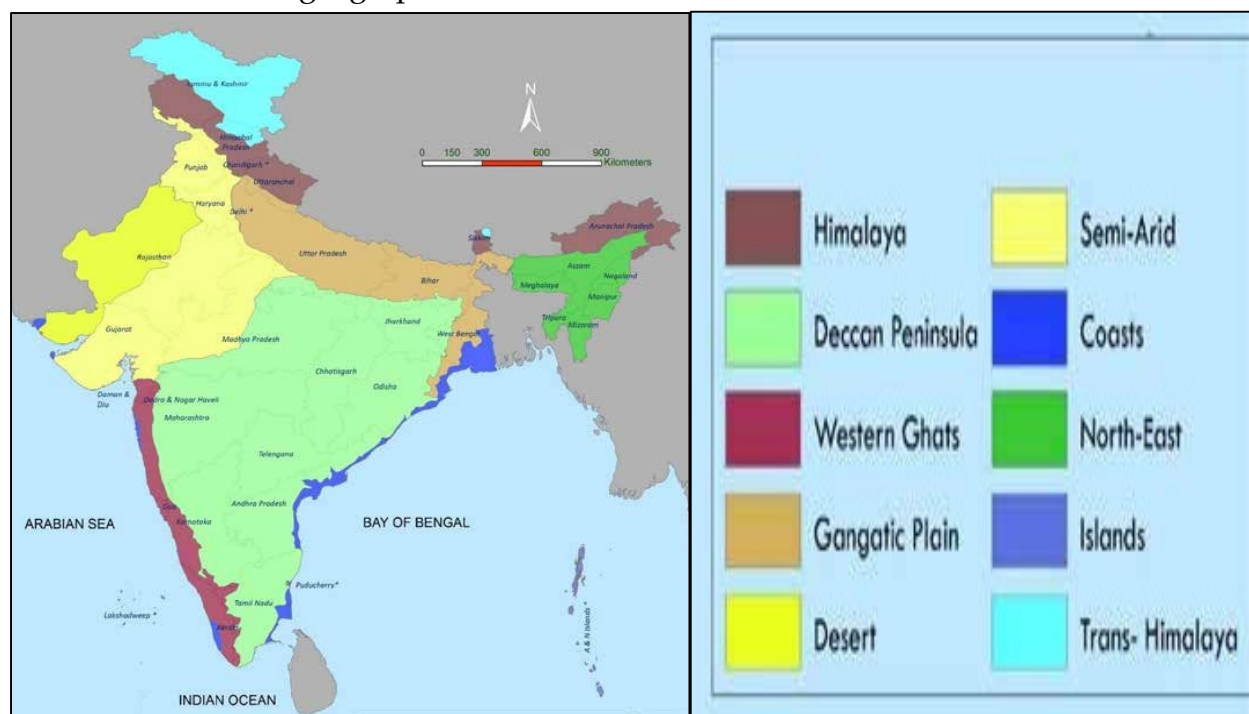
<sup>3</sup> [The Living Planet Report 2020, “Bending the curve of Biodiversity Loss”, World Wildlife Fund & Institute of Zoology \(Zoological Society of London\)](#)

7. India has framed several national acts and policies to conserve the biodiversity. The Environment (Protection) Act (EP Act) enacted in 1986 paved the way for legal interventions for protection of ecosystems including coastal, riverine and wetlands ecosystems. The Wildlife (Protection) Act, 1972, (WP Act), the Forest (Conservation) Act, 1980 (FC Act), the Biodiversity Act and the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (referred to as Forest Rights Act, 2006 hereafter) further strengthen the legal base for conservation and sustainable utilization of biological diversity.

8. Biodiversity encompasses all variety and variability of living organisms. It includes biodiversity within species, between species and diversity of ecosystems. The biodiversity profile of a country at any point of time is a reflection of the presence of this kind of diversity, the consequences of the way it has been utilized and how it has been conserved through legal or other measures. The different aspects of India's biodiversity are discussed in the following sections of this chapter.

### Diversity of regions: Biogeographic zones in India

9. Biogeographic zones are large distinctive units of similar ecology, biome representation, community, and species (e.g., the Himalaya, the Western Ghats). India has 10 identified biogeographic zones<sup>4</sup>.



(Executive summary). Wildlife Institute of India, Dehradun.



S. No.	Biogeographic zones	Biotic provinces	Area (sq.km)
1.	Trans-Himalaya	Ladakh mountains, Tibetan plateau	1,74,225
2.	Himalaya	Northwest, West, Central and East Himalayas	2,10,386
3.	Desert	Thar, Kutch	2,13,672
4.	Semi-arid	Punjab plains, Gujarat Rajputana	5,45,686
5.	Western Ghats	Malabar plains, Western Ghats	1,31,490
6.	Deccan Peninsula	Central highlands, Chhota-Nagpur, Eastern highlands, Central Plateau, Deccan South	13,77,363
7.	Gangetic plains	Upper and Lower Gangetic plains	3,55,025
8.	Coast	West and East coast, Lakshadweep	82,182
9.	North-East	Brahmaputra valley, Northeast hills	1,70,937
10.	Islands	Andaman and Nicobar	12,972
	Marine Influenced Area		10,440

Source: *Ibid*

### **Biodiversity Hotspots in India<sup>5</sup>**

10. The concept of biodiversity hotspots was coined by Norman Myers in 1988. He defined “hotspots” as high concentrations of endemic species with high habitat loss. A biodiversity hotspot is identified based on two criteria<sup>6</sup>:

- i) It must have at least 1500 vascular plants as endemics
- ii) It must have 30% or less of its original natural vegetation.

11. The first point indicates that the region is irreplaceable and the second point indicates that it is threatened. Around the world, 36 areas qualify to be hotspots. These areas constitute just 2.4% of Earth’s land surface, but more than half of the world’s plant species and nearly 43% of bird, mammal, reptile and amphibian species are endemic to these areas – i.e., species found no place else. Among the 36 global biodiversity hotspots of the world, 4 are found within India. These hotspots are discussed in the following paragraphs.

### **The Western Ghats as part of the Western Ghats-Sri Lanka Global Hotspot**

12. The Western Ghats, stretching about 1,600 km from the north of Mumbai to the southern tip of India, hosts a large proportion of the country's plant and animal species; many of which are endemic to India. The Western Ghats are considered as a UNESCO World Heritage Site. There are 39 protected areas including national parks, reserve

<sup>5</sup> Source: [ENVIS Resource Partner on Biodiversity, BSI, MoEFCC](#)

<sup>6</sup> [Biodiversity Hotspots - Conservation International](#)

forests, and wildlife sanctuaries present in the region. It also constitutes approximately 27% of the total Indian flora.

**Table 1: Key Statistics of the Western Ghats**

Hotspot Original Extent (km <sup>2</sup> )	1,89,611
Hotspot Vegetation Remaining (km <sup>2</sup> )	43,611
Endemic Plant Species	3,049
Endemic Threatened Birds	10
Endemic Threatened Mammals	14
Endemic Threatened Amphibians	87
Extinct Species†	20
Human Population Density (people/km <sup>2</sup> )	261
Area Protected (km <sup>2</sup> )	26,130
Area Protected (km <sup>2</sup> ) in Categories I-IV*	21,259

†Recorded extinctions since the year 1500. \*Categories I-IV afford higher levels of protection.  
Source: *ibid*

**Table 2: Species Diversity and Endemism**

Taxonomic Group	Species	Endemic Species	Endemism (%)
Plants	5,916	3,049	51.5
Mammals	140	18	12.9
Birds	458	35	7.6
Reptiles	267	174	65.2
Amphibians	178	130	73.0
Freshwater Fishes	191	139	72.8

Source: *ibid*

### The Nicobar Islands as part of the Sundaland Hotspot

13. The Andaman and Nicobar Islands are situated south of the Burmese peninsula, in the Bay of Bengal. Nicobar Islands are a part of the Sundaland global biodiversity hotspot. Due to high precipitation and their tropical location, the predominant vegetation type in these islands is evergreen forest. There are 11 major forest types in these islands. The islands, comprising only 0.25% of India's geographical area, are home to more than 10% of the country's fauna species.

**Table 3: Key Statistics of the Sundaland Hotspot**

Hotspot Original Extent (km <sup>2</sup> )	15,01,063
Hotspot Vegetation Remaining (km <sup>2</sup> )	1,00,571
Endemic Plant Species	15,000

Endemic Threatened Birds	43
Endemic Threatened Mammals	60
Endemic Threatened Amphibians	59
Extinct Species†	4
Human Population Density (people/km <sup>2</sup> )	153
Area Protected (km <sup>2</sup> )	1,79,723
Area Protected (km <sup>2</sup> ) in Categories I-IV*	77,408

†Recorded extinctions since the year 1500. \*Categories I-IV afford higher levels of protection.  
Source: *ibid*

**Table 4: Species Diversity and Endemism**

Taxonomic Group	Species	Endemic Species	Endemism (%)
Plants	25,000	15,000	60.0
Mammals	380	172	45.3
Birds	769	142	18.5
Reptiles	452	243	53.8
Amphibians	244	196	80.3
Freshwater Fishes	950	350	36.8

Source: *ibid*

### North-eastern region as part of Indo-Burma Hotspot

14. The Northeast region of India comprising of the states of Arunachal Pradesh, Assam, Meghalaya, Manipur, Tripura, Mizoram, Nagaland and Sikkim. The north eastern region has been in focus for its high biodiversity and this region has been a priority for leading conservation agencies of the world. The region is ecologically represented by the Eastern Himalayan biome and is rich in a number of endemic flora and fauna. The Indo-Burma Hotspot has extraordinarily high plant species richness.

**Table 5: Key Statistics of the North-Eastern Region**

Hotspot Original Extent (km <sup>2</sup> )	23,73,057
Hotspot Vegetation Remaining (km <sup>2</sup> )	1,18,653
Endemic Plant Species	7,000
Endemic Threatened Birds	18
Endemic Threatened Mammals	25
Endemic Threatened Amphibians	35
Extinct Species†	1
Human Population Density (people/km <sup>2</sup> )	134
Area Protected (km <sup>2</sup> )	2,35,758

Area Protected (km <sup>2</sup> ) in Categories I-IV*	1,32,283
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†Recorded extinctions since the year 1500. \*Categories I-IV afford higher levels of protection.  
Source: *ibid*

**Table 6: Species Diversity and Endemism**

Taxonomic Group	Species	Endemic Species	Endemism (%)
Plants	13,500	7,000	51.9
Mammals	433	73	16.9
Birds	1,266	64	5.1
Reptiles	522	204	39.1
Amphibians	286	154	53.8
Freshwater Fishes	1,262	553	43.8

Source: *ibid*

### Eastern Himalaya comprising North-eastern Himalayas of India, Bhutan and Nepal

15. The Himalaya Hotspot is home to the world's highest mountains, including Mt. Everest. The mountains rise abruptly, resulting in a diversity of ecosystems that range from alluvial grasslands and subtropical broadleaf forests to alpine meadows above the tree line. Of the estimated 10,000 species of plants in the Himalaya Hotspot, about 3,160 are endemic, as are 71 genera. The largest family of flowering plants in the hotspot is the Orchidaceae, with 750 species<sup>7</sup>. Nearly 980 birds have been recorded in the hotspot, but only 15 are endemic. About 300 mammal species have been recorded in the Himalaya, including a dozen that are endemic to the hotspot—the Endangered golden langur (*Trachypithecus geei*) and Critically Endangered pygmy hog (*Sus salvanius*) among them. The hotspot is home to important populations of numerous large birds and mammals, including vultures, tigers, elephants, rhinos and wild water buffalo.

**Table 7: Key Statistics of the Eastern Himalayas**

Hotspot Original Extent (km <sup>2</sup> )	7,41,706
Hotspot Vegetation Remaining (km <sup>2</sup> )	1,85,427
Endemic Plant Species	3,160
Endemic Threatened Birds	8
Endemic Threatened Mammals	4
Endemic Threatened Amphibians	4
Extinct Species†	0
Human Population Density (people/km <sup>2</sup> )	123

<sup>7</sup>CEPF Himalaya. (n.d.). Retrieved from Critical Ecosystem Partnership Fund (CEPF).

Area Protected (km <sup>2</sup> )	1,12,578
Area Protected (km <sup>2</sup> ) in Categories I-IV*	77,739

†Recorded extinctions since the year 1500. \*Categories I-IV afford higher levels of protection.  
Source: *ibid*

**Table 8: Species Diversity and Endemism**

Taxonomic Group	Species	Endemic Species	Endemism (%)
Plants	10,000	3,160	31.6
Mammals	300	12	4.0
Birds	977	15	1.5
Reptiles	176	48	27.3
Amphibians	105	42	40.0
Freshwater Fishes	269	33	12.3

Source: *ibid*

## India - A Mega Diverse Region

16. A handful of countries, which serve as home to the majority of the world's species, are considered extremely bio diverse. The World Conservation Monitoring Centre recognized 17 mega diverse countries in July 2000. The 17 mega diverse countries of the world are Australia, Brazil, China, Colombia, Democratic Republic of the Congo Ecuador, Indonesia, India, Madagascar, Malaysia, Mexico, Papua New Guinea, Peru Philippines, South Africa, United States, Venezuela. Together, these 17 countries harbour more than 70% of the earth's species. India is one of them. The principle criterion for mega diversity is endemism, first at the species level and then at higher taxonomic levels such as genus and family. To qualify as a mega diverse country, a country must have at least 5000 of the world's plants as endemics and have marine ecosystems within its borders. India qualifies both the criteria.

17. Situated at the tri-junction of Afro-tropical, Indo-Malayan and Paleo-Arctic realm, India has a wide array of ecozones, namely, the deserts, the high mountains, the highlands, the tropical and temperate forests, the swamplands, the plains, the grasslands, and the islands. India represents great geological, geomorphological, climatic, biotic and cultural diversity. The vast diversity of climatic features and habitats has led to a wide variety of flora and fauna.

18. India has tremendous species and ecosystem diversity. Over **1,02,161** species of fauna and **49,441** species of flora have been documented in the 10 biogeographic zones of



the country. The total forest cover area in India is 7,12,249 sq. km, which is 21.67% of total geographic area of the country. Considering floral diversity, out of the 49,441 known plant species in India, 11,554 are endemic (**Table 9**).

**Table 9: India's Floral Species Diversity and Endemism - 2019**

Major Groups	Number of Species	No. of Endemic Species	No. of Threatened Species
<b>Flowering Plants</b>			
Gymnosperms	82	12	12
Angiosperms	18,666	4,303	416
<b>Non-flowering Plants</b>			
Bryophytes	2,780	629	7
Pteridophytes	1,302	66	2
<b>Others</b>			
Virus & Bacteria	1,223		
Algae	7,411	1,924	
Fungi	15,396	c. 4100	1
Lichens	2,581	c. 520	
<b>Total</b>	<b>49,441</b>		

Source: Botanical Survey of India, Kolkata.

19. In the case of fauna, 28,537 species are endemic to the country and account for 28% of the total 1,02,161 species identified so far in India. **Table 10** shows the known faunal species, their endemism and threat status.

**Table 10: India's Faunal Species Diversity and Endemism - 2019**

Major Groups	Number of Species	No. of Endemic Species	No. of Threatened Species
<b>Protozoans</b>	3,545	640	
<b>Invertebrates</b>	91,800	26,782	135
<b>Chordates</b>	6,816	1,115	540
<b>Of which</b>			
Fishes	3,439	482	228
Amphibia	427	287	75
Reptilia	641	220	54
Birds	1,343	81	89
Mammals	429	45	94
<b>Total</b>	<b>1,02,161</b>	<b>28,537</b>	<b>675</b>

20. Along with many other countries, India has its own fair share of issues due to Invasive Alien Species. Invasive alien species are species whose introduction and/or spread outside their natural past or present distribution threatens biological diversity.

Some example of the commonly found faunal alien species in India are the African apple snail (*Achatina fulica*), Papaya Mealy Bug (*Paracoccus marginatus*), Cotton Mealy Bug (*Phenacoccus solenopsis*) and Amazon sailfin catfish (*Pterygoplichthys pardalis*), while commonly found floral alien species in India are *Prosopis juliflora*, *Vilayti Kikar*, *Parthenium hysterophorus*, *Lantana camara* and *Water hyacinth (Eichhornia crassipes)*.

**Table 11: Invasive Alien Species of India**

Category	Number of Invasive Alien Species
Terrestrial Plants	54
Aquatic Ecosystem	56
Agriculture Ecosystem	44
Island Ecosystem	14
Total	168

*Source: National Biodiversity Authority*

### Taxonomic diversity of India

21. The Botanical Survey of India (BSI) and the Zoological Survey of India (ZSI) are the two apex organisations of India that have been actively engaged in taxonomic study of all major groups of Indian plants and animals, respectively. Every year, these two organisations collate information on the discoveries during the previous year using the research published by scientists on various aspects of taxonomy including species new to science and new records. Statements on the taxonomic diversity of the States of India, as presented in this publication, have been prepared using the information made available by the BSI, ZSI, National Biodiversity Authority and the State Biodiversity Boards. **Table 12** below gives the phylum-wise details of the taxonomic diversity of India.

**Table 12: Number of Fauna and Flora Species in India - 2019**

Category	Taxonomic group	Number of Species in India	
FAUNA	<b>Protista</b>	<b>3,545</b>	
	Phylum Protozoa	3,545	
	<b>Animalia</b>	<b>98,616</b>	
	INVERTEBRATA	Phylum Mesozoa	10
		Phylum Porifera	550
		Phylum Cnidaria	1,453
		Phylum Ctenophora	19
		Phylum Platyhelminthes	1,789
		Phylum Rotifera	467
		Phylum Gastrotricha	163
Phylum Kinorhyncha		10	

Category	Taxonomic group	Number of Species in India	
	Phylum Nematoda	2,984	
	Phylum Acanthocephala	306	
	Phylum Sipuncula	41	
	Phylum Mollusca	5,227	
	Phylum Echiura	47	
	Phylum Annelida	1,035	
	Phylum Onychophora	1	
	Phylum Arthropoda	76,461	
	Phylum Phoronida	3	
	Phylum Bryozoa (Ectoprocta)	337	
	Phylum Entoprocta	10	
	Phylum Brachiopoda	8	
	Phylum Chaetognatha	44	
	Phylum Tardigrada	31	
	Phylum Nemertea	6	
	Phylum Echinodermata	784	
	Phylum Hemichordata	14	
	Phylum Protochordata		
	VERTEBRATA	Phylum Chordata	6,816
		<i>Of Which</i>	
Class Pisces: Fresh water Fishes		3,439	
Class Pisces: Marine and Estuarine Fishes			
Class Amphibia		427	
Class Reptilia		641	
Class Aves		1,343	
Class Mammalia	429		
<b>TOTAL FAUNAL SPECIES</b>		<b>1,02,161</b>	
FLORA	Virus/Bacteria	1,223	
	Algae	7,411	
	Fungi	15,396	
	Lichens	2,581	
	Bryophytes	2,780	
	Pteridophytes	1,302	
	Gymnosperms	82	
	Angiosperms	18,666	
<b>TOTAL FLORAL SPECIES</b>		<b>49,441</b>	
<b>GRAND TOTAL (FLORA + FAUNA)</b>		<b>1,51,602</b>	

22. Statement on the taxonomic diversity of the States is given in **Annexure 5.1**. A more detailed discussion on the crop diversity and the floral diversity in the forests of India can also be seen in the chapters on croplands and forests in this publication.

### **India's pride –Tiger and Elephant**

23. Large animals need large areas. When these areas are protected, thousands of other plants and animals also benefit from this protection. Failing to protect them can lead not only to the extinction of these species, but the loss of many other plant and animal species that make up the ecological community of their habitat. This loss of species and genetic level biodiversity also impacts ecosystem functions and makes ecosystems less resilient to environmental shocks and change (including climate change). This also threatens the supply of future ecosystem services. These considerations are reflected in India's long standing and successful track record of protecting its tigers and elephants.

24. Sitting at the crown of the food-chain, the tiger is the apex predator in the Indian jungle. The tiger is vitally important in culling its prey-base in a sustainable manner. If it didn't, the prey-base would breed exponentially with no natural control and the forest would not be able to provide the prey base with sufficient fodder.

25. A lesser known fact is that tiger habitats help to store more carbon on an average as compared to the other forests in the region, and therefore help to stem the tide of global warming and climate change. In fact, according to WWF, there is significant evidence to prove that eliminating a large carnivore population has a severe anthropogenic impact on nature.

26. Elephants, on the other hand, are known for their nomadic behaviour, and the daily and seasonal migrations they make through their home ranges are immensely important to the environment. They are landscape architects, creating clearings in the forest, preventing overgrowth of certain plant species and allowing space for the regeneration of others, which in turn provide sustenance to other herbivorous animals.

27. These are some of the reasons why the Elephant and Tiger are regarded as the "National Heritage" Animals of India. Both the Elephant and Tiger are accorded highest protection under Schedule I species of Wildlife (Protection) Act, 1972 and listed as endangered species by International Union for Conservation of Nature (IUCN). Around 50-60% of the estimated world Asian elephant's population is in India, which is also home to 60% of the global tiger population, reflective of the conservation initiatives.

28. According to most recent all India elephant estimation (2017), the elephant population in the country is estimated to be 29,964 and captive elephant population (2018) is 2,675 (as reported by States). The overall tiger population in India was estimated at 2,967 (Standard Error range 2,603 to 3,346).

29. The status of tiger reserves and their population in India (for the year 2018-19) is given in Statement 5.1, while that for the elephant reserves of India (as on 16.08.2018) is given in Statement 5.2. The estimated tiger numbers in States and Landscapes of India are given in Statement 5.3 and the region wise population estimation of elephants in India, 2017 is given in Statement 5.4.

30. India's national tiger assessment is the largest biodiversity survey being carried out anywhere in the world. To aid conservation of these two species, Project Elephant (initiated in 1991-92) and Project Tiger (initiated in 1973) are being carried out in India, some highlights of which are given in the following paragraphs.

### **Project Tiger<sup>8</sup>**

31. Project Tiger aims to harness the functional role of the tiger and its charisma to garner resources and public support for conserving representative ecosystems. It was initiated in 1973 with nine tiger reserves (around 18,278 km<sup>2</sup>), and has now expanded to cover 50 tiger reserves (72,749 km<sup>2</sup>) covering about 2.21% of India's geographical area. The National Tiger Conservation Authority (NTCA) in collaboration with the State Forest Departments, Conservation NGO's and coordinated by the Wildlife Institute of India (WII), conducts a National assessment for the "Status of Tigers, Co-predators, Prey and their Habitat" every four years since 2006.

32. Primary data collection for occupancy, habitat assessment, human impacts and prey assessment are done by the frontline staff of the forest departments of the 20 tiger states. Since the field methodology being used for the status assessment has essentially been the same since 2006, the competency of the wildlife managers in conducting these exercises has increased significantly over the years. Now camera traps are regularly used by the management staff of all tiger reserves each year to estimate the minimum number of tigers. Some wildlife managers have been trained and have acquired skills for designing, implementing and analyzing capture-mark-recapture and distance sampling based studies.

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<sup>8</sup>[Jhala, Y.V., Qureshi, Q. and Nayak, A.K. \(eds\) 2020. Status of tigers, copredators and prey in India, 2018. National Tiger Conservation Authority, Government of India, New Delhi, and Wildlife Institute of India, Dehradun](#)



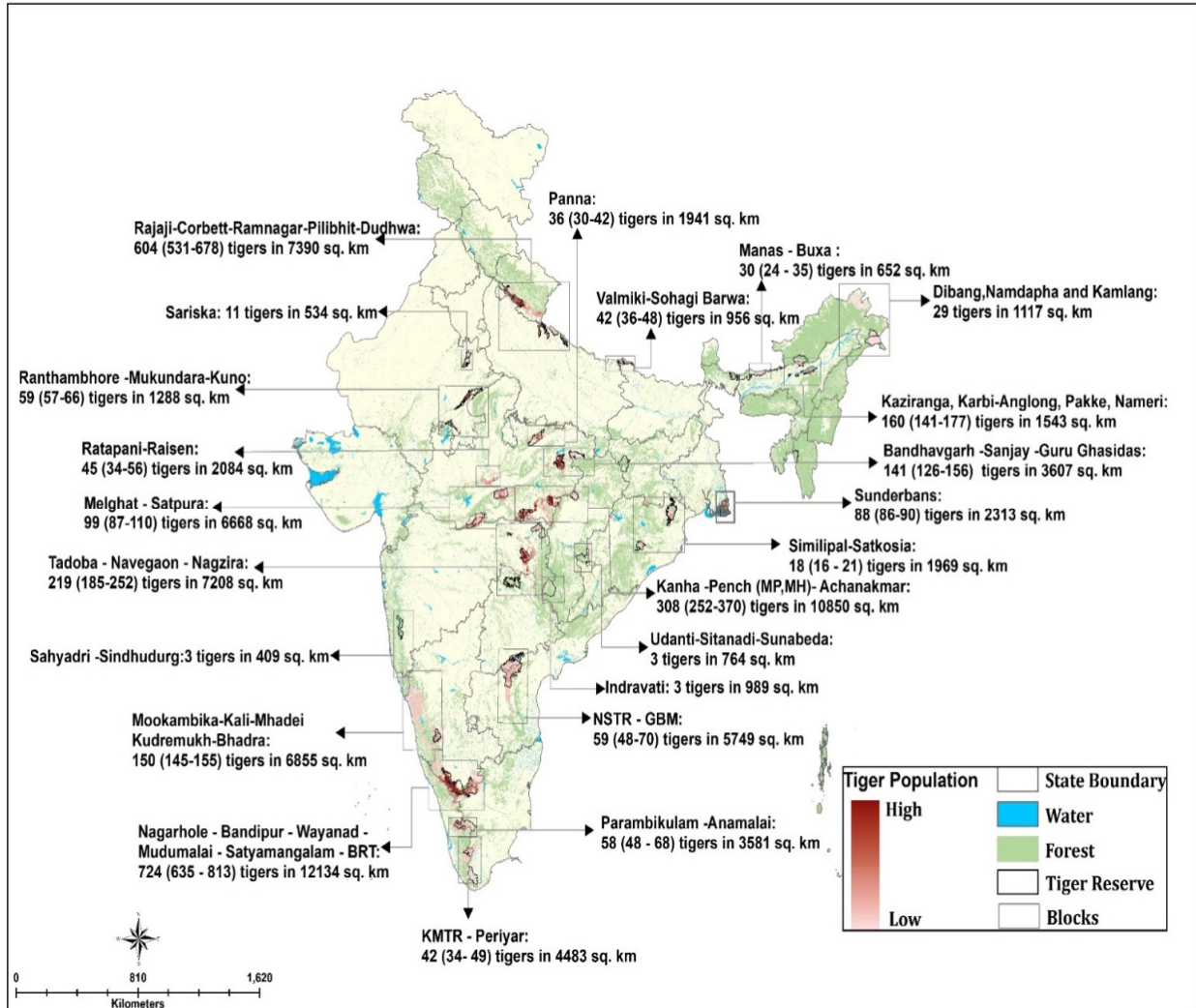
33. The fourth status assessment of tigers conducted in the year 2018 was the most comprehensive to date, in terms of both resource and data amassed. Camera traps were placed in 26,838 locations across 141 different sites in 20 States known to host Tigers and surveyed an effective area of 1,21,337 square kilometres. These camera traps captured 3,48,58,623 photographs of wildlife - 76,651 of which were tigers, 51,777 were leopards, and the remaining were those of other native fauna. From these photographs, individual tigers were identified using stripe-pattern-recognition software. The latest “tiger census” has been recognized by Guinness World Records as the largest camera-trap wildlife survey in the world.

34. The magnitude of anthropogenic disturbances within Tiger Reserves and tiger occupied areas are assessed using a Relative Abundance Index (RAI) obtained through camera trap images of livestock, free ranging domestic dogs, wild animals with traps, poachers with arms or poached carcasses.

#### **Highlights of the latest Tiger Assessment - 2018**

- The overall tiger population in India was estimated at 2,967 (SE range 2,603 to 3,346). Out of this, 83% were actually camera trapped individual tigers and 87% were accounted for by camera trap-based capture-mark-recapture and remaining 13% were estimated through appropriate models (Statement 5.3).
- Tigers were observed to be increasing at a rate of 6% per annum in India when consistently sampled areas were compared from 2006 to 2018.
- Overall tiger occupancy, based on the forest cover survey report by Forest Survey of India (2017), was found to be stable at 88,985 km<sup>2</sup> (in year 2017) at the country scale since 2014, when the tiger occupancy was 88,558 km<sup>2</sup>.
- The largest contiguous tiger population in the world of about 724 tigers was found in the Western Ghats while the second largest population of about 604 tigers was found across Uttarakhand and western Uttar Pradesh.
- The density of tiger was found to be significantly and strongly related with prey abundance indices. It increases as chital, sambar and gaur encounter rates as well as their dung density increased.
- Security, in the form of protected areas, has harbored higher tiger densities.

Figure 2: Tiger Population Map in Tiger Reserves - 2018



## Project Elephant

35. **Project Elephant** was launched by the Government of India in the year 1991-92 with the following objectives:

- Protection of Elephants: control of poaching, patrolling, weapons, equipment, intelligence gathering, etc.
- Improvement of habitats and corridors: eco restoration, land acquisition, resettlement & rehabilitation, soil and water conservation;
- Human-Elephant Conflicts: crop protection measures, elephant proof trenches, solar power fencing, translocation of elephants, early warning systems, awareness and training programme for securing elephant corridors in the country for the safe passage of elephants; and

- Captive Elephant Welfare: Elephant Rescue & Rehabilitation Centers, Elephant welfare committees, veterinary services, public education.

36. Under the Project, critical elephant habitats have been notified as “Elephant Reserves” for better management of wild elephants. There are 30 notified and 1 proposed Elephant Reserve in the country (Khasi Hills Elephant Reserve in Meghalaya). Further, several guidelines have been issued under the Project including those for ‘management of Human Elephant Conflict’, ‘care and management of captive elephants’, Protocol on Transboundary Elephant Conservation between India and Bangladesh, Standard Operating Procedure (SOP) for Dealing with Captive and Wild Elephant Deaths Due to Anthrax/Suspected Cases of Anthrax.

37. These concerted efforts towards achieving the objectives of Project Elephant have resulted in an increase of wild elephant population from an estimated 15,000 in 1980 to almost 30,000 in 2017. For the first time in India, an all India synchronized elephant census was conducted in 2017.

#### **Highlights of the latest Elephant Assessment**

- There are 30 notified Elephant Reserves, extending over about 65,507 sq km, and 1 proposed Elephant Reserve in the country (Statement 5.2).
- The all India enumeration of wild population of elephants in the country is carried out at every five-year interval. The estimated population of wild elephants in the country has increased to 29,964 as compared to 27,669-27,719 in 2007.
- Asiatic Elephants (*Elephas maximus*) were once widespread in India and old literatures indicate that even during the Moghul period, elephants were found all over India. However, the current distribution of wild elephant in India is now restricted to four general areas: north-eastern India, central India, north-western India and southern India.
- In north-eastern India, the elephant range extends from the eastern border of Nepal in northern West Bengal and passes through parts of upper and western Assam, eastern Arunachal Pradesh, the foothills of Nagaland, as also some areas of Garo and Khasi Hills of Meghalaya. Isolated herds have also been observed in Tripura, Mizoram, Manipur, and the Barak valley districts of Assam.
- In central India, highly fragmented elephant populations are found in the States of Odisha, Jharkhand, and the southern part of West Bengal, with some animals wandering into Chhattisgarh.
- In north-western India, the species occurs in six fragmented populations at the foot of the Himalayas in Uttarakhand and Uttar Pradesh.

- There are eight main fragmented populations in southern India: in northern Karnataka; the crestline of Karnataka–Western Ghats; Bhadra– Malnad; Brahmagiri–Nilgiris–Eastern Ghats; Nilambur–Silent Valley–Coimbatore; Anamalais–Parambikulam; Periyar–Srivilliputhur; and Agasthya malai.

### **Monitoring of Illegal Killing of Elephants (MIKE) Programme**

38. In addition to the Project Elephant, elephants in India are also being monitored under the MIKE Programme, with the following objectives:

- To measure levels and trends in the illegal hunting of elephants;
- To determine changes in these trends over time; and
- To determine the factors causing or associated with such changes, and to try and assess in particular to what extent observed trends are a result of any decisions taken by the Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

39. Under the MIKE programme, data are being collected on a monthly basis in specified MIKE patrol forms from eight MIKE sites, viz., Chirang Ripu (Assam), Dhang Patki (Assam), Eastern Dooars (WB), Deomali (Arunachal Pradesh), Garo Hills (Meghalaya), Mayurbhanj (Odisha), Mysore (Karnataka), Nilgiri (Tamil Nadu), Shivalik (Uttarakhand) and Wayanad (Kerala).

### **Conservation Measures in India**

40. There are two broad approaches in conservation that are adopted to protect and maintain biodiversity - in-situ and ex-situ. In-situ conservation refers to the conservation of species in their natural habitats, while ex-situ conservation is the preservation of components of biological diversity outside their natural habitats, e.g., zoos. In-situ conservation is considered the most appropriate way of conserving biodiversity. Conserving the areas where populations of species exist naturally is an underlying condition for the conservation of biodiversity and hence, protected areas form a central element of any national strategy to conserve biodiversity.

41. The International Union for Conservation of Nature (IUCN) is a membership Union composed of both government and civil society organisations. The IUCN, through its World Commission on Protected Areas develops knowledge based policy, advice and guidance on the full suite of issues surrounding protected areas. The enlisting of protected areas is part of a strategy being used toward the conservation of the world's

natural environment and biodiversity. The IUCN has developed the *protected area management categories* system to define, record, and classify the wide variety of specific aims and concerns when categorising protected areas and their objectives.

42. In India, the Protected Areas are declared under Wildlife (Protection) Act, 1972. India has 18 biosphere reserves and 86 conservation reserves. Amongst the protected areas, India has 101 national parks and 553 sanctuaries covering an area of 1.6 lakh sq. km.

### **Wildlife Sanctuary**

43. A Wildlife Sanctuary is a natural habitat, owned by the government or private agency, which safeguards particular species of birds and animals. It restricts any activity that puts animals/species at any unduly stressful condition. It corresponds to IUCN Category IV Protected areas. In India, there are 553 wildlife sanctuaries as of December 2019.<sup>9</sup>

### **National Parks**

44. IUCN has defined 'National Parks' as Category II type of protected areas. It is established by central or state government. These areas are protected from human exploitation, pollution and stand for conservation of wild nature. There are 101 national parks in India as of December 2019.

### **Conservation Reserves and Community Reserves**

45. Conservation Reserves and Community Reserves denote those protected areas of India which typically act as buffer zones to or connectors and migration corridors between established national parks, wildlife sanctuaries and reserved and protected forests of India. Such areas are designated as conservation areas if they are uninhabited and completely owned by the Government of India but used for subsistence by communities and community areas if part of the lands are privately owned. These protected area categories were first introduced in the Wildlife (Protection) Amendment Act of 2002. These categories were added because of reduced protection in and around existing or proposed protected areas due to private ownership of land and land use.

### **Biosphere Reserves (BR)**

46. These are large areas of bio diversity where flora and fauna are protected. These regions of environmental protection approximately correspond to IUCN Category V of Protected areas. They may cover multiple national parks and wildlife sanctuaries. These are established to protect biodiversity of a larger area. There are 18 Biosphere Reserves in

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<sup>9</sup>[ENVIS Centre on Wildlife & Protected Areas, Wildlife Institute of India](#)



India established by the government. The concept of biosphere reserves is the key to achieving a balance between conserving biodiversity, encouraging economic and social development and preserving cultural values.

**Table 13: Status of different categories of Protected Areas in India**

Categories of Protected Area		Number	Area (in Km <sup>2</sup> )
Terrestrial Protected Area	National Parks	101	40564
	Wild Life Sanctuaries	553	119757
	Community Reserves	163	833
	Conservation Reserves	89	4128
	<b>Total</b>	<b>906</b>	<b>165282</b>
Marine Protected Areas	National Parks	13	2798
	Sanctuaries	116	6909
	Community/ Conservation Reserves	4	272
	<b>Total</b>	<b>133</b>	<b>9979</b>

Source: 1. Wildlife Institute of India and K Sivakumar, *Coastal and Marine Biodiversity Protected Areas in India: Challenges and Way Forward*, K. Venkataraman et al. (eds.), *Ecology and Conservation of Tropical Marine Faunal Communities*, Springer-Verlag Berlin Heidelberg 2013.

*State-wise number of Terrestrial and Marine Protected Areas is given at Annexure 5.2.*

### Insights into the Red List Species in India

47. The International Union for Conservation of Nature (IUCN) Red List of Threatened Species is one of the most well-known objective assessment systems for classifying the status of plants, animals and other organisms threatened with extinction. It contains explicit criteria and categories to classify the conservation status of individual species on the basis of their probability of extinction.

48. The IUCN Red List categories and criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. It divides species into nine categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct. Any species that has been assessed as Critically Endangered, Endangered or Vulnerable are called 'threatened species'. The IUCN list also includes 'Least Concern' Species, which have a lower risk of extinction, but are still important in terms of global biodiversity. Some 'Least Concern' species are undergoing slow declines and hence, it is important to monitor these species and to develop appropriate conservation actions to prevent them from becoming threatened in the future. The inclusion of the different categories of species helps track the changing status of biodiversity.

49. The IUCN Red List is a powerful tool to inform and catalyse action for biodiversity conservation and policy change, critical to protecting the natural resources required for survival. By providing information about range, population size, habitat and ecology, use and/or trade, threats and conservation actions, the IUCN Red List helps inform necessary conservation decisions and guide funding priorities.

50. The IUCN Red List relies on Assessors (trained individuals and species experts) to assess species based on the currently available data and information. The information is gathered from a range of sources, including published scientific papers, books, reports, expert knowledge, indigenous knowledge and citizen science. The Red List Authorities review the assessments, and then the IUCN Red List Unit checks the assessments before publishing them on IUCN Red List website.

### **IUCN Red List Spatial Data**

51. The IUCN Red List of Threatened Species contains global assessments for over 1,20,000 species. The IUCN provides, in public domain, intercontinental species shape files with the Geographic Coordinate System as *GCS\_WGS\_1984* and the Unit as *Degree* (~100km). The IUCN data repository has spatial datasets on mammals, amphibians, birds, reptiles, fishes, plants and other groups. More than 80% of the total red list species (>96,600 species) have spatial data<sup>10</sup>. The data is freely accessible and includes taxonomic information, distribution status, IUCN Red List Category, sources and other relevant details. More information and resources can be found at the IUCN Red List Resources & Publications page<sup>11</sup>.

52. The IUCN spatial datasets can be used to evaluate the species richness of the red list species for any defined region/area. Species Richness represents a measure of variety of species based simply on a count of the number of species in a particular sample and is generally expressed as the number of species per unit area.

53. In order to facilitate its use, the IUCN Red List Toolbox for ArcMap<sup>12</sup> is also available alongside the dataset, which intersects the red list species polygon with a grid or shapefile of polygons, giving the number of species per cell or region polygon. The toolbox also enables preparation of Species Richness Map, which shows the number of IUCN red list species found per pixel having area 0.07 degree<sup>2</sup>, or roughly 865 sq.km.

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<sup>10</sup><https://www.iucnredlist.org/resources/spatial-data-download>

<sup>11</sup><https://www.iucnredlist.org/resources>

<sup>12</sup><https://www.iucnredlist.org/resources/spatialtoolsanddata>

54. To understand the distribution of the red listed species in India, an exercise was undertaken using IUCN spatial datasets on mammals, amphibians and reptiles, using the IUCN Red List of Threatened Species, Red List Version 2020-2 downloaded on August 31, 2020. The number of red listed terrestrial species in India under these categories, as available in the IUCN spatial datasets is given in the following **Table 14**.

**Table 14: Data availability for India in IUCN Spatial Database as on August 31, 2020**

Category	Acronym	Number of Species		
		Mammals	Amphibians	Reptiles
Critically Endangered	CR	9	20	10
Endangered	EN	60	36	13
Near Threatened	NT	58	13	11
Vulnerable	VU	87	23	23
Least Concerned	LC	338	119	199
Data Deficient	DD	40	87	66
<b>Grand Total</b>		<b>592</b>	<b>298</b>	<b>322</b>

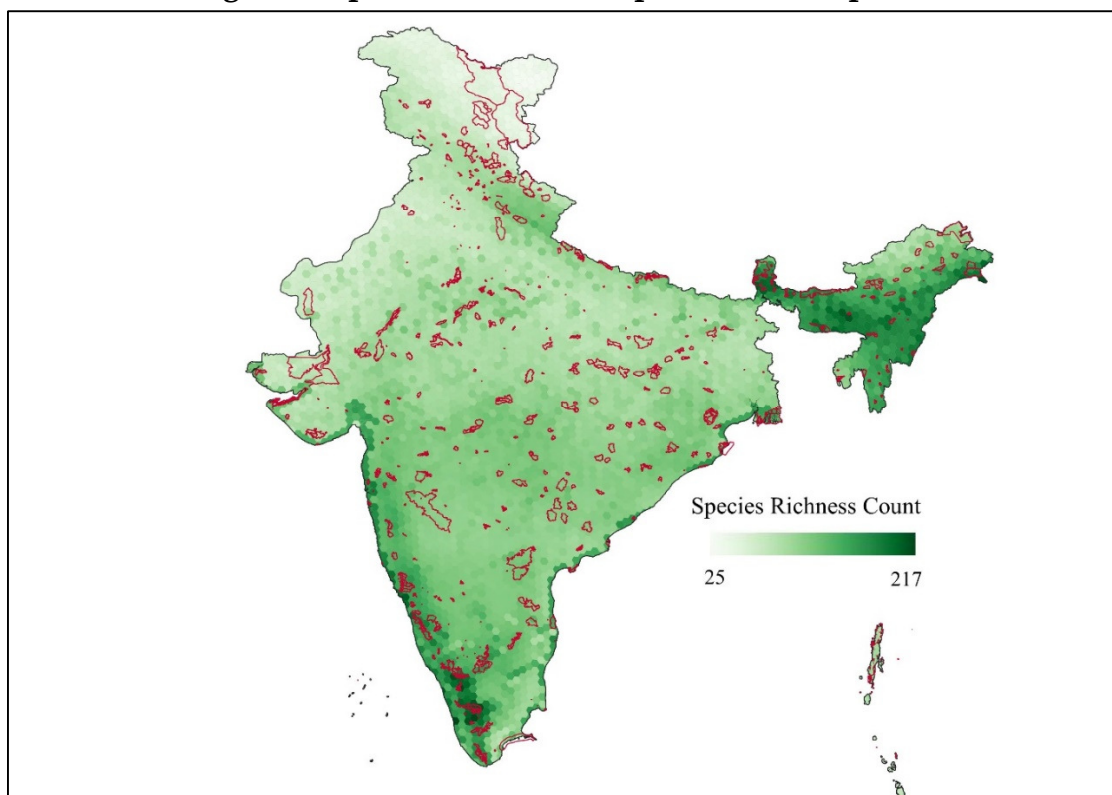
55. The state level red list species counts, as compiled using the IUCN Red List Toolbox, are given in the **Table 15** and **Figure 3** shows the species richness across the country, with the protected areas of India marked on the map.

**Table 15: State wise Count of IUCN Red List Species**

State/UT	Species Richness Count		
	Mammals	Amphibians	Reptiles
Andhra Pradesh	126	23	79
Arunachal Pradesh	195	77	60
Assam	179	61	60
Bihar	126	25	43
Chhattisgarh	81	23	40
Delhi	49	10	12
Goa	108	31	61
Gujarat	120	18	62
Haryana	92	11	19
Himachal Pradesh	123	17	19
Jammu & Kashmir	152	16	22
Jharkhand	82	20	46
Karnataka	147	82	102
Kerala	144	103	140
Madhya Pradesh	93	16	44
Maharashtra	132	44	95
Manipur	146	42	54
Meghalaya	142	53	50

State/UT	Species Richness Count		
	Mammals	Amphibians	Reptiles
Mizoram	130	27	49
Nagaland	138	53	52
Odisha	112	24	72
Punjab	87	11	16
Rajasthan	90	10	25
Sikkim	157	27	32
Tamil Nadu	152	80	158
Telangana	83	21	44
Tripura	99	24	39
Uttar Pradesh	121	20	39
Uttarakhand	139	23	26
West Bengal	211	53	93
Andaman & Nicobar	55	14	40
Chandigarh	56	10	9
Dadra & Nagar Haveli	69	19	31
Daman & Diu	94	11	45
Lakshadweep	27		5
Puducherry	104	19	64

**Figure 3: Species Richness Map of Red List Species**



^ Species includes Mammals, Amphibians, Reptiles; the red polygons indicate the protected areas.

## **Legal Backing for Conservation of Threatened Species in India**

56. Law is a reflection of the needs and demands of society. The very existence of legislation is proof that some consensus has developed concerning the importance of conserving species and ecosystems. Supporting the identification of threatened species by the Botanical Survey of India and the Zoological Survey of India, plants and animals, which are on the verge of extinction or likely to become extinct in the near future, are notified legally as threatened species under Section 38 of the Biological Diversity Act, 2002.

57. Section 38 of the Biological Diversity Act, 2002 provides for the Central Government, in consultation with the concerned State Government, to notify 'any species which is on the verge of extinction or likely to become extinct in the near future as a threatened species and prohibit or regulate collection thereof for any purpose and take appropriate steps to rehabilitate and preserve those species'.

58. The notification process under Section 38 is facilitated by the National Biodiversity Authority (NBA) in consultations with the Botanical Survey of India for plants and the Zoological Survey of India for animals through the concerned State Biodiversity Boards.

59. These notifications are available in public domain on the website of National Biodiversity Authority at <http://nbaindia.org/content/18/21/1/notifications.html>.

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**Statement 5.1: Population estimates of tigers in tiger reserves for the year 2018-19**

States	Tiger Reserves	Tigers utilizing the Tiger Reserve		Tigers within the Tiger Reserve	
		Number	Standard Error	Number	Standard Error
<b>Shivalik Hills and Gangetic Plains</b>					
Bihar	Valmiki	33	1	32	0.06
Uttar Pradesh	Dudhwa	107	16	82	3.4
Uttar Pradesh	Pilibhit	65	3	57	0.3
Uttarakhand	Corbett	266	6	231	0.3
Uttarakhand	Rajaji	52	5	38	1
<b>Central India and Eastern Ghats</b>					
Andhra Pradesh	Nagarjunasagar Srisailem	43	2	38	0.03
Chhattisgarh	Achankamar	–	–	5	–
Chhattisgarh	Indravati*	3	–	3	–
Chhattisgarh	Udanti Sitanadi	–	–	1	–
Jharkhand	Palamau	–	–	0	–
Madhya Pradesh	Bandhavgarh	124	5	104	0.43
Madhya Pradesh	Kanha	108	5	88	0.45
Madhya Pradesh	Panna	31	3	25	0.5
Madhya Pradesh	Pench	87	10	61	4
Madhya Pradesh	Satpuda	47	2	40	0.02
Madhya Pradesh	Sanjay Dubri	6	–	5	–
Maharashtra	Bor	–	–	6	–
Maharashtra	Meighat	49	2	46	0.04
Maharashtra	Navegaon Nagzira	6	1	6	0.003
Maharashtra	Pench	82	8	53	2.5
Maharashtra	Sahyadri*	–	–	3	–
Maharashtra	Tadoba	106	6	83	1.15
Odisha	Satkosia	–	–	1	–
Odisha	Simlipal	12	1	8	0.04
Rajasthan	Mukundra	–	–	1	–
Rajasthan	Ranthambore	55	1	53	0.17
Rajasthan	Sariska	–	–	11	–
Telangana	Amrabad	9	2	7	0.25
Telangana	Kawal	–	–	1	–
<b>Western Ghats</b>					
Karnataka	Bandipur	173	12	126	2
Karnataka	Bhadra	38	4	30	0.32
Karnataka	Biligiri Rangaswamy Temple	86	8	52	0.25

States	Tiger Reserves	Tigers utilizing the Tiger Reserve		Tigers within the Tiger Reserve	
		Number	Standard Error	Number	Standard Error
Karnataka	Anshi Dandeli (Kali)	11	–	4	–
Karnataka	Nagarhole	164	7	127	0.43
Kerala	Parambikulam	33	3	26	0.2
Kerala	Periyar	33	6	26	0.46
Tamil Nadu	Anamalai	25	3	20	0.23
Tamil Nadu	KMTR	8	1	7	0.01
Tamil Nadu	Mudumalai	162	10	103	0.38
Tamil Nadu	Sathyamangalam	126	6	83	2
<b>NE Hills and Brahmaputra Plains</b>					
Arunachal Pradesh	Kamlang*	–	–	4	1
Arunachal Pradesh	Namdapha*	–	–	11	1
Arunachal Pradesh	Pakke	–	–	3	–
Assam	Kaziranga	135	7	104	10
Assam	Manas	31	2	31	2
Assam	Nameri	–	–	3	–
Assam	Orang	21	3	21	2.8
Mizoram	Dampa	–	–	0	–
West Bengal	Buxa	–	–	0	–
<b>Sundarban</b>					
West Bengal	Sundarvan	106	4	88	2

Source: Status of Tigers Copredators & Prey in India 2018, National Tiger Conservation Authority & Wildlife Institution of India

#: MaxEnt model result; \*: scat DNA result

\*\* Same three tigers in Nameri and Paake. In some tiger reserves that abut each other (Bandipur, Madumalai, and Sathyamangalam; Pench – Madhya Pradesh and Pench - Maharashtra) individual tigers could be double counted. These double counts are accounted for in estimating the tiger population at the landscape and State scale. In order to minimize double count of tigers the estimate of “Tigers within Tiger Reserves” is to be used.

**Statement 5.2: Elephant reserves in India (as on 16.08.2018)**

Sl. No	State	Elephant Range	Elephant Reserve with date of notification	Total Area (Sq. Km)
I	West Bengal	Eastern India (South West Bengal- Jharkhand- Orissa)	1. Mayurjharna ER(24.10.02)	414
	Jharkhand		2. Singhbhum ER (26.9.01)	4,530
	Orissa		3. Mayurbhanj ER (29.9.01)	3,214
	Orissa		4. Mahanadi ER (20.7.02)	1,038
	Orissa		5. Sambalpur ER (27.3.02)	427
	Chhattisgarh		6. Badalkhol-Tamorpingla (15.9.2011)	1,048
	<b>Sub total</b>			<b>10,671</b>
II	Arunachal Pradesh	North Brahmaputra	7. Kameng ER (19.6.02)	1,892
	Assam		8. Sonitpur ER (6.3.03)	1,420
	<b>Sub total</b>			<b>3,312</b>
III	Assam	South Brahmaputra	9. Dihing-Patkai ER (17.4.03)	937
	Arunachal Pradesh		10. South Arunachal ER (29.2.08)	1,958
	<b>Sub total</b>			<b>2,895</b>
IV	Assam	Kaziranga	11. Kaziranga - Karbi Anglong (17.4.03)	3,270
	Assam		12. Dhansiri-Lungding ER (19.4.03)	2,740
	Nagaland		13. Intanki ER (28.2.05)	202
	Nagaland		14. Singphan ER* (16.8.2018)	24
	<b>Sub total</b>			<b>6,236</b>
V	Assam	Eastern Dooars	15. Chirang-Ripu ER (7.3.03)	2,600
	West Bengal		16. Eastern Dooars ER (28.8.02)	978
	<b>Sub total</b>			<b>3,578</b>
VI	Meghalaya	E. Himalayas	17. Garo Hills ER (31.10.01)	3,500
	<b>Sub total</b>			<b>3,500</b>
VI I	Karnataka	Nilgiri - Eastern Ghat	18. Mysore ER (25.11.02)	8,056
	Karnataka		19. Dandeli ER (26.03.2015)	2,321
	Kerala		20. Wayanad ER (2.4.02)	1,200
	Tamil Nadu		21. Nilgiri ER (19.9.03)	4,663
	Andhra Pradesh		22. Rayala ER (9.12.03)	766
	<b>Sub total</b>			<b>17,006</b>
VI II	Kerala	South Nilgiri	23. Nilambur ER (2.4.02)	1,419
	Tamil Nadu		24. Coimbatore ER (19.9.03)	566
	<b>Sub total</b>			<b>1,985</b>
IX	Tamil Nadu	Western Ghat	25. Anamalai ER (19.9.03)	1,457
	Kerala		26. Anaimudi ER (2.4.02)	3,728
	<b>Sub total</b>			<b>5,185</b>
X	Kerala	Periyar	27. Periyar (2.4.02)	3,742
	Tamil Nadu		28. Srivilliputtur ER(19.9.03)	1,249
	<b>Sub total</b>			<b>4,991</b>
XI	Uttarakhand	North India	29. Shivalik ER (28.10.02)	5,405
	Uttar Pradesh		30. Uttar Pradesh ER (9.9.09)	744
	<b>Sub total</b>			<b>6,149</b>
	<b>TOTAL</b>			<b>65,507</b>

**Statement 5.3: Estimated number of tiger in States and Landscapes of India**

State	Tiger Population			
	2006	2010	2014	2018
<b>Shivalik Hills and Gangetic Plains Landscape</b>				
Bihar	10 (7-13)	8	28(25-31)	31 (26 - 37)
Uttarakhand	178 (161-195)	227 (199-256)	340 (299-381)	442 (393 - 491)
Uttar Pradesh	109 (91-127)	118 (113-124)	117 (103-131)	173 (148 - 198)
Shivalik-Gangetic	297 (259-335)	353(320-388)	485 (427-543)	646 (567 - 726)
<b>Central Indian Landscape and Eastern Ghats</b>				
Andhra Pradesh	95 (84-107)	72 (65-79)	68 (58-78)	48 (40 - 56)#
Telangana	-	-	-	26 (23 - 30)#
Chhattisgarh	26 (23-28}	26 (24-27)	46 (39-53)*	19 (18 - 21)
Jharkhand	-	10 (6-14)	3*	5
Madhya Pradesh	300 (236-364)	257 (213-301)	308 (264-352)*	526 (441 - 621)
Maharashtra	103 (76-131)	168 (155-183)	190 (163-217)*	312 (270 - 354)
Odisha	45 (37-53)	32 (20-44)	28 (24-32)*	28 (26 - 30)
Rajasthan	32 (30-35)	36 (35-37)	45 (39-51)	69 (62 - 76)
Central India & Eastern Ghats	601 (486-718)	601 (518-685)	688 (596-780)	1,033 (885-1,193)
<b>Western Ghats Landscape</b>				
Goa	-	-	5*	3
Karnataka	290 (241-339)	300 (280-320)	406 (360-452)	524 (475 - 573)
Kerala	46 (39-53)	71 (67-75)	136 (119-150)	190 (166 - 215)
Tamil Nadu	76 (56-95)	163 (153-173)	229 (201-253)	264 (227 - 302)
Western Ghats	402 (336-487)	534 (500-568)	776 (685-861)	981 (871 - 1,093)
<b>North East Hills and Brahmaputra Plains Landscape</b>				
Arunachal Pradesh	14 (12-18)		28*	29*
Assam	70 (60-80)	143 (113-173)	167 (150-184)	190 (165 - 215)
Mizoram	6 (4-8)		5 3*	0
Nagaland	-	-	-	0
Northern West Bengal	10 (8-12)	-	3*	0
North East Hills, and Brahmaputra	100 (84-118)	148 (118-178)	201 (174-212)	219 (194 - 244)
Sundarban		70 (62-96)	76 (62-96)	88 (86-90)
<b>TOTAL</b>	<b>1,411 (1,165-1,657)</b>	<b>1,706 (1,507-1,896)</b>	<b>2,226 (1,945-2,491)</b>	<b>2,967 (2,603-3,346)</b>

Source: Status of Tigers Copredators & Prey in India 2018, National Tiger Conservation Authority & Wildlife Institution of India

\*: Scat DNA based estimates were also used ; #: For comparison with previous estimates of Andhra Pradesh, combine population estimate of current Andhra Pradesh and Telangana.

Note: Numbers in parenthesis are one standard error limits of the mean.

**Statement 5.4: Region wise population estimation of Elephants in India, 2017**

Region	State	Elephant density / km <sup>2</sup>	Elephant Population
North-East	Arunachal Pradesh	0.23	1614
	Assam	0.38	5719
	Meghalaya	0.16	1754
	Tripura	0.1	102*
	Nagaland	0.45	446*
	West Bengal (North Region)	0.25	488
	Manipur		9
	Mizoram		7
			<b>10,139</b>
East Central Region	Odisha		1976
	Jharkhand	0.16	679
	Chhattisgarh		247
	Bihar		25
	Madhya Pradesh		7
	West Bengal (South Region)		194
			<b>3128</b>
North West Region	Uttarakhand	0.45	1839
	Uttar Pradesh		232
	Haryana		7
	Himachal		7
			<b>2085</b>
South Region	Karnataka	0.67	6049
	Kerala	0.32	5706*
	Maharashtra		6
	Andhra Pradesh		65
	Andaman & Nicobar Islands	0.14	25*
	Tamil Nadu		2761
			<b>14612</b>
<b>GRAND TOTAL</b>			<b>29964</b>

Note: # The total census figures for West Bengal is 682 (North Bengal (488) + South Bengal (194)).

\* Results are based on indirect (dung) count method as direct counts could not be carried out as informed by State & UTs like Kerala, Nagaland, Tripura and Andaman & Nicobar Islands.



### Statement 5.5: Number of Protected Areas in India from 2000 to 2019

(as on December, 2019)

Year	National Parks		Wild Life Sanctuaries		Community Reserves		Conservation Reserves		Total Protected Area	
	Number	Area (km <sup>2</sup> )	Number	Area (km <sup>2</sup> )	Number	Area (km <sup>2</sup> )	Number	Area (km <sup>2</sup> )	Number	Area (km <sup>2</sup> )
2000	89	37,803	485	1,08,863	-	-	-	-	574	1,46,666
2006	96	38,392	503	1,11,229	1	0.31	4	43	604	1,49,665
2007	98	38,429	507	1,11,529	5	21	7	95	617	1,50,074
2008	99	39,442	510	1,13,123	5	21	45	1,260	659	1,53,846
2009	99	39,442	512	1,13,395	5	21	45	1,260	661	1,54,118
2010	102	40,284	516	1,13,843	5	21	47	1,382	670	1,55,530
2011	102	40,284	518	1,13,999	5	21	52	1,801	677	1,56,105
2012	103	40,500	526	1,14,933	5	21	59	2,013	693	1,57,468
2013	102	40,500	532	1,17,124	19	31	64	2,233	717	1,59,887
2014	103	40,500	535	1,18,291	43	58	64	2,233	745	1,61,082
2015	103	40,500	541	1,18,866	44	59	71	2,549	759	1,61,975
2016	103	40,500	543	1,18,918	45	60	72	2,566	763	1,62,044
2017	103	40,500	544	1,18,932	46	73	76	2,588	769	1,62,092
2018	104	40,501	544	1,18,932	46	73	77	2,594	771	1,62,100
2019	101*	40,564	553	1,19,757	163	833	89	4128	906	1,65,282

Source: National Wildlife Database, Wildlife Institute of India

Note: 1. \* Three Button Islands National Parks (North Button Island, Middle Button Island & South Button Island) of Andaman & Nicobar Islands have been merged with Rani Jhansi Marine National Park.

2. These data are based on availability of data from Forest Department and Gazette Notification notified by the Ministries.

3. - Community Reserves and Conservation Reserves have been established in India from 2006 onwards. Hence these values are zero for the year 2000.

**SEEA**

# Monitoring for Sustainability



## Chapter 6

### SEEA – Monitoring for Sustainability

#### Introduction

1. The future of human being is completely dependent on the actions taken today. A path for sustainable development can only be charted by the integration of economic, social and environmental aspects and by understanding their interlinkages. Recognizing this, the UN General Assembly in its 70<sup>th</sup> Session in 2015 considered and adopted the 17 Sustainable Development Goals (SDGs) and associated 169 targets for the next 15 years. The 17 SDGs, built on the principle of “leaving no one behind”, came into force with effect from 01<sup>st</sup> January, 2016, emphasizing a new Agenda that promotes an all-inclusive approach for achieving sustainable development for all.

Figure 1: Sustainable Development Goals<sup>1</sup>



2. At the core of the concept of sustainable development, is the recognition that environmental commons – such as the atmosphere, forests and oceans – must be safeguarded

<sup>1</sup> United Nations Sustainable Development Goals Knowledge Platform;  
<https://www.un.org/sustainabledevelopment/news/communications-material>



as crucial sources of ecosystem services and natural resources. **The Stockholm Conference, 1972** was one of the initial steps towards putting environmental concerns on the global agenda. It resulted in the **Stockholm Declaration** which contained **principles** and **Action Plan** with recommendations for environmental policy. Subsequently, a number of Multilateral Environmental Agreements (MEAs) came into practice. Complementing national legislation and bilateral or regional agreements, multilateral environmental agreements form the overarching international legal basis for global efforts to address particular environmental issues.

3. The role of multilateral environmental agreements in achieving the 2030 Agenda and the Sustainable Development Goals is indisputable. There are direct and indirect references to the multilateral environmental agreements in the Goals and targets adopted. This includes Goals 12 and 17, which are applicable across the board, and in specific Goals such as Goal 12, on chemicals and wastes, Goal 13, on climate change, and Goals 14 and 15, on ecosystems and biological diversity. Multilateral environmental agreements have a key role in fulfilling the need for the Goals to be appropriately understood and to extend support putting in place mechanisms for implementing the Goals.

4. Critical to this progress towards the SDGs and the multilateral environment agreements, is the availability of a tool that can be used for compiling cohesive statistics and for deriving coherent and comparable indicators that can help assess the progress. In this context, the System of Environmental-Economic Accounting (SEEA) is the most suited candidate framework, with its internationally agreed concepts and definitions, as also the underpinning accounting structure. The framework helps define relationships between indicators and provides a strong basis for data compilation and confrontation. As a result, the SEEA Framework represents an important information base from which indicators can be chosen for use in populating different sets of indicators.

5. Be it the MEAs, the post-2020 biodiversity agenda, the international climate policy, or the overarching SDGs, the SEEA can be used to measure several of the indicators directly and provide supplemental information for numerous others. The SEEA framework is designed to support mainstreaming the environment into economic and development planning and therefore, there are multiple entry-points for SEEA-compliant accounts to support reporting for these frameworks. **Table 1** gives some of the SEEA accounts which are of relevance to the various MEAs including the SDGs.

**Table 1: Linkage of SEEA Accounts with Multilateral Environment Agreements & SDGs**

S. No.	MEAs/International Obligations	SEEA accounts
1	Sustainable Development Goal	<ul style="list-style-type: none"> <li>• Land cover/Land use accounts</li> <li>• Ecosystem service supply and use accounts</li> <li>• SEEA-Water, Waste Accounts</li> <li>• Material Flow account</li> <li>• Environment Expenditure accounts</li> <li>• Ecosystem condition account</li> <li>• Biodiversity accounts</li> <li>• SEEA-EEA Extent accounts</li> </ul>
2	UN Convention to Combat Desertification (UNCCD)	<ul style="list-style-type: none"> <li>• Land cover or land use accounts</li> <li>• ecosystem condition accounts</li> <li>• carbon accounts</li> </ul>
3	UN Framework Convention on climate Change (UNFCCC)	<ul style="list-style-type: none"> <li>• Land cover or land use accounts</li> <li>• Carbon accounting</li> <li>• Residual Flow Accounts</li> <li>• SEEA-Water</li> </ul>
4	Convention on Biological Diversity (CBD) - Aichi Targets	<ul style="list-style-type: none"> <li>• Biodiversity accounts</li> <li>• Carbon accounts</li> <li>• SEEA-Water</li> <li>• Ecosystem extent and condition accounts</li> <li>• Material Flow accounts</li> <li>• Urban ecosystem accounting</li> </ul>
5	Ramsar Convention	<ul style="list-style-type: none"> <li>• Ecosystem extent and condition accounts</li> <li>• SEEA- Waste</li> </ul>
6	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	<ul style="list-style-type: none"> <li>• Biodiversity accounts</li> </ul>
7	Reducing Emissions from Deforestation and Forest Degradation (REDD+)	<ul style="list-style-type: none"> <li>• Carbon accounts</li> <li>• Ecosystem extent account</li> <li>• Forest asset account</li> </ul>



S. No.	MEAs/International Obligations	SEEA accounts
8	United Nations Forum on Forests (UNFF)	<ul style="list-style-type: none"> <li>• Ecosystem condition accounts</li> <li>• Forest asset accounts</li> <li>• Carbon accounts</li> <li>• SEEA-Water</li> <li>• Accounts of the Protected Areas</li> </ul>
9	Waste related MEAs (Rotterdam Convention, Stockholm Convention, Basel Convention, Minamata Convention)	<ul style="list-style-type: none"> <li>• Residual Flow Accounts</li> </ul>
10	IPBES	<ul style="list-style-type: none"> <li>• Biodiversity accounts</li> <li>• Ecosystem service supply accounts</li> <li>• Residual Flow Accounts for fertiliser applications and CO2 emissions</li> </ul>
11	IUCN	<ul style="list-style-type: none"> <li>• Biodiversity Accounts with focus on threatened species</li> </ul>

### **SEEA and biodiversity**

6. Building support for biodiversity protection among key decision makers is likely to be much easier if there are clear and understandable links to economic and social development. The SEEA provides a consistent monitoring framework that produces actionable indicators on ecosystem extent and condition, as well as the supply and use of ecosystem services, all of which can reflect the status of biodiversity. It can also be used to track expenditures on conservation efforts in both the public and private sectors. Its integrated systems approach can assist in clarifying the major drivers of biodiversity loss and ecosystem changes, identify key trade-offs, and support the development of “win-win” conservation approaches.

### **SEEA and climate change**

7. SEEA accounts can be used to inform a wide range of policy questions on climate change related to climate impacts and adaptation strategies. They can also help with mitigation strategies by providing consistent information by economic sector on energy use (by type) and resulting development of emissions, the value of investments in mitigating technologies, as well as the distribution of emission (or carbon) credits.

## **SEEA and ecosystems**

8. Ecosystem accounts formed under the ambit of SEEA framework, whether they are extent accounts, condition accounts or ecosystem services accounts; provide an underpinning connection between the former and the Sustainable Development Goals. Amongst them, ecosystem extent accounts are an essential determinant for several SDG indicators, as it is comparatively easy to assess and provides a good indicator for broader sustainable development concerns. For example, the extent of freshwater ecosystems is a good first proxy for water provisioning services. Similarly, forest extent is a good first proxy for conservation of forest biodiversity and the delivery of forest ecosystem services.

## **SEEA and sustainable cities**

9. SDGs also recognize that sustainable urban development and management are crucial to the quality of life of our people. There is focus to reduce the negative impacts of urban activities and of chemicals which are hazardous for human health and the environment, through environmentally sound management and safe use of chemicals, the reduction and recycling of waste and more efficient use of water and energy. SEEA can be used to produce several consistent indicators which can help in understanding the trends in these aspects and also help frame policies for effective urban management.

## **SEEA for SDGs – an illustration using SDG 11.3.1**

10. Land is a finite resource and land cover today is altered principally by direct human use: by agriculture and livestock raising, forest harvesting and management and urban and suburban construction and development. A defining feature of urbanization in many areas is an outward expansion far beyond formal administrative boundaries. However, cities require an orderly urban expansion that makes the land use more efficient. They need to plan for future internal population growth and city growth resulting from migrations. They also need to accommodate new and thriving urban functions such as transportation routes, etc., as they expand. However, frequently the physical growth of urban areas is disproportionate in relation to population growth and this results in land use that is less efficient in many forms. This type of growth is often not sustainable due to its negative impact on the environment, like the increased pressures of water and waste management mechanisms.

11. Goal 11 of the SDGs focuses on sustainable cities, and one of the global indicators defined therein, 11.3.1, endeavours to help assess the progress made in respect of ‘sustainable human settlement planning and management’. Indicator 11.3.1 is defined as the ‘Ratio of land consumption rate to population growth rate’ and data on this indicator can help inform on

the manner in which cities and other urban settlements are rapidly expanding and significantly changing the natural and urban environments.

12. It is expected that the rates of change in urban land consumption varies significantly across regions, with faster growth recorded in the developing regions. The key outcomes of the recorded fast rates of urban sprawl include, among others, inefficient land use, which negatively impacts the environment, increased costs of providing basic services to populations, increased demand for and use of energy, challenges associated with waste management, and growth in the number of unplanned settlements, some of which are located in environmentally sensitive areas.

13. In order to help assess the status of million plus cities in India with respect of SDG Indicator 11.3.1, experimental estimates for these cities were compiled using the Land Use Efficiency (LUE) tool<sup>2</sup> developed for this purpose by Joint Research Centre of the European Union.

14. The tool uses the Global Human Settlement Layer (GHSL), which is an open and free dataset for assessing the human presence on the planet. Creation and updating of the GHSL is supported by the Joint Research Centre (JRC) and the DG for Regional and Urban Policy (DG REGIO) of the European Commission, together with the international partnership GEO Human Planet Initiative. The tool gives the flexibility to select any area of interest and hence, the million plus cities of India were selected.

15. The GHSL is a set of georeferenced layers that provides information on human settlements and population with global coverage. It has produced elaborate historical satellite images and data from open sources. The main datasets consist of gridded layers of built-up area and number of inhabitants for four dates: 1975, 1990, 2000, and 2015. The GHSL allows measuring the growth of cities and towns over time, including information on population, urbanization rate and land consumption. In the context of GHSL, a global layer on built-up surfaces (GHS-BU) was produced from Landsat image collections. The information generated with the GHS-BU was then used to downscale population as available in the population censuses for the administrative units to the grids. Population estimates for the further years are nationally adjusted to population totals from the United Nation's World Population Prospects: The 2015 Revision, so as to get population (GHS-POP) for the same years and grids as the GHS-BU.

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<sup>2</sup> <https://ghsl.jrc.ec.europa.eu/tools.php>

16. *Experimental estimates* of SDG 11.3.1 were compiled using the GHSL for the million plus cities of India to help understand the rate of growth of population vis-à-vis the built-up area. Since these estimates have been compiled using the data available in the GHSL, these are likely to be at variance with the official estimates of growth of population and built-up area in these cities. **These estimates should, therefore, not be cited as official estimates of the NSO for SDG 11.3.1 for any of these cities.** Experimental estimates of SDG 11.3.1, as well as the foundational data as per the GHSL, is given in Table 2 below.

**Table 2: SDG 11.3.1 for the million plus cities of India**

S. No.	Name of the city	Built-up Area (sq. km)		Population growth rate (PGR)*	Land consumption rate (LCR)*	SDG 11.3.1
		2000	2015			
1	Agra	65.19	90.96	1.79	2.22	1.24
2	Ahmedabad	195.71	260.95	1.70	1.92	1.13
3	Allahabad	31.96	39.66	1.76	1.44	0.82
4	Amritsar	78.79	103.76	1.25	1.84	1.47
5	Asansol	336.76	401.19	0.95	1.17	1.23
6	Aurangabad	60.37	79.58	2.21	1.84	0.83
7	Bangalore	281.08	398.79	3.68	2.33	0.63
8	Bhopal	65.56	85.28	2.36	1.75	0.74
9	Chandigarh	13.39	16.47	1.32	1.38	1.05
10	Chennai	376.26	450.97	1.97	1.21	0.61
11	Coimbatore	114.35	142.58	1.52	1.47	0.97
12	Delhi	535.95	574.37	1.76	0.46	0.26
13	Dhanbad	92.86	96.51	0.94	0.26	0.27
14	Durg-Bhilainagar	67.22	82.10	1.58	1.33	0.84
15	Faridabad (NCR)	95.04	108.24	2.62	0.87	0.33
16	Ghaziabad (NCR)	122.90	140.91	3.18	0.91	0.29
17	Greater Mumbai	317.59	327.95	1.24	0.21	0.17
18	Gwalior	34.67	44.28	2.05	1.63	0.80
19	Hyderabad	383.65	477.89	1.81	1.46	0.81
20	Indore	94.40	138.72	2.65	2.57	0.97
21	Jabalpur	25.43	30.75	1.22	1.27	1.04
22	Jaipur	165.19	215.58	2.18	1.77	0.81
23	Jamshedpur	44.86	46.41	1.40	0.23	0.16
24	Jodhpur	74.40	93.57	2.31	1.53	0.66
25	Kannur	100.81	122.66	0.33	1.31	3.93
26	Kanpur	81.13	98.40	0.85	1.29	1.51
27	Kochi	211.78	269.15	0.45	1.60	3.55
28	Kolkata	1669.63	1801.05	0.88	0.51	0.57

S. No.	Name of the city	Built-up Area (sq. km)		Population growth rate (PGR)*	Land consumption rate (LCR)*	SDG 11.3.1
		2000	2015			
29	Kota	66.50	80.99	1.99	1.31	0.66
30	Kozhikode	88.98	103.53	0.59	1.01	1.70
31	Lucknow	75.49	98.98	2.18	1.81	0.83
32	Ludhiana	201.75	233.30	1.24	0.97	0.78
33	Madurai	33.06	41.91	1.51	1.58	1.05
34	Malappuram	107.99	127.86	1.05	1.13	1.07
35	Meerut	58.37	90.06	1.28	2.89	2.27
36	Nagpur	125.54	148.07	1.19	1.10	0.92
38	Nashik	72.92	107.59	1.83	2.59	1.41
39	Patna	61.50	66.54	1.92	0.53	0.27
40	Pune	191.33	300.29	2.47	3.01	1.22
41	Raipur	59.00	73.60	2.76	1.47	0.53
42	Rajkot	89.95	114.90	1.65	1.63	0.99
43	Ranchi	39.02	45.49	1.96	1.02	0.52
44	Surat	72.39	94.11	3.37	1.75	0.52
45	Thiruvananthapuram	131.96	144.06	0.04	0.58	13.01
46	Thrissur	125.32	165.91	0.31	1.87	5.96
47	Tiruchirapalli	29.67	59.24	1.06	4.61	4.34
48	Vadodara	88.35	103.72	1.18	1.07	0.91
49	Varanasi	70.84	85.52	1.42	1.26	0.88
50	Vasai - Virar (MMR)	129.80	139.47	2.89	0.48	0.17
51	Vijayawada	216.59	251.74	0.67	1.00	1.50
52	Vishakhapatnam	85.32	102.44	1.10	1.22	1.10

\* Note: the growth rate is for the period 2000-2015.

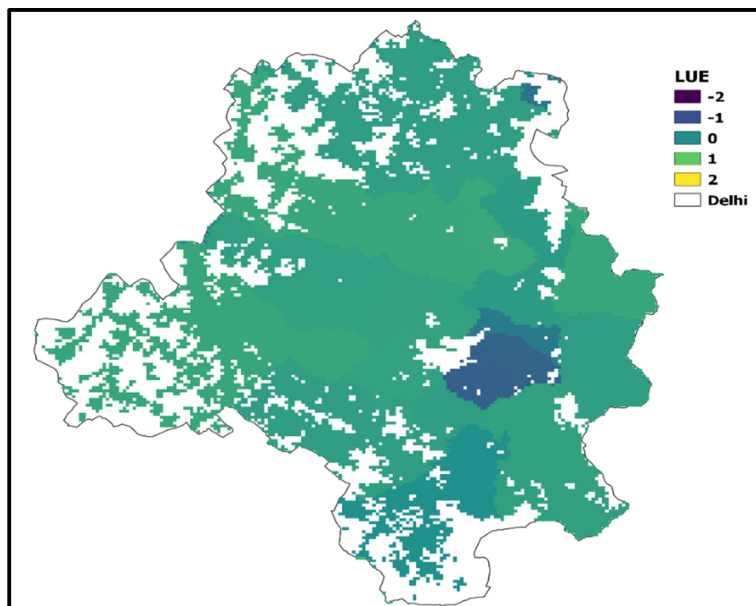
17. The main limitation of this tool is its inability to capture the vertical development of constructions, which is primarily due to the fact that the available input data represents 2D information of built surface and population.

18. Another interesting output of the JRC tool is the map of Land Use Efficiency for each of these cities. In the tool, Land Use Efficiency is defined as the average annual rate of change of built-up area per capita. The map shows the negative, zero and positive values of LUE. Negative values generally indicate a loss of population and constant built-up surface, while positive values indicate a faster increment of population than built-up increment (due to the increment of the density or because of the expansion of the urban area). Values around zero



indicate stable zones with a linear increment of built-up surfaces and population. As an example, the map for Delhi is shown below in **Figure 2**.

**Figure 2 - Land Use Efficiency Map for Delhi**



## Conclusion

19. SEEA can be the basis for the development of coherent environmental-economic SDG indicators. There are several indicators that could in part (e.g., the numerator or denominator of a ratio indicator) or completely, be generated by the SEEA framework (e.g., SDG Indicator 15.1.1 on Forest area as a proportion of total land area), or that could provide input data to the SEEA framework (e.g., SDG Indicator 14.3.1 on marine acidity for ecosystem condition accounts). The systems approach of the SEEA can enable development of statistics and indicators on both natural resources (e.g. timber, water) and ecosystems and how they relate to the economy. Using the SEEA framework can increase the efficiency of data collection and compilation, and at the same time, can provide policy makers with relevant information.

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# Annexures

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	ANDHRA PRADESH				ARUNACHAL PRADESH			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	78774	3673	2767	79680	2635	35	13	2658
		Current Shifting cultivation	14		1	14	775	267	353	689
		Fallow	9642	461	2214	7890	72	0	0	72
		Plantation	7462	2173	635	8999	58	0	2	56
		<b>Sub Total 1</b>	<b>95892</b>	<b>6307</b>	<b>5617</b>	<b>96583</b>	<b>3540</b>	<b>302</b>	<b>368</b>	<b>3474</b>
2	Barren/unculturable/ Wastelands	Barren Rocky	2267		4	2263	242	22	5	259
		Gullied / Ravinous Land	133	5	88	50				0
		Rann				0				0
		Salt Affected Land	1182	37	70	1149				0
		Sandy Area	480	0	16	464	24	39	2	61
		Scrub Land	11522	4	569	10957	2611	393	119	2886
		<b>Sub Total 2</b>	<b>15585</b>	<b>46</b>	<b>748</b>	<b>14883</b>	<b>2877</b>	<b>455</b>	<b>126</b>	<b>3206</b>
3	Builtup	Mining	447	51	3	495	1	0		1
		Rural	2926	36	1	2962	379	8	25	362
		Urban	1503	222	0	1725	137	12	12	137
		<b>Sub Total 3</b>	<b>4876</b>	<b>309</b>	<b>4</b>	<b>5182</b>	<b>517</b>	<b>20</b>	<b>37</b>	<b>501</b>
4	Forest	Deciduous	25155	1	554	24603	143	0	27	116
		Evergreen/Semi evergreen	251			251	58857	19	1083	57793
		Forest Plantation	671	38	95	614	30	4	5	28
		Scrub Forest	8120	507	434	8192	1410	758	73	2096
		Swamp / Mangroves	376	20	12	384				0
<b>Sub Total 4</b>	<b>34573</b>	<b>566</b>	<b>1095</b>	<b>34043</b>	<b>60439</b>	<b>782</b>	<b>1188</b>	<b>60033</b>		
5	Grass / Grazing	Grass / Grazing	98			98	5514	157	764	4907
		<b>Sub Total 5</b>	<b>98</b>	<b>0</b>	<b>0</b>	<b>98</b>	<b>5514</b>	<b>157</b>	<b>764</b>	<b>4907</b>
6	Snow and Glacier	Snow and Glacier				0	9295	887	45	10137
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9295</b>	<b>887</b>	<b>45</b>	<b>10137</b>
7	Wet lands / Water bodies	Inland Wetland	438	19	70	387	0	0		0
		Coastal Wetland	888	0	30	858		0		0
		River/Stream/Canals	3879	31	11	3900	1527	6	80	1453
		Water bodies	6760	386	91	7055	34	1	3	31
		<b>Sub Total 7</b>	<b>11965</b>	<b>437</b>	<b>202</b>	<b>12200</b>	<b>1561</b>	<b>7</b>	<b>82</b>	<b>1485</b>
<b>Grand Total</b>			<b>162989</b>	<b>7665</b>	<b>7665</b>	<b>162989</b>	<b>83743</b>	<b>2610</b>	<b>2610</b>	<b>83743</b>

Note: 1. Calculated on the basis of change matrices provided by National Remote Sensing Centre

2. Totals may not match due to rounding off.



## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	ASSAM				BIHAR			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	24596	299	478	24417	65143	3461	1623	66981
		Current Shifting cultivation	88	33	63	58				0
		Fallow	504	64	67	501	4460	908	2516	2852
		Plantation	3826	24	28	3822	2717	262	29	2950
		<b>Sub Total 1</b>	<b>29013</b>	<b>420</b>	<b>636</b>	<b>28798</b>	<b>72319</b>	<b>4632</b>	<b>4168</b>	<b>72783</b>
2	Barren/unculturable/Wastelands	Barren Rocky	0		0	0	102	2	11	93
		Gullied / Ravinous Land				0	75	12	15	71
		Rann				0				0
		Salt Affected Land				0	3			3
		Sandy Area	78	34	70	42	21	31	3	49
		Scrub Land	3316	853	78	4091	2843	673	1031	2485
		<b>Sub Total 2</b>	<b>3395</b>	<b>886</b>	<b>148</b>	<b>4133</b>	<b>3045</b>	<b>718</b>	<b>1060</b>	<b>2702</b>
3	Builtup	Mining	85	54	3	136	204	35	0	238
		Rural	652	5	18	640	5448	6	18	5437
		Urban	722	26	4	744	844	56	2	899
		<b>Sub Total 3</b>	<b>1459</b>	<b>85</b>	<b>25</b>	<b>1520</b>	<b>6496</b>	<b>98</b>	<b>20</b>	<b>6574</b>
4	Forest	Deciduous	27853	225	841	27237	4627	29	91	4565
		Evergreen/Semi evergreen	4806	3	443	4367				0
		Forest Plantation	86	7	10	84	5	1		5
		Scrub Forest	844	545	108	1281	1246	61	5	1302
		Swamp / Mangroves				0				0
<b>Sub Total 4</b>	<b>33590</b>	<b>780</b>	<b>1402</b>	<b>32968</b>	<b>5878</b>	<b>91</b>	<b>96</b>	<b>5873</b>		
5	Grass / Grazing	Grass / Grazing	2953	716	636	3033	18		1	17
		<b>Sub Total 5</b>	<b>2953</b>	<b>716</b>	<b>636</b>	<b>3033</b>	<b>18</b>		<b>1</b>	<b>17</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	1217	30	95	1153	1944	252	212	1984
		Coastal Wetland				0				0
		River/Stream/Canals	6729	784	767	6746	4289	331	586	4034
		Water bodies	82	9	3	87	182	25	4	203
<b>Sub Total 7</b>	<b>8028</b>	<b>823</b>	<b>865</b>	<b>7986</b>	<b>6415</b>	<b>608</b>	<b>801</b>	<b>6222</b>		
<b>Grand Total</b>			<b>78438</b>	<b>3711</b>	<b>3711</b>	<b>78438</b>	<b>94171</b>	<b>6146</b>	<b>6146</b>	<b>94171</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	CHHATTISGARH				GOA			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	59188	506	226	59467	540	11	106	445
		Current Shifting cultivation	0		0	0				0
		Fallow	2370	186	412	2144	43	55	9	89
		Plantation	210	16	4	222	173	3	8	168
		<b>Sub Total 1</b>	<b>61768</b>	<b>707</b>	<b>642</b>	<b>61833</b>	<b>756</b>	<b>69</b>	<b>123</b>	<b>702</b>
2	Barren/unculturable/Wastelands	Barren Rocky	691			691	56	1	40	18
		Gullied / Ravinous Land	82			82				0
		Rann				0				0
		Salt Affected Land				0				0
		Sandy Area	26	2	3	25	8	3	0	10
		Scrub Land	2962	31	129	2863	287	119	64	342
		<b>Sub Total 2</b>	<b>3760</b>	<b>33</b>	<b>133</b>	<b>3661</b>	<b>350</b>	<b>124</b>	<b>105</b>	<b>370</b>
3	Builtup	Mining	229	13		242	85	10	21	74
		Rural	3253	1		3254	27	10	2	35
		Urban	941	45		986	263	42	14	291
		<b>Sub Total 3</b>	<b>4423</b>	<b>59</b>		<b>4482</b>	<b>374</b>	<b>62</b>	<b>37</b>	<b>400</b>
4	Forest	Deciduous	57551	13	41	57523	1155	159	15	1299
		Evergreen/Semi evergreen				0	618	3	1	620
		Forest Plantation	86	2		88	41	5	0	46
		Scrub Forest	4169	18	15	4172	208	24	168	64
		Swamp / Mangroves				0	16	0	1	16
<b>Sub Total 4</b>	<b>61806</b>	<b>33</b>	<b>56</b>	<b>61783</b>	<b>2039</b>	<b>191</b>	<b>186</b>	<b>2044</b>		
5	Grass / Grazing	Grass / Grazing				0	0		0	0
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	5			5	58	16	2	73
		Coastal Wetland				0	25		3	22
		River/Stream/Canals	1847	3	3	1847	69		1	68
		Water bodies	1585	20	21	1583	30	0	7	23
		<b>Sub Total 7</b>	<b>3437</b>	<b>22</b>	<b>24</b>	<b>3435</b>	<b>182</b>	<b>16</b>	<b>12</b>	<b>186</b>
<b>Grand Total</b>			<b>135194</b>	<b>855</b>	<b>855</b>	<b>135194</b>	<b>3702</b>	<b>462</b>	<b>462</b>	<b>3702</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.



## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	GUJARAT				HARYANA			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	105613	822	823	105612	37659	227	911	36974
		Current Shifting cultivation				0				0
		Fallow	15542	704	780	15466	492	531	175	848
		Plantation	546	4	1	549	146	41	40	147
		<b>Sub Total 1</b>	<b>121702</b>	<b>1530</b>	<b>1604</b>	<b>121627</b>	<b>38297</b>	<b>799</b>	<b>1126</b>	<b>37969</b>
2	Barren/unculturable/ Wastelands	Barren Rocky	16			16	5		0	4
		Gullied / Ravinous Land	218		0	218	0		0	0
		Rann	18722		132	18590				0
		Salt Affected Land	3510	9	22	3497	56	22	4	74
		Sandy Area	40	0		40	24	14	24	14
		Scrub Land	19962	3	59	19906	1007	153	22	1138
		<b>Sub Total 2</b>	<b>42467</b>	<b>12</b>	<b>212</b>	<b>42267</b>	<b>1092</b>	<b>189</b>	<b>51</b>	<b>1230</b>
3	Builtup	Mining	267	10	0	278	173	66	21	218
		Rural	2527	19	0	2546	1021	144	1	1165
		Urban	2655	97		2752	1602	161	4	1759
		<b>Sub Total 3</b>	<b>5450</b>	<b>126</b>		<b>5576</b>	<b>2796</b>	<b>371</b>	<b>26</b>	<b>3142</b>
4	Forest	Deciduous	9192		0	9192	663	17	12	667
		Evergreen/Semi evergreen	6			6				0
		Forest Plantation	179			179	16	1		17
		Scrub Forest	2810		0	2809	163	156	163	156
		Swamp / Mangroves	996		9	987				0
<b>Sub Total 4</b>	<b>13183</b>		<b>10</b>	<b>13173</b>	<b>841</b>	<b>174</b>	<b>175</b>	<b>841</b>		
5	Grass / Grazing	Grass / Grazing	17			17	623	4	189	439
		<b>Sub Total 5</b>	<b>17</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>623</b>	<b>4</b>	<b>189</b>	<b>439</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	222	9	10	222	47	17	5	58
		Coastal Wetland	6220	181	11	6390				0
		River/Stream/Canals	3228	35	2	3262	358	20	19	359
		Water bodies	3536	10	54	3492	159	20	4	175
		<b>Sub Total 7</b>	<b>13206</b>	<b>236</b>	<b>77</b>	<b>13365</b>	<b>563</b>	<b>57</b>	<b>28</b>	<b>592</b>
<b>Grand Total</b>			<b>196024</b>	<b>1904</b>	<b>1904</b>	<b>196024</b>	<b>44212</b>	<b>1595</b>	<b>1595</b>	<b>44212</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	HIMACHAL PRADESH				JAMMU & KASHMIR			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	6418		3	6415	11303	283	333	11253
		Current Shifting cultivation				0				0
		Fallow	3			3	55	0	2	53
		Plantation	2180		5	2174	2210	2151	2210	2151
		<b>Sub Total 1</b>	<b>8600</b>	<b>0</b>	<b>8</b>	<b>8592</b>	<b>13569</b>	<b>2433</b>	<b>2546</b>	<b>13456</b>
2	Barren/unculturable/ Wastelands	Barren Rocky	10521	1	0	10522	142160	2491	68965	75685
		Gullied / Ravinous Land	82			82	949	2647	114	3482
		Rann				0				0
		Salt Affected Land				0	151	30		181
		Sandy Area	64			64	5548	3226	459	8314
		Scrub Land	7459	0	6	7453	7129	667	3094	4702
		<b>Sub Total 2</b>	<b>18126</b>	<b>1</b>	<b>6</b>	<b>18121</b>	<b>155936</b>	<b>9061</b>	<b>72633</b>	<b>92364</b>
3	Builtup	Mining	27	1	4	24	12	3	3	12
		Rural	310	0	0	310	333	11	7	337
		Urban	293	4	0	297	396	3	21	378
		<b>Sub Total 3</b>	<b>630</b>	<b>6</b>	<b>4</b>	<b>631</b>	<b>740</b>	<b>17</b>	<b>30</b>	<b>727</b>
4	Forest	Deciduous	1274		1	1273	554	38	12	580
		Evergreen/Semi evergreen	11031		1	11030	12040	0	783	11257
		Forest Plantation	2			2	12439		1	12439
		Scrub Forest	161	0	0	161	8755	9278	8755	9278
		Swamp / Mangroves				0	0			0
<b>Sub Total 4</b>	<b>12468</b>	<b>0</b>	<b>3</b>	<b>12465</b>	<b>33790</b>	<b>9315</b>	<b>9551</b>	<b>33554</b>		
5	Grass / Grazing	Grass / Grazing	5867	3	1	5870	890	67	481	477
		<b>Sub Total 5</b>	<b>5867</b>	<b>3</b>	<b>1</b>	<b>5870</b>	<b>890</b>	<b>67</b>	<b>481</b>	<b>477</b>
6	Snow and Glacier	Snow and Glacier	8683			8683	8593	65961	1206	73347
		<b>Sub Total 6</b>	<b>8683</b>	<b>0</b>	<b>0</b>	<b>8683</b>	<b>8593</b>	<b>65961</b>	<b>1206</b>	<b>73347</b>
7	Wet lands / Water bodies	Inland Wetland	3		0	3	461	2	222	240
		Coastal Wetland				0				0
		River/Stream/Canals	877	4	4	877	1787	0	111	1676
		Water bodies	420	12		431	6471	0	76	6396
		<b>Sub Total 7</b>	<b>1299</b>	<b>15</b>	<b>4</b>	<b>1311</b>	<b>8719</b>	<b>2</b>	<b>410</b>	<b>8312</b>
<b>Grand Total</b>			<b>55673</b>	<b>26</b>	<b>26</b>	<b>55673</b>	<b>222236</b>	<b>86857</b>	<b>86857</b>	<b>222236</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	JHARKHAND				KARNATAKA			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	33766	1044	7230	27580	111481	10	560	110930
		Current Shifting cultivation				0				0
		Fallow	6309	6962	1067	12203	3725		98	3627
		Plantation	72	4	2	74	17580	8	1	17587
		<b>Sub Total 1</b>	<b>40146</b>	<b>8011</b>	<b>8299</b>	<b>39858</b>	<b>132786</b>	<b>18</b>	<b>659</b>	<b>132145</b>
2	Barren/unculturable/Wastelands	Barren Rocky	401	4	1	404	1943	0	28	1916
		Gullied / Ravinous Land	277	17	1	294	111	11	8	114
		Rann				0				0
		Salt Affected Land				0	682	12	29	666
		Sandy Area	0			0	7	6	2	12
		Scrub Land	4751	207	11	4946	7076	546	112	7510
		<b>Sub Total 2</b>	<b>5429</b>	<b>228</b>	<b>13</b>	<b>5644</b>	<b>9820</b>	<b>576</b>	<b>179</b>	<b>10217</b>
3	Builtup	Mining	478	36	8	506	553	179	2	730
		Rural	2924	0		2924	3462	6	3	3465
		Urban	1124	4	0	1128	2842	51	18	2875
		<b>Sub Total 3</b>	<b>4526</b>	<b>40</b>	<b>8</b>	<b>4558</b>	<b>6857</b>	<b>236</b>	<b>23</b>	<b>7069</b>
4	Forest	Deciduous	22117	0	8	22109	15721	0	796	14925
		Evergreen/Semi evergreen	0			0	10952		356	10595
		Forest Plantation	43	1		44	2626		557	2069
		Scrub Forest	5385	45	3	5427	5346	1771	6	7111
		Swamp / Mangroves	0			0	6		0	6
<b>Sub Total 4</b>	<b>27545</b>	<b>46</b>	<b>11</b>	<b>27580</b>	<b>34651</b>	<b>1771</b>	<b>1715</b>	<b>34707</b>		
5	Grass / Grazing	Grass / Grazing				0	313		12	301
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>313</b>	<b>0</b>	<b>12</b>	<b>301</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	13			13	31		1	30
		Coastal Wetland				0	26		2	24
		River/Stream/Canals	1372	1		1374	2003	1	5	1999
		Water bodies	674	5		680	5305	1	9	5298
		<b>Sub Total 7</b>	<b>2059</b>	<b>7</b>		<b>2066</b>	<b>7365</b>	<b>2</b>	<b>16</b>	<b>7351</b>
<b>Grand Total</b>			<b>79706</b>	<b>8331</b>	<b>8331</b>	<b>79706</b>	<b>191791</b>	<b>2604</b>	<b>2604</b>	<b>191791</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	KERALA				MADHYA PRADESH			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	2758	99	39	2818	183132	1112	681	183563
		Current Shifting cultivation				0				0
		Fallow	72	3	2	73	4628	14	469	4173
		Plantation	19014	75	189	18900	339	64	1	402
		<b>Sub Total 1</b>	<b>21843</b>	<b>178</b>	<b>230</b>	<b>21791</b>	<b>188098</b>	<b>1190</b>	<b>1150</b>	<b>188139</b>
2	Barren/unculturable/Wastelands	Barren Rocky	297	0	4	294	389		9	380
		Gullied / Ravinous Land				0	1505	0	14	1491
		Rann				0				0
		Salt Affected Land				0				0
		Sandy Area	16	3	9	10				0
		Scrub Land	967	83	82	968	23702	10	729	22983
		<b>Sub Total 2</b>	<b>1281</b>	<b>86</b>	<b>95</b>	<b>1272</b>	<b>25597</b>	<b>10</b>	<b>752</b>	<b>24854</b>
3	Builtup	Mining	111	6	5	111	394	86	5	474
		Rural	2680	11	24	2668	3111	80	0	3190
		Urban	736	167		903	1792	2057	1792	2057
		<b>Sub Total 3</b>	<b>3526</b>	<b>185</b>	<b>29</b>	<b>3682</b>	<b>5297</b>	<b>2223</b>	<b>1798</b>	<b>5722</b>
4	Forest	Deciduous	1552	28	3	1577	67974	5	56	67922
		Evergreen/Semi evergreen	6293	2	7	6287	0			0
		Forest Plantation	2071	38	6	2103	72	16		88
		Scrub Forest	643	32	75	600	12637	2	32	12607
		Swamp / Mangroves	0		0	0				0
<b>Sub Total 4</b>	<b>10560</b>	<b>99</b>	<b>92</b>	<b>10567</b>	<b>80683</b>	<b>22</b>	<b>88</b>	<b>80617</b>		
5	Grass / Grazing	Grass / Grazing	121	3	64	59	2			2
		<b>Sub Total 5</b>	<b>121</b>	<b>3</b>	<b>64</b>	<b>59</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	222	1	36	187				0
		Coastal Wetland	105		3	102				0
		River/Stream/Canals	576	0	1	575	3216	2	13	3205
		Water bodies	630	0	2	629	5360	487	133	5714
		<b>Sub Total 7</b>	<b>1533</b>	<b>1</b>	<b>42</b>	<b>1492</b>	<b>8576</b>	<b>489</b>	<b>146</b>	<b>8919</b>
<b>Grand Total</b>			<b>38863</b>	<b>552</b>	<b>552</b>	<b>38863</b>	<b>308252</b>	<b>3934</b>	<b>3934</b>	<b>308252</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	MAHARASHTRA				MANIPUR			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	185955	4889	14728	176116	1594	426	98	1923
		Current Shifting cultivation				0	462	488	311	639
		Fallow	17197	12881	4566	25512	9	1	0	9
		Plantation	5482	581	278	5785	32	3	13	22
		<b>Sub Total 1</b>	<b>208633</b>	<b>18352</b>	<b>19572</b>	<b>207413</b>	<b>2097</b>	<b>919</b>	<b>423</b>	<b>2593</b>
2	Barren/unculturable/Wastelands	Barren Rocky	1233	360	41	1552	0	1		2
		Gullied / Ravinous Land	485	151	141	495	0	1		1
		Rann				0				0
		Salt Affected Land	34	17	0	51	0			0
		Sandy Area	1	18		19				0
		Scrub Land	19986	3102	347	22741	3044	1256	672	3628
		<b>Sub Total 2</b>	<b>21739</b>	<b>3648</b>	<b>529</b>	<b>24857</b>	<b>3044</b>	<b>1259</b>	<b>672</b>	<b>3632</b>
		<b>Sub Total 3</b>	<b>8075</b>	<b>117</b>	<b>159</b>	<b>8033</b>	<b>510</b>	<b>35</b>	<b>0</b>	<b>546</b>
3	Builtup	Mining	395	35	65	364		0		0
		Rural	3407	4	24	3388	404	35		440
		Urban	4273	78	70	4281	106			106
		<b>Sub Total 3</b>	<b>8075</b>	<b>117</b>	<b>159</b>	<b>8033</b>	<b>510</b>	<b>35</b>	<b>0</b>	<b>546</b>
		<b>Sub Total 4</b>	<b>42210</b>	<b>79</b>	<b>2518</b>	<b>39771</b>	<b>11569</b>	<b>219</b>	<b>1574</b>	<b>10214</b>
4	Forest	Deciduous	6951	0	394	6557	2754	4	158	2600
		Evergreen/Semi evergreen	255	16	35	235	2	0	0	2
		Forest Plantation	8405	1588	89	9904	1789	901	518	2172
		Scrub Forest	296		2	295				0
		Swamp / Mangroves	58118	1683	3039	56761	16113	1125	2251	14987
5	Grass / Grazing	Grass / Grazing				0	3	0		3
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	7	10		16	107	11	0	118
		Coastal Wetland	1134	1	32	1104				0
		River/Stream/Canals	3968	2	15	3955	148	0	15	133
		Water bodies	6017	109	576	5550	304	13	2	315
		<b>Sub Total 7</b>	<b>11126</b>	<b>123</b>	<b>623</b>	<b>10625</b>	<b>559</b>	<b>24</b>	<b>16</b>	<b>567</b>
<b>Grand Total</b>			<b>307690</b>	<b>23922</b>	<b>23922</b>	<b>307690</b>	<b>22327</b>	<b>3362</b>	<b>3362</b>	<b>22327</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.



State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	MEGHALAYA				MIZORAM			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	1358	7	1	1363	151	42	16	177
		Current Shifting cultivation	230	157	207	181	579	641	533	687
		Fallow	0	0		1				0
		Plantation	563	4	0	568	85	9	17	77
		<b>Sub Total 1</b>	<b>2152</b>	<b>168</b>	<b>208</b>	<b>2112</b>	<b>815</b>	<b>692</b>	<b>566</b>	<b>941</b>
2	Barren/unculturable/Wastelands	Barren Rocky	272	0	0	272	1			1
		Gullied / Ravinous Land				0				0
		Rann				0				0
		Salt Affected Land				0				0
		Sandy Area	5	0		5				0
		Scrub Land	2747	6	11	2742	139	902	59	982
		<b>Sub Total 2</b>	<b>3024</b>	<b>7</b>	<b>11</b>	<b>3019</b>	<b>140</b>	<b>902</b>	<b>59</b>	<b>982</b>
3	Builtup	Mining	63	4		67				0
		Rural	751	8	1	759	135	14	0	149
		Urban	85	3	0	88	70	2		73
		<b>Sub Total 3</b>	<b>899</b>	<b>15</b>	<b>1</b>	<b>914</b>	<b>206</b>	<b>16</b>	<b>0</b>	<b>222</b>
4	Forest	Deciduous	14623	1	161	14462	6959	893	1124	6728
		Evergreen/Semi evergreen	756		2	754	8082	1098	617	8562
		Forest Plantation	14		1	13	96		2	93
		Scrub Forest	608	206	13	801	4477	1057	2230	3304
		Swamp / Mangroves	1			1				0
<b>Sub Total 4</b>	<b>16001</b>	<b>206</b>	<b>177</b>	<b>16030</b>	<b>19614</b>	<b>3047</b>	<b>3974</b>	<b>18687</b>		
5	Grass / Grazing	Grass / Grazing	0			0	155	7	71	91
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>155</b>	<b>7</b>	<b>71</b>	<b>91</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	56			56				0
		Coastal Wetland				0				0
		River/Stream/Canals	279	1	0	279	125	1	0	126
		Water bodies	18	0		18	27	5	0	31
		<b>Sub Total 7</b>	<b>353</b>	<b>1</b>	<b>0</b>	<b>353</b>	<b>152</b>	<b>6</b>	<b>0</b>	<b>157</b>
<b>Grand Total</b>			<b>22429</b>	<b>398</b>	<b>398</b>	<b>22429</b>	<b>21081</b>	<b>4671</b>	<b>4671</b>	<b>21081</b>

Note: 1. Calculated on the basis of change matrices provided by  
2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	NAGALAND				ODISHA			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	739	27	22	744	76273	459	142	76591
		Current Shifting cultivation	909	765	805	869	669	252	65	856
		Fallow	21	20	2	39	1722	16	387	1351
		Plantation	11	1		12	353	27	1	379
		<b>Sub Total 1</b>	<b>1681</b>	<b>813</b>	<b>829</b>	<b>1664</b>	<b>79017</b>	<b>755</b>	<b>595</b>	<b>79177</b>
2	Barren/unculturable/Wastelands	Barren Rocky	4			4	508		0	507
		Gullied / Ravinous Land				0	627	6	24	609
		Rann				0				0
		Salt Affected Land				0	16	11	1	26
		Sandy Area				0	69	2	5	65
		Scrub Land	1716	1964	534	3146	10113	119	244	9988
		<b>Sub Total 2</b>	<b>1720</b>	<b>1964</b>	<b>534</b>	<b>3150</b>	<b>11333</b>	<b>138</b>	<b>274</b>	<b>11197</b>
3	Builtup	Mining	15	2		17	234	29	2	261
		Rural	278	3		282	5077	4	1	5080
		Urban	139	4		143	1107	33		1140
		<b>Sub Total 3</b>	<b>432</b>	<b>9</b>	<b>0</b>	<b>442</b>	<b>6418</b>	<b>67</b>	<b>4</b>	<b>6481</b>
4	Forest	Deciduous	10412	197	1029	9580	44087	238	458	43866
		Evergreen/Semi evergreen	175		1	175				0
		Forest Plantation	225	8	2	231	1133	85	1	1216
		Scrub Forest	1716	823	1419	1120	6181	245	166	6260
		Swamp / Mangroves				0	252	11	2	261
<b>Sub Total 4</b>	<b>12529</b>	<b>1027</b>	<b>2450</b>	<b>11106</b>	<b>51652</b>	<b>580</b>	<b>628</b>	<b>51604</b>		
5	Grass / Grazing	Grass / Grazing	6			6				0
		<b>Sub Total 5</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland				0	357	3	44	317
		Coastal Wetland				0	1362	1	24	1339
		River/Stream/Canals	187			187	3038	7	6	3039
		Water bodies	24			24	2531	39	15	2554
		<b>Sub Total 7</b>	<b>211</b>	<b>0</b>	<b>0</b>	<b>211</b>	<b>7288</b>	<b>50</b>	<b>89</b>	<b>7249</b>
<b>Grand Total</b>			<b>16579</b>	<b>3813</b>	<b>3813</b>	<b>16579</b>	<b>155707</b>	<b>1590</b>	<b>1590</b>	<b>155707</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	PUNJAB				RAJASTHAN			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	42802	763	486	43078	153770	12965	42623	124112
		Current Shifting cultivation				0				0
		Fallow	69	66	42	93	78715	42577	12991	108300
		Plantation	821	71	421	470	117	6		123
		<b>Sub Total 1</b>	<b>43691</b>	<b>900</b>	<b>949</b>	<b>43642</b>	<b>232602</b>	<b>55547</b>	<b>55614</b>	<b>232535</b>
2	Barren/unculturable/ Wastelands	Barren Rocky				0	4554		3	4552
		Gullied / Ravinous Land	35	8	20	23	1320		0	1319
		Rann				0	100		0	100
		Salt Affected Land	25	20	25	20	802		4	798
		Sandy Area	126	57	71	112	23713		0	23713
		Scrub Land	356	56	224	188	34978		44	34934
		<b>Sub Total 2</b>	<b>541</b>	<b>140</b>	<b>340</b>	<b>342</b>	<b>65467</b>	<b>0</b>	<b>52</b>	<b>65415</b>
		<b>Sub Total 2</b>	<b>541</b>	<b>140</b>	<b>340</b>	<b>342</b>	<b>65467</b>	<b>0</b>	<b>52</b>	<b>65415</b>
3	Builtup	Mining	121	64	41	144	397	13		410
		Rural	1734	96	41	1789	3276	16		3291
		Urban	1823	248	45	2025	2148	99		2247
		<b>Sub Total 3</b>	<b>3678</b>	<b>408</b>	<b>127</b>	<b>3958</b>	<b>5821</b>	<b>127</b>	<b>0</b>	<b>5948</b>
4	Forest	Deciduous	1423	52	45	1431	17218	651	332	17537
		Evergreen/Semi evergreen	13	1		14				0
		Forest Plantation	15	5	2	18	135		11	123
		Scrub Forest	70	41	35	77	11083	342	651	10774
		Swamp / Mangroves		0		0				0
		<b>Sub Total 4</b>	<b>1521</b>	<b>99</b>	<b>81</b>	<b>1539</b>	<b>28436</b>	<b>994</b>	<b>995</b>	<b>28434</b>
5	Grass / Grazing	Grass / Grazing			0	0	3309		6	3303
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3309</b>	<b>0</b>	<b>6</b>	<b>3303</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	115	13	86	41	192		17	175
		Coastal Wetland				0				0
		River/Stream/Canals	732	41	47	725	3284	0	0	3284
		Water bodies	84	35	4	115	3129	16	0	3144
		<b>Sub Total 7</b>	<b>930</b>	<b>88</b>	<b>137</b>	<b>881</b>	<b>6605</b>	<b>16</b>	<b>17</b>	<b>6604</b>
<b>Grand Total</b>			<b>50362</b>	<b>1636</b>	<b>1636</b>	<b>50362</b>	<b>342239</b>	<b>56684</b>	<b>56684</b>	<b>342239</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	SIKKIM				TAMIL NADU			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	589		2	587	59426	4689	10265	53850
		Current Shifting cultivation				0				0
		Fallow	1			1	19054	8437	4537	22954
		Plantation	4			4	9938	2333	852	11419
		<b>Sub Total 1</b>	<b>594</b>	<b>0</b>	<b>2</b>	<b>592</b>	<b>88417</b>	<b>15460</b>	<b>15654</b>	<b>88223</b>
2	Barren/unculturable/ Wastelands	Barren Rocky	928	333	152	1109	338		1	337
		Gullied / Ravinous Land				0	182	2	0	184
		Rann				0				0
		Salt Affected Land				0	312	4	36	279
		Sandy Area	4	0	0	4	306	4	7	303
		Scrub Land	21	2	0	23	4182	31	33	4180
		<b>Sub Total 2</b>	<b>952</b>	<b>336</b>	<b>152</b>	<b>1136</b>	<b>5320</b>	<b>41</b>	<b>78</b>	<b>5283</b>
3	Builtup	Mining	0			0	598	19	1	616
		Rural	6	0		6	6137			6137
		Urban	18	0		18	2648	151	2	2797
		<b>Sub Total 3</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>9383</b>	<b>170</b>	<b>3</b>	<b>9550</b>
4	Forest	Deciduous	183	2	0	184	11203	161	4	11359
		Evergreen/Semi evergreen	2573	1	47	2528	4474		155	4319
		Forest Plantation	4		0	4	1322	0	3	1319
		Scrub Forest	53	22	0	75	0	10		10
		Swamp / Mangroves				0	80	2	1	80
<b>Sub Total 4</b>	<b>2813</b>	<b>25</b>	<b>47</b>	<b>2791</b>	<b>17078</b>	<b>173</b>	<b>163</b>	<b>17087</b>		
5	Grass / Grazing	Grass / Grazing	621		68	553	200	52	0	252
		<b>Sub Total 5</b>	<b>621</b>	<b>0</b>	<b>68</b>	<b>553</b>	<b>200</b>	<b>52</b>	<b>0</b>	<b>252</b>
6	Snow and Glacier	Snow and Glacier	2025	241	335	1930				0
		<b>Sub Total 6</b>	<b>2025</b>	<b>241</b>	<b>335</b>	<b>1930</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland				0	130			130
		Coastal Wetland				0	714		3	711
		River/Stream/Canals	47			47	1751		1	1750
		Water bodies	21	2		22	7065	11	3	7072
		<b>Sub Total 7</b>	<b>68</b>	<b>2</b>	<b>0</b>	<b>69</b>	<b>9659</b>	<b>11</b>	<b>7</b>	<b>9663</b>
<b>Grand Total</b>			<b>7096</b>	<b>604</b>	<b>604</b>	<b>7096</b>	<b>130058</b>	<b>15906</b>	<b>15906</b>	<b>130058</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	TRIPURA				TELANGANA			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	1415	0	18	1397	59928	3718	3204	60442
		Current Shifting cultivation	16	29	15	31				0
		Fallow	34		5	29	9157	2703	2112	9749
		Plantation	813	7	47	773	1120	145	88	1177
		<b>Sub Total 1</b>	<b>2278</b>	<b>36</b>	<b>85</b>	<b>2229</b>	<b>70205</b>	<b>6566</b>	<b>5404</b>	<b>71368</b>
2	Barren/unculturable/Wastelands	Barren Rocky				0	759	127	119	767
		Gullied / Ravinous Land	0	0		0	122	34	27	129
		Rann				0				0
		Salt Affected Land				0	254	207	27	434
		Sandy Area	2	2	0	3	2	3	1	5
		Scrub Land	255	127	79	303	5001	1080	993	5087
		<b>Sub Total 2</b>	<b>257</b>	<b>129</b>	<b>79</b>	<b>307</b>	<b>6138</b>	<b>1450</b>	<b>1166</b>	<b>6422</b>
3	Builtup	Mining	6	0	1	6	479	103	116	466
		Rural	561	3		564	2015	70	49	2036
		Urban	321	1	1	321	1877	162	173	1866
		<b>Sub Total 3</b>	<b>889</b>	<b>4</b>	<b>2</b>	<b>891</b>	<b>4371</b>	<b>336</b>	<b>338</b>	<b>4369</b>
4	Forest	Deciduous	2377	379	189	2568	19248	32	1266	18014
		Evergreen/Semi evergreen	3793	2	140	3655		0		0
		Forest Plantation	301	0	9	292	418	25	89	354
		Scrub Forest	478	312	357	432	4727	517	628	4616
		Swamp / Mangroves				0		0		0
<b>Sub Total 4</b>	<b>6949</b>	<b>693</b>	<b>694</b>	<b>6948</b>	<b>24394</b>	<b>574</b>	<b>1982</b>	<b>22985</b>		
5	Grass / Grazing	Grass / Grazing				0	31	4	3	32
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>31</b>	<b>4</b>	<b>3</b>	<b>32</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	6		1	5	16	5	2	19
		Coastal Wetland				0				0
		River/Stream/Canals	51		1	50	2190	33	27	2197
		Water bodies	57	0	0	57	4734	94	140	4688
		<b>Sub Total 7</b>	<b>114</b>	<b>0</b>	<b>2</b>	<b>112</b>	<b>6940</b>	<b>132</b>	<b>169</b>	<b>6903</b>
<b>Grand Total</b>			<b>10486</b>	<b>863</b>	<b>863</b>	<b>10486</b>	<b>112079</b>	<b>9062</b>	<b>9062</b>	<b>112079</b>

Note: 1. Calculated on the basis of change matrices provided by  
2. Totals may not match due to rounding off.



## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	UTTAR PRADESH				UTTARAKHAND			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	183424	1309	2426	182306	9691	14	25	9680
		Current Shifting cultivation				0				0
		Fallow	6417	1653	785	7286	927	0	3	924
		Plantation	4742	168	3	4907	176		0	175
		<b>Sub Total 1</b>	<b>194583</b>	<b>3130</b>	<b>3215</b>	<b>194498</b>	<b>10794</b>	<b>14</b>	<b>29</b>	<b>10779</b>
2	Barren/unculturable/Wastelands	Barren Rocky	220			220	6026	197	2987	3236
		Gullied / Ravinous Land	1287	1	9	1278	0			0
		Rann				0				0
		Salt Affected Land	2581	11	19	2574				0
		Sandy Area	13	3		17	26	24	1	49
		Scrub Land	3486	80	202	3364	1092	100	8	1184
		<b>Sub Total 2</b>	<b>7588</b>	<b>95</b>	<b>230</b>	<b>7452</b>	<b>7143</b>	<b>322</b>	<b>2996</b>	<b>4470</b>
3	Builtup	Mining	368	41	2	408	24	3	0	26
		Rural	8259	42	11	8289	210	2	0	212
		Urban	3921	183	2	4102	402	11		413
		<b>Sub Total 3</b>	<b>12548</b>	<b>266</b>	<b>15</b>	<b>12799</b>	<b>635</b>	<b>16</b>	<b>0</b>	<b>651</b>
4	Forest	Deciduous	13020	8	70	12958	6279	0	1	6278
		Evergreen/Semi evergreen	231			231	16164		4	16160
		Forest Plantation	117	5	0	122	793		1	792
		Scrub Forest	2047	58	14	2091	2089		1	2089
		Swamp / Mangroves	69		2	67	7			7
<b>Sub Total 4</b>	<b>15485</b>	<b>71</b>	<b>87</b>	<b>15470</b>	<b>25333</b>	<b>0</b>	<b>8</b>	<b>25326</b>		
5	Grass / Grazing	Grass / Grazing	157		18	139	4329	7	532	3804
		<b>Sub Total 5</b>	<b>157</b>	<b>0</b>	<b>18</b>	<b>139</b>	<b>4329</b>	<b>7</b>	<b>532</b>	<b>3804</b>
6	Snow and Glacier	Snow and Glacier				0	3986	3437	195	7228
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3986</b>	<b>3437</b>	<b>195</b>	<b>7228</b>
7	Wet lands / Water bodies	Inland Wetland	2303	70	148	2225	0			0
		Coastal Wetland				0				0
		River/Stream/Canals	6693	704	512	6886	1063	9	42	1031
		Water bodies	1570	28	140	1458	199	1	4	196
		<b>Sub Total 7</b>	<b>10567</b>	<b>802</b>	<b>800</b>	<b>10570</b>	<b>1262</b>	<b>10</b>	<b>46</b>	<b>1226</b>
<b>Grand Total</b>			<b>240928</b>	<b>4364</b>	<b>4364</b>	<b>240928</b>	<b>53483</b>	<b>3807</b>	<b>3807</b>	<b>53483</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	WEST BENGAL				ANDAMAN & NICOBAR ISLANDS			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	51709	166	253	51622	316	1	2	315
		Current Shifting cultivation				0				0
		Fallow	41	0	5	36	0	0		0
		Plantation	2508	14	2	2521	74	2	0	76
		<b>Sub Total 1</b>	<b>54259</b>	<b>180</b>	<b>260</b>	<b>54179</b>	<b>390</b>	<b>3</b>	<b>2</b>	<b>392</b>
2	Barren/unculturable/ Wastelands	Barren Rocky	51			51				0
		Gullied / Ravinous Land	19	2	4	18				0
		Rann				0				0
		Salt Affected Land	1	1		2				0
		Sandy Area	29	7	17	19	7			7
		Scrub Land	1358	29	303	1085	2	1		3
		<b>Sub Total 2</b>	<b>1459</b>	<b>40</b>	<b>324</b>	<b>1175</b>	<b>9</b>	<b>1</b>	<b>0</b>	<b>10</b>
3	Buitup	Mining	257	40	6	291				0
		Rural	13281	23	9	13295	7			7
		Urban	2415	63	2	2476	63	1		64
		<b>Sub Total 3</b>	<b>15953</b>	<b>126</b>	<b>17</b>	<b>16062</b>	<b>69</b>	<b>1</b>	<b>0</b>	<b>70</b>
4	Forest	Deciduous	6510	328	67	6771	1427	1	3	1425
		Evergreen/Semi evergreen	199		0	199	5059	0	1	5058
		Forest Plantation	702	73	40	735				0
		Scrub Forest	512	36	183	365	273	6	5	274
		Swamp / Mangroves	1771	24	15	1779	819	9	2	825
<b>Sub Total 4</b>	<b>9694</b>	<b>460</b>	<b>305</b>	<b>9849</b>	<b>7578</b>	<b>16</b>	<b>11</b>	<b>7583</b>		
5	Grass / Grazing	Grass / Grazing	171	27	49	149				0
		<b>Sub Total 5</b>	<b>171</b>	<b>27</b>	<b>49</b>	<b>149</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	194	0	77	118	18		0	18
		Coastal Wetland	94	5	6	93	124	0	7	118
		River/Stream/Canals	5616	113	61	5668	53		2	51
		Water bodies	1313	149	1	1461	8		0	8
		<b>Sub Total 7</b>	<b>7217</b>	<b>267</b>	<b>145</b>	<b>7339</b>	<b>203</b>	<b>0</b>	<b>9</b>	<b>195</b>
<b>Grand Total</b>			<b>88752</b>	<b>1099</b>	<b>1099</b>	<b>88752</b>	<b>8249</b>	<b>22</b>	<b>22</b>	<b>8249</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	CHANDIGARH				DADAR & NAGAR HAVELI			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	12		1	11	156		0	155
		Current Shifting cultivation				0				0
		Fallow	0			0	112	0	1	112
		Plantation	1			1	14		0	14
		<b>Sub Total 1</b>	<b>12</b>	<b>0</b>	<b>1</b>	<b>12</b>	<b>283</b>	<b>0</b>	<b>1</b>	<b>281</b>
2	Barren/unculturable/Wastelands	Barren Rocky				0			0	
		Gullied / Ravinous Land				0			0	
		Rann				0			0	
		Salt Affected Land				0			0	
		Sandy Area				0			0	
		Scrub Land	1			1	0		0	0
		<b>Sub Total 2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
3	Builtup	Mining	0			0	1		1	
		Rural	1			1	2		2	
		Urban	88	1		89	31	2		33
		<b>Sub Total 3</b>	<b>89</b>	<b>1</b>	<b>0</b>	<b>90</b>	<b>34</b>	<b>2</b>	<b>0</b>	<b>35</b>
4	Forest	Deciduous	1			1	147		0	147
		Evergreen/Semi evergreen	8			8	6			6
		Forest Plantation	0			0	0			0
		Scrub Forest	0			0	1			1
		Swamp / Mangroves				0				0
<b>Sub Total 4</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>154</b>	<b>0</b>	<b>0</b>	<b>154</b>		
5	Grass / Grazing	Grass / Grazing				0				0
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland				0				0
		Coastal Wetland				0				0
		River/Stream/Canals	0			0	8			8
		Water bodies	2	0		2	12	0		12
		<b>Sub Total 7</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>
<b>Grand Total</b>			<b>114</b>	<b>1</b>	<b>1</b>	<b>114</b>	<b>491</b>	<b>2</b>	<b>2</b>	<b>491</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	DAMAN & DIU				DELHI			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	19		2	17	506	1	18	452
		Current Shifting cultivation				0				
		Fallow	11	0	0	11	7	1	16	77
		Plantation	10		0	10	2	14		16
		<b>Sub Total 1</b>	<b>39</b>	<b>0</b>	<b>2</b>	<b>37</b>	<b>514</b>	<b>15</b>	<b>33</b>	<b>545</b>
2	Barren/unculturable/ Wastelands	Barren Rocky				0			0	
		Gullied / Ravinous Land				0			1	6
		Rann				0				
		Salt Affected Land	0		0	0				0
		Sandy Area	3			3	0			
		Scrub Land	1	1	0	1	75		3	62
		<b>Sub Total 2</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>75</b>	<b>0</b>	<b>4</b>	<b>69</b>
3	Builtup	Mining	1		0	1	3		0	1
		Rural	1	0		1	23	1		51
		Urban	20	2	0	23	824	18		754
		<b>Sub Total 3</b>	<b>22</b>	<b>2</b>	<b>0</b>	<b>24</b>	<b>851</b>	<b>19</b>	<b>0</b>	<b>806</b>
4	Forest	Deciduous	1			1	1	1		11
		Evergreen/Semi evergreen				0	12			
		Forest Plantation				0				0
		Scrub Forest				0	1			12
		<b>Sub Total 4</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>13</b>	<b>15</b>	<b>1</b>	<b>0</b>	<b>23</b>
5	Grass / Grazing	Grass / Grazing				0			1	6
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>6</b>
6	Snow and Glacier	Snow and Glacier				0				
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland	8		0	8	4	0	0	4
		Coastal Wetland	19			19				
		River/Stream/Canals	4			4	21	2		27
		Water bodies	1		0	0	3			4
		<b>Sub Total 7</b>	<b>32</b>	<b>0</b>	<b>0</b>	<b>31</b>	<b>28</b>	<b>3</b>	<b>0</b>	<b>35</b>
<b>Grand Total</b>			<b>112</b>	<b>3</b>	<b>3</b>	<b>112</b>	<b>1483</b>	<b>38</b>	<b>38</b>	<b>1483</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

## State-wise Asset Account for Land Use Land Cover

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	LAKSHADWEEP				PUDUCHERRY			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	27			27	144	0	0	144
		Current Shifting cultivation				0				0
		Fallow				0	61		0	61
		Plantation				0	115		0	115
		<b>Sub Total 1</b>	<b>27</b>	<b>0</b>	<b>0</b>	<b>27</b>	<b>320</b>	<b>0</b>	<b>1</b>	<b>319</b>
2	Barren/unculturable/Wastelands	Barren Rocky				0				0
		Gullied / Ravinous Land				0				0
		Rann				0				0
		Salt Affected Land				0				0
		Sandy Area				0	2	3		5
		Scrub Land				0	2	1	0	2
		<b>Sub Total 2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>7</b>
3	Builtup	Mining				0	0			0
		Rural	0			0	35		0	35
		Urban	5			5	86	1	0	86
		<b>Sub Total 3</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>121</b>	<b>1</b>	<b>0</b>	<b>121</b>
4	Forest	Deciduous				0	0			0
		Evergreen/Semi evergreen				0				0
		Forest Plantation				0	0			0
		Scrub Forest				0				0
		Swamp / Mangroves				0	2			2
<b>Sub Total 4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>		
5	Grass / Grazing	Grass / Grazing				0				0
		<b>Sub Total 5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
6	Snow and Glacier	Snow and Glacier				0				0
		<b>Sub Total 6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
7	Wet lands / Water bodies	Inland Wetland				0	1			1
		Coastal Wetland				0	8		1	7
		River/Stream/Canals				0	18		2	16
		Water bodies	0			0	20	0	0	20
		<b>Sub Total 7</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>46</b>	<b>0</b>	<b>3</b>	<b>43</b>
<b>Grand Total</b>			<b>32</b>	<b>0</b>	<b>0</b>	<b>32</b>	<b>492</b>	<b>4</b>	<b>4</b>	<b>492</b>

Note: 1. Calculated on the basis of change matrices provided by

2. Totals may not match due to rounding off.

Annexure 1.1  
(Area in Sq. km)

Sl. No.	L1	L2	Asset Account for Land Cover of INDIA			
			Opening Stock (2011-12)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	Agriculture	Crop land	1553007	41056	90107	1503956
		Current Shifting cultivation	3743	2633	2353	4023
		Fallow	181469	79956	33247	228179
		Plantation	83514	4346	2742	85118
		<b>Sub Total 1</b>	<b>1821732</b>	<b>127991</b>	<b>128448</b>	<b>1821276</b>
2	Barren/unculturable/ Wastelands	Barren Rocky	173986	3540	72371	105154
		Gullied / Ravinous Land	7511	2898	468	9941
		Rann	18822	0	132	18690
		Salt Affected Land	9610	372	228	9754
		Sandy Area	30644	3471	680	33436
		Scrub Land	184144	12602	9862	186885
		<b>Sub Total 2</b>	<b>424717</b>	<b>22883</b>	<b>83740</b>	<b>363860</b>
3	Builtup	Mining	6024	907	310	6620
		Rural	74653	658	233	75079
		Urban	38321	2201	372	40150
		<b>Sub Total 3</b>	<b>118998</b>	<b>3766</b>	<b>916</b>	<b>121848</b>
4	Forest	Deciduous	444433	3753	11300	436886
		Evergreen/Semi evergreen	156105	1134	4194	153045
		Forest Plantation	23895	330	871	23355
		Scrub Forest	96406	11466	8252	99620
		Swamp / Mangroves	4704	66	47	4723
<b>Sub Total 4</b>	<b>725543</b>	<b>16749</b>	<b>24663</b>	<b>717629</b>		
5	Grass / Grazing	Grass / Grazing	25397	1049	2894	23551
		<b>Sub Total 5</b>	<b>25397</b>	<b>1049</b>	<b>2894</b>	<b>23551</b>
6	Snow and Glacier	Snow and Glacier	32581	70525	1782	101325
		<b>Sub Total 6</b>	<b>32581</b>	<b>70525</b>	<b>1782</b>	<b>101325</b>
7	Wet lands / Water bodies	Inland Wetland	8175	458	1027	7606
		Coastal Wetland	10719	189	121	10787
		River/Stream/Canals	61032	2130	2333	60829
		Water bodies	58367	1478	1293	58552
		<b>Sub Total 7</b>	<b>138294</b>	<b>4254</b>	<b>4775</b>	<b>137774</b>
<b>Grand Total</b>			<b>3287263</b>	<b>247218</b>	<b>247218</b>	<b>3287263</b>

Note: 1. Calculated on the basis of change matrices provided by  
2. Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		ARUNACHAL PRADESH																			
		2015-16																			
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup							
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total			
2011-12	1: Agriculture	1.1: Crop land	76008		304	76311	1959				1		15			16	17	27	146	191	
		1.2: Current Shifting cultivation		14		14															
		1.3: Plantation	417		6826	7244	178	7422			2		0			2	2	2	23	27	
		Farmland (FL) = 1.1+1.2+1.3	76425	14	7130	83568	2137	85705			3		16			18	19	29	169	218	
		1.4: Fallow	2018		126	2144	7428	9572			0		3			3	10	5	32	47	
	Sub Total	78443	14	7255	85712	9565	95277			3		19			21	29	34	201	265		
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						2263							2263	4			0	4	
		2.2: Gullied / Ravinous Land	83		4	86		86		45				1	46				0	0	
		2.3: Rann																			
		2.4: Salt Affected Land	63			63		63				1112		3	1115	0	0		1	1	
		2.5: Sandy Area	9		1	10		10					464	0	465	0			0	1	
		2.6: Scrub Land	498		26	524		524		2		18		10953	10973	13	1		7	21	
		Sub Total	653		31	684		684	2263	47		1130	464	10957	14862	18	1		9	28	
	3: Builtup	3.1: Mining														444			3	447	
		3.2: Rural															2926		1	2926	
		3.3: Urban														0	0	1503	1503		
		Sub Total														444	2926	1506	4876		
	4: Forest	4.1: Deciduous	65		0	65		65									2	0	1	3	
		4.2: Evergreen/Semi evergreen																		0	
		4.3: Forest Plantation	47			47		47												0	
		4.4: Scrub Forest	417		0	417	1	418									1			1	
		4.5: Swamp / Mangroves																		0	
	Sub Total	528		0	529	1	530									3	0	1	4		
	5: Grass / Grazing	5.1: Grass / Grazing																			
	6: Snow and Glacier	6.1: Snow and Glacier																			
	7: Wetlands / Water bodies	7.1: Inland Wetland	1			1	1	2													
		7.2: Coastal Wetland	3		0	3		3									0		7	7	
		7.3: River/Stream/Canals	2		1	2		2									0		0	0	
7.4: Water bodies		50		1	51	34	85				0	0		0	1	1	1	2			
Sub Total		55		1	57	35	92				0	0		0	1	1	1	8	9		
<b>Grand Total</b>		<b>79680</b>	<b>14</b>	<b>7288</b>	<b>86981</b>	<b>9602</b>	<b>96583</b>	<b>2263</b>	<b>50</b>		<b>1149</b>	<b>464</b>	<b>10957</b>	<b>14883</b>	<b>495</b>	<b>2962</b>	<b>1725</b>	<b>5182</b>			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			ANDHRA PRADESH													
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total	
2011-12	1: Agriculture	1.1: Crop land								0	0	16	281	297	78774	
		1.2: Current Shifting cultivation				1		1								14
		1.3: Plantation	1					1			0	5	5	10		7462
		Farmland (FL) = 1.1+1.2+1.3	1			1		2		0	0	21	286	308		86250
		1.4: Fallow	0				0	0				2	17	20		9642
		Sub Total	1			1	0	2		0	0	23	303	327		95892
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky														2267
		2.2: Gullied / Ravinous Land				0		0					0	0	0	133
		2.3: Rann														
		2.4: Salt Affected Land											2	2		1182
		2.5: Sandy Area					0	0		4				4		480
		2.6: Scrub Land								1		2	1	5		11522
	Sub Total				0	0	1		5		2	4	11		15585	
	3: Builtup	3.1: Mining														447
		3.2: Rural														2926
		3.3: Urban														1503
		Sub Total														4876
	4: Forest	4.1: Deciduous	24601		25	458		25084					3	0	4	25155
		4.2: Evergreen/Semi evergreen		251				251								251
		4.3: Forest Plantation	0		576	48		624		0					0	671
		4.4: Scrub Forest			14	7686		7699				2	0	2		8120
		4.5: Swamp / Mangroves					364	364		12		0	0	12		376
		Sub Total	24602	251	614	8191	364	34021		12		5	0	17		34573
	5: Grass / Grazing	5.1: Grass / Grazing							98							98
	6: Snow and Glacier	6.1: Snow and Glacier														
	7: Wetlands / Water bodies	7.1: Inland Wetland									367			69	436	438
7.2: Coastal Wetland						18	18			858	0	2	860	888		
7.3: River/Stream/Canals									0	0	3868	8	3877	3879		
7.4: Water bodies						1	1		2		1	6669	6672	6760		
Sub Total						19	19		369	858	3869	6748	11844	11965		
Grand Total			24603	251	614	8192	384	34043	98		387	858	3900	7055	12200	162989

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		ARUNACHAL PRADESH																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	2622		0	2623						1	11	12		0	0	0	
		1.2: Current Shifting cultivation	0	422		422	0	422	0					9	10		0	0	
		1.3: Plantation			56	56		7422						2	2				
		Farmland(FL) = 1.1+1.2+1.3	2623	422	56	3101	0	10466	0				1	22	24		1	0	1
		1.4: Fallow	0			0	72	72						0	0				
	Sub Total	2623	422	56	3101	72	10538	0				1	22	24		1	0	1	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						237					5	242					
		2.2: Gullied / Ravinous Land																	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area									22		22						
		2.6: Scrub Land	1	3		3		3	5				0	2492	2498		0	0	0
	Sub Total	1	3		3		3	5				0	2492	2498		0	0	0	
	3: Builtup	3.1: Mining														1		1	
		3.2: Rural						0					13	13		354	12	366	
		3.3: Urban											12	12			125	125	
		Sub Total						0					25	25	1	354	137	492	
	4: Forest	4.1: Deciduous											27	27					
		4.2: Evergreen/Semi evergreen	31	248		279		279	15			2	95	111	0	7	0	7	
		4.3: Forest Plantation											5	5					
		4.4: Scrub Forest	3	16		18		18	0			0	41	41		0		0	
		4.5: Swamp / Mangroves																	
	Sub Total	34	264		298		298	15			2	168	185	0	7	0	8		
	5: Grass / Grazing	5.1: Grass / Grazing	0	0		1		1	2			9	111	122					
	6: Snow and Glacier	6.1: Snow and Glacier							0				36	36					
	7: Wetlands / Water bodies	7.1: Inland Wetland																	
		7.2: Coastal Wetland																	
7.3: River/Stream/Canals							0				27	25	52			0	0		
7.4: Water bodies							0					0	0						
Sub Total						0				27	25	52			0	0			
<b>Grand Total</b>		<b>2658</b>	<b>689</b>	<b>56</b>	<b>3402</b>	<b>72</b>	<b>3474</b>	<b>259</b>				<b>61</b>	<b>2886</b>	<b>3206</b>	<b>1</b>	<b>362</b>	<b>137</b>	<b>501</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		ARUNACHAL PRADESH													
		2015-16													
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total	
2011-12	1: Agriculture	1.1: Crop land			0		0	0			0	0	0	2635	
		1.2: Current Shifting cultivation		0		342	342	1				0	0	775	
		1.3: Plantation													7424
		Farmland (FL) = 1.1+1.2+1.3		0	0	342	342	1				0	0	0	10834
		1.4: Fallow													72
		Sub Total		0	0	342	342	1				0	0	0	10905
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky								0				0	242
		2.2: Gullied / Ravinous Land													
		2.3: Rann													
		2.4: Salt Affected Land													
		2.5: Sandy Area										2		2	24
		2.6: Scrub Land			5		3	7	0	102				0	0
	Sub Total			5		3	7	0	102			2	0	2	2877
	3: Builtup	3.1: Mining													1
		3.2: Rural													379
		3.3: Urban													137
		Sub Total													517
	4: Forest	4.1: Deciduous	116					116							143
		4.2: Evergreen/Semi evergreen	0	57774	2	407	58183	128	146			2	0	2	58857
		4.3: Forest Plantation				24	24								30
		4.4: Scrub Forest		10	2	1337	1350				0	0		0	1410
		4.5: Swamp / Mangroves													
	Sub Total	116	57784	28	1745	59673	128	146		0	2	0	2	60439	
	5: Grass / Grazing	5.1: Grass / Grazing		3		5	7	4750	632	0		2		2	5514
	6: Snow and Glacier	6.1: Snow and Glacier		1		1	3	6	9250				0	0	9295
	7: Wetlands / Water bodies	7.1: Inland Wetland									0				0
		7.2: Coastal Wetland													
7.3: River/Stream/Canals			1		1	1	22	4			1448		1448	1527	
7.4: Water bodies								3				31	31	34	
Sub Total			1		1	1	22	7	0		1448	31	1479	1561	
<b>Grand Total</b>		<b>116</b>	<b>57793</b>	<b>28</b>	<b>2096</b>	<b>60033</b>	<b>4907</b>	<b>10137</b>	<b>0</b>	<b>0</b>	<b>1453</b>	<b>31</b>	<b>1485</b>	<b>83743</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		ASSAM																		
		2015-16																		
		1: Agriculture					2: Barren/Unculturable/ Wastelands							3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	24118	2	5	24125	43	24168					10	39	49	34	3	2	39	
		1.2: Current Shifting cultivation		25		25		25						39	39					
		1.3: Plantation	2		3798	3800		7422					0	13	14	1			0	2
		Farmland (FL) = 1.1+1.2+1.3	24120	28	3803	27951	43	31615					10	91	101	35	3	2	40	
		1.4: Fallow	47			47	437	484					1	3	3	2	0	2	4	
	Sub Total	24167	28	3803	27998	480	32099					11	94	104	38	3	5	45		
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky												0	0					
		2.2: Gullied / Ravinous Land																		
		2.3: Rann																		
		2.4: Salt Affected Land																		
		2.5: Sandy Area	16		0	16		16					9	1	10	1	0	0	1	
		2.6: Scrub Land	9	14	8	31	3	35					1	3238	3239	1		0	1	
	Sub Total	25	14	8	47	3	51					9	3240	3249	2	0	0	3		
	3: Builtup	3.1: Mining												1	1	82		2	83	
		3.2: Rural												11	11	1	635	0	636	
		3.3: Urban											0	4	4	0		718	718	
		Sub Total											0	17	17	82	635	720	1437	
	4: Forest	4.1: Deciduous	19	4	2	25	1	25					2	609	611	6	0	16	23	
		4.2: Evergreen/Semi evergreen	4	8	7	19	1	20					0	17	17	1	0	0	1	
		4.3: Forest Plantation		0		0		0						1	1			0	0	
		4.4: Scrub Forest	11	5	1	16		16						57	57	1		0	1	
		4.5: Swamp / Mangroves																		
	Sub Total	33	17	9	60	2	61					2	684	686	8	1	16	25		
	5: Grass / Grazing	5.1: Grass / Grazing	73		0	73	8	81					4	23	27	0	0	0	1	
	6: Snow and Glacier	6.1: Snow and Glacier																		
	7: Wetlands / Water bodies	7.1: Inland Wetland	36			36	4	40					1	15	16	5	1	2	8	
		7.2: Coastal Wetland																		
7.3: River/Stream/Canals		82	0	1	83	3	86					15	17	32	1	1	0	2		
7.4: Water bodies		1			1		1						2	2	0			0		
Sub Total	119	0	1	120	7	127					16	34	50	6	2	2	10			
Grand Total		24417	58	3822	28297	501	28798					42	4091	4133	136	640	744	1520		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			ASSAM													
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies					Grand Total	
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4		Sub Total
2011-12	1: Agriculture	1.1: Crop land	62				62	35		23			213	7	243	24596
		1.2: Current Shifting cultivation	3	0		21	24									88
		1.3: Plantation	7			0	7			0		3	0	3	3	7447
		Farmland (FL) = 1.1+1.2+1.3	72	0		21	93	35		23		216	7	246	32131	
		1.4: Fallow	1				1	1		1		8	0	10	10	504
	Sub Total	73	0		21	94	36		24		224	8	256	32635		
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky				0	0									0
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area	1			1	2	30		0		19		19	19	78
		2.6: Scrub Land	16			18	34	1		0		6		6	3316	
	Sub Total	17			19	36	31		0		25		25	3395		
	3: Builtup	3.1: Mining				0	0									85
		3.2: Rural											5		5	652
		3.3: Urban														722
	Sub Total				0	0						5		5	1459	
	4: Forest	4.1: Deciduous	27012		2	132	27146	3		1		44	0	45	27853	
		4.2: Evergreen/Semi evergreen	103	4364	5	282	4753	2		0		13		14	4806	
		4.3: Forest Plantation	0		77	9	85					0		0	86	
		4.4: Scrub Forest	24	2	0	736	762	1		0		7		7	844	
		4.5: Swamp / Mangroves														
	Sub Total	27140	4365	84	1158	32747	6		1		65	0	66	33590		
	5: Grass / Grazing	5.1: Grass / Grazing	5	1		57	64	2316		4		459	0	463	2953	
	6: Snow and Glacier	6.1: Snow and Glacier														
	7: Wetlands / Water bodies	7.1: Inland Wetland	2	0		5	7	17			1123		5	1	1129	1217
		7.2: Coastal Wetland														
7.3: River/Stream/Canals		0			19	20	626		1		5962	0	5963	6729		
7.4: Water bodies					0	0					0	78	78	82		
Sub Total	2	0		25	27	643		1124		5968	79	7170	8028			
Grand Total	27237	4367	84	1281	32968	3033		1153		6746	87	7986	78438			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		BIHAR																		
		2015-16																		
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	63520		230	63750	695	64445		1			5	351	357	21	4	21	46	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	22		2688	2710	2	7422		0				1	1	0	2	1	2	
		Farmland (FL) = 1.1+1.2+1.3	63542		2917	66460	697	71866		1			5	353	359	21	5	21	48	
		1.4: Fallow	2275		30	2304	1944	4248		0			2	44	46	7		14	21	
		Sub Total	65817		2947	68764	2640	76114		1			8	396	405	29	5	35	69	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky	3		0	3	2	5	92	0					92	0			0	
		2.2: Gullied / Ravinous Land	11			11	0	11		59				2	62					
		2.3: Rann																		
		2.4: Salt Affected Land										3			3					
		2.5: Sandy Area	2			2	0	2					18	1	19					
		2.6: Scrub Land	697		2	699	161	860	1	6			11	1812	1831	3	1	2	6	
		Sub Total	713		2	715	164	879	93	66		3	29	1815	2006	3	1	2	6	
	3: Builtup	3.1: Mining	0			0		0						0	0	203			203	
		3.2: Rural														0	5430	18	5448	
		3.3: Urban	0			0		0						1	1	0		843	843	
		Sub Total	0			0		0						1	1	203	5430	860	6494	
	4: Forest	4.1: Deciduous	0			0		0	0	4				16	21	0			0	
		4.2: Evergreen/Semi evergreen																		
		4.3: Forest Plantation																		
		4.4: Scrub Forest							0	1				1	2					
		4.5: Swamp / Mangroves																		
	Sub Total	0			0		0	1	5				17	22	0			0		
	5: Grass / Grazing	5.1: Grass / Grazing	0			0		0						1	1					
	6: Snow and Glacier	6.1: Snow and Glacier																		
	7: Wetlands / Water bodies	7.1: Inland Wetland	162		0	163	13	176		0			0	11	11	1		1	3	
		7.2: Coastal Wetland																		
7.3: River/Stream/Canals		288		0	289	35	324					12	242	254	2		0	2		
7.4: Water bodies		0		0	1	0	1						1	1	0	0	0	0		
Sub Total		451		1	452	48	500		0			13	254	267	3	0	2	5		
<b>Grand Total</b>		<b>66981</b>		<b>2950</b>	<b>69931</b>	<b>2852</b>	<b>72783</b>	<b>93</b>	<b>71</b>		<b>3</b>	<b>49</b>	<b>2485</b>	<b>2702</b>	<b>238</b>	<b>5437</b>	<b>899</b>	<b>6574</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		BIHAR													
		2015-16													
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	0		1		1			116		172	6	294	65143
		1.2: Current Shifting cultivation													
		1.3: Plantation								1		0	0	1	7427
		Farmland (FL) = 1.1+1.2+1.3	0		1		1			117		172	6	295	72570
		1.4: Fallow			0	0	0			116		28	1	145	4460
	Sub Total	0		1	0	1			233		200	7	440	77029	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky	5				5								102
		2.2: Gullied / Ravinous Land	0			0	0					0	2	2	75
		2.3: Rann													
		2.4: Salt Affected Land										1			3
		2.5: Sandy Area													21
		2.6: Scrub Land	21				21			13		108	5	126	2843
	Sub Total	26			0	26			13		108	6	127	3045	
	3: Builtup	3.1: Mining								0				0	204
		3.2: Rural													5448
		3.3: Urban								0				0	844
		Sub Total								0				0	6496
	4: Forest	4.1: Deciduous	4536		0	60	4596					1	9	10	4627
		4.2: Evergreen/Semi evergreen													5
		4.3: Forest Plantation			5		5								
		4.4: Scrub Forest	1			1241	1242					1	2	3	1246
		4.5: Swamp / Mangroves													
	Sub Total	4537		5	1301	5843					2	10	12	5878	
	5: Grass / Grazing	5.1: Grass / Grazing							17				0	0	18
	6: Snow and Glacier	6.1: Snow and Glacier													
	7: Wetlands / Water bodies	7.1: Inland Wetland								1733		21	1	1755	1944
		7.2: Coastal Wetland													
7.3: River/Stream/Canals		1			1	2			4		3703	0	3707	4289	
7.4: Water bodies					0	0			2		0	178	180	182	
Sub Total		1			1	2			1738		3725	179	5642	6415	
<b>Grand Total</b>		<b>4565</b>		<b>5</b>	<b>1302</b>	<b>5873</b>		<b>17</b>		<b>1984</b>		<b>4034</b>	<b>203</b>	<b>6222</b>	<b>94171</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		CHHATTISGARH																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	58962		12	58974	182	59156								6	0	15	21
		1.2: Current Shifting cultivation																	
		1.3: Plantation	2		206	208	2	7422								0		0	0
		Farmland (FL) = 1.1+1.2+1.3	58964		218	59182	184	66577								6	0	15	21
		1.4: Fallow	368		1	369	1958	2327						31	31	2	0	10	11
	Sub Total	59331		219	59551	2142	68904						31	31	7	0	25	33	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						691						691					
		2.2: Gullied / Ravinous Land							82					82					
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area	0			0		0					23	23	0			0	
		2.6: Scrub Land	100		3	103	2	104						2833	2833	4	0	18	22
	Sub Total	100		3	103	2	104	691	82			23	2833	3628	4	0	18	22	
	3: Builtup	3.1: Mining														229			229
		3.2: Rural															3253		3253
		3.3: Urban																941	941
		Sub Total														229	3253	941	4423
	4: Forest	4.1: Deciduous	15		0	15		15								1	0	2	3
		4.2: Evergreen/Semi evergreen																0	0
		4.3: Forest Plantation																0	0
		4.4: Scrub Forest	0			0	0	1								0		0	0
		4.5: Swamp / Mangroves																	
	Sub Total	15		0	15	0	16								2	0	2	4	
	5: Grass / Grazing	5.1: Grass / Grazing																	
	6: Snow and Glacier	6.1: Snow and Glacier																	
	7: Wetlands / Water bodies	7.1: Inland Wetland																	
		7.2: Coastal Wetland																	
7.3: River/Stream/Canals		1			1		1					2	2						
7.4: Water bodies		20		0	20		20						0	0					
Sub Total		21		0	21		21					2	0	3					
<b>Grand Total</b>		<b>59467</b>		<b>222</b>	<b>59690</b>	<b>2144</b>	<b>61833</b>	<b>691</b>	<b>82</b>			<b>25</b>	<b>2863</b>	<b>3661</b>	<b>242</b>	<b>3254</b>	<b>986</b>	<b>4482</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			CHHATTISGARH													
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total	
2011-12	1: Agriculture	1.1: Crop land				2	2						9	9	59188	
		1.2: Current Shifting cultivation	0				0							0	0	
		1.3: Plantation												0	0	7422
		Farmland (FL) = 1.1+1.2+1.3	0			2	2							9	9	66610
		1.4: Fallow												1	1	2370
		Sub Total	0			2	2							10	10	68980
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky														691
		2.2: Gullied / Ravinous Land														82
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area										3	0	3	3	26
		2.6: Scrub Land			1			1						2	2	2962
	Sub Total			1			1						3	2	5	3760
	3: Builtup	3.1: Mining														229
		3.2: Rural														3253
		3.3: Urban														941
		Sub Total														4423
	4: Forest	4.1: Deciduous	57510			16	57526							7	7	57551
		4.2: Evergreen/Semi evergreen														
		4.3: Forest Plantation	0		85		86									86
		4.4: Scrub Forest	13		1	4154	4167							0	0	4169
		4.5: Swamp / Mangroves														
	Sub Total	57523		86	4170	61779							7	7	61806	
	5: Grass / Grazing	5.1: Grass / Grazing														
	6: Snow and Glacier	6.1: Snow and Glacier														
	7: Wetlands / Water bodies	7.1: Inland Wetland									5				5	5
		7.2: Coastal Wetland														
7.3: River/Stream/Canals											1844	0	1844	1844	1847	
7.4: Water bodies		0		0	1	1						1564	1564	1564	1585	
Sub Total		0		0	1	1				5	1844	1564	3413	3413	3437	
<b>Grand Total</b>			57523		87	4172	61783				5	1847	1583	3435	135194	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

Land Use Land Cover (LULC) Change Matrix

Annexure 1.2

(Area in Sq. km)

LULC_CLASSES		DELHI																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	505			505													
		1.2: Current Shifting cultivation																	
		1.3: Plantation			2	2	7422												
		Farmland (FL) = 1.1+1.2+1.3	505		2	507	7927												
		1.4: Fallow			0	0	7												
		Sub Total	505		2	507	7	7934											
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																	
		2.2: Gullied / Ravinous Land																	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area										0		0					
		2.6: Scrub Land											75		75				
	Sub Total										0	75	75						
	3: Builtup	3.1: Mining													3			3	
		3.2: Rural														23		23	
		3.3: Urban															824	824	
		Sub Total													3	23	824	851	
	4: Forest	4.1: Deciduous																	
		4.2: Evergreen/Semi evergreen	0			0	0												
		4.3: Forest Plantation																	
		4.4: Scrub Forest																	
4.5: Swamp / Mangroves																			
Sub Total	0			0	0														
5: Grass / Grazing	5.1: Grass / Grazing																		
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals										0		0						
	7.4: Water bodies																		
Sub Total										0		0							
<b>Grand Total</b>		<b>505</b>		<b>2</b>	<b>507</b>	<b>7</b>	<b>514</b>						<b>1</b>	<b>75</b>	<b>75</b>	<b>3</b>	<b>23</b>	<b>824</b>	<b>851</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		DELHI															
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land											0	0	0	506	
		1.2: Current Shifting cultivation															
		1.3: Plantation															7422
		Farmland (FL) = 1.1+1.2+1.3												0	0	0	7927
		1.4: Fallow															7
		Sub Total												0	0	0	7934
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															
		2.2: Gullied / Ravinous Land															
		2.3: Rann															
		2.4: Salt Affected Land															
		2.5: Sandy Area															0
		2.6: Scrub Land															75
	Sub Total															75	
	3: Builtup	3.1: Mining															3
		3.2: Rural															23
		3.3: Urban															824
		Sub Total															851
	4: Forest	4.1: Deciduous	1					1									1
		4.2: Evergreen/Semi evergreen		12				12									12
		4.3: Forest Plantation															
		4.4: Scrub Forest															
		4.5: Swamp / Mangroves															
	Sub Total	1	12				14									14	
5: Grass / Grazing	5.1: Grass / Grazing																
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland									4					4	4	
	7.2: Coastal Wetland																
	7.3: River/Stream/Canals											21			21	21	
	7.4: Water bodies												3		3	3	
	Sub Total									4		21	3		28	28	
<b>Grand Total</b>		1	12				14			4		21	3		28	1483	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		GOA																		
		2015-16																		
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup							
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	434		0	434	51	486	0				0	17	17	0	9	5	14	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	0		165	165		7422					0	5	5	0				0
		<b>Farmland (FL) = 1.1+1.2+1.3</b>	434		165	600	51	7907	0				0	22	22	1	9	5	15	
		1.4: Fallow	3			3	34	37						4	4	0	0	0	1	
	<b>Sub Total</b>	438		165	603	85	7944	0				0	25	26	1	9	6	16		
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky	1			1	1	2	16					32	48	0		1	1	
		2.2: Gullied / Ravinous Land																		
		2.3: Rann																		
		2.4: Salt Affected Land																		
		2.5: Sandy Area										7		7						
		2.6: Scrub Land	4		1	5	1	6	0					222	222	5	0	30	35	
	<b>Sub Total</b>	5		1	6	2	8	16				7	254	278	5	0	31	36		
	3: Builtup	3.1: Mining					1	1	1					19	19	64		0	64	
		3.2: Rural											1	1	0	25		25		
		3.3: Urban	0			0		0					0	10	10	3	0	249	252	
		<b>Sub Total</b>	0			0	1	1	1				0	30	31	67	25	249	341	
	4: Forest	4.1: Deciduous	0			0		0	0				0	7	7	1		0	1	
		4.2: Evergreen/Semi evergreen	0			0		0	0				0	0	0			0	0	
		4.3: Forest Plantation											0	0	0			0	0	
		4.4: Scrub Forest	2		2	4	0	4					0	17	17	0		5	5	
		4.5: Swamp / Mangroves																		
	<b>Sub Total</b>	2		2	4	0	4	0				0	25	25	2		5	7		
5: Grass / Grazing	5.1: Grass / Grazing																			
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland	0			0	1	1						1	1	0			0		
	7.2: Coastal Wetland	0			0		0					3	3							
	7.3: River/Stream/Canals											0	0							
	7.4: Water bodies											6	6							
<b>Sub Total</b>	0			0	1	1					3	7	10	0			0			
<b>Grand Total</b>	445		168	613	89	702	18				10	342	370	74	35	291	400			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			GOA														
			2015-16														
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total			
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	4		4	8		16			6				6	540	
		1.2: Current Shifting cultivation															
		1.3: Plantation	0			2		2			1					1	7429
		<b>Farmland (FL) = 1.1+1.2+1.3</b>	<b>4</b>		<b>4</b>	<b>10</b>		<b>19</b>			<b>7</b>					<b>7</b>	<b>7970</b>
		1.4: Fallow				0		0			1					1	43
	<b>Sub Total</b>	<b>4</b>		<b>4</b>	<b>10</b>		<b>19</b>			<b>7</b>					<b>7</b>	<b>8012</b>	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky		0		5		5								5	56
		2.2: Gullied / Ravinous Land															
		2.3: Rann															
		2.4: Salt Affected Land															
		2.5: Sandy Area	0					0								0	8
		2.6: Scrub Land	14	0	0	4		19			4				0	4	287
	<b>Sub Total</b>	<b>15</b>	<b>1</b>	<b>0</b>	<b>8</b>		<b>24</b>			<b>4</b>				<b>0</b>	<b>4</b>	<b>350</b>	
	3: Builtup	3.1: Mining	0			0		0								0	85
		3.2: Rural				0		0								0	27
		3.3: Urban	1			0		1			0					0	263
		<b>Sub Total</b>	<b>1</b>			<b>1</b>		<b>1</b>			<b>0</b>					<b>0</b>	<b>374</b>
	4: Forest	4.1: Deciduous	1140			4		1144			3					3	1155
		4.2: Evergreen/Semi evergreen		617		1		618									618
		4.3: Forest Plantation			41	0		41									41
		4.4: Scrub Forest	139	2		40		181			0					0	208
		4.5: Swamp / Mangroves					15	15			1					1	16
		<b>Sub Total</b>	<b>1279</b>	<b>620</b>	<b>41</b>	<b>44</b>	<b>15</b>	<b>1999</b>			<b>4</b>					<b>4</b>	<b>2039</b>
	5: Grass / Grazing	5.1: Grass / Grazing				0		0	0							0	0
	6: Snow and Glacier	6.1: Snow and Glacier															
	7: Wetlands / Water bodies	7.1: Inland Wetland					0	0			57					57	58
		7.2: Coastal Wetland										22				22	25
7.3: River/Stream/Canals					0		0					68			68	69	
7.4: Water bodies										1			23		24	30	
<b>Sub Total</b>					<b>0</b>	<b>0</b>	<b>0</b>			<b>57</b>	<b>22</b>	<b>68</b>	<b>23</b>		<b>171</b>	<b>182</b>	
<b>Grand Total</b>			<b>1299</b>	<b>620</b>	<b>46</b>	<b>64</b>	<b>16</b>	<b>2044</b>	<b>0</b>		<b>73</b>	<b>22</b>	<b>68</b>	<b>23</b>	<b>186</b>	<b>3702</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		GUJARAT																		
		2015-16																		
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup							
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	104791		2	104792	698	105490				0		2	2	2	12	74	87	
		1.2: Current Shifting cultivation																		
		1.3: Plantation			545	545			7422											
		Farmland (FL) = 1.1+1.2+1.3	104791		546	105337	698	112912				0		2	2	2	12	74	87	
		1.4: Fallow	758		0	759	14762	15520					0	0	5	3	7	14	14	
		Sub Total	105549		547	106095	15460	128432				0		2	2	6	15	80	102	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						16						16						
		2.2: Gullied / Ravinous Land	0			0		0		218				218				0	0	
		2.3: Rann								18590				18590						
		2.4: Salt Affected Land	1			1	0	1				3488		3488				0	0	
		2.5: Sandy Area											40	40						
		2.6: Scrub Land	13		2	15	2	17					0	19903	19903	4	4	9	17	
	Sub Total	14		2	16	2	18	16	218	18590	3488	40	19903	42255	4	4	9	17		
	3: Builtup	3.1: Mining													267			0	267	
		3.2: Rural														2527		0	2527	
		3.3: Urban															2655	2655		
		Sub Total													267	2527	2655	5450		
	4: Forest	4.1: Deciduous																0	0	
		4.2: Evergreen/Semi evergreen																		
		4.3: Forest Plantation																0	0	
		4.4: Scrub Forest																2	2	
		4.5: Swamp / Mangroves																3	3	
	Sub Total																3	3		
5: Grass / Grazing	5.1: Grass / Grazing																			
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland	2			2	2	4				0		0	0			0	0		
	7.2: Coastal Wetland	1			1	1	1				3		3				4	4		
	7.3: River/Stream/Canals	0			0	0	1													
	7.4: Water bodies	47			47	1	48				5		6	0				0		
	Sub Total	49			49	4	53				9		10	0			5	5		
<b>Grand Total</b>		<b>105612</b>		<b>549</b>	<b>106161</b>	<b>15466</b>	<b>121627</b>	<b>16</b>	<b>218</b>	<b>18590</b>	<b>3497</b>	<b>40</b>	<b>19906</b>	<b>42267</b>	<b>278</b>	<b>2546</b>	<b>2752</b>	<b>5576</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		GUJARAT															
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land									8	3	22	1	34	105613	
		1.2: Current Shifting cultivation															
		1.3: Plantation											1		1	7423	
		Farmland (FL) = 1.1+1.2+1.3									8	3	23	1	35	113036	
		1.4: Fallow									1	0	5	1	7	15542	
		Sub Total									9	4	28	2	43	128578	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky														16	
		2.2: Gullied / Ravinous Land														218	
		2.3: Rann										132			132	18722	
		2.4: Salt Affected Land										21	0	0	21	3510	
		2.5: Sandy Area														40	
		2.6: Scrub Land									0	16	7	1	24	19962	
	Sub Total									0	169	7	1	177	42467		
	3: Builtup	3.1: Mining														267	
		3.2: Rural														2527	
		3.3: Urban														2655	
		Sub Total														5450	
	4: Forest	4.1: Deciduous	9192					9192								9192	
		4.2: Evergreen/Semi evergreen		6				6								6	
		4.3: Forest Plantation			179			179								179	
		4.4: Scrub Forest				2809		2809								2810	
		4.5: Swamp / Mangroves					987	987				6	0	1	7	996	
	Sub Total	9192	6	179	2809	987	13173				6	0	1	7	13183		
	5: Grass / Grazing	5.1: Grass / Grazing							17							17	
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland									212	2	0	3	217	222		
	7.2: Coastal Wetland									0	6209		3	6212	6220		
	7.3: River/Stream/Canals										1	3226	0	3227	3228		
	7.4: Water bodies										0	0	3482	3482	3536		
	Sub Total									212	6212	3226	3488	13139	13206		
<b>Grand Total</b>		<b>9192</b>	<b>6</b>	<b>179</b>	<b>2809</b>	<b>987</b>	<b>13173</b>	<b>17</b>		<b>222</b>	<b>6390</b>	<b>3262</b>	<b>3492</b>	<b>13365</b>	<b>196024</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		HARYANA																		
		2015-16																		
		1: Agriculture					2: Barren/Unculturable/ Wastelands							3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	36748		35	36783	525	37309				19	2	54	75	58	41	138	236	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	18		106	124	2	7422					0	10	10	0	0	2	2	
		Farmland (FL) = 1.1+1.2+1.3	36766		141	36907	528	44730				19	2	64	85	58	41	140	238	
		1.4: Fallow	146		2	148	317	464				1	0	4	6	7	1	8	16	
		Sub Total	36911		143	37055	844	45195				20	2	68	90	65	41	148	254	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky				0	0	4					0	4			0	0	0	
		2.2: Gullied / Ravinous Land	0			0	0					0		0						
		2.3: Rann																		
		2.4: Salt Affected Land	2		0	2	0	2			52		1	53	0	0	0	1		
		2.5: Sandy Area	2		0	2	1	3				12	9	20				0	0	
		2.6: Scrub Land	11		2	14	0	14			1		985	985	0	1	4	5		
		Sub Total	16		2	18	2	20	4		52	12	994	1063	1	1	5	7		
	3: Builtup	3.1: Mining	19		0	19	1	20			0		1	1	152		0	152		
		3.2: Rural											0	0		1021	0	1021		
		3.3: Urban	0		0	0	0	0				3	3	0		1598	1598			
		Sub Total	19		0	19	1	20			0		5	5	152	1021	1599	2771		
	4: Forest	4.1: Deciduous	2		1	3	0	4				0	4	4						
		4.2: Evergreen/Semi evergreen																		
		4.3: Forest Plantation																		
		4.4: Scrub Forest																		
		4.5: Swamp / Mangroves																		
	Sub Total	2		1	3	0	4				0	4	4							
	5: Grass / Grazing	5.1: Grass / Grazing	5		0	5	0	5			0		65	66	0	102	7	109		
	6: Snow and Glacier	6.1: Snow and Glacier																		
	7: Wetlands / Water bodies	7.1: Inland Wetland	2			2	0	2			1		1	2			0	0	0	
		7.2: Coastal Wetland																		
7.3: River/Stream/Canals		18			18	1	18					0	0							
7.4: Water bodies		1		0	1	0	1					1	1		0	0	1			
Sub Total		21		0	21	1	22			1	0	1	3		0	1	1			
<b>Grand Total</b>		<b>36974</b>		<b>147</b>	<b>37121</b>	<b>848</b>	<b>37969</b>	<b>4</b>		<b>74</b>	<b>14</b>	<b>1138</b>	<b>1230</b>	<b>218</b>	<b>1165</b>	<b>1759</b>	<b>3142</b>			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			HARYANA													Grand Total		
			2015-16															
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies								
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total			
2011-12	1: Agriculture	1.1: Crop land	1			0		1	3			12		15	9	36	37659	
		1.2: Current Shifting cultivation																
		1.3: Plantation	7					7	0			0		0	0	0	7442	
		Farmland (FL) = 1.1+1.2+1.3	8			0		8	3			12		15	9	36	45100	
		1.4: Fallow							0			2		3	1	6	492	
		Sub Total	8			0		8	3			14		18	10	42	45592	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															5	
		2.2: Gullied / Ravinous Land															0	
		2.3: Rann																
		2.4: Salt Affected Land									0					0	56	
		2.5: Sandy Area											1	0	0	1	24	
		2.6: Scrub Land	1					1	0		1			0	1	1	1007	
	Sub Total	1					1	0		1		1	0	2	2	1092		
	3: Builtup	3.1: Mining	0					0			0				0	0	173	
		3.2: Rural															1021	
		3.3: Urban							0		0				0	0	1602	
		Sub Total	0					0	0		0			0	0	0	2796	
	4: Forest	4.1: Deciduous	651		1	1		653	0					1	1	2	663	
		4.2: Evergreen/Semi evergreen																
		4.3: Forest Plantation			16			16									16	
		4.4: Scrub Forest	7			155		163							0	0	163	
		4.5: Swamp / Mangroves																
	Sub Total	658		17	156		831	0					1	1	2	841		
5: Grass / Grazing	5.1: Grass / Grazing	0					0	434		1		0	7	8	623			
6: Snow and Glacier	6.1: Snow and Glacier																	
7: Wetlands / Water bodies	7.1: Inland Wetland							0			41			1	43	47		
	7.2: Coastal Wetland																	
	7.3: River/Stream/Canals											339	0	339	358			
	7.4: Water bodies	0					0	0		1		0	155	156	159			
	Sub Total	0					0	1		43		339	156	539	563			
<b>Grand Total</b>			<b>667</b>		<b>17</b>	<b>156</b>		<b>841</b>	<b>439</b>		<b>58</b>		<b>359</b>	<b>175</b>	<b>592</b>	<b>44212</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		HIMACHAL PRADESH																	
		2015-16																	
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	6415			6415											1	1	
		1.2: Current Shifting cultivation																	
		1.3: Plantation			2174	2174	7422											2	2
		Farmland (FL) = 1.1+1.2+1.3	6415		2174	8589	13837											3	3
		1.4: Fallow					3												
		Sub Total	6415		2174	8589	3	13839										3	3
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						10521						10521					
		2.2: Gullied / Ravinous Land							82					82					
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area										64		64					
		2.6: Scrub Land											7452	7452				0	0
		Sub Total						10521	82			64	7452	18120				0	0
	3: Builtup	3.1: Mining											0	0	23				23
		3.2: Rural													0	310			310
		3.3: Urban															293		293
		Sub Total											0	0	23	310	293		626
	4: Forest	4.1: Deciduous							1				0	1				0	0
		4.2: Evergreen/Semi evergreen														0	0	1	1
		4.3: Forest Plantation																0	0
		4.4: Scrub Forest																	
		4.5: Swamp / Mangroves																	
	Sub Total							1				0	1	0	0		1	1	
5: Grass / Grazing	5.1: Grass / Grazing													0	0			0	
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland											0	0						
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals																0	0	
	7.4: Water bodies																		
Sub Total											0	0				0	0		
<b>Grand Total</b>		<b>6415</b>		<b>2174</b>	<b>8589</b>	<b>3</b>	<b>8592</b>	<b>10522</b>	<b>82</b>			<b>64</b>	<b>7453</b>	<b>18121</b>	<b>23</b>	<b>310</b>	<b>297</b>	<b>630</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			HIMACHAL PRADESH												
			2015-16												
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total	
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4
2011-12	1: Agriculture	1.1: Crop land						0					1	1	6418
		1.2: Current Shifting cultivation													
		1.3: Plantation						3					0	0	7427
		Farmland (FL) = 1.1+1.2+1.3						3					1	1	13845
		1.4: Fallow													3
		<b>Sub Total</b>						3					1	1	13847
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky											0	0	10521
		2.2: Gullied / Ravinous Land													82
		2.3: Rann													
		2.4: Salt Affected Land													
		2.5: Sandy Area													64
		2.6: Scrub Land										4	2	6	7458
		<b>Sub Total</b>										4	2	6	18126
	3: Builtup	3.1: Mining											3	3	27
		3.2: Rural													310
		3.3: Urban											0	0	293
		<b>Sub Total</b>											4	4	630
	4: Forest	4.1: Deciduous	1273					1273					0	0	1274
		4.2: Evergreen/Semi evergreen		11030				11030					1	1	11031
		4.3: Forest Plantation			2			2							2
		4.4: Scrub Forest				161		161							161
		4.5: Swamp / Mangroves													
		<b>Sub Total</b>	1273	11030	2	161		12465					1	1	12468
5: Grass / Grazing	5.1: Grass / Grazing				0		0	5866				0	0	5867	
6: Snow and Glacier	6.1: Snow and Glacier								8683					8683	
7: Wetlands / Water bodies	7.1: Inland Wetland									3				3	
	7.2: Coastal Wetland														
	7.3: River/Stream/Canals										873	3	876	876	
	7.4: Water bodies											420	420	420	
	<b>Sub Total</b>									3	873	423	1298	1299	
	<b>Grand Total</b>	1273	11030	2	161		12465	5870	8683	3		877	431	1311	55673

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

Land Use Land Cover (LULC) Change Matrix

Annexure 1.2

(Area in Sq. km)

LULC_CLASSES		JAMMU & KASHMIR																		
		2015-16																		
		1: Agriculture					2: Barren/Unculturable/ Wastelands							3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	10970		10	10980	0	10980	67	2			7	174	250	0	5	2	7	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	3		2140	2142		7422	3	2			0	17	23	0	5	1	6	
		Farmland (FL) = 1.1+1.2+1.3	10973		2149	13122	0	18402	71	4			7	191	273	0	10	3	13	
		1.4: Fallow	1			1	53	54	0				0	0	0				0	
	Sub Total	10974		2149	13124	53	18456	71	4			7	191	273	0	10	3	13		
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky	7			7		7	73195	2526		9	3035	102	78867	0	0	0	0	
		2.2: Gullied / Ravinous Land							20	835			3	4	861					
		2.3: Rann																		
		2.4: Salt Affected Land										151			151					
		2.5: Sandy Area							105	37		0	5088	12	5242					
		2.6: Scrub Land	11			11		11	827				35	4034	4896		1	0	1	
	Sub Total	18			18		18	74146	3398		160	8162	4152	90017	0	1	0	1		
	3: Builtup	3.1: Mining							3					0	3	9		0	9	
		3.2: Rural	0			0		0	2				0	4	6		326		326	
		3.3: Urban	0			0		0	1	5			1	7	14	2		375	377	
		Sub Total	0			0		0	6	5			1	11	23	11	326	375	712	
	4: Forest	4.1: Deciduous	0		0	0		0	3	3				0	6					
		4.2: Evergreen/Semi evergreen	15			15		15	35	13			0	74	123					
		4.3: Forest Plantation																		
		4.4: Scrub Forest	242		1	244		244	239	15			5	119	380					
		4.5: Swamp / Mangroves																		
	Sub Total	258		1	259		259	278	31			5	194	509						
	5: Grass / Grazing	5.1: Grass / Grazing	2			2		2	74	3			55	132						
	6: Snow and Glacier	6.1: Snow and Glacier							1018	24		1	19	17	1078					
	7: Wetlands / Water bodies	7.1: Inland Wetland	0			0		0	62			21	76	61	221		0		0	
		7.2: Coastal Wetland																		
7.3: River/Stream/Canals		0			0		0	13	17		0	43	19	92	0			0		
7.4: Water bodies		0			0		0	17				1	2	19	0			0		
Sub Total		0			0		0	93	17		21	120	82	332	1	0		1		
<b>Grand Total</b>		<b>11253</b>		<b>2151</b>	<b>13403</b>	<b>53</b>	<b>13456</b>	<b>75685</b>	<b>3482</b>		<b>181</b>	<b>8314</b>	<b>4702</b>	<b>92364</b>	<b>12</b>	<b>337</b>	<b>378</b>	<b>727</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			JAMMU & KASHMIR														
			2015-16														
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total			
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	0	0		64		64		3	0				0	11303	
		1.2: Current Shifting cultivation															
		1.3: Plantation	31			2		33	0	5	0			0	1	7490	
		<b>Farmland (FL) = 1.1+1.2+1.3</b>	<b>32</b>	<b>0</b>		<b>66</b>		<b>97</b>	<b>0</b>	<b>8</b>	<b>1</b>			<b>0</b>	<b>1</b>	<b>18793</b>	
		1.4: Fallow				0		0								55	
	<b>Sub Total</b>	<b>32</b>	<b>0</b>		<b>66</b>		<b>97</b>	<b>0</b>	<b>8</b>	<b>1</b>			<b>0</b>	<b>1</b>	<b>18848</b>		
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky	1			434		435	0	62850						142160	
		2.2: Gullied / Ravinous Land				61		61		27						949	
		2.3: Rann															
		2.4: Salt Affected Land														151	
		2.5: Sandy Area								305						5548	
		2.6: Scrub Land				86		86	0	2134			0		0	7129	
	<b>Sub Total</b>	<b>1</b>			<b>582</b>		<b>583</b>	<b>0</b>	<b>65316</b>			<b>0</b>		<b>0</b>	<b>155936</b>		
	3: Builtup	3.1: Mining														12	
		3.2: Rural	0			1		1		0						333	
		3.3: Urban				4		4		0	0				0	396	
		<b>Sub Total</b>	<b>0</b>			<b>5</b>		<b>5</b>		<b>0</b>	<b>0</b>			<b>0</b>	<b>0</b>	<b>740</b>	
	4: Forest	4.1: Deciduous	542			6		548								554	
		4.2: Evergreen/Semi evergreen	1	11257		502		11760	8	133	0				0	12040	
		4.3: Forest Plantation			12439	0		12439		0						12439	
		4.4: Scrub Forest	2	0		7741		7742	56	333	1				1	8755	
		4.5: Swamp / Mangroves					0	0								0	
	<b>Sub Total</b>	<b>545</b>	<b>11257</b>	<b>12439</b>	<b>8249</b>	<b>0</b>	<b>32489</b>	<b>65</b>	<b>466</b>	<b>1</b>				<b>1</b>	<b>33790</b>		
	5: Grass / Grazing	5.1: Grass / Grazing		0		241		241	409	106					890		
	6: Snow and Glacier	6.1: Snow and Glacier	2			125		127	1	7386				0	8593		
	7: Wetlands / Water bodies	7.1: Inland Wetland							0	1	238				238	461	
		7.2: Coastal Wetland															
7.3: River/Stream/Canals		0			8		8		11			1676		1676	1787		
7.4: Water bodies					3		3	1	52	0			6395	6395	6471		
<b>Sub Total</b>		<b>0</b>			<b>11</b>		<b>11</b>	<b>1</b>	<b>64</b>	<b>238</b>		<b>1676</b>	<b>6395</b>	<b>8310</b>	<b>8719</b>		
<b>Grand Total</b>	<b>580</b>	<b>11257</b>	<b>12439</b>	<b>9278</b>	<b>0</b>	<b>33554</b>	<b>477</b>	<b>73347</b>	<b>240</b>		<b>1676</b>	<b>6396</b>	<b>8312</b>	<b>222236</b>			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		JHARKHAND																	
		2015-16																	
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	26536		2	26538	6961	33499	3	16			190	209	12	0	1	13	
		1.2: Current Shifting cultivation																	
		1.3: Plantation			70	70	1	7422					1	1					
		Farmland (FL) = 1.1+1.2+1.3	26536		72	26608	6962	40921	3	16			191	210	12	0	1	13	
		1.4: Fallow	1044		2	1046	5242	6288	0	1			10	12	5		1	6	
		Sub Total	27580		74	27654	12203	47208	3	17			201	222	17	0	2	19	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky							400					400	1			1	
		2.2: Gullied / Ravinous Land								276				276					
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area										0		0					
		2.6: Scrub Land			1	1		1	0	0				4739	4740	9		1	10
	Sub Total			1	1		1	401	276			0	4739	5416	10		1	11	
	3: Builtup	3.1: Mining			0	0							5	5	470			0	470
		3.2: Rural														2924			2924
		3.3: Urban													0		1124		1124
		Sub Total			0	0		0					5	5	470	2924	1124		4518
	4: Forest	4.1: Deciduous					0	0					0	0	7		1		8
		4.2: Evergreen/Semi evergreen																	
		4.3: Forest Plantation																	
		4.4: Scrub Forest					0	0		0			0	0	1		0		1
		4.5: Swamp / Mangroves											1	1	8		1		9
	Sub Total					0	0		0			1	1	8		1		9	
	5: Grass / Grazing	5.1: Grass / Grazing																	
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals	0			0		0					0	0					0	
	7.4: Water bodies														0			0	
Sub Total	0			0		0					0	0	0	0			0		
<b>Grand Total</b>		<b>27580</b>		<b>74</b>	<b>27655</b>	<b>12203</b>	<b>39858</b>	<b>404</b>	<b>294</b>			<b>0</b>	<b>4946</b>	<b>5644</b>	<b>506</b>	<b>2924</b>	<b>1128</b>	<b>4558</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		JHARKHAND															
		2015-16															
		4: Forest						5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies					Grand Total		
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total			
2011-12	1: Agriculture	1.1: Crop land	0			43		43					0	2	2	33766	
		1.2: Current Shifting cultivation															
		1.3: Plantation				0		0									7423
		Farmland (FL) = 1.1+1.2+1.3	0			43		43					0	2	2	41188	
		1.4: Fallow				1		1						2	2	6309	
		Sub Total	0			44		44					0	4	4	47497	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky				0		0						0	0	401	
		2.2: Gullied / Ravinous Land				1		1								277	
		2.3: Rann															
		2.4: Salt Affected Land														0	
		2.5: Sandy Area															
		2.6: Scrub Land				0		0						0	0	4751	
		Sub Total				1		1						0	0	5429	
	3: Builtup	3.1: Mining				0		0					1	1	2	478	
		3.2: Rural														2924	
		3.3: Urban														1124	
		Sub Total				0		0					1	1	2	4526	
	4: Forest	4.1: Deciduous	22109			0		22110								22117	
		4.2: Evergreen/Semi evergreen		0				0								0	
		4.3: Forest Plantation				43		43								43	
		4.4: Scrub Forest			1	5382		5383						0	0	5385	
		4.5: Swamp / Mangroves					0	0								0	
	Sub Total	22109	0	44	5382	0	27535						0	0	27545		
	5: Grass / Grazing	5.1: Grass / Grazing															
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland									13				13	13		
	7.2: Coastal Wetland																
	7.3: River/Stream/Canals											1372		1372	1372		
	7.4: Water bodies												674	674	674		
	Sub Total									13		1372	674	2059	2059		
<b>Grand Total</b>		<b>22109</b>	<b>0</b>	<b>44</b>	<b>5427</b>	<b>0</b>	<b>27580</b>			<b>13</b>		<b>1374</b>	<b>679</b>	<b>2066</b>	<b>79706</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		KARNATAKA																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	110921		7	110927						0	409	410	99	4	40	143	
		1.2: Current Shifting cultivation																	
		1.3: Plantation	0		17579	17579	7422						1	1					
		Farmland (FL) = 1.1+1.2+1.3	110921		17585	128506	118349						0	410	411	99	4	40	143
		1.4: Fallow	6		1	8	3627	3635					77	77	8	1	5	13	
		Sub Total	110927		17587	128514	3627	121984					0	487	488	107	5	44	156
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						1915						1915	28		0	28	
		2.2: Gullied / Ravinous Land							103				6	109	1			1	
		2.3: Rann																	
		2.4: Salt Affected Land	0		0	0	0		6		654		22	681	0		1	1	
		2.5: Sandy Area						0				5	2	7					
		2.6: Scrub Land	3		0	4	4		4		10	1	6964	6979	23	0	5	28	
	Sub Total	3		0	4	4	4	1915	113		664	6	6994	9692	53	0	6	59	
	3: Builtup	3.1: Mining											2	2	550		0	551	
		3.2: Rural													3	3459	0	3462	
		3.3: Urban											11	11	7	0	2824	2830	
		Sub Total											13	13	559	3459	2824	6843	
	4: Forest	4.1: Deciduous						0				0	3	3	3	0		3	
		4.2: Evergreen/Semi evergreen						0				0		0	0			0	
		4.3: Forest Plantation										0		0	2		0	2	
		4.4: Scrub Forest							1		0			1	5			5	
		4.5: Swamp / Mangroves																	
	Sub Total						0	1		0	0	3	4	10	0	0	11		
5: Grass / Grazing	5.1: Grass / Grazing			0	0	0						12	12						
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland									0			0		0	0	0		
	7.2: Coastal Wetland										2		2						
	7.3: River/Stream/Canals							1		1	3		5			0	0		
	7.4: Water bodies						0	0		1		1	2	0			0		
	Sub Total						0	1		2	5	1	8	0	0	0	1		
<b>Grand Total</b>		<b>110930</b>		<b>17587</b>	<b>128517</b>	<b>3627</b>	<b>132145</b>	<b>1916</b>	<b>114</b>		<b>666</b>	<b>12</b>	<b>7510</b>	<b>10217</b>	<b>730</b>	<b>3465</b>	<b>2875</b>	<b>7069</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		KARNATAKA															
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land											0	1	1	111481	
		1.2: Current Shifting cultivation															
		1.3: Plantation															7423
		Farmland (FL) = 1.1+1.2+1.3											0	1	1	118904	
		1.4: Fallow															3725
		Sub Total											0	1	1	122629	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															1943
		2.2: Gullied / Ravinous Land				1		1									111
		2.3: Rann															
		2.4: Salt Affected Land	0			0		0									682
		2.5: Sandy Area															7
		2.6: Scrub Land	0			64		64					0	0	0		7076
	Sub Total	0			65		65					0	0	0		9820	
	3: Builtup	3.1: Mining															553
		3.2: Rural															3462
		3.3: Urban															2842
		Sub Total															6857
	4: Forest	4.1: Deciduous	14925			789		15715						0	0		15721
		4.2: Evergreen/Semi evergreen		10595		356		10951									10952
		4.3: Forest Plantation			2069	554		2623									2626
		4.4: Scrub Forest				5340		5340									5346
		4.5: Swamp / Mangroves				0	6	6									6
	Sub Total	14925	10595	2069	7040	6	34636							0	0	34651	
	5: Grass / Grazing	5.1: Grass / Grazing							301								313
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland									30					30	31	
	7.2: Coastal Wetland				0		0				24				24	26	
	7.3: River/Stream/Canals	0					0					1998			1998	2003	
	7.4: Water bodies				6		6						5297		5297	5305	
	Sub Total	0			6		6			30	24	1998	5297		7350	7365	
<b>Grand Total</b>		<b>14925</b>	<b>10595</b>	<b>2069</b>	<b>7111</b>	<b>6</b>	<b>34707</b>	<b>301</b>		<b>30</b>	<b>24</b>	<b>1999</b>	<b>5298</b>	<b>7351</b>	<b>191791</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		KERALA																		
		2015-16																		
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	2719		21	2740	2	2741						2	2	0	11	4	15	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	0		18824	18825	0	7422						63	63	0	0	123	124	
		Farmland (FL) = 1.1+1.2+1.3	2719		18846	21565	2	10163						65	65	0	11	127	138	
		1.4: Fallow			1	1	70	71						1	1			0	0	
		Sub Total	2719		18847	21566	72	10234						65	65	0	11	127	139	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky					0	0	294						294	3			3	
		2.2: Gullied / Ravinous Land																		
		2.3: Rann																		
		2.4: Salt Affected Land																		
		2.5: Sandy Area	1		8	9		9					7		7					
		2.6: Scrub Land	30			30	1	32						885	885	2		16	19	
	Sub Total	31		8	39	1	41	294				7	885	1186	6		16	22		
	3: Builtup	3.1: Mining											5	5	105			0	105	
		3.2: Rural														2656	24	2680		
		3.3: Urban															736	736		
		Sub Total											5	5	105	2656	759	3521		
	4: Forest	4.1: Deciduous	1			1		1					1	1						
		4.2: Evergreen/Semi evergreen			2	2		2					6	6						
		4.3: Forest Plantation			1	1		1					3	3						
		4.4: Scrub Forest	34			34		34									0		0	
		4.5: Swamp / Mangroves																		
	Sub Total	35		3	38		38					10	10		0		0			
	5: Grass / Grazing	5.1: Grass / Grazing			40	40		40					1	1						
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland	33		2	35	0	35						1	1			0	0		
	7.2: Coastal Wetland											3	3							
	7.3: River/Stream/Canals												1	1			0	0		
	7.4: Water bodies			0	0		0	0					0	0						
	Sub Total	33		2	36	0	36	0				3	2	5			0	0		
<b>Grand Total</b>		<b>2818</b>		<b>18900</b>	<b>21718</b>	<b>73</b>	<b>21791</b>	<b>294</b>				<b>10</b>	<b>968</b>	<b>1272</b>	<b>111</b>	<b>2668</b>	<b>903</b>	<b>3682</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		KERALA														Grand Total		
		2015-16																
		4: Forest						5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Sub Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4					
2011-12	1: Agriculture	1.1: Crop land													0	0	2758	
		1.2: Current Shifting cultivation																
		1.3: Plantation				1		1	1		0						0	7610
		Farmland (FL) = 1.1+1.2+1.3				1		1	1	1	0						0	10368
		1.4: Fallow				0		0										72
		Sub Total				1		1	1	1	0						0	10439
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky																297
		2.2: Gullied / Ravinous Land																
		2.3: Rann																
		2.4: Salt Affected Land																
		2.5: Sandy Area			0			0						0			0	16
		2.6: Scrub Land	5		3	24		31	1		0		0				0	967
	Sub Total	5		3	24		31	1		0		0				0	1281	
	3: Builtup	3.1: Mining																111
		3.2: Rural																2680
		3.3: Urban																736
		Sub Total																3526
	4: Forest	4.1: Deciduous	1549	0	1	0		1550									0	1552
		4.2: Evergreen/Semi evergreen	0	6286	0			6286	0					0			0	6293
		4.3: Forest Plantation	0		2065			2065	1									2071
		4.4: Scrub Forest	23	0	18	568		609	0				0				0	643
		4.5: Swamp / Mangroves					0	0			0						0	0
	Sub Total	1572	6286	2084	568	0	10510	1		0		0	0			0	10560	
	5: Grass / Grazing	5.1: Grass / Grazing			16	8		24	57									121
6: Snow and Glacier	6.1: Snow and Glacier																	
7: Wetlands / Water bodies	7.1: Inland Wetland										186					186	222	
	7.2: Coastal Wetland											102				102	105	
	7.3: River/Stream/Canals				0		0						575			575	576	
	7.4: Water bodies		1		0		1								629	629	630	
	Sub Total		1		0		1			186	102	575	629		1491	1491	1533	
<b>Grand Total</b>		<b>1577</b>	<b>6287</b>	<b>2103</b>	<b>600</b>	<b>0</b>	<b>10567</b>	<b>59</b>		<b>187</b>	<b>102</b>	<b>575</b>	<b>629</b>	<b>1492</b>	<b>1492</b>	<b>38863</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MADHYA PRADESH																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	182451		56	182507	13	182520		0			6	7	32	60	152	244	
		1.2: Current Shifting cultivation																	
		1.3: Plantation	0		338	339		7422							0			0	
		Farmland (FL) = 1.1+1.2+1.3	182451		394	182845	13	189942		0			6	7	32	60	152	244	
		1.4: Fallow	431		1	432	4159	4592					2	2	4	4	13	20	
		Sub Total	182882		396	183278	4172	194533		0			9	9	36	64	165	265	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky	2			2		2	380					380	1	2	3	6	
		2.2: Gullied / Ravinous Land	12			12		12		1491				1491	0	0	0	0	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area																	
		2.6: Scrub Land	530		5	536	1	536					22973	22973	35	13	84	133	
		Sub Total	545		5	550	1	551	380	1491			22973	24844	36	15	88	139	
	3: Builtup	3.1: Mining			1	1		1							389	1	1	390	
		3.2: Rural														3111	0	3111	
		3.3: Urban													0	0	1791	1791	
		Sub Total			1	1		1							389	3111	1792	5292	
	4: Forest	4.1: Deciduous	5			5		5							12	0	2	15	
		4.2: Evergreen/Semi evergreen																	
		4.3: Forest Plantation																	
		4.4: Scrub Forest	2			2		2							1		10	11	
		4.5: Swamp / Mangroves																	
	Sub Total	7			7		7							13	0	12	25		
5: Grass / Grazing	5.1: Grass / Grazing																		
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals	0			0		0												
	7.4: Water bodies	129		0	129	0	129					1	1	0	0	0	1		
	Sub Total	129		0	129	0	129					1	1	0	0	0	1		
<b>Grand Total</b>		<b>183563</b>		<b>402</b>	<b>183965</b>	<b>4173</b>	<b>188139</b>	<b>380</b>	<b>1491</b>			<b>22983</b>	<b>24854</b>	<b>474</b>	<b>3190</b>	<b>2057</b>	<b>5722</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MADHYA PRADESH															
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	2		0			3					1	357	358	183132	
		1.2: Current Shifting cultivation															
		1.3: Plantation															7422
		Farmland (FL) = 1.1+1.2+1.3	2		0			3					1	357	358	190553	
		1.4: Fallow			0			0					0	14	14	4628	
		Sub Total	2		0			3					1	371	372	195181	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky												1	1	389	
		2.2: Gullied / Ravinous Land												1	1	1505	
		2.3: Rann															
		2.4: Salt Affected Land															
		2.5: Sandy Area															
		2.6: Scrub Land			1			1					1	58	59	23702	
	Sub Total			1			1					1	61	61	25597		
	3: Builtup	3.1: Mining	2					2						1	1	394	
		3.2: Rural			0			0						0	0	3111	
		3.3: Urban												0	0	1792	
		Sub Total	2		0			2						2	2	5297	
	4: Forest	4.1: Deciduous	67917		6	0		67924						30	30	67974	
		4.2: Evergreen/Semi evergreen		0				0								0	
		4.3: Forest Plantation			72			72								72	
		4.4: Scrub Forest			8	12605		12613						11	11	12637	
		4.5: Swamp / Mangroves															
	Sub Total	67917	0	86	12606		80609						41	41	80683		
	5: Grass / Grazing	5.1: Grass / Grazing							2							2	
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland																
	7.2: Coastal Wetland																
	7.3: River/Stream/Canals											3203	13	3216	3216		
	7.4: Water bodies	0			1		2					1	5227	5228	5360		
	Sub Total	0			1		2					3203	5240	8443	8576		
<b>Grand Total</b>		<b>67922</b>	<b>0</b>	<b>88</b>	<b>12607</b>		<b>80617</b>	<b>2</b>				<b>3205</b>	<b>5714</b>	<b>8919</b>	<b>308252</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MAHARASHTRA																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	171227		572	171799	12763	184561	45	91		1	1	873	1012	14	4	37	55
		1.2: Current Shifting cultivation																	
		1.3: Plantation	206		5204	5410	39	7422	1	0		0	0	26	27	0		0	0
		Farmland (FL) = 1.1+1.2+1.3	171433		5775	177209	12802	191983	45	92		1	1	899	1039	14	4	37	55
		1.4: Fallow	4067		9	4076	12631	16706	33	11			0	354	398	5	1	28	33
		Sub Total	175500		5784	181285	25432	208689	78	103		1	1	1253	1437	19	4	65	88
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky					29	29	1192					10	1202	0		0	0
		2.2: Gullied / Ravinous Land	65		1	66	36	102	2	344				31	377				
		2.3: Rann																	
		2.4: Salt Affected Land										34			34				
		2.5: Sandy Area											1		1				
		2.6: Scrub Land	39		0	39	1	39	212	37			0	19639	19888	8		9	17
		Sub Total	104		1	105	66	171	1406	381		34	1	19680	21502	8		9	18
	3: Builtup	3.1: Mining	0			0		0	8	1			46	54	329			1	330
		3.2: Rural	0		0	0		0	1	1			19	21	0	3383	0		3384
		3.3: Urban	0			0		0	3	0		2	57	63	4	0	4203		4207
		Sub Total	0		0	0		0	12	2		2	122	138	334	3384	4204		7921
	4: Forest	4.1: Deciduous	1			1	1	1	34	1			1476	1511	3		1		4
		4.2: Evergreen/Semi evergreen	0			0		0	1			0	142	142	0				0
		4.3: Forest Plantation																	
		4.4: Scrub Forest	0			0		0	19	0			37	56	0				0
		4.5: Swamp / Mangroves											2	2					
	Sub Total	1			1	1	2	54	1			0	1656	1711	4		1		4
5: Grass / Grazing	5.1: Grass / Grazing																		
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland							1			14	13	2	30			1	1	
	7.3: River/Stream/Canals							0	3			3	6	12					
	7.4: Water bodies	511			511	13	524	1	4				22	27	0		0	0	
	Sub Total	511			511	13	524	2	7		14	16	30	70	0		1	1	
<b>Grand Total</b>		<b>176116</b>		<b>5785</b>	<b>181901</b>	<b>25512</b>	<b>207413</b>	<b>1552</b>	<b>495</b>		<b>51</b>	<b>19</b>	<b>22741</b>	<b>24857</b>	<b>364</b>	<b>3388</b>	<b>4281</b>	<b>8033</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MAHARASHTRA															
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	2			236		238			9	1	0	79	89	185955	
		1.2: Current Shifting cultivation															
		1.3: Plantation	0			4		5						1	1	7454	
		Farmland (FL) = 1.1+1.2+1.3	2			240		243			9	1	0	80	90	193409	
		1.4: Fallow	0			51		51					1	7	7	17197	
		Sub Total	2			291		294			9	1	1	86	98	210606	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky	1			1		2								1233	
		2.2: Gullied / Ravinous Land	2			3		5					1	0	1	485	
		2.3: Rann															
		2.4: Salt Affected Land									0			0	0	34	
		2.5: Sandy Area														1	
		2.6: Scrub Land	10	0		28		38			0		0	2	2	19986	
		Sub Total	12	0		32		44			0	0	1	2	4	21739	
	3: Builtup	3.1: Mining	4			5		9						1	1	395	
		3.2: Rural	0			2		2						0	0	3407	
		3.3: Urban				3		3								4273	
		Sub Total	4			9		14						2	2	8075	
	4: Forest	4.1: Deciduous	39692		16	972		40680			0			14	15	42210	
		4.2: Evergreen/Semi evergreen	0	6557		249		6806						2	2	6951	
		4.3: Forest Plantation	25		219	10		254						0	0	255	
		4.4: Scrub Forest	32			8316		8348						1	1	8405	
		4.5: Swamp / Mangroves					295	295			0				0	296	
	Sub Total	39750	6557	235	9547	295	56383			0	0		17	17	58118		
	5: Grass / Grazing	5.1: Grass / Grazing															
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland									7				7	7		
	7.2: Coastal Wetland				0		0				1102		0	1103	1134		
	7.3: River/Stream/Canals				1		1						3953	2	3955		
	7.4: Water bodies	2			23		25			0			5441	5441	6017		
	Sub Total	2			24		26			7	1102	3953	5443	10505	11126		
<b>Grand Total</b>		<b>39771</b>	<b>6557</b>	<b>235</b>	<b>9904</b>	<b>295</b>	<b>56761</b>			<b>16</b>	<b>1104</b>	<b>3955</b>	<b>5550</b>	<b>10625</b>	<b>307690</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MANIPUR																
		2015-16																
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup				
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total
2011-12	1: Agriculture	1.1: Crop land	1496	26	0	1522	1	1523					38	38		2		2
		1.2: Current Shifting cultivation	147	151		298		298	0	0			107	107		1		1
		1.3: Plantation		1	19	20		7422					11	11				
		Farmland (FL) = 1.1+1.2+1.3	1644	178	19	1840	1	9243	0	0			156	156		3		3
		1.4: Fallow					9	9										
	Sub Total	1644	178	19	1840	9	9251	0	0			156	156		3		3	
	2: Barren/unculturable/ Wastelands	2.1: Barren Rocky						0						0				0
		2.2: Gullied / Ravinous Land							0					0				0
		2.3: Rann																
		2.4: Salt Affected Land								0				0				0
		2.5: Sandy Area																
		2.6: Scrub Land	25	77		103		103	1				2372	2373		1		1
	Sub Total	25	77		103		103	2	0		0	2372	2374		1		1	
	3: Builtup	3.1: Mining																
		3.2: Rural														404		404
		3.3: Urban															106	106
		Sub Total														404	106	510
	4: Forest	4.1: Deciduous	210	237	1	448		448	0	1			853	854	0	31		31
		4.2: Evergreen/Semi evergreen	29	33	2	64		64					56	56		0		0
		4.3: Forest Plantation											0	0				
		4.4: Scrub Forest	15	112		127		127					187	187		0		0
		4.5: Swamp / Mangroves																
	Sub Total	254	383	3	639		639	0	1			1096	1097	0	31		31	
	5: Grass / Grazing	5.1: Grass / Grazing																
6: Snow and Glacier	6.1: Snow and Glacier																	
7: Wetlands / Water bodies	7.1: Inland Wetland											0	0					
	7.2: Coastal Wetland																	
	7.3: River/Stream/Canals		1		1		1					4	4					
	7.4: Water bodies											0	0					
	Sub Total		1		1		1					4	4					
<b>Grand Total</b>		<b>1923</b>	<b>639</b>	<b>22</b>	<b>2584</b>	<b>9</b>	<b>2593</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3628</b>	<b>3632</b>	<b>0</b>	<b>440</b>	<b>106</b>	<b>546</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MANIPUR													
		2015-16													
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total
2011-12	1: Agriculture	1.1: Crop land	1			16	17	0		9			4	13	1594
		1.2: Current Shifting cultivation	2	0		54	56								462
		1.3: Plantation	1			0	2								7434
		Farmland (FL) = 1.1+1.2+1.3	4	0		70	75	0		9			4	13	9490
		1.4: Fallow								0					9
		Sub Total	4	0		70	75	0		10			4	14	9499
	2: Barren/unculturable/ Wastelands	2.1: Barren Rocky													0
		2.2: Gullied / Ravinous Land													0
		2.3: Rann													0
		2.4: Salt Affected Land													0
		2.5: Sandy Area													0
		2.6: Scrub Land	5			562	567					0	0	0	3044
	Sub Total	5			562	567					0	0	0	3044	
	3: Builtup	3.1: Mining													404
		3.2: Rural													106
		3.3: Urban													510
		Sub Total													510
	4: Forest	4.1: Deciduous	9994	3		238	10236	0					0	0	11569
		4.2: Evergreen/Semi evergreen	7	2596	0	30	2633								2754
		4.3: Forest Plantation			1	0	1								2
		4.4: Scrub Forest	203			1271	1474						0	0	1789
		4.5: Swamp / Mangroves													0
	Sub Total	10205	2599	2	1539	14345	0					0	0	16113	
5: Grass / Grazing	5.1: Grass / Grazing						3							3	
6: Snow and Glacier	6.1: Snow and Glacier													0	
7: Wetlands / Water bodies	7.1: Inland Wetland								107					107	
	7.2: Coastal Wetland													0	
	7.3: River/Stream/Canals				1	1					133	9	142	148	
	7.4: Water bodies								2			303	304	304	
	Sub Total				1	1			109	133	133	311	553	559	
<b>Grand Total</b>		<b>10214</b>	<b>2600</b>	<b>2</b>	<b>2172</b>	<b>14987</b>	<b>3</b>		<b>118</b>	<b>133</b>	<b>315</b>	<b>567</b>	<b>22327</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MEGHALAYA																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	1357			1357						0		0			1		1
		1.2: Current Shifting cultivation	0	24	2	25									0	0	0	0	
		1.3: Plantation			563	563													
		Farmland (FL) = 1.1+1.2+1.3	1357	24	565	1945	8804						0		0	0	1	0	1
		1.4: Fallow				0	0												
		Sub Total	1357	24	565	1945	0	8804					0		0	0	1	0	1
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						272							272	0	0	0	0
		2.2: Gullied / Ravinous Land																	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area										5		5					
		2.6: Scrub Land	0	5	0	5	5						2736	2736	1	3	1	5	
	Sub Total	0	5	0	5	5	272				5	2736	3012	1	4	1	5		
	3: Builtup	3.1: Mining													63			63	
		3.2: Rural													1	751	0	751	
		3.3: Urban													0		85	85	
		Sub Total													64	751	85	899	
	4: Forest	4.1: Deciduous	6	138	2	147	0	147	0			0	6	7	3	4	1	7	
		4.2: Evergreen/Semi evergreen		2		2		2									0	0	0
		4.3: Forest Plantation															0	1	1
		4.4: Scrub Forest		12		12		12								0	0	0	0
		4.5: Swamp / Mangroves																	
	Sub Total	6	152	2	161	0	161	0				0	6	7	3	4	1	8	
	5: Grass / Grazing	5.1: Grass / Grazing																	
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals	0			0		0						0	0					
	7.4: Water bodies																		
	Sub Total	0			0		0						0	0					
<b>Grand Total</b>		<b>1363</b>	<b>181</b>	<b>568</b>	<b>2112</b>	<b>1</b>	<b>2112</b>	<b>272</b>				<b>5</b>	<b>2742</b>	<b>3019</b>	<b>67</b>	<b>759</b>	<b>88</b>	<b>914</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			MEGHALAYA												Grand Total	
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies						
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4		Sub Total
2011-12	1: Agriculture	1.1: Crop land										0		0	1358	
		1.2: Current Shifting cultivation				205	205								0	230
		1.3: Plantation											0		0	7422
		Farmland (FL) = 1.1+1.2+1.3				205	205						0		0	9010
		1.4: Fallow														0
		Sub Total				205	205						0		0	9010
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky														272
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area														5
		2.6: Scrub Land	0			0	1						0	0	0	2747
	Sub Total	0			0	1						0	0	0	3024	
	3: Builtup	3.1: Mining														63
		3.2: Rural											0		0	751
		3.3: Urban														85
		Sub Total											0		0	899
	4: Forest	4.1: Deciduous	14462					14462					0	0	0	14623
		4.2: Evergreen/Semi evergreen		754		0		754								756
		4.3: Forest Plantation			13			13								14
		4.4: Scrub Forest	0			595		595					0		0	608
		4.5: Swamp / Mangroves					1	1								1
		Sub Total	14462	754	13	595	1	15825					0	0	0	16001
	5: Grass / Grazing	5.1: Grass / Grazing							0							0
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland									56				56	56	
	7.2: Coastal Wetland															
	7.3: River/Stream/Canals				0		0					278		278	279	
	7.4: Water bodies												18	18	18	
	Sub Total				0		0			56		278	18	352	353	
<b>Grand Total</b>			<b>14462</b>	<b>754</b>	<b>13</b>	<b>801</b>	<b>1</b>	<b>16030</b>	<b>0</b>		<b>56</b>		<b>279</b>	<b>18</b>	<b>353</b>	<b>22429</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		MIZORAM																
		2015-16																
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup				
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total
2011-12	1: Agriculture	1.1: Crop land	135	0		135						15	15					
		1.2: Current Shifting cultivation		47		47						135	135					
		1.3: Plantation	0	3	67	71	7422					5	5		0	0	1	
		Farmland (FL) = 1.1+1.2+1.3	135	50	67	252	7603						156	156		0	0	1
		1.4: Fallow																
		Sub Total	135	50	67	252	7603						156	156		0	0	1
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						1						1				
		2.2: Gullied / Ravinous Land																
		2.3: Rann																
		2.4: Salt Affected Land																
		2.5: Sandy Area																
		2.6: Scrub Land	0	6	0	6	6						79	79		1		1
	Sub Total	0	6	0	6	6	1					79	80		1		1	
	3: Builtup	3.1: Mining																
		3.2: Rural													135	0	135	
		3.3: Urban														70	70	
		Sub Total													135	71	206	
	4: Forest	4.1: Deciduous	9	278	3	290	290					368	368		7	1	8	
		4.2: Evergreen/Semi evergreen	12	132	2	146	146											
		4.3: Forest Plantation	0	2		2	2											
		4.4: Scrub Forest	15	217	4	237	237						345	345		5	1	6
		4.5: Swamp / Mangroves																
	Sub Total	36	629	9	674	674						714	714		12	2	14	
	5: Grass / Grazing	5.1: Grass / Grazing	5	3		8	8					33	33		1		1	
6: Snow and Glacier	6.1: Snow and Glacier																	
7: Wetlands / Water bodies	7.1: Inland Wetland																	
	7.2: Coastal Wetland																	
	7.3: River/Stream/Canals											0	0					
	7.4: Water bodies																	
Sub Total											0	0						
<b>Grand Total</b>		<b>177</b>	<b>687</b>	<b>77</b>	<b>941</b>	<b>941</b>	<b>1</b>					<b>982</b>	<b>982</b>		<b>149</b>	<b>73</b>	<b>222</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			MIZORAM													
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total
2011-12	1: Agriculture	1.1: Crop land						0					0	0	151	
		1.2: Current Shifting cultivation	308	0		89	397						0	0	579	
		1.3: Plantation				8	8							0	0	7436
		Farmland (FL) = 1.1+1.2+1.3	308	0		98	406	0						0	0	8166
		1.4: Fallow														
		<b>Sub Total</b>	308	0		98	406	0						0	0	8166
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky														1
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area														
		2.6: Scrub Land	39			12	52	0								139
		<b>Sub Total</b>	39			12	52	0								140
	3: Builtup	3.1: Mining														
		3.2: Rural												0	0	135
		3.3: Urban														70
		<b>Sub Total</b>												0	0	206
	4: Forest	4.1: Deciduous	5835	1		448	6284	7				1	1	2	6959	
		4.2: Evergreen/Semi evergreen		7465		469	7934						2	2	8082	
		4.3: Forest Plantation		0	93	0	94							0	96	
		4.4: Scrub Forest	546	1096		2247	3889						1	1	4477	
		4.5: Swamp / Mangroves														
		<b>Sub Total</b>	6380	8562	93	3164	18200	7				1	4	5	19614	
	5: Grass / Grazing	5.1: Grass / Grazing	0			29	29	84							155	
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland															
	7.2: Coastal Wetland															
	7.3: River/Stream/Canals				0	0						125		125		
	7.4: Water bodies	0			0	0							27	27		
	<b>Sub Total</b>	0			0	0						125	27	152		
	<b>Grand Total</b>	6728	8562	93	3304	18687	91					126	31	157	21081	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			NAGALAND																
			2015-16																
			1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup					
			1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total
2011-12	1: Agriculture	1.1: Crop land	717		0	717	20	738									0	1	1
		1.2: Current Shifting cultivation		104	1	105						398	398		0			0	
		1.3: Plantation			11	11		7422											
		Farmland (FL) = 1.1+1.2+1.3	717	104	12	834	20	8264					398	398		0	1	1	
		1.4: Fallow	2			2	19	21					0	0					
		Sub Total	719	104	12	836	39	8285					399	399		0	1	1	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky							4					4					
		2.2: Gullied / Ravinous Land																	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area																	
		2.6: Scrub Land	9	212	0	221		221					1182	1182	0	1	3	4	
	Sub Total	9	212	0	221		221	4				1182	1186	0	1	3	4		
	3: Builtup	3.1: Mining													15			15	
		3.2: Rural														278		278	
		3.3: Urban															139	139	
		Sub Total													15	278	139	432	
	4: Forest	4.1: Deciduous	13	248		260		260					476	476	2	2	0	4	
		4.2: Evergreen/Semi evergreen	0	1		1		1									0	0	
		4.3: Forest Plantation	2			2		2											
		4.4: Scrub Forest	1	305		306		306					1089	1089		0		0	
		4.5: Swamp / Mangroves																	
	Sub Total	16	553		569		569					1565	1565	2	2	0	4		
	5: Grass / Grazing	5.1: Grass / Grazing																	
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals																		
	7.4: Water bodies																		
	Sub Total																		
<b>Grand Total</b>			<b>744</b>	<b>869</b>	<b>12</b>	<b>1625</b>	<b>39</b>	<b>1664</b>	<b>4</b>				<b>3146</b>	<b>3150</b>	<b>17</b>	<b>282</b>	<b>143</b>	<b>442</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			NAGALAND													
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total
2011-12	1: Agriculture	1.1: Crop land			0			0								739
		1.2: Current Shifting cultivation	2		0	403		405								909
		1.3: Plantation														7422
		Farmland (FL) = 1.1+1.2+1.3	2		1	403		406								9070
		1.4: Fallow														21
		<b>Sub Total</b>	2		1	403		406								9091
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky														4
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area														
		2.6: Scrub Land	170		3	137		309								1716
		<b>Sub Total</b>	170		3	137		309								1720
	3: Builtup	3.1: Mining														15
		3.2: Rural														278
		3.3: Urban														139
		<b>Sub Total</b>														432
	4: Forest	4.1: Deciduous	9384		4	283		9671								10412
		4.2: Evergreen/Semi evergreen		175				175								175
		4.3: Forest Plantation			223			223								225
		4.4: Scrub Forest	24		0	297		322								1716
		4.5: Swamp / Mangroves														
		<b>Sub Total</b>	9408	175	227	581		10391								12529
	5: Grass / Grazing	5.1: Grass / Grazing							6							6
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland															
	7.2: Coastal Wetland															
	7.3: River/Stream/Canals										187				187	
	7.4: Water bodies											24			24	
	<b>Sub Total</b>										187	24		211	211	
	<b>Grand Total</b>	9580	175	231	1120		11106	6			187	24		211	16579	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		ODISHA																			
		2015-16																			
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup							
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total			
2015-16	1: Agriculture	1.1: Crop land	76131		21	76153	13	76165					1		0	1	11	3	26	39	
		1.2: Current Shifting cultivation		603		603		603					13	13							
		1.3: Plantation	1		352	353		7422											0	0	
		Farmland (FL) = 1.1+1.2+1.3	76132	603	373	77109	13	84190				1	13	14	11	3	26	40			
		1.4: Fallow	372		2	374	1335	1709		0			2	2	1	0	1	2			
	Sub Total	76505	603	375	77483	1348	85899		0		1	14	15	12	4	26	42				
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						507						507	0			0			
		2.2: Gullied / Ravinous Land		0		0		0		603				3	605		0			0	
		2.3: Rann																			
		2.4: Salt Affected Land										15		15							
		2.5: Sandy Area			0	0		0			0	64	1	64							
		2.6: Scrub Land	8	31	3	42		42		5		0	9869	9874	8	0	3	11			
		Sub Total	8	31	4	43		43	507	607		15	64	9873	11067	8	0	3	12		
	3: Builtup	3.1: Mining											2	2	231		0	232			
		3.2: Rural														5076	1	5077			
		3.3: Urban															1107	1107			
		Sub Total											2	2	231	5076	1108	6415			
	4: Forest	4.1: Deciduous	23	189		212		212					0	66	66	8		1	9		
		4.2: Evergreen/Semi evergreen																			
		4.3: Forest Plantation														1		1	1		
		4.4: Scrub Forest		33		33		33		1			33	35	1		0	1			
		4.5: Swamp / Mangroves										1		1							
	Sub Total	23	222		244		244		1		1	0	99	101	9		2	11			
	5: Grass / Grazing	5.1: Grass / Grazing																			
	6: Snow and Glacier	6.1: Snow and Glacier																			
	7: Wetlands / Water bodies	7.1: Inland Wetland	39		0	40		40													
		7.2: Coastal Wetland	12			12		12				0	0	0	1						
7.3: River/Stream/Canals		2			2		2				0	1	2	0		0	0				
7.4: Water bodies		2			2	4	6				9		9			0	0				
Sub Total		55		0	55	4	59				10	2	0	12	0	0	0				
<b>Grand Total</b>		<b>76591</b>	<b>856</b>	<b>379</b>	<b>77825</b>	<b>1351</b>	<b>79177</b>	<b>507</b>	<b>609</b>		<b>26</b>	<b>65</b>	<b>9988</b>	<b>11197</b>	<b>261</b>	<b>5080</b>	<b>1140</b>	<b>6481</b>			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		ODISHA																
		2015-16																
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total					
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4	Sub Total	Grand Total			
2015-16	1: Agriculture	1.1: Crop land			30			30				3	0	5	29	37	76273	
		1.2: Current Shifting cultivation	3			49												669
		1.3: Plantation									0						0	7422
		Farmland (FL) = 1.1+1.2+1.3	3		30	49		83			3	0	5	29	37		84364	
		1.4: Fallow	0		8			8							1		1	1722
		Sub Total	4		38	49		91			3	0	5	29	38		38	86085
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky																508
		2.2: Gullied / Ravinous Land	4			18		21										627
		2.3: Rann																
		2.4: Salt Affected Land												1		1		16
		2.5: Sandy Area	1		2			3				0	1			1		69
		2.6: Scrub Land	139		34	11		184				0	0	0		1		10113
	Sub Total	144		36	29		208				0	2	1		3		11333	
	3: Builtup	3.1: Mining			0			0										234
		3.2: Rural																5077
		3.3: Urban																1107
		Sub Total			0			0										6418
	4: Forest	4.1: Deciduous	43628		5	167		43800					0	0		0		44087
		4.2: Evergreen/Semi evergreen																
		4.3: Forest Plantation	0		1131	0		1131										1133
		4.4: Scrub Forest	91		6	6015	1	6112						0		0		6181
		4.5: Swamp / Mangroves				0	250	250				0		1		1		252
	Sub Total	43719		1142	6182	251	51294					0	0	1	1		51652	
	5: Grass / Grazing	5.1: Grass / Grazing																
	6: Snow and Glacier	6.1: Snow and Glacier																
	7: Wetlands / Water bodies	7.1: Inland Wetland			0		0	0			314		0	4		318		357
		7.2: Coastal Wetland					8	8				1338		4		1342		1362
		7.3: River/Stream/Canals				0	2	2					3031	0		3032		3038
7.4: Water bodies											0	0	2516		2516		2531	
Sub Total				0	0	10	10			314	1338	3032	2523		7207		7288	
<b>Grand Total</b>		<b>43866</b>		<b>1216</b>	<b>6260</b>	<b>261</b>	<b>51604</b>			<b>317</b>	<b>1339</b>	<b>3039</b>	<b>2554</b>	<b>7249</b>		<b>155707</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		PUNJAB																		
		2015-16																		
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2015-16	1: Agriculture	1.1: Crop land	42315		51	42367	10	42377		1		8	31	19	59	57	83	186	325	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	409		400	809	0	7422				0	1	4	6	0	1	2	4	
		Farmland (FL) = 1.1+1.2+1.3	42725		451	43176	11	49799		1		9	32	23	65	57	83	189	329	
		1.4: Fallow	28		2	30	27	57				0	2	1	3	2	1	5	8	
		Sub Total	42753		452	43206	38	49856		1		9	34	24	68	59	85	194	338	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																		
		2.2: Gullied / Ravinous Land	14			14	1	15		15				1	16	0	0	1	1	
		2.3: Rann																		
		2.4: Salt Affected Land	11		0	11	1	12		0		9	0	1	10	0	0	2	2	
		2.5: Sandy Area	52		1	53	4	56				0	55	4	59	1	1	7	8	
		2.6: Scrub Land	101		13	114	40	154		0		1	5	132	138	1	4	26	31	
		Sub Total	177		14	191	46	237		16		10	60	138	224	2	5	36	43	
	3: Builtup	3.1: Mining	33		0	33	0	33		0			1	1	2	80	1	5	86	
		3.2: Rural	26		0	26	0	26		1		0	1	0	2	1	1693	9	1703	
		3.3: Urban	25		1	26	6	32			0	2	5	7	1	5	1778	1784		
		Sub Total	84		1	84	7	91		1		0	4	6	11	82	1699	1791	3572	
	4: Forest	4.1: Deciduous	4			4	0	4		4			0	1	6	0	0	0	1	
		4.2: Evergreen/Semi evergreen																		
		4.3: Forest Plantation	1			1		1					0	0	0					
		4.4: Scrub Forest	6		1	7	1	8		1			0	2	3	0	0	1	1	
		4.5: Swamp / Mangroves																		
	Sub Total	10		1	12	1	12		5			0	4	9	0	0	2	2		
5: Grass / Grazing	5.1: Grass / Grazing															0		0		
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland	32		2	33	2	35				1	0	7	8		0	2	2		
	7.2: Coastal Wetland																			
	7.3: River/Stream/Canals	21		0	21	0	21		0			13	9	22	1	0	0	1		
	7.4: Water bodies	2		0	2		2			0			0	0		0	1	1		
	Sub Total	54		2	56	2	58		0		1	13	17	31	1	0	2	3		
<b>Grand Total</b>		<b>43078</b>		<b>470</b>	<b>43549</b>	<b>93</b>	<b>43642</b>		<b>23</b>		<b>20</b>	<b>112</b>	<b>188</b>	<b>342</b>	<b>144</b>	<b>1789</b>	<b>2025</b>	<b>3958</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			PUNJAB														
			2015-16														
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total			
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total	
2015-16	1: Agriculture	1.1: Crop land	9		0	5	0	14			8		15	3	26	42802	
		1.2: Current Shifting cultivation															
		1.3: Plantation	0		0	0		0			1		0	0	2	7433	
		Farmland (FL) = 1.1+1.2+1.3	9		0	5	0	15			9		15	3	27	50235	
		1.4: Fallow				0		0			0		0	0	1	69	
		Sub Total	9		0	5	0	15			9		15	4	28	50304	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															
		2.2: Gullied / Ravinous Land	3		0			3								35	
		2.3: Rann															
		2.4: Salt Affected Land									1			0	1	25	
		2.5: Sandy Area	0					0			0		1	0	2	126	
		2.6: Scrub Land	18	1	1	2		22			1		9	1	11	356	
	Sub Total	21	1	1	2		25			2		11	1	13	541		
	3: Builtup	3.1: Mining	0		0	0		0			0			0	0	121	
		3.2: Rural	1			0		1			0		0	1	1	1734	
		3.3: Urban	0			0		0			0		0	0	0	1823	
		Sub Total	1		0	1		2			0		0	1	2	3678	
	4: Forest	4.1: Deciduous	1379			1	32	1412			0		1	0	1	1423	
		4.2: Evergreen/Semi evergreen		13				13								13	
		4.3: Forest Plantation			13	1		14								15	
		4.4: Scrub Forest	19		2	36		57			0		0	1	1	70	
		4.5: Swamp / Mangroves															
	Sub Total	1398	13	16	69		1495			0		1	1	3	1521		
	5: Grass / Grazing	5.1: Grass / Grazing				0		0	0							0	
	6: Snow and Glacier	6.1: Snow and Glacier															
	7: Wetlands / Water bodies	7.1: Inland Wetland	0		0			1			28		13	28	69	115	
		7.2: Coastal Wetland															
		7.3: River/Stream/Canals	1			0		1			1		684	1	686	732	
7.4: Water bodies		0					0			1			80	81	84		
Sub Total	2		0	0		2			30		698	108	836	930			
<b>Grand Total</b>			<b>1431</b>	<b>14</b>	<b>18</b>	<b>77</b>	<b>0</b>	<b>1539</b>	<b>0</b>	<b>41</b>	<b>725</b>	<b>115</b>	<b>881</b>	<b>50362</b>			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		RAJASTHAN																	
		2015-16																	
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	111148		6	111153	42576	153729							2	7	22	31	
		1.2: Current Shifting cultivation																	
		1.3: Plantation			117	117		7422											
		Farmland (FL) = 1.1+1.2+1.3	111148		122	111270	42576	161151							2	7	22	31	
		1.4: Fallow	12949		0	12949	65724	78673							2	9	28	39	
		Sub Total	124097		123	124219	108299	239823							4	16	50	69	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky							4552						4552	2	0	0	3
		2.2: Gullied / Ravinous Land								1319					1319	0	0	0	0
		2.3: Rann									100				100		0	0	0
		2.4: Salt Affected Land									798				798		4	4	4
		2.5: Sandy Area										23713			23713		0	0	0
		2.6: Scrub Land											34934		34934	5		38	43
		Sub Total							4552	1319	100	798	23713	34934	65415	7	0	43	51
	3: Builtup	3.1: Mining													397				397
		3.2: Rural														3276			3276
		3.3: Urban															2148		2148
		Sub Total													397	3276	2148		5821
	4: Forest	4.1: Deciduous													0		0		0
		4.2: Evergreen/Semi evergreen																	
		4.3: Forest Plantation																	
		4.4: Scrub Forest																1	1
		4.5: Swamp / Mangroves																	
	Sub Total														0		1	1	
5: Grass / Grazing	5.1: Grass / Grazing													2		4		6	
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland	16			16	1	17												
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals																0	0	
	7.4: Water bodies																0	0	
	Sub Total	16			16	1	17										0	0	
<b>Grand Total</b>		<b>124112</b>		<b>123</b>	<b>124235</b>	<b>108300</b>	<b>232535</b>	<b>4552</b>	<b>1319</b>	<b>100</b>	<b>798</b>	<b>23713</b>	<b>34934</b>	<b>65415</b>	<b>410</b>	<b>3291</b>	<b>2247</b>	<b>5948</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			RAJASTHAN													
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total
2011-12	1: Agriculture	1.1: Crop land											11	11	153770	
		1.2: Current Shifting cultivation														
		1.3: Plantation														7422
		Farmland (FL) = 1.1+1.2+1.3												11	11	161192
		1.4: Fallow										0	3	3	3	78715
		Sub Total										0	14	14	14	239906
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky														4554
		2.2: Gullied / Ravinous Land												0	0	1320
		2.3: Rann														100
		2.4: Salt Affected Land														802
		2.5: Sandy Area														23713
		2.6: Scrub Land												1	1	34978
		Sub Total												1	1	65467
	3: Builtup	3.1: Mining														397
		3.2: Rural														3276
		3.3: Urban														2148
		Sub Total														5821
	4: Forest	4.1: Deciduous	16886			332		17218								17218
		4.2: Evergreen/Semi evergreen														
		4.3: Forest Plantation	1		123	10		135								135
		4.4: Scrub Forest	650			10432		11082								11083
		4.5: Swamp / Mangroves														
	Sub Total	17537		123	10774		28434								28436	
5: Grass / Grazing	5.1: Grass / Grazing							3303					0	0	3309	
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland									175				175	192	
	7.2: Coastal Wetland															
	7.3: River/Stream/Canals										3284	0	3284	3284	3284	
	7.4: Water bodies											3129	3129	3129	3129	
	Sub Total									175	3284	3129	6588	6605	6605	
<b>Grand Total</b>			<b>17537</b>	<b>123</b>	<b>10774</b>	<b>28434</b>	<b>3303</b>		<b>175</b>	<b>3284</b>	<b>3144</b>	<b>6604</b>	<b>6604</b>	<b>342239</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		SIKKIM																	
		2015-16																	
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	587			587							0	0			0	0	
		1.2: Current Shifting cultivation																	
		1.3: Plantation			4	4	7422												
		Farmland (FL) = 1.1+1.2+1.3	587		4	591	8008							0	0			0	0
		1.4: Fallow					1	1											
		Sub Total	587		4	591	1	8009						0	0			0	0
	2:Barren/unculturable/ Wastelands	2.1: Barren Rocky						776										776	
		2.2:Gullied / Ravinous Land																	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area										4	0	4					
		2.6: Scrub Land											21	21					
		Sub Total						776				4	21	800					
	3: Builtup	3.1: Mining													0				0
		3.2: Rural														6			6
		3.3: Urban															18		18
		Sub Total													0	6	18		24
	4: Forest	4.1: Deciduous											0	0				0	0
		4.2: Evergreen/Semi evergreen										0		0		0		0	0
		4.3: Forest Plantation											0	0					
		4.4: Scrub Forest																	
		4.5: Swamp / Mangroves																	
		Sub Total										0	0	0		0	0		0
	5: Grass / Grazing	5.1: Grass / Grazing											2	2					
6: Snow and Glacier	6.1: Snow and Glacier						333						333						
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals																		
	7.4: Water bodies																		
	Sub Total																		
<b>Grand Total</b>		<b>587</b>		<b>4</b>	<b>591</b>	<b>1</b>	<b>592</b>	<b>1109</b>				<b>4</b>	<b>23</b>	<b>1136</b>	<b>0</b>	<b>6</b>	<b>18</b>	<b>24</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			SIKKIM															
			2015-16															
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	2					2									589	
		1.2: Current Shifting cultivation																
		1.3: Plantation																7422
		Farmland (FL) = 1.1+1.2+1.3	2					2										8010
		1.4: Fallow																1
		Sub Total	2					2										8011
	2:Barren/unculturable/ Wastelands	2.1: Barren Rocky								152					0	0		928
		2.2:Gullied / Ravinous Land																
		2.3: Rann																
		2.4: Salt Affected Land																
		2.5: Sandy Area																4
		2.6: Scrub Land									0							21
		Sub Total								152					0	0		952
	3: Builtup	3.1: Mining																0
		3.2: Rural																6
		3.3: Urban																18
		Sub Total																24
	4: Forest	4.1: Deciduous	183					183										183
		4.2: Evergreen/Semi evergreen		2526		22		2549		24								2573
		4.3: Forest Plantation			4			4										4
		4.4: Scrub Forest				53		53		0								53
		4.5: Swamp / Mangroves																
	Sub Total	183	2526	4	75		2788		24								2813	
5: Grass / Grazing	5.1: Grass / Grazing				0		0	553	64					1	1		621	
6: Snow and Glacier	6.1: Snow and Glacier		1				1		1690					0	0		2025	
7: Wetlands / Water bodies	7.1: Inland Wetland																	
	7.2: Coastal Wetland																	
	7.3: River/Stream/Canals											47					47	
	7.4: Water bodies												21				21	
	Sub Total											47	21				68	
<b>Grand Total</b>			<b>184</b>	<b>2528</b>	<b>4</b>	<b>75</b>		<b>2791</b>	<b>553</b>	<b>1930</b>			<b>47</b>	<b>22</b>	<b>69</b>		<b>7096</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		TAMIL NADU																		
		2015-16																		
		1: Agriculture					2: Barren/Unculturable/ Wastelands							3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2015-16	1: Agriculture	1.1: Crop land	49161		2094	51254	8051	59306		1		1	0	4	5	9		87	96	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	480		9085	9565	356	7422				0	0	1	1	0		14	14	
		Farmland (FL) = 1.1+1.2+1.3	49641		11179	60820	8407	66727		1		1	0	5	6	9		101	110	
		1.4: Fallow	4196		239	4435	14517	18952				0		13	14	4		44	48	
		Sub Total	53837		11419	65255	22924	85680		1		1	0	18	20	13		145	158	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky					1	1	337							0			0	
		2.2: Gullied / Ravinous Land					0	0		182				0	182					
		2.3: Rann																		
		2.4: Salt Affected Land					28	28				276		7	282	1		1	1	
		2.5: Sandy Area			0	0	0	0		0		1	298	1	301			0	0	
		2.6: Scrub Land	13			13		13		1		1	1	4149	4151	3		4	8	
		Sub Total	13		0	13	29	42	337	183		278	299	4157	5254	4		5	9	
	3: Builtup	3.1: Mining									0		1	1	597		0	597		
		3.2: Rural														6137		6137		
		3.3: Urban											1	1	1		2646	2647		
		Sub Total									0		2	2	598	6137	2646	9382		
	4: Forest	4.1: Deciduous											2	2	0		0	1		
		4.2: Evergreen/Semi evergreen													0		0	0		
		4.3: Forest Plantation										2		2	0			0		
		4.4: Scrub Forest																		
		4.5: Swamp / Mangroves								0	1	0	1				0	0		
		Sub Total									0	3	2	5	0		0	1		
5: Grass / Grazing	5.1: Grass / Grazing															0	0			
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland																			
	7.2: Coastal Wetland								0	1	1	1								
	7.3: River/Stream/Canals					0	0				0	0	1							
	7.4: Water bodies	0		0	1	1	1					0	0	0			0			
	Sub Total	0		0	1	1	1			0	1	1	2	0			0			
<b>Grand Total</b>		<b>53850</b>		<b>11419</b>	<b>65269</b>	<b>22954</b>	<b>88223</b>	<b>337</b>	<b>184</b>		<b>279</b>	<b>303</b>	<b>4180</b>	<b>5283</b>	<b>616</b>	<b>6137</b>	<b>2797</b>	<b>9550</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			TAMIL NADU													Grand Total	
			2015-16														
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Sub Total			
			4.1	4.2	4.3	4.4	4.5	5.1	6.1	7.1	7.2	7.3	7.4				
2015-16	1: Agriculture	1.1: Crop land				3	3	7						9	9	59426	
		1.2: Current Shifting cultivation															
		1.3: Plantation				0	0								1	1	7439
		Farmland (FL) = 1.1+1.2+1.3				3	3	7							11	11	66864
		1.4: Fallow	0			0	0	39									19054
		Sub Total	0			3	3	46							11	11	85918
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															338
		2.2: Gullied / Ravinous Land				0	0										182
		2.3: Rann															
		2.4: Salt Affected Land				0	0										312
		2.5: Sandy Area	5					5									306
		2.6: Scrub Land	1			3	4	6							0	0	4182
	Sub Total	6			3	9	6							0	0	5320	
	3: Builtup	3.1: Mining															598
		3.2: Rural															6137
		3.3: Urban															2648
		Sub Total															9383
	4: Forest	4.1: Deciduous	11198			1	11200										11203
		4.2: Evergreen/Semi evergreen	154	4319	0	0	4474										4474
		4.3: Forest Plantation	0		1319	1	1320										1322
		4.4: Scrub Forest				0	0										0
		4.5: Swamp / Mangroves					78	78									80
	Sub Total	11353	4319	1319	3	78	17072									17078	
5: Grass / Grazing	5.1: Grass / Grazing						200									200	
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland										130				130	130	
	7.2: Coastal Wetland					2	2				711				711	714	
	7.3: River/Stream/Canals					0	0					1750			1750	1751	
	7.4: Water bodies	0			1	0	2						7062		7062	7065	
	Sub Total	0			1	2	3				130	711	1750	7062	9652	9659	
<b>Grand Total</b>			<b>11359</b>	<b>4319</b>	<b>1319</b>	<b>10</b>	<b>80</b>	<b>17087</b>	<b>252</b>		<b>130</b>	<b>711</b>	<b>1750</b>	<b>7072</b>	<b>9663</b>	<b>130058</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		TRIPURA																
		2015-16																
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup				
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total
2011-12	1: Agriculture	1.1: Crop land	1397	0	0	1397						1	9	10	0	0	0	1
		1.2: Current Shifting cultivation		2		2							0	0				
		1.3: Plantation		0	766	766						1	34	35		0	0	0
		Farmland (FL) = 1.1+1.2+1.3	1397	2	766	2165	8820						1	44	45	0	0	0
		1.4: Fallow	0			0	29						0	4	4			
		Sub Total	1397	2	766	2165	29	8849					1	47	49	0	0	0
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																
		2.2: Gullied / Ravinous Land							0					0				
		2.3: Rann																
		2.4: Salt Affected Land																
		2.5: Sandy Area											1	0	2			
		2.6: Scrub Land		1	1	3	3		0				0	175	176		1	1
	Sub Total		1	1	3	3		0				1	176	177		1	1	
	3: Builtup	3.1: Mining											0	0	6		0	6
		3.2: Rural														561		561
		3.3: Urban		0		0	0						1	1			320	320
		Sub Total		0		0	0						1	1	6	561	321	887
	4: Forest	4.1: Deciduous	0	3	5	8	8						77	77		2	0	2
		4.2: Evergreen/Semi evergreen	0	19	0	19	19		0					0		0		0
		4.3: Forest Plantation		1		1	1											
		4.4: Scrub Forest		5		5	5						0	0		0		0
		4.5: Swamp / Mangroves																
	Sub Total	0	27	5	33	33		0					78	78		2	0	2
5: Grass / Grazing	5.1: Grass / Grazing																	
6: Snow and Glacier	6.1: Snow and Glacier																	
7: Wetlands / Water bodies	7.1: Inland Wetland											1	1					
	7.2: Coastal Wetland																	
	7.3: River/Stream/Canals		0		0	0						1	0	1				
	7.4: Water bodies												0	0				
Sub Total		0		0	0						1	1	2					
<b>Grand Total</b>		<b>1397</b>	<b>31</b>	<b>773</b>	<b>2200</b>	<b>29</b>	<b>2229</b>	<b>0</b>	<b></b>	<b></b>	<b>3</b>	<b>303</b>	<b>307</b>	<b>6</b>	<b>564</b>	<b>321</b>	<b>891</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		TRIPURA													Grand Total	
		2015-16														
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Sub Total			
		4.1	4.2	4.3	4.4	4.5	5.1	6.1	7.1	7.2	7.3	7.4				
2011-12	1: Agriculture	1.1: Crop land	1			6		7								1415
		1.2: Current Shifting cultivation	3			11		15								16
		1.3: Plantation	1			11		12				0		0	0	7469
		Farmland (FL) = 1.1+1.2+1.3	5			29		34					0	0	0	8900
		1.4: Fallow	0			1		1								34
		Sub Total	5			30		35					0	0	0	8934
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky														0
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area				0		0								2
		2.6: Scrub Land	1			75		76								255
	Sub Total	1			75		76								257	
	3: Builtup	3.1: Mining				0		0								6
		3.2: Rural														561
		3.3: Urban				0		0								321
	Sub Total				1		1								889	
	4: Forest	4.1: Deciduous	2189			101		2290								2377
		4.2: Evergreen/Semi evergreen	22	3654	0	97		3774								3793
		4.3: Forest Plantation	1		292	7		300								301
		4.4: Scrub Forest	350	2		121		473								478
		4.5: Swamp / Mangroves														
	Sub Total	2562	3655	292	327		6836								6949	
5: Grass / Grazing	5.1: Grass / Grazing															
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland									5				5	6	
	7.2: Coastal Wetland															
	7.3: River/Stream/Canals				0		0					50		50	51	
	7.4: Water bodies												57	57	57	
Sub Total				0		0			5		50	57	112	114		
<b>Grand Total</b>		<b>2568</b>	<b>3655</b>	<b>292</b>	<b>432</b>		<b>6948</b>			<b>5</b>		<b>50</b>	<b>57</b>	<b>112</b>	<b>10486</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		TELANGANA																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	56724		102	56826	2162	58989	15	21		42	0	488	565	34	51	77	162
		1.2: Current Shifting cultivation																	
		1.3: Plantation	55		1032	1087	3	7422	0			1		21	22	2	0	1	3
		Farmland (FL) = 1.1+1.2+1.3	56780		1134	57914	2166	66410	15	21		42	0	509	587	36	51	78	165
		1.4: Fallow	1587		13	1600	7045	8646	5	7		121	1	278	411	19	12	43	74
	Sub Total	58367		1147	59514	9211	75056	19	28		163	1	787	998	55	63	121	239	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky	3			3	17	20	641				0	80	721	5	0	1	6
		2.2: Gullied / Ravinous Land	8			8	3	11	0	95		0		14	109	0			0
		2.3: Rann																	
		2.4: Salt Affected Land	23			23		23		0		227		1	229	0			0
		2.5: Sandy Area	0			0		0					2	0	2				
		2.6: Scrub Land	403		7	410	445	855	58	1		26	0	4007	4092	20	2	13	35
	Sub Total	438		7	445	465	909	699	96		253	2	4102	5152	25	2	14	42	
	3: Builtup	3.1: Mining	2		1	3	10	13	23			3		65	91	363	0	5	368
		3.2: Rural	12		0	12	3	15	1	0		0		10	12	1	1965	17	1984
		3.3: Urban	26		20	45	43	89	1	1		2		56	60	10	4	1704	1718
		Sub Total	40		20	60	56	116	24	1		6		131	162	374	1970	1726	4070
	4: Forest	4.1: Deciduous	869		2	872	7	878	20	1		1	1	37	61	5	1	1	7
		4.2: Evergreen/Semi evergreen																	
		4.3: Forest Plantation	36			36		36						0	0	2			2
		4.4: Scrub Forest	604			604	1	604	4	2		1	0	3	9	2	0	1	3
		4.5: Swamp / Mangroves																	
	Sub Total	1509		2	1512	8	1519	24	3		2	1	40	71	9	1	2	12	
5: Grass / Grazing	5.1: Grass / Grazing	0			0	0	0						0	0			2	2	
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals	5			5	0	6	0	1		2	1	8	12	2	0		2	
	7.4: Water bodies	83		0	83	9	92	1			8	0	18	27	2	0	1	3	
	Sub Total	88		0	89	9	97	1	1		10	1	27	39	3	0	1	4	
<b>Grand Total</b>		<b>60442</b>		<b>1177</b>	<b>61619</b>	<b>9749</b>	<b>71368</b>	<b>767</b>	<b>129</b>		<b>434</b>	<b>5</b>	<b>5087</b>	<b>6422</b>	<b>466</b>	<b>2036</b>	<b>1866</b>	<b>4369</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		TELANGANA														Grand Total	
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Sub Total				
		4.1	4.2	4.3	4.4	4.5	5.1	6.1	7.1	7.2	7.3	7.4					
2011-12	1: Agriculture	1.1: Crop land	6		0	126	0	132	3			0		14	64	78	59928
		1.2: Current Shifting cultivation															
		1.3: Plantation	4			0		4						0	0	0	7451
		<b>Farmland (FL) = 1.1+1.2+1.3</b>	<b>10</b>		<b>0</b>	<b>126</b>	<b>0</b>	<b>136</b>	<b>3</b>			<b>0</b>		<b>14</b>	<b>64</b>	<b>78</b>	<b>67379</b>
		1.4: Fallow	0			6		7	0			1		3	15	19	9157
	<b>Sub Total</b>	<b>10</b>		<b>0</b>	<b>132</b>	<b>0</b>	<b>143</b>	<b>3</b>			<b>1</b>		<b>17</b>	<b>79</b>	<b>97</b>	<b>76536</b>	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky				13		13							0	0	759
		2.2: Gullied / Ravinous Land				1		1						0	0	1	122
		2.3: Rann															
		2.4: Salt Affected Land										1			0	1	254
		2.5: Sandy Area												1		1	2
		2.6: Scrub Land	0	0	2	15		17						0	1	1	5001
	<b>Sub Total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>29</b>		<b>31</b>				<b>1</b>		<b>1</b>	<b>2</b>	<b>4</b>	<b>6138</b>	
	3: Builtup	3.1: Mining	0			8		8							0	0	479
		3.2: Rural	0			3		3	0				0	1	1	1	2015
		3.3: Urban	3		2	5		9	1			0			0	0	1877
		<b>Sub Total</b>	<b>3</b>		<b>2</b>	<b>15</b>		<b>20</b>	<b>1</b>			<b>0</b>		<b>0</b>	<b>2</b>	<b>2</b>	<b>4371</b>
	4: Forest	4.1: Deciduous	17983		13	299		18295						1	5	6	19248
		4.2: Evergreen/Semi evergreen															
		4.3: Forest Plantation	14		330	37		380									418
		4.4: Scrub Forest	4		8	4099		4110	0						1	1	4727
		4.5: Swamp / Mangroves															
	<b>Sub Total</b>	<b>18000</b>		<b>350</b>	<b>4435</b>		<b>22786</b>	<b>0</b>					<b>1</b>	<b>6</b>	<b>6</b>	<b>24394</b>	
5: Grass / Grazing	5.1: Grass / Grazing							28								31	
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland				0		0				14		1	0	16	16	
	7.2: Coastal Wetland																
	7.3: River/Stream/Canals	0			2		2	0			0		2163	5	2169	2190	
	7.4: Water bodies	0			2		2	0			3		13	4594	4610	4734	
	<b>Sub Total</b>	<b>0</b>			<b>4</b>		<b>4</b>	<b>0</b>			<b>17</b>		<b>2177</b>	<b>4600</b>	<b>6794</b>	<b>6940</b>	
<b>Grand Total</b>	<b>18014</b>	<b>0</b>	<b>354</b>	<b>4616</b>	<b>0</b>	<b>22985</b>	<b>32</b>			<b>19</b>		<b>2197</b>	<b>4688</b>	<b>6903</b>	<b>112079</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		UTTARAKHAND																		
		2015-16																		
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup							
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	9666			9666	0	9666					10	0	10	2	1	5	8	
		1.2: Current Shifting cultivation																		
		1.3: Plantation			175	175	7422										0	0	0	0
		Farmland (FL) = 1.1+1.2+1.3	9666		175	9841	0	17087					10	0	10	2	1	5	8	
		1.4: Fallow	1			1	924	925						0	0	0	0	1	1	2
		Sub Total	9667		175	9842	924	18012					10	0	10	3	1	6	10	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						3039					0	86	3125					
		2.2: Gullied / Ravinous Land							0						0					
		2.3: Rann																		
		2.4: Salt Affected Land																		
		2.5: Sandy Area											25	0	25					
		2.6: Scrub Land	0			0	0	0	2				1	1083	1087	0	0	4	4	
		Sub Total	0			0	0	0	3041	0			26	1170	4237	0	0	4	4	
	3: Builtup	3.1: Mining														23			23	
		3.2: Rural															210		210	
		3.3: Urban																402	402	
		Sub Total														23	210	402	635	
	4: Forest	4.1: Deciduous										0	0	1	0	0	0	0	0	
		4.2: Evergreen/Semi evergreen										4	0	4	0	0	0	0	0	
		4.3: Forest Plantation																0	0	
		4.4: Scrub Forest										0		0	0	0	0	0	1	
		4.5: Swamp / Mangroves																		
	Sub Total											4	0	5	0	0	1	2		
5: Grass / Grazing	5.1: Grass / Grazing										1	1	2							
6: Snow and Glacier	6.1: Snow and Glacier						195						195							
7: Wetlands / Water bodies	7.1: Inland Wetland																			
	7.2: Coastal Wetland																			
	7.3: River/Stream/Canals	9			9	9					7	13	21	0				0		
	7.4: Water bodies	3			3	3					0	0	0	0				0		
	Sub Total	13			13	13					7	13	21	0				0		
<b>Grand Total</b>		<b>9680</b>		<b>175</b>	<b>9855</b>	<b>924</b>	<b>10779</b>	<b>3236</b>	<b>0</b>			<b>49</b>	<b>1184</b>	<b>4470</b>	<b>26</b>	<b>212</b>	<b>413</b>	<b>651</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			UTTARAKHAND														
			2015-16														
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total			
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total	
2011-12	1: Agriculture	1.1: Crop land											7	0	7	9691	
		1.2: Current Shifting cultivation															
		1.3: Plantation											0		0	7422	
		Farmland (FL) = 1.1+1.2+1.3											7	0	7	17113	
		1.4: Fallow											0		0	927	
		Sub Total											7	0	7	18040	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky									2901						6026
		2.2: Gullied / Ravinous Land															0
		2.3: Rann															
		2.4: Salt Affected Land															
		2.5: Sandy Area											0		0	26	
		2.6: Scrub Land									0		1	0	1	1092	
		Sub Total									2901		1	0	1	7143	
	3: Builtup	3.1: Mining											0	0	0	24	
		3.2: Rural											0		0	210	
		3.3: Urban														402	
		Sub Total											0	0	0	635	
	4: Forest	4.1: Deciduous	6278					6278					1		1	6279	
		4.2: Evergreen/Semi evergreen		16160				16160					0	0	0	16164	
		4.3: Forest Plantation	0		792			792					0		0	793	
		4.4: Scrub Forest				2089		2089					0		0	2089	
		4.5: Swamp / Mangroves					7	7								7	
	Sub Total	6278	16160	792	2089	7	25326					1	0	1	25333		
	5: Grass / Grazing	5.1: Grass / Grazing							3797	530						4329	
	6: Snow and Glacier	6.1: Snow and Glacier								3791						3986	
	7: Wetlands / Water bodies	7.1: Inland Wetland										0			0	0	
		7.2: Coastal Wetland															
7.3: River/Stream/Canals								7	5			1021	0	1021	1063		
7.4: Water bodies									1				195	195	199		
Sub Total								7	6	0	0	1021	195	1216	1262		
<b>Grand Total</b>			<b>6278</b>	<b>16160</b>	<b>792</b>	<b>2089</b>	<b>7</b>	<b>25326</b>	<b>3804</b>	<b>7228</b>	<b>0</b>	<b>1031</b>	<b>196</b>	<b>1226</b>	<b>53483</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		UTTAR PRADESH																		
		2015-16																		
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	180998		167	181164	1550	182714		0		5	2	19	27	18	31	119	168	
		1.2: Current Shifting cultivation																		
		1.3: Plantation	0		4739	4739		7422									0		1	1
		Farmland (FL) = 1.1+1.2+1.3	180998		4906	185903	1550	190136		0		5	2	19	27	18	31	120	169	
		1.4: Fallow	647			647	5632	6279				1		4	5	21	9	47	77	
		Sub Total	181645		4906	186550	7182	196415		0		6	2	23	32	39	40	167	246	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						220							220					
		2.2: Gullied / Ravinous Land							1278					4	1281	0		1	1	
		2.3: Rann																		
		2.4: Salt Affected Land	1		0	2	2				2563		5	2568	0	2	4	6	6	
		2.5: Sandy Area											13	13						
		2.6: Scrub Land	60		0	60	1	61		0		5	0	3284	3289	2	0	5	7	
	Sub Total	61		0	62	1	63	220	1278		2567	13	3293	7371	2	2	11	15		
	3: Builtup	3.1: Mining	1			1	1								366			0	366	
		3.2: Rural	5		0	5	5				0	0		0	0	8247	3	8251		
		3.3: Urban	0			0	0									0	3919	3920		
		Sub Total	6		0	6	0	6			0	0		0	366	8248	3923	12537		
	4: Forest	4.1: Deciduous	0			0	0		0				5	5	0		1	1		
		4.2: Evergreen/Semi evergreen																		
		4.3: Forest Plantation																		
		4.4: Scrub Forest	1			1	1											0	0	
		4.5: Swamp / Mangroves																		
	Sub Total	1			1	1	1		0				5	5	0		1	1		
5: Grass / Grazing	5.1: Grass / Grazing	1			1	1						10	10							
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland	114		0	114	6	121						4	4			1	1		
	7.2: Coastal Wetland																			
	7.3: River/Stream/Canals	350		0	350	86	436		0		0	1	28	29		0	0	0		
	7.4: Water bodies	128		0	128	10	138						1	1			0	0		
	Sub Total	592		0	593	102	695		0		0	1	34	35		0	1	1		
<b>Grand Total</b>		<b>182306</b>		<b>4907</b>	<b>187213</b>	<b>7286</b>	<b>194498</b>	<b>220</b>	<b>1278</b>		<b>2574</b>	<b>17</b>	<b>3364</b>	<b>7452</b>	<b>408</b>	<b>8289</b>	<b>4102</b>	<b>12799</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		UTTAR PRADESH															
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	1		0	1		2				27		472	14	514	183424
		1.2: Current Shifting cultivation															
		1.3: Plantation									0		1	1	2	7425	
		Farmland (FL) = 1.1+1.2+1.3	1		0	1		2			27		473	15	515	190848	
		1.4: Fallow									1		54	1	56	6417	
		<b>Sub Total</b>	1		0	1		2			28		528	16	572	197266	
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															220
		2.2: Gullied / Ravinous Land					0	0						4		4	1287
		2.3: Rann															
		2.4: Salt Affected Land	0				0	0					5	0	6	2581	
		2.5: Sandy Area															13
		2.6: Scrub Land	1					1			5		121	2	127	3486	
		<b>Sub Total</b>	2				1	2			5		130	2	137	7588	
	3: Builtup	3.1: Mining	0					0									368
		3.2: Rural									0		3	0	3	8259	
		3.3: Urban											1		1	3921	
			<b>Sub Total</b>	0					0		0		4	0	4	12548	
	4: Forest	4.1: Deciduous	12950			0	52	13002			2		11	0	13	13020	
		4.2: Evergreen/Semi evergreen		231				231								231	
		4.3: Forest Plantation			117			117					0		0	117	
		4.4: Scrub Forest	5		5	2033		2043			0		4	0	4	2047	
		4.5: Swamp / Mangroves					1	67	68				1		1	69	
		<b>Sub Total</b>	12955	231	122	2085	67	15461			2		16	0	18	15485	
5: Grass / Grazing	5.1: Grass / Grazing								139			7		7	157		
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland					3	3				2155		19	0	2175	2303	
	7.2: Coastal Wetland																
	7.3: River/Stream/Canals	0				2	2			35		6182	10	6226	6693		
	7.4: Water bodies									0		0	1430	1431	1570		
	<b>Sub Total</b>	0				5	5			2190		6202	1440	9832	10567		
	<b>Grand Total</b>	12958	231	122	2091	67	15470	139		2225		6886	1458	10570	240928		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		WEST BENGAL																	
		2015-16																	
		1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	51456		12	51468					1	1	0	2	25	10	33	68	
		1.2: Current Shifting cultivation																	
		1.3: Plantation	0		2507	2507	7422						0	0	0		0	1	1
		Farmland (FL) = 1.1+1.2+1.3	51456		2519	53975	58890				1	1	0	2	25	10	34	69	
		1.4: Fallow	3			3	39							0	0			0	0
	<b>Sub Total</b>	<b>51459</b>		<b>2519</b>	<b>53978</b>	<b>36</b>	<b>58929</b>				<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>25</b>	<b>10</b>	<b>34</b>	<b>69</b>	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky						51						51					
		2.2: Gullied / Ravinous Land							16					17		0			0
		2.3: Rann																	
		2.4: Salt Affected Land									1			1					
		2.5: Sandy Area	4		1	5	5				0	12	1	14		1			1
		2.6: Scrub Land	49		0	49	49		2			0	1055	1058	11	10	9		30
		<b>Sub Total</b>	<b>53</b>		<b>1</b>	<b>54</b>	<b>54</b>	<b>51</b>	<b>18</b>		<b>1</b>	<b>13</b>	<b>1058</b>	<b>1140</b>	<b>11</b>	<b>11</b>	<b>9</b>		<b>31</b>
	3: Builtup	3.1: Mining	1			1	0	1					2	2	251	13273	6		251
		3.2: Rural									0		0			13273		6	13278
		3.3: Urban											0	0	0	0	2412		2413
		<b>Sub Total</b>	<b>1</b>			<b>1</b>	<b>0</b>	<b>1</b>			<b>0</b>		<b>2</b>	<b>2</b>	<b>251</b>	<b>13273</b>	<b>2418</b>		<b>15942</b>
	4: Forest	4.1: Deciduous	3		0	3	3	0				0	23	23	3	1	9		13
		4.2: Evergreen/Semi evergreen																	
		4.3: Forest Plantation	0			0	0					0		0			2		2
		4.4: Scrub Forest	8		0	8	8		0					0			0		0
		4.5: Swamp / Mangroves										1		1	0				0
		<b>Sub Total</b>	<b>11</b>		<b>0</b>	<b>12</b>	<b>12</b>	<b>0</b>				<b>1</b>	<b>23</b>	<b>24</b>	<b>3</b>	<b>1</b>	<b>10</b>		<b>14</b>
	5: Grass / Grazing	5.1: Grass / Grazing	8			8	8						0	0		0		0	
	6: Snow and Glacier	6.1: Snow and Glacier																	
	7: Wetlands / Water bodies	7.1: Inland Wetland	63			63	63						0	0		1	3		4
		7.2: Coastal Wetland									0	1		1	0				0
7.3: River/Stream/Canals		26		0	26	0	27			0	4	1	5	1	0	1		2	
7.4: Water bodies		0			0	0						0	0	1				1	
<b>Sub Total</b>		<b>90</b>		<b>0</b>	<b>90</b>	<b>0</b>	<b>90</b>			<b>0</b>	<b>5</b>	<b>1</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>4</b>		<b>6</b>	
<b>Grand Total</b>		<b>51622</b>		<b>2521</b>	<b>54142</b>	<b>36</b>	<b>54179</b>	<b>51</b>	<b>18</b>		<b>2</b>	<b>19</b>	<b>1085</b>	<b>1175</b>	<b>291</b>	<b>13295</b>	<b>2476</b>	<b>16062</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		WEST BENGAL															
		2015-16															
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total				
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	10					10			0	0	61	99	161	51709	
		1.2: Current Shifting cultivation															
		1.3: Plantation											1	0	1	7423	
		<b>Farmland (FL) = 1.1+1.2+1.3</b>	<b>10</b>					<b>10</b>			<b>0</b>	<b>0</b>	<b>61</b>	<b>100</b>	<b>161</b>	<b>59132</b>	
		1.4: Fallow											2	0	2	41	
	<b>Sub Total</b>	<b>10</b>					<b>10</b>			<b>0</b>	<b>0</b>	<b>63</b>	<b>100</b>	<b>163</b>	<b>59174</b>		
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky														51	
		2.2: Gullied / Ravinous Land	2					2						0	0	19	
		2.3: Rann															
		2.4: Salt Affected Land														1	
		2.5: Sandy Area	1		0		1	2	1				7	0	7	29	
		2.6: Scrub Land	180					180	21				20	0	20	1358	
	<b>Sub Total</b>	<b>183</b>		<b>0</b>		<b>1</b>	<b>184</b>	<b>22</b>				<b>27</b>	<b>0</b>	<b>28</b>	<b>1459</b>		
	3: Builtup	3.1: Mining	2			0		2	0			0	1	1	1	257	
		3.2: Rural											3		3	13281	
		3.3: Urban	0					0					1		1	2415	
	<b>Sub Total</b>	<b>2</b>			<b>0</b>		<b>2</b>	<b>0</b>			<b>0</b>	<b>5</b>	<b>1</b>	<b>6</b>	<b>15953</b>		
	4: Forest	4.1: Deciduous	6444		12	14		6470			0	0	1	0	2	6510	
		4.2: Evergreen/Semi evergreen		199		0		199								199	
		4.3: Forest Plantation	16		662	22		700								702	
		4.4: Scrub Forest	115		60	329	0	504					0		0	512	
		4.5: Swamp / Mangroves					1756	1756					7	7	14	1771	
	<b>Sub Total</b>	<b>6574</b>	<b>199</b>	<b>734</b>	<b>365</b>	<b>1756</b>	<b>9628</b>			<b>0</b>	<b>0</b>	<b>9</b>	<b>7</b>	<b>16</b>	<b>9694</b>		
	5: Grass / Grazing	5.1: Grass / Grazing					2	2	122				7	31	38	171	
	6: Snow and Glacier	6.1: Snow and Glacier															
	7: Wetlands / Water bodies	7.1: Inland Wetland							0		117		0	9	126	194	
		7.2: Coastal Wetland	0			4	4					88	0	1	90	94	
7.3: River/Stream/Canals		2		0		17	19	4			4	5555	1	5560	5616		
7.4: Water bodies												0	0	1312	1313		
<b>Sub Total</b>	<b>2</b>		<b>0</b>		<b>20</b>	<b>22</b>	<b>4</b>		<b>117</b>	<b>92</b>	<b>5556</b>	<b>1323</b>	<b>7088</b>	<b>7217</b>			
<b>Grand Total</b>	<b>6771</b>	<b>199</b>	<b>735</b>	<b>365</b>	<b>1779</b>	<b>9849</b>	<b>149</b>		<b>118</b>	<b>93</b>	<b>5668</b>	<b>1461</b>	<b>7339</b>	<b>88752</b>			

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		CHANDIGARH																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	11			11											1	1	
		1.2: Current Shifting cultivation																	
		1.3: Plantation			1	1	7422												
		Farmland (FL) = 1.1+1.2+1.3	11		1	12	7433											1	1
		1.4: Fallow					0												
		Sub Total	11		1	12	0	7433										1	1
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																	
		2.2: Gullied / Ravinous Land																	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area																	
		2.6: Scrub Land											0	0				0	0
	Sub Total											0	0				0	0	
	3: Builtup	3.1: Mining													0			0	0
		3.2: Rural														1		1	1
		3.3: Urban															88	88	88
		Sub Total													0	1	88	89	89
	4: Forest	4.1: Deciduous																	
		4.2: Evergreen/Semi evergreen																	
		4.3: Forest Plantation																	
		4.4: Scrub Forest																	
		4.5: Swamp / Mangroves																	
	Sub Total																		
5: Grass / Grazing	5.1: Grass / Grazing																		
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland																		
	7.3: River/Stream/Canals																		
	7.4: Water bodies																		
Sub Total																			
<b>Grand Total</b>			11		1	12	0	12						0	0	0	1	89	90

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		CHANDIGARH															
		2015-16															
		4: Forest						5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total			
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4		Sub Total		
2011-12	1: Agriculture	1.1: Crop land														12	
		1.2: Current Shifting cultivation															
		1.3: Plantation															7422
		Farmland (FL) = 1.1+1.2+1.3															7433
		1.4: Fallow															0
		Sub Total															7433
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															
		2.2: Gullied / Ravinous Land															
		2.3: Rann															
		2.4: Salt Affected Land															
		2.5: Sandy Area															
		2.6: Scrub Land												0	0		1
	Sub Total												0	0		1	
	3: Builtup	3.1: Mining															0
		3.2: Rural															1
		3.3: Urban															88
		Sub Total															89
	4: Forest	4.1: Deciduous	1						1								1
		4.2: Evergreen/Semi evergreen		8					8								8
		4.3: Forest Plantation			0				0								0
		4.4: Scrub Forest				0			0								0
		4.5: Swamp / Mangroves															
	Sub Total	1	8	0	0			10								10	
5: Grass / Grazing	5.1: Grass / Grazing																
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland																
	7.2: Coastal Wetland																
	7.3: River/Stream/Canals											0			0	0	
	7.4: Water bodies												2		2	2	
Sub Total											0	2		2	2		
<b>Grand Total</b>		<b>1</b>	<b>8</b>	<b>0</b>	<b>0</b>		<b>10</b>					<b>0</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>114</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			DADAR & NAGAR HAVELI																	
			2015-16																	
			1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup						
			1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	155			155	0	156									0	0		
		1.2: Current Shifting cultivation																		
		1.3: Plantation			14	14		7422										0	0	
		Farmland (FL) = 1.1+1.2+1.3	155		14	170	0	7577										0	0	
		1.4: Fallow					112	112										1	1	
		Sub Total	155		14	170	112	7689										1	1	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																		
		2.2: Gullied / Ravinous Land																		
		2.3: Rann																		
		2.4: Salt Affected Land																		
		2.5: Sandy Area																		
		2.6: Scrub Land																0	0	
		Sub Total																0	0	
	3: Builtup	3.1: Mining													1				1	
		3.2: Rural														2			2	
		3.3: Urban					0	0										31	31	
		Sub Total					0	0							1	2	31		33	
	4: Forest	4.1: Deciduous																		
		4.2: Evergreen/Semi evergreen																		
		4.3: Forest Plantation																		
		4.4: Scrub Forest																		
		4.5: Swamp / Mangroves																		
		Sub Total																		
5: Grass / Grazing	5.1: Grass / Grazing																			
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland																			
	7.2: Coastal Wetland																			
	7.3: River/Stream/Canals																			
	7.4: Water bodies																			
	Sub Total																			
<b>Grand Total</b>			155		14	170	112	281									1	2	33	35

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			DADAR & NAGAR HAVELI													
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total		
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total
2011-12	1: Agriculture	1.1: Crop land											0	0	156	
		1.2: Current Shifting cultivation														
		1.3: Plantation													7422	
		<b>Farmland (FL) = 1.1+1.2+1.3</b>												0	0	7578
		1.4: Fallow														112
		<b>Sub Total</b>												0	0	7690
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky														
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area														
		2.6: Scrub Land														0
		<b>Sub Total</b>														0
	3: Builtup	3.1: Mining														1
		3.2: Rural														2
		3.3: Urban														31
		<b>Sub Total</b>														34
	4: Forest	4.1: Deciduous	147					147						0	0	147
		4.2: Evergreen/Semi evergreen		6				6								6
		4.3: Forest Plantation			0			0								0
		4.4: Scrub Forest				1		1								1
		4.5: Swamp / Mangroves														
		<b>Sub Total</b>	147	6	0	1		154						0	0	154
5: Grass / Grazing	5.1: Grass / Grazing															
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland															
	7.2: Coastal Wetland															
	7.3: River/Stream/Canals											8		8	8	
	7.4: Water bodies												12	12	12	
	<b>Sub Total</b>											8	12	20	20	
<b>Grand Total</b>			147	6	0	1		154					8	12	20	491

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			LAKSHADWEEP															
			2015-16															
			1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup			
			1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3
2011-12	1: Agriculture	1.1: Crop land	27			27	27											
		1.2: Current Shifting cultivation																
		1.3: Plantation					7422											
		Farmland (FL) = 1.1+1.2+1.3	27			27	7448											
		1.4: Fallow																
		Sub Total	27			27	7448											
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																
		2.2: Gullied / Ravinous Land																
		2.3: Rann																
		2.4: Salt Affected Land																
		2.5: Sandy Area																
		2.6: Scrub Land																
		Sub Total																
	3: Builtup	3.1: Mining																
		3.2: Rural														0		0
		3.3: Urban															5	5
		Sub Total														0	5	5
	4: Forest	4.1: Deciduous																
		4.2: Evergreen/Semi evergreen																
		4.3: Forest Plantation																
		4.4: Scrub Forest																
		4.5: Swamp / Mangroves																
	Sub Total																	
	5: Grass / Grazing	5.1: Grass / Grazing																
6: Snow and Glacier	6.1: Snow and Glacier																	
7: Wetlands / Water bodies	7.1: Inland Wetland																	
	7.2: Coastal Wetland																	
	7.3: River/Stream/Canals																	
	7.4: Water bodies																	
Sub Total																		
<b>Grand Total</b>			27			27	27									0	5	5

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			LAKSHADWEEP												Grand Total	
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies						
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4		Sub Total
2011-12	1: Agriculture	1.1: Crop land														27
		1.2: Current Shifting cultivation														
		1.3: Plantation														
		<b>Farmland (FL) = 1.1+1.2+1.3</b>														7422
		1.4: Fallow														
		<b>Sub Total</b>														7448
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky														
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														
		2.5: Sandy Area														
		2.6: Scrub Land														
		<b>Sub Total</b>														
	3: Builtup	3.1: Mining														
		3.2: Rural														0
		3.3: Urban														5
		<b>Sub Total</b>														5
	4: Forest	4.1: Deciduous														
		4.2: Evergreen/Semi evergreen														
		4.3: Forest Plantation														
		4.4: Scrub Forest														
		4.5: Swamp / Mangroves														
	<b>Sub Total</b>															
	5: Grass / Grazing	5.1: Grass / Grazing														
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland															
	7.2: Coastal Wetland															
	7.3: River/Stream/Canals															
	7.4: Water bodies												0	0	0	
	<b>Sub Total</b>												0	0	0	
<b>Grand Total</b>														0	0	32

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		ANDAMAN & NICOBAR ISLANDS																		
		2015-16																		
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup						
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total		
2011-12	1: Agriculture	1.1: Crop land	314			314	0	314						1	1			0	0	
		1.2: Current Shifting cultivation																		
		1.3: Plantation			74	74													0	0
		Farmland (FL) = 1.1+1.2+1.3	314		74	388	0	7736							1	1			0	0
		1.4: Fallow					0	0												
		Sub Total	314		74	388	0	7736							1	1			0	0
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																		
		2.2: Gullied / Ravinous Land																		
		2.3: Rann																		
		2.4: Salt Affected Land																		
		2.5: Sandy Area										7		7						
		2.6: Scrub Land											2	2						
		Sub Total										7	2	9						
	3: Builtup	3.1: Mining																		
		3.2: Rural															7			7
		3.3: Urban																63		63
		Sub Total															7	63		69
	4: Forest	4.1: Deciduous	1			1	0	1											0	0
		4.2: Evergreen/Semi evergreen	0			0	0	0											0	0
		4.3: Forest Plantation																		
		4.4: Scrub Forest			2	2		2											0	0
		4.5: Swamp / Mangroves	0		0	0	0	0											1	1
		Sub Total	1		2	3	0	3											1	1
5: Grass / Grazing	5.1: Grass / Grazing																			
6: Snow and Glacier	6.1: Snow and Glacier																			
7: Wetlands / Water bodies	7.1: Inland Wetland	0			0	0	0													
	7.2: Coastal Wetland	0			0	0	0													
	7.3: River/Stream/Canals																			
	7.4: Water bodies			0	0	0	0													
	Sub Total	0		0	0	0	0													
<b>Grand Total</b>		<b>315</b>		<b>76</b>	<b>391</b>	<b>0</b>	<b>392</b>						<b>7</b>	<b>3</b>	<b>10</b>		<b>7</b>	<b>64</b>	<b>70</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			ANDAMAN & NICOBAR ISLANDS														
			2015-16														
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total			
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total	
2011-12	1: Agriculture	1.1: Crop land		0		0	0	0								316	
		1.2: Current Shifting cultivation															
		1.3: Plantation															7422
		Farmland (FL) = 1.1+1.2+1.3		0		0	0	0									7737
		1.4: Fallow															0
		<b>Sub Total</b>		0		0	0	0									7737
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky															
		2.2: Gullied / Ravinous Land															
		2.3: Rann															
		2.4: Salt Affected Land															
		2.5: Sandy Area															7
		2.6: Scrub Land															2
		<b>Sub Total</b>															9
	3: Builtup	3.1: Mining															
		3.2: Rural															7
		3.3: Urban															63
		<b>Sub Total</b>															69
	4: Forest	4.1: Deciduous	1425			2	0	1427									1427
		4.2: Evergreen/Semi evergreen		5058		1		5059				0				0	5059
		4.3: Forest Plantation															
		4.4: Scrub Forest	0	0		268	2	270				0				0	273
		4.5: Swamp / Mangroves	1			1	816	818				0				0	819
		<b>Sub Total</b>	1425	5058		271	819	7574				0			0	7578	
5: Grass / Grazing	5.1: Grass / Grazing																
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland										18				18	18	
	7.2: Coastal Wetland				0	6	7				118				118	124	
	7.3: River/Stream/Canals				2		2					51			51	53	
	7.4: Water bodies												8		8	8	
	<b>Sub Total</b>				2	6	9			18	118	51	8	194	203		
	<b>Grand Total</b>	1425	5058		274	825	7583			18	118	51	8	195	8249		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		PUDUCHERRY																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2015-16	1: Agriculture	1.1: Crop land	143			143						0	0	0			0	0	
		1.2: Current Shifting cultivation																	
		1.3: Plantation			115	115	7422						0	0	0				
		Farmland (FL) = 1.1+1.2+1.3	143		115	258	7565						0	0	1			0	0
		1.4: Fallow	0			0	61	61					0	0	0				
		Sub Total	144		115	258	61	7626					0	0	1			0	0
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																	
		2.2: Gullied / Ravinous Land																	
		2.3: Rann																	
		2.4: Salt Affected Land																	
		2.5: Sandy Area											2		2				
		2.6: Scrub Land												1	1			0	0
		Sub Total											2	1	3			0	0
	3: Builtup	3.1: Mining														0			0
		3.2: Rural											0	0	0		35		35
		3.3: Urban												0	0			86	86
		Sub Total											0	0	0	0	35	86	120
	4: Forest	4.1: Deciduous																	
		4.2: Evergreen/Semi evergreen																	
		4.3: Forest Plantation																	
		4.4: Scrub Forest																	
		4.5: Swamp / Mangroves																	
		Sub Total																	
5: Grass / Grazing	5.1: Grass / Grazing																		
6: Snow and Glacier	6.1: Snow and Glacier																		
7: Wetlands / Water bodies	7.1: Inland Wetland																		
	7.2: Coastal Wetland											0	0	1					
	7.3: River/Stream/Canals											2	0	2					
	7.4: Water bodies	0			0	0	0						0	0					
	Sub Total	0			0	0	0					2	0	3					
<b>Grand Total</b>		<b>144</b>		<b>115</b>	<b>258</b>	<b>61</b>	<b>319</b>					<b>5</b>	<b>2</b>	<b>7</b>	<b>0</b>	<b>35</b>	<b>86</b>	<b>121</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			PUDUCHERRY														
			2015-16														
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies				Grand Total			
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3		7.4	Sub Total	
2015-16	1: Agriculture	1.1: Crop land												0	0	144	
		1.2: Current Shifting cultivation															
		1.3: Plantation															7422
		Farmland (FL) = 1.1+1.2+1.3													0	0	7565
		1.4: Fallow															61
		Sub Total													0	0	7626
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky															
		2.2: Gullied / Ravinous Land															
		2.3: Rann															
		2.4: Salt Affected Land															
		2.5: Sandy Area															2
		2.6: Scrub Land															2
		Sub Total															4
	3: Builtup	3.1: Mining															0
		3.2: Rural															35
		3.3: Urban															86
		Sub Total															121
	4: Forest	4.1: Deciduous	0					0									0
		4.2: Evergreen/Semi evergreen															
		4.3: Forest Plantation			0			0									0
		4.4: Scrub Forest															
4.5: Swamp / Mangroves						2	2									2	
Sub Total		0		0		2	2									2	
5: Grass / Grazing	5.1: Grass / Grazing																
6: Snow and Glacier	6.1: Snow and Glacier																
7: Wetlands / Water bodies	7.1: Inland Wetland									1					1	1	
	7.2: Coastal Wetland										7				7	8	
	7.3: River/Stream/Canals											16			16	18	
	7.4: Water bodies												20		20	20	
	Sub Total									1	7	16	20		43	46	
<b>Grand Total</b>			0	0		2	2				1	7	16	20	43	492	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			DAMAN & DIU																	
			2015-16																	
			1: Agriculture					2: Barren/Unculturable/ Wastelands						3: Builtup						
			1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	17			17							0	0			2	2		
		1.2: Current Shifting cultivation																		
		1.3: Plantation			10	10	7422											0	0	
		Farmland (FL) = 1.1+1.2+1.3	17		10	27	7438							0	0			2	2	
		1.4: Fallow				10	10							0	0					
		Sub Total	17		10	27	10	7449						0	0			2	2	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky																		
		2.2: Gullied / Ravinous Land																		
		2.3: Rann																		
		2.4: Salt Affected Land								0				0				0	0	
		2.5: Sandy Area									3			3						
		2.6: Scrub Land				0	0							0	0			0	0	
		Sub Total				0	0				0	3	0	4				0	0	
	3: Builtup	3.1: Mining													1			0	1	
		3.2: Rural														1			1	
		3.3: Urban												0			20	20		
		Sub Total												0	0	1	1	20	22	
	4: Forest	4.1: Deciduous																		
		4.2: Evergreen/Semi evergreen																		
		4.3: Forest Plantation																		
		4.4: Scrub Forest																		
		4.5: Swamp / Mangroves																		
	Sub Total																			
	5: Grass / Grazing	5.1: Grass / Grazing																		
	6: Snow and Glacier	6.1: Snow and Glacier																		
	7: Wetlands / Water bodies	7.1: Inland Wetland												0	0					
		7.2: Coastal Wetland																		
		7.3: River/Stream/Canals																		
7.4: Water bodies													0	0						
Sub Total												0	0							
<b>Grand Total</b>			17		10	27	11	37					0	3	1	4	1	1	23	24

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES			DAMAN & DIU												Grand Total	
			2015-16													
			4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wet lands / Water bodies						
			4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4		Sub Total
2011-12	1: Agriculture	1.1: Crop land													19	
		1.2: Current Shifting cultivation														
		1.3: Plantation														7422
		Farmland (FL) = 1.1+1.2+1.3														7440
		1.4: Fallow														11
		Sub Total														7451
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky														
		2.2: Gullied / Ravinous Land														
		2.3: Rann														
		2.4: Salt Affected Land														0
		2.5: Sandy Area														3
		2.6: Scrub Land														1
		Sub Total														4
	3: Builtup	3.1: Mining														1
		3.2: Rural														1
		3.3: Urban														20
		Sub Total														22
	4: Forest	4.1: Deciduous	1					1								1
		4.2: Evergreen/Semi evergreen														
		4.3: Forest Plantation														
		4.4: Scrub Forest														
		4.5: Swamp / Mangroves					13	13								13
Sub Total		1				13	14								14	
5: Grass / Grazing	5.1: Grass / Grazing															
6: Snow and Glacier	6.1: Snow and Glacier															
7: Wetlands / Water bodies	7.1: Inland Wetland									8					8	
	7.2: Coastal Wetland										19				19	
	7.3: River/Stream/Canals											4			4	
	7.4: Water bodies												0		0	
	Sub Total									8	19	4	0		31	
<b>Grand Total</b>			<b>1</b>				<b>13</b>	<b>14</b>			<b>8</b>	<b>19</b>	<b>4</b>	<b>0</b>	<b>31</b>	<b>112</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		All India																	
		2015-16																	
		1: Agriculture						2: Barren/Unculturable/ Wastelands						3: Builtup					
		1.1	1.2	1.3	FL	1.4	Sub Total	2.1	2.2	2.3	2.4	2.5	2.6	Sub Total	3.1	3.2	3.3	Sub Total	
2011-12	1: Agriculture	1.1: Crop land	1462900	29	3709	1466638	78276	1544914	130	134	0	94	71	2722	3150	454	366	1195	2015
		1.2: Current Shifting cultivation	148	1391	2	1541	0	1541	0	0	0	0	0	701	702	0	2	0	2
		1.3: Plantation	1618	4	80771	82394	582	82976	4	4	0	1	2	217	229	7	11	174	191
		Farmland (FL) = 1.1+1.2+1.3	1464666	1423	84483	1550572	78859	1629431	135	138	0	95	73	3640	4081	461	378	1369	2208
		1.4: Fallow	30951	0	429	31380	148222	179602	37	20	0	126	7	831	1022	103	48	289	440
	<b>Sub Total</b>	<b>1495617</b>	<b>1423</b>	<b>84911</b>	<b>1581952</b>	<b>227081</b>	<b>1809033</b>	<b>172</b>	<b>159</b>	<b>0</b>	<b>221</b>	<b>80</b>	<b>4471</b>	<b>5103</b>	<b>564</b>	<b>426</b>	<b>1658</b>	<b>2648</b>	
	2: Barren/Unculturable/ Wastelands	2.1: Barren Rocky	16	0	0	16	50	66	101614	2526	0	9	3036	316	107501	46	2	6	54
		2.2: Gullied / Ravinous Land	193	0	4	198	40	238	21	7044	0	0	3	67	7136	2	1	4	6
		2.3: Rann	0	0	0	0	0	0	0	18690	0	0	0	18690	0	0	0	0	
		2.4: Salt Affected Land	102	0	0	102	29	132	0	6	0	9382	0	39	9428	3	2	14	18
		2.5: Sandy Area	85	0	12	97	5	103	105	37	0	1	29964	33	30141	3	1	8	12
		2.6: Scrub Land	2616	348	75	3039	660	3699	1107	58	0	60	55	174283	175564	159	45	295	498
	<b>Sub Total</b>	<b>3013</b>	<b>349</b>	<b>91</b>	<b>3453</b>	<b>784</b>	<b>4237</b>	<b>102849</b>	<b>9671</b>	<b>18690</b>	<b>9453</b>	<b>33059</b>	<b>174738</b>	<b>348460</b>	<b>212</b>	<b>51</b>	<b>326</b>	<b>589</b>	
	3: Builtup	3.1: Mining	56	0	2	58	12	70	34	1	0	4	1	150	189	5713	2	17	5732
		3.2: Rural	43	0	0	43	3	47	4	2	0	1	1	59	67	7	74420	91	74519
		3.3: Urban	52	0	20	72	50	121	5	6	0	4	3	169	187	28	10	37949	37988
		<b>Sub Total</b>	<b>150</b>	<b>0</b>	<b>23</b>	<b>173</b>	<b>65</b>	<b>238</b>	<b>43</b>	<b>9</b>	<b>0</b>	<b>9</b>	<b>5</b>	<b>377</b>	<b>442</b>	<b>5749</b>	<b>74432</b>	<b>38058</b>	<b>118239</b>
	4: Forest	4.1: Deciduous	1244	1097	18	2359	9	2368	58	15	0	1	4	4058	4137	59	49	37	145
		4.2: Evergreen/Semi evergreen	92	443	12	547	1	548	51	14	0	0	6	390	460	1	8	2	10
		4.3: Forest Plantation	86	2	1	90	0	90	0	0	0	0	2	11	13	5	0	4	9
		4.4: Scrub Forest	1360	705	11	2076	3	2079	263	21	0	1	6	1932	2222	12	6	21	38
		4.5: Swamp / Mangroves	0	0	0	0	0	0	0	0	0	1	2	2	5	0	0	3	3
	<b>Sub Total</b>	<b>2783</b>	<b>2247</b>	<b>43</b>	<b>5072</b>	<b>13</b>	<b>5085</b>	<b>372</b>	<b>50</b>	<b>0</b>	<b>3</b>	<b>21</b>	<b>6392</b>	<b>6838</b>	<b>76</b>	<b>62</b>	<b>66</b>	<b>205</b>	
	5: Grass / Grazing	5.1: Grass / Grazing	95	3	40	138	9	147	76	3	0	0	15	315	408	2	103	14	118
	6: Snow and Glacier	6.1: Snow and Glacier	0	0	0	0	0	0	1547	24	0	1	19	53	1643	0	0	0	0
	7: Wetlands / Water bodies	7.1: Inland Wetland	501	0	4	505	29	535	62	0	0	23	77	103	265	7	2	10	18
		7.2: Coastal Wetland	15	0	0	15	1	16	1	0	0	17	22	3	44	0	0	12	13
7.3: River/Stream/Canals		805	1	2	809	125	934	14	22	0	4	137	374	551	6	1	2	9	
7.4: Water bodies		978	0	3	981	71	1051	20	4	0	23	1	58	106	5	1	3	9	
<b>Sub Total</b>		<b>2299</b>	<b>1</b>	<b>9</b>	<b>2310</b>	<b>226</b>	<b>2536</b>	<b>97</b>	<b>26</b>	<b>0</b>	<b>67</b>	<b>237</b>	<b>538</b>	<b>966</b>	<b>18</b>	<b>5</b>	<b>27</b>	<b>49</b>	
<b>Grand Total</b>	<b>1503956</b>	<b>4023</b>	<b>85118</b>	<b>1593097</b>	<b>228179</b>	<b>1821276</b>	<b>105154</b>	<b>9941</b>	<b>18690</b>	<b>9754</b>	<b>33436</b>	<b>186885</b>	<b>363860</b>	<b>6620</b>	<b>75079</b>	<b>40150</b>	<b>121848</b>		

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## Land Use Land Cover (LULC) Change Matrix

(Area in Sq. km)

LULC_CLASSES		All India														
		2015-16														
		4: Forest					5: Grass / Grazing	6: Snow and Glacier	7: Wetlands / Water bodies					Grand Total		
		4.1	4.2	4.3	4.4	4.5	Sub Total	5.1	6.1	7.1	7.2	7.3	7.4		Sub Total	
2011-12	1: Agriculture	1.1: Crop land	102	0	37	509	0	648	48	3	222	5	1014	987	2229	1553007
		1.2: Current Shifting cultivation	321	1	0	1176	0	1498	1	0	0	0	0	0	0	3743
		1.3: Plantation	53	0	0	30	0	83	4	5	3	0	12	9	25	83514
		Farmland (FL) = 1.1+1.2+1.3	476	1	37	1714	0	2229	53	8	226	5	1027	996	2253	1640263
		1.4: Fallow	2	0	8	60	0	70	41	0	122	0	106	65	294	181469
		Sub Total	479	1	45	1774	0	2299	94	8	348	6	1133	1061	2547	1821732
	2: Barren/Unculturable/Wastelands	2.1: Barren Rocky	7	0	0	453	0	460	0	65902	0	0	0	1	1	173986
		2.2: Gullied / Ravinous Land	10	0	0	86	0	96	0	27	0	0	6	4	10	7511
		2.3: Rann	0	0	0	0	0	0	0	0	0	132	0	0	132	18822
		2.4: Salt Affected Land	0	0	0	0	0	1	0	0	2	21	5	3	32	9610
		2.5: Sandy Area	8	0	2	1	2	13	31	305	4	0	35	0	39	30644
		2.6: Scrub Land	623	6	45	1042	0	1716	30	2237	26	16	279	79	400	184144
		Sub Total	648	7	47	1583	2	2285	61	68471	32	169	325	88	614	424717
	3: Builtup	3.1: Mining	9	0	0	13	0	23	0	0	0	0	2	8	10	6024
		3.2: Rural	1	0	0	6	0	7	0	0	0	0	11	2	14	74653
		3.3: Urban	5	0	2	12	0	18	1	0	1	0	3	1	5	38321
		Sub Total	14	0	2	32	0	48	2	0	1	0	16	12	29	118998
	4: Forest	4.1: Deciduous	433133	5	86	4410	0	437633	10	0	6	0	66	68	139	444433
		4.2: Evergreen/Semi evergreen	288	151911	8	2416	0	154623	139	303	1	0	15	5	21	156105
		4.3: Forest Plantation	58	0	23025	699	0	23782	1	0	0	0	0	0	1	23895
		4.4: Scrub Forest	2248	1113	125	88154	3	91643	57	333	1	0	14	17	33	96406
		4.5: Swamp / Mangroves	1	0	0	2	4657	4660	0	0	13	6	9	8	36	4704
		Sub Total	435728	153029	23244	95680	4661	712342	207	637	21	7	104	98	230	725543
	5: Grass / Grazing	5.1: Grass / Grazing	6	4	16	340	2	368	22502	1333	5	0	475	40	521	25397
	6: Snow and Glacier	6.1: Snow and Glacier	2	3	0	126	0	131	7	30799	0	0	0	1	1	32581
	7: Wetlands / Water bodies	7.1: Inland Wetland	2	0	1	8	0	11	18	1	7148	2	61	116	7327	8175
		7.2: Coastal Wetland	0	0	0	0	38	38	0	0	0	10598	1	10	10609	10719
7.3: River/Stream/Canals		5	1	0	38	19	62	659	20	40	6	58699	52	58797	61032	
7.4: Water bodies		3	1	0	38	1	43	1	56	11	0	15	57074	57101	58367	
Sub Total		10	2	1	84	58	155	679	77	7200	10606	58776	57251	133833	138294	
<b>Grand Total</b>		<b>436886</b>	<b>153045</b>	<b>23355</b>	<b>99620</b>	<b>4723</b>	<b>717629</b>	<b>23551</b>	<b>101325</b>	<b>7606</b>	<b>10787</b>	<b>60829</b>	<b>58552</b>	<b>137774</b>	<b>3287263</b>	

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Andhra Pradesh				Arunachal Pradesh			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	1402685	4696	5462	1401919	361377	43593	0	404970
2	A2	1449272	2339	7403	1444208	869	5416	178	6107
3	A3	1796167	10	6617	1789560	37174	0	5338	31836
4	A4	82902	0	0	82902				
5	A5	55126	0	78	55048	7	0	0	7
6	A6	65	0	0	65				
7	A7								
8	B1	3869	0	0	3869				
9	B2	9842	0	0	9842				
10	B3	1695	0	0	1695				
11	B4								
12	B5								
13	B6	150	0	0	150				
14	C1	8133	0	3734	4399	12390	151	0	12541
15	C2					3992	0	151	3841
16	C3					18651	0	0	18651
17	D1	219	0	0	219				
18	D2								
19	D3	6980	0	99	6881				
20	D4	4881	0	17	4864				
21	D5	174241	1074	1012	174303				
22	D6	75670	669	1725	74614				
23	D7	21477	213	438	21252				
24	D8	33425	0	222	33203				
25	D9	37608	0	366	37242				
26	D10	12842	248	29	13061				
27	E1					338225	0	3491	334734
28	E2					1656	491	0	2147
29	F1								
30	F2					585	0	0	585
31	G1	906	118	0	1024				
32	G2	49222	8393	43	57572				
33	G3	491	365	0	856				
34	H1					3133	1674	32	4775
35	H2	283102	0	1150	281952	162631	0	0	162631
36	H3	10081	0	25	10056	36	0	0	36
37	N	2923	13218	2923	13218	45167	3032	45167	3032
	Total	5523974	31343	31343	5523974	985893	54357	54357	985893
	Land Degradation Total	5521051	18125	28420	5510756	940726	51325	9190	982861

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Assam				Bihar			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	77064	1433	525	77972	18706	899	4	19601
2	A2	229785	3964	0	233749	237105	982	40	238047
3	A3	41658	4751	0	46409	79588	0	17	79571
4	A4	878	0	0	878				
5	A5	160	0	0	160	7808	0	0	7808
6	A6								
7	A7								
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1	176233	20658	2123	194768	657558	40816	545	697829
15	C2	23142	2146	160	25128	7147	4460	1354	10253
16	C3	41816	6959	0	48775	3561	245	776	3030
17	D1					82446	157	5121	77482
18	D2								
19	D3					11665	0	119	11546
20	D4					168	0	0	168
21	D5					25380	68	3015	22433
22	D6					1287	0	68	1219
23	D7								
24	D8					1070	0	0	1070
25	D9								
26	D10								
27	E1	72735	0	39	72696				
28	E2	1210	0	21	1189				
29	F1								
30	F2								
31	G1	764	0	0	764	1518	0	0	1518
32	G2	863	205	0	1068	1686	56	0	1742
33	G3	4889	5005	23	9871	1527	0	0	1527
34	H1	303	11	36	278				
35	H2	34	0	0	34	14509	0	56	14453
36	H3	25569	5562	3453	27678	945	1592	156	2381
37	N	49310	4996	49310	4996	47521	9517	47521	9517
Total		746413	55690	55690	746413	1201195	58792	58792	1201195
Land Degradation Total		697103	50694	6380	741417	1153674	49275	11271	1191678

Source: National Remote Sensing Centre  
Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Chhattisgarh				Goa			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	45774	78	27	45825	3064	49	0	3113
2	A2	2148541	43	5721	2142863	11879	73	137	11815
3	A3	951580	0	752	950828	9914	0	110	9804
4	A4								
5	A5	96902	0	291	96611				
6	A6								
7	A7								
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1								
15	C2					769	0	0	769
16	C3								
17	D1					240	0	0	240
18	D2								
19	D3					1107	0	0	1107
20	D4								
21	D5								
22	D6								
23	D7								
24	D8								
25	D9								
26	D10								
27	E1	94	0	0	94	37	0	0	37
28	E2								
29	F1								
30	F2								
31	G1	13218	2330	0	15548				
32	G2	18035	3760	120	21675	8120	825	122	8823
33	G3	201	27	0	228				
34	H1								
35	H2	343326	0	362	342964	7119	0	45	7074
36	H3	13317	0	0	13317	299	0	0	299
37	N	148	1183	148	1183	533	0	533	0
Total		3631136	7421	7421	3631136	43081	947	947	43081
Land Degradation Total		3630988	6238	7273	3629953	42548	947	414	43081

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Gujrat				Haryana			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	517864	1619	1203	518280	8254	2312	11	10555
2	A2	818694	1677	5330	815041	38458	1198	361	39295
3	A3	185494	1604	2946	184152	46117	0	2091	44026
4	A4	7701	0	124	7577	1315	0	0	1315
5	A5	89924	0	710	89214	3791	0	0	3791
6	A6	4475	0	30	4445	7971	0	0	7971
7	A7					157	0	0	157
8	B1	405	266	0	671	793	42	77	758
9	B2	973	0	330	643	1290	67	0	1357
10	B3								
11	B4	14	0	0	14	9960	30872	2215	38617
12	B5					132384	54	42118	90320
13	B6								
14	C1	88318	1419	8128	81609	75244	5046	50742	29548
15	C2	5972	114	2356	3730	13341	1955	11100	4196
16	C3					2045	27	556	1516
17	D1	1023161	29387	26613	1025935	4987	1646	232	6401
18	D2	1726143	0	0	1726143				
19	D3	836538	11724	51761	796501	8165	2582	637	10110
20	D4	239585	14700	23958	230327	768	276	0	1044
21	D5	12706	0	0	12706	28422	143	31	28534
22	D6					18148	0	618	17530
23	D7					2523	0	0	2523
24	D8	1254	0	0	1254	18023	796	1317	17502
25	D9	133	0	0	133	10921	162	208	10875
26	D10	378	0	0	378	927	406	0	1333
27	E1								
28	E2								
29	F1								
30	F2								
31	G1	1110	568	0	1678	1483	103	0	1586
32	G2	22765	9707	16	32456	1393	15	0	1408
33	G3	1252	342	83	1511	5526	558	0	6084
34	H1								
35	H2	285168	0	1494	283674	10315	0	0	10315
36	H3	184544	24	13742	170826	578	0	24	554
37	N	3099	68772	3099	68772	5253	69331	5253	69331
Total		6057670	141923	141923	6057670	458552	117591	117591	458552
Land Degradation Total		6054571	73151	138824	5988898	453299	48260	112338	389221

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Himachal Pradesh				Jharkhand			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	8737	0	0	8737	91027	20	0	91047
2	A2	17436	0	0	17436	202818	4	0	202822
3	A3	203910	92	0	204002	239667	4	75	239596
4	A4	3758	0	0	3758	24432	0	0	24432
5	A5	27309	0	0	27309	156701	0	0	156701
6	A6	40624	0	0	40624	9224	0	0	9224
7	A7	13253	0	0	13253	23891	0	0	23891
8	B1					14158	0	0	14158
9	B2					42966	0	0	42966
10	B3					175009	0	0	175009
11	B4					1011	0	0	1011
12	B5					2117	0	0	2117
13	B6					1339	0	0	1339
14	C1	4	0	0	4	1147	0	0	1147
15	C2	37	0	0	37				
16	C3					40	0	0	40
17	D1								
18	D2								
19	D3								
20	D4								
21	D5								
22	D6								
23	D7								
24	D8					17972	0	0	17972
25	D9					27627	0	0	27627
26	D10								
27	E1								
28	E2								
29	F1	164464	0	0	164464	37477	0	0	37477
30	F2	573383	0	0	573383	1849902	0	0	1849902
31	G1								
32	G2	1590	0	161	1429	5	271	0	276
33	G3	368	0	0	368	391	527	55	863
34	H1	41000	0	28	40972	418771	0	0	418771
35	H2	173873	0	22	173851	6800353	0	231	6800122
36	H3	10214	0	0	10214	134328	0	0	134328
37	N	0	119	0	119	567	102	567	102
Total		1279960	211	211	1279960	10272940	928	928	10272940
Land Degradation Total		1279960	92	211	1279841	10272373	826	361	10272838

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Jammu & Kashmir				Karnataka			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	200085	3874	439	203520	768613	10985	5311	774287
2	A2	633873	139	7277	626735	2798346	6410	5959	2798797
3	A3	267321	234	1644	265911	644415	3713	11145	636983
4	A4					652724	0	0	652724
5	A5	95205	0	1064	94141	13229	0	0	13229
6	A6	6613	0	0	6613				
7	A7								
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1	66	0	0	66	581	0	0	581
15	C2					1387	0	0	1387
16	C3	288	0	0	288	36	0	0	36
17	D1					31932	0	377	31555
18	D2								
19	D3					4935	251	0	5186
20	D4					6235	126	0	6361
21	D5					17902	0	0	17902
22	D6					9557	0	0	9557
23	D7					684	0	0	684
24	D8					21225	0	6	21219
25	D9					12729	0	0	12729
26	D10					11317	0	0	11317
27	E1					33583	0	0	33583
28	E2					214	0	0	214
29	F1								
30	F2								
31	G1	245	302	14	533	2281	33	0	2314
32	G2	22711	18411	0	41122	57473	2048	0	59521
33	G3	1869	2455	0	4324	382	0	0	382
34	H1								
35	H2	78185	0	6895	71290	176413	0	887	175526
36	H3	5233	0	0	5233	4131	0	0	4131
37	N	10952	2870	10952	2870	0	119	0	119
Total		1322646	28285	28285	1322646	5270324	23685	23685	5270324
Land Degradation Total		1311694	25415	17333	1319776	5270324	23566	23685	5270205

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Kerala				Madhya Pradesh			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	515	0	52	463	29342	4131	3	33470
2	A2	69057	0	143	68914	2428378	1706	53644	2376440
3	A3	5470	0	152	5318	2734054	0	9424	2724630
4	A4					31533	0	0	31533
5	A5					321053	0	0	321053
6	A6					93069	0	0	93069
7	A7					50314	0	0	50314
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1	83973	0	31044	52929	6	0	0	6
15	C2	16107	34	33	16108	86	0	0	86
16	C3								
17	D1					414	0	252	162
18	D2								
19	D3								
20	D4								
21	D5								
22	D6								
23	D7								
24	D8					16127	0	0	16127
25	D9					8927	0	0	8927
26	D10					385	0	0	385
27	E1	46308	0	33	46275				
28	E2	7817	0	0	7817				
29	F1								
30	F2								
31	G1					377	276	0	653
32	G2	2810	249	0	3059	20553	20877	0	41430
33	G3	2632	0	0	2632	179	336	0	515
34	H1	62	0	0	62				
35	H2	91948	0	132	91816	211188	0	1137	210051
36	H3	2143	0	0	2143	591	0	0	591
37	N	0	31306	0	31306	0	37134	0	37134
Total		328842	31589	31589	328842	5946576	64460	64460	5946576
Land Degradation Total		328842	283	31589	297536	5946576	27326	64460	5909442

Source: National Remote Sensing Centre  
Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Maharashtra				Manipur			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	971284	291838	160867	1102255	60176	8045	60	68161
2	A2	6182325	539011	556717	6164619	56142	9573	672	65043
3	A3	3338108	314669	466970	3185807	87916	1058	247	88727
4	A4	32843	224	2	33065				
5	A5	127170	367	0	127537				
6	A6								
7	A7								
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1					1011	0	0	1011
15	C2					105	227	0	332
16	C3								
17	D1	16883	0	0	16883				
18	D2								
19	D3	29149	0	0	29149				
20	D4	19	0	0	19				
21	D5	64084	0	0	64084				
22	D6	38653	0	0	38653				
23	D7	3565	0	0	3565				
24	D8	25488	0	0	25488				
25	D9	61	0	0	61				
26	D10	5531	0	0	5531				
27	E1	1351	0	0	1351	631684	0	221	631463
28	E2					0	0	0	0
29	F1								
30	F2								
31	G1	103	1036	0	1139				
32	G2	30176	13269	300	43145				
33	G3	475	1453	0	1928				
34	H1					0	239	0	239
35	H2	149205	0	1949	147256	22	0	0	22
36	H3	1349	26	4	1371				
37	N	31648	56564	31648	56564	17942	0	17942	0
	Total	11049470	1218457	1218457	11049470	854998	19142	19142	854998
	Land Degradation Total	11017822	1161893	1186809	10992906	837056	19142	1200	854998

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Meghalaya				Mizoram			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	14489	13656	101	28044	144139	34522	12888	165773
2	A2	21838	4380	5073	21145	28543	50280	0	78823
3	A3	0	0	0	0	8365	13195	0	21560
4	A4					136	285	0	421
5	A5	37578	0	0	37578				
6	A6								
7	A7								
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1	258	0	0	258				
15	C2	35	0	0	35				
16	C3	11	0	0	11				
17	D1								
18	D2								
19	D3								
20	D4								
21	D5								
22	D6								
23	D7								
24	D8								
25	D9								
26	D10								
27	E1	370108	6776	0	376884	469794	0	519	469275
28	E2	88657	0	6776	81881	85	234	0	319
29	F1								
30	F2								
31	G1								
32	G2	6910	477	0	7387				
33	G3								
34	H1								
35	H2	82567	0	0	82567				
36	H3	697	0	0	697				
37	N	13339	0	13339	0	85109	0	85109	0
Total		636487	25289	25289	636487	736171	98516	98516	736171
Land Degradation Total		623148	25289	11950	636487	651062	98516	13407	736171

Source: National Remote Sensing Centre  
Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Nagaland				Odisha			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	13097	15191	0	28288	2167935	33621	24334	2177222
2	A2	9643	4727	7103	7267	2794999	30937	81632	2744304
3	A3	0	288	0	288	820934	51326	28657	843603
4	A4					428	0	0	428
5	A5					65027	0	0	65027
6	A6					2397	0	0	2397
7	A7								
8	B1								
9	B2								
10	B3								
11	B4					335	0	0	335
12	B5								
13	B6								
14	C1					10500	653	36	11117
15	C2					2525	296	0	2821
16	C3					1673	563	83	2153
17	D1								
18	D2								
19	D3					2209	0	0	2209
20	D4								
21	D5								
22	D6								
23	D7								
24	D8					857	0	9	848
25	D9								
26	D10								
27	E1	676161	0	625	675536	18835	0	0	18835
28	E2	67262	625	35	67852				
29	F1								
30	F2								
31	G1					8689	5014	0	13703
32	G2	409	479	0	888	14035	5969	0	20004
33	G3					507	156	0	663
34	H1								
35	H2					55758	0	63	55695
36	H3					5648	108	3	5753
37	N	13547	0	13547	0	64043	70217	64043	70217
Total		780119	21310	21310	780119	6037334	198860	198860	6037334
Land Degradation Total		766572	21310	7763	780119	5973291	128643	134817	5967117

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Punjab				Rajasthan			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	12301	349	203	12447	344339	1170	32922	312587
2	A2	25432	236	388	25280	894315	14303	18029	890589
3	A3	8152	19	300	7871	943441	14301	13207	944535
4	A4	3019	0	0	3019	102147	0	989	101158
5	A5	8454	0	2	8452	285074	0	499	284575
6	A6	4716	0	168	4548	153505	0	9	153496
7	A7	951	0	0	951	65547	0	0	65547
8	B1	180	0	138	42	5517748	790	267	5518271
9	B2	17443	14647	108	31982	996542	152	14258	982436
10	B3	0	2	0	2	873497	26	3898	869625
11	B4	4669	0	0	4669	2140489	408318	9254	2539553
12	B5	22893	8	15431	7470	3956577	993	463774	3493796
13	B6	0	146	0	146	426096	20	24615	401501
14	C1	9383	611	517	9477	3971	0	0	3971
15	C2	947	912	504	1355	3003	0	0	3003
16	C3	3282	0	2667	615	1795	0	0	1795
17	D1	4683	267	1308	3642	228842	0	7664	221178
18	D2					8558	0	0	8558
19	D3					45468	7502	174	52796
20	D4					41091	23	17	41097
21	D5	9	16	0	25	50646	6	139	50513
22	D6					4430	121	146	4405
23	D7					11016	663	0	11679
24	D8	556	24	0	580	81137	0	464	80673
25	D9	5	0	0	5	41544	464	33	41975
26	D10					23333	0	0	23333
27	E1								
28	E2								
29	F1								
30	F2								
31	G1					4095	860	0	4955
32	G2	42	435	35	442	51751	33252	21	84982
33	G3	11322	8402	7552	12172	1584	134	0	1718
34	H1					8	0	0	8
35	H2	62	0	0	62	838580	0	10464	828116
36	H3	23265	194	58	23401	11660	0	18	11642
37	N	8946	12057	8946	12057	21637	139400	21637	139400
Total		170712	38325	38325	170712	18173466	622498	622498	18173466
Land Degradation Total		161766	26268	29379	158655	18151829	483098	600861	18034066

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Sikkim				Tamil Nadu			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	83	3	0	86	440103	0	349	439754
2	A2	4541	0	3	4538	775881	0	1729	774152
3	A3	738	0	0	738	521543	0	80	521463
4	A4					16383	0	0	16383
5	A5					14141	0	0	14141
6	A6					385	0	0	385
7	A7								
8	B1					18219	0	0	18219
9	B2								
10	B3								
11	B4					6389	9	0	6398
12	B5					16593	0	9	16584
13	B6					4181	0	0	4181
14	C1					3355	28	25	3358
15	C2					7269	0	87	7182
16	C3								
17	D1					40077	0	1	40076
18	D2								
19	D3					41899	0	11	41888
20	D4								
21	D5					158440	0	0	158440
22	D6					86521	0	0	86521
23	D7					6491	0	0	6491
24	D8					937	0	0	937
25	D9					11858	0	0	11858
26	D10					257	0	0	257
27	E1					89182	0	0	89182
28	E2					34959	0	0	34959
29	F1	1212	0	0	1212				
30	F2	10059	0	0	10059				
31	G1					2219	0	0	2219
32	G2					19960	11	0	19971
33	G3					6305	0	0	6305
34	H1	754	0	10	744				
35	H2	58884	0	0	58884	112589	0	11	112578
36	H3	29	0	0	29	6659	0	0	6659
37	N	0	10	0	10	0	2254	0	2254
Total		76300	13	13	76300	2442795	2302	2302	2442795
Land Degradation Total		76300	3	13	76290	2442795	48	2302	2440541

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Telangana				Tripura			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	759241	0	1520	757721	1276	8	0	1284
2	A2	1388310	48	2532	1385826	326	10	0	336
3	A3	715992	0	480	715512	4271	6	0	4277
4	A4	4524	0	0	4524				
5	A5	15560	0	43	15517	179	0	0	179
6	A6								
7	A7								
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1	2457	0	0	2457	282	3	0	285
15	C2					13	0	0	13
16	C3	42	0	0	42				
17	D1	1077	0	0	1077				
18	D2								
19	D3	425	0	0	425				
20	D4								
21	D5	127155	0	53	127102				
22	D6	67751	0	0	67751				
23	D7	19834	0	0	19834				
24	D8	8735	0	0	8735				
25	D9	4361	0	0	4361				
26	D10	1354	0	0	1354				
27	E1	249	0	0	249	88598	0	413	88185
28	E2					6721	0	0	6721
29	F1								
30	F2								
31	G1	500	0	0	500				
32	G2	41414	6866	0	48280				
33	G3	75	0	0	75	600	545	95	1050
34	H1	13	0	0	13	0	6	0	6
35	H2	72146	0	210	71936				
36	H3	130	0	0	130	475	123	212	386
37	N	2463	387	2463	387	695	714	695	714
Total		3233808	7301	7301	3233808	103436	1415	1415	103436
Land Degradation Total		3231345	6914	4838	3233421	102741	701	720	102722

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	Uttar Pradesh				Uttarakhand			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	227137	235	2116	225256	88283	0	5	88278
2	A2	556221	96	1400	554917	127113	232	48	127297
3	A3	139644	0	117	139527	366155	268	234	366189
4	A4	166270	0	146	166124	15652	0	0	15652
5	A5	374113	0	628	373485	15602	0	0	15602
6	A6	87823	0	0	87823	8780	0	0	8780
7	A7	148373	0	0	148373				
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1	366671	2845	2439	367077	3	0	0	3
15	C2	27929	268	2236	25961	185	0	0	185
16	C3	52113	0	185	51928				
17	D1	68	0	0	68				
18	D2								
19	D3	35	0	0	35				
20	D4								
21	D5	4545	1224	49	5720				
22	D6	50946	380	1501	49825				
23	D7	7424	214	215	7423				
24	D8	180716	4309	291	184734				
25	D9	190731	4261	3648	191344				
26	D10	166213	68	4800	161481				
27	E1								
28	E2								
29	F1					121976	0	0	121976
30	F2					124800	0	0	124800
31	G1	114	16	0	130				
32	G2	5973	3378	0	9351	324	199	0	523
33	G3	14267	552	0	14819	1085	432	0	1517
34	H1	10	0	0	10	5681	3289	0	8970
35	H2	60459	0	578	59881	63745	0	0	63745
36	H3	32504	370	256	32618	315	1701	0	2016
37	N	2576	4965	2576	4965	5834	0	5834	0
Total		2862875	23181	23181	2862875	945533	6121	6121	945533
Land Degradation Total		2860299	18216	20605	2857910	939699	6121	287	945533

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Land Degradation Account

Annexure 1.3  
(Area in ha)

Sl. No.	Category	West Bengal				Union Territories			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	189947	944	1384	189507	54341		754	53587
2	A2	142703	175	12753	130125	4999	209		5208
3	A3	10445	2019	1216	11248	83			83
4	A4	9	0	0	9				
5	A5	10514	0	97	10417	813			813
6	A6								
7	A7	278	0	0	278				
8	B1								
9	B2								
10	B3								
11	B4								
12	B5								
13	B6								
14	C1	98471	1351	2972	96850	392			392
15	C2	6926	5559	1388	11097				
16	C3	3721	0	11	3710	3			3
17	D1	312	0	0	312	1276		88	1188
18	D2								
19	D3	25	0	0	25				
20	D4	416	0	0	416				
21	D5								
22	D6								
23	D7					136	2		138
24	D8								
25	D9								
26	D10								
27	E1								
28	E2								
29	F1								
30	F2								
31	G1	1329	1532	0	2861				
32	G2	7839	3467	167	11139	315	30		345
33	G3	7440	8871	92	16219				
34	H1	120	295	52	363				
35	H2	6844	0	11	6833	1179			1179
36	H3	2131	0	0	2131	5735			5735
37	N	8483	4413	8483	4413				
	Total	497953	28626	28626	497953	69272	241	842	68671
	<b>Land Degradation Total</b>	<b>489470</b>	<b>24213</b>	<b>20143</b>	<b>493540</b>	<b>69272</b>	<b>241</b>	<b>842</b>	<b>68671</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

Land Degradation Account of India

Annexure 1.3

(Area in ha)

Sl. No.	Category	India (Total)			
		Opening Stock (2005-06)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	A1	9021278	473271	250540	9244009
2	A2	24097842	678168	774272	24001738
3	A3	14208316	407557	551819	14064054
4	A4	1146654	509	1261	1145902
5	A5	1821440	367	3412	1818395
6	A6	419647	0	207	419440
7	A7	302764	0	0	302764
8	B1	5555372	1098	482	5555988
9	B2	1069056	14866	14696	1069226
10	B3	1050201	28	3898	1046331
11	B4	2162867	439199	11469	2590597
12	B5	4130564	1055	521332	3610287
13	B6	431766	166	24615	407317
14	C1	1600407	73581	102305	1571683
15	C2	120917	15971	19369	117519
16	C3	129077	7794	4278	132593
17	D1	1436617	31457	41656	1426418
18	D2	1734701	0	0	1734701
19	D3	988600	22059	52801	957858
20	D4	293163	15125	23992	284296
21	D5	663530	2531	4299	661762
22	D6	352963	1170	4058	350075
23	D7	73150	1092	653	73589
24	D8	407522	5129	2309	410342
25	D9	346505	4887	4255	347137
26	D10	222537	722	4829	218430
27	E1	2836944	6776	5341	2838379
28	E2	208581	1350	6832	203099
29	F1	325129	0	0	325129
30	F2	2558729	0	0	2558729
31	G1	38951	12188	14	51125
32	G2	386374	132649	985	518038
33	G3	63367	30160	7900	85627
34	H1	469855	5514	158	475211
35	H2	10140204	0	25697	10114507
36	H3	482606	9700	17951	474355
37	N	441735	532680	441735	532680
Total		<b>91739931</b>	<b>2928819</b>	<b>2929420</b>	<b>91739330</b>
<b>Land Degradation Total</b>		<b>91298196</b>	<b>2396139</b>	<b>2487685</b>	<b>91206650</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	ANDHRA PRADESH				ARUNACHAL PRADESH			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	169	1	54	116				0
2	2	3	0	1	2				0
3	3	6591	4	304	6291	630	11	7	634
4	4	4844	98	342	4600	1600	307	89	1818
5	5	147	1	28	120		1		1
6	6	17	0	0	17				0
7	7	885	6	90	800				0
8	8	377	0	27	350				0
9	9	15	0	1	14	822	258	571	509
10	10	1	1	0	2	948	576	320	1204
11	11	8302	0	128	8174	32	0	15	17
12	12	611	121	0	732	1	14	0	15
13	13	97	0	0	97	254	0	0	254
14	14	27	0	14	13				0
15	15	23	0	7	16				0
16	16	292	7	37	262				0
17	17	4	0	2	2				0
18	18				0				0
19	19				0				0
20	20	2	1	1	3				0
21	21	3	0	0	3				0
22	22	2377	0	8	2369	124	1	1	124
23	23					9330	1	0	9330
24	999	8	813	8	813	169	2	169	2
<b>Grand Total</b>		<b>24794</b>	<b>1052</b>	<b>1052</b>	<b>24794</b>	<b>13908</b>	<b>1172</b>	<b>1172</b>	<b>13908</b>
<b>Wastelands Total</b>		<b>24786</b>	<b>239</b>	<b>1043</b>	<b>23982</b>	<b>13739</b>	<b>1170</b>	<b>1003</b>	<b>13906</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	ASSAM				BIHAR			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1				0	68	0	1	67
2	2				0				0
3	3	2145	340	392	2093	481	64	124	421
4	4	1798	481	286	1993	1792	46	208	1629
5	5	185	0	9	176	444	31	101	375
6	6	578	29	33	574	4744	313	1154	3904
7	7				0	1	0	0	1
8	8				0	0		0	0
9	9	82	25	54	53				0
10	10	83	31	32	82				0
11	11	1569	231	39	1761	1100	9	6	1103
12	12	2032	91	7	2116	51	2	0	53
13	13	22	0	0	21	7	0	3	4
14	14				0				0
15	15	41	20	18	42	21	4	4	21
16	16			0	0				0
17	17			0	0				0
18	18				0				0
19	19				0				0
20	20	57	29		86	9	2	0	11
21	21	5	1		6	8	0	0	8
22	22				0	89	0	0	89
23	23				0				0
24	999	598	192	598	192	321	1451	321	1451
<b>Grand Total</b>		<b>9195</b>	<b>1470</b>	<b>1470</b>	<b>9195</b>	<b>9136</b>	<b>1922</b>	<b>1922</b>	<b>9136</b>
<b>Wastelands Total</b>		<b>8596</b>	<b>1278</b>	<b>871</b>	<b>9003</b>	<b>8815</b>	<b>472</b>	<b>1602</b>	<b>7685</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	CHHATTISGARH				GOA			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	64	1	0	65				0
2	2	12	3	0	15				0
3	3	460	41	30	471	82	17	2	98
4	4	2253	231	78	2407	265	4	19	250
5	5	1	0	0	1	25	0	0	25
6	6	2	0	0	2	14	1	0	15
7	7				0				0
8	8				0				0
9	9				0				0
10	10	0	0	0	0				0
11	11	4093	189	112	4171	64	0	0	64
12	12	2828	51	12	2867	6	0	0	6
13	13	0	0	0	0				0
14	14	18	0	0	18	0	0	0	0
15	15	31	3	7	27				0
16	16				0	6	0	0	6
17	17				0				0
18	18				0				0
19	19				0				0
20	20	38	70	0	108	33	1	0	34
21	21	16	21	0	37	0	0	0	0
22	22	686	4	4	686	18	0	0	18
23	23				0				0
24	999	538	164	538	164	3	2	3	2
<b>Grand Total</b>		<b>11040</b>	<b>780</b>	<b>780</b>	<b>11040</b>	<b>518</b>	<b>26</b>	<b>26</b>	<b>518</b>
<b>Wastelands Total</b>		<b>10502</b>	<b>616</b>	<b>243</b>	<b>10875</b>	<b>515</b>	<b>23</b>	<b>22</b>	<b>516</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.Km)

Sl. No.	Wastelands Categories	GUJARAT				HARYANA			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	243	5	29	218				0
2	2	1		1	0				0
3	3	9388	479	700	9168	151	16	14	152
4	4	8285	684	542	8427	702	18	61	659
5	5	31	9	0	39	16	0	0	16
6	6	47	8	2	53	20	0	0	19
7	7	636	51	84	604	47	1	0	48
8	8	142	17	0	159	18	0	0	18
9	9				0				0
10	10				0				0
11	11	2291	8	7	2292	84	0	0	84
12	12	465	6	0	471	35	0	0	35
13	13	15	1	0	17	656	0	66	590
14	14	54	7	1	60	35	1	2	34
15	15	1	0	0	1	1	0	0	1
16	16	93	4	2	95				0
17	17				0	0	0	0	0
18	18				0				0
19	19				0				0
20	20	83	17	2	98	2	0	0	2
21	21	18	4	0	22	1	0	0	1
22	22	15	0	0	16				0
23	23				0				0
24	999	835	906	835	906	1	108	1	108
<b>Grand Total</b>		<b>22646</b>	<b>2205</b>	<b>2205</b>	<b>22646</b>	<b>1767</b>	<b>144</b>	<b>144</b>	<b>1767</b>
<b>Wastelands Total</b>		<b>21811</b>	<b>1300</b>	<b>1370</b>	<b>21740</b>	<b>1766</b>	<b>36</b>	<b>144</b>	<b>1659</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	HIMACHAL PRADESH				JAMMU & KASHMIR			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	64			64	881	17	0	898
2	2	3			3	2481	0	0	2481
3	3	930			930	901	16	4	912
4	4	4036		0	4036	3308	50	43	3314
5	5				0	100	0	0	100
6	6	0			0	0	0	0	0
7	7				0	100	4	1	102
8	8				0	69	10	0	79
9	9	0			0				0
10	10				0				0
11	11	210			210	7027	115	119	7023
12	12	19			19	2925	11	0	2936
13	13	633			633	190	1	1	191
14	14				0	40	1	0	41
15	15	68			68	2699	57	37	2719
16	16				0				0
17	17				0	5060	580	4	5636
18	18				0				0
19	19				0				0
20	20	11	0		11	4	0	0	4
21	21	4			4	4	0	0	4
22	22	2023		0	2023	72636	6147	4099	74684
23	23	14832	0		14832	77656	4225	7310	74571
24	999				0	34	418	34	418
<b>Grand Total</b>		<b>22832</b>	<b>0</b>	<b>0</b>	<b>22832</b>	<b>176115</b>	<b>11651</b>	<b>11651</b>	<b>176115</b>
<b>Wastelands Total</b>		<b>22832</b>	<b>0</b>	<b>0</b>	<b>22832</b>	<b>176080</b>	<b>11234</b>	<b>11617</b>	<b>175697</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	JHARKHAND				KARNATAKA			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	271	0	1	270	80	2	1	80
2	2	1	0	0	1	0	0	0	0
3	3	2103	1	7	2097	1542	7	122	1427
4	4	2420	1	21	2400	3562	94	84	3571
5	5	0	0	0	0	12	0	0	12
6	6	0	0	0	0	10	0	0	10
7	7				0	398	4	7	394
8	8				0	3	1	0	4
9	9				0	0		0	0
10	10				0				0
11	11	5121	1	49	5073	4921	8	0	4928
12	12	1185	23	1	1208	1201	0	7	1194
13	13				0		0		0
14	14	5	1	0	6	6	0	0	6
15	15	0	0	0	0	7	0	1	6
16	16				0	3	0	0	3
17	17				0				0
18	18				0	1	0	0	1
19	19				0				0
20	20	253	64	0	317	405	8	1	413
21	21	20	3	0	23	6	0	0	7
22	22	394	0	22	372	1174	0	0	1173
23	23				0				0
24	999	21	28	21	28	0	100	0	100
<b>Grand Total</b>		<b>11795</b>	<b>123</b>	<b>123</b>	<b>11795</b>	<b>13330</b>	<b>224</b>	<b>224</b>	<b>13330</b>
<b>Wastelands Total</b>		<b>11774</b>	<b>94</b>	<b>102</b>	<b>11767</b>	<b>13330</b>	<b>124</b>	<b>224</b>	<b>13230</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	KERALA				MADHYA PRADESH			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1				0	1477	0	5	1472
2	2				0	11	0	0	11
3	3	492	34	201	325	6605	0	72	6534
4	4	677	76	138	616	14530	1	343	14188
5	5	2	1	0	3				0
6	6	1	0	0	1				0
7	7				0				0
8	8				0				0
9	9				0				0
10	10				0				0
11	11	603	7	27	584	13389	4	73	13321
12	12	1	0	0	1	3360	11	3	3368
13	13	381	0	2	379	14	0	1	13
14	14	0	0	0	0				0
15	15				0	3	0	0	3
16	16	27	0	0	27				0
17	17				0				0
18	18				0				0
19	19				0				0
20	20	25	41	2	65	267	55	1	321
21	21		0		0	28	33	0	61
22	22	291	3	6	288	251	0	6	245
23	23				0				0
24	999	260	236	260	236	62	460	62	460
<b>Grand Total</b>		<b>2760</b>	<b>399</b>	<b>635</b>	<b>2524</b>	<b>39997</b>	<b>566</b>	<b>566</b>	<b>39997</b>
<b>Wastelands Total</b>		<b>2500</b>	<b>163</b>	<b>375</b>	<b>2288</b>	<b>39935</b>	<b>106</b>	<b>504</b>	<b>39537</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	MAHARASHTRA				MANIPUR			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	506	5	9	502		1		1
2	2				0				0
3	3	10256	133	233	10156	2236	86	1111	1211
4	4	12382	228	233	12377	2285	1096	236	3145
5	5	8	1	0	8	2	6	0	8
6	6	2	1	0	2				0
7	7	31	0	0	31				0
8	8	22	0	0	22				0
9	9				0	297	303	99	500
10	10				0	244	96	40	299
11	11	10031	117	235	9913	500	0	14	486
12	12	1074	230	99	1205	2	0	2	0
13	13	148	0	0	148		0		0
14	14	21	0	0	22				0
15	15	4	1	0	4				0
16	16	69	0	1	68				0
17	17				0				0
18	18				0				0
19	19				0				0
20	20	39	3	1	41				0
21	21	1	8	0	9				0
22	22	1575	0	6	1568		2		2
23	23				0				0
24	999	133	225	133	225	235	148	235	148
<b>Grand Total</b>		<b>36300</b>	<b>950</b>	<b>950</b>	<b>36300</b>	<b>5800</b>	<b>1738</b>	<b>1738</b>	<b>5800</b>
<b>Wastelands Total</b>		<b>36168</b>	<b>725</b>	<b>817</b>	<b>36075</b>	<b>5565</b>	<b>1590</b>	<b>1503</b>	<b>5652</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	MEGHALAYA				MIZORAM			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1				0				0
2	2				0				0
3	3	569	91	150	510	2226	354	992	1587
4	4	2648	154	190	2612	461	165	159	467
5	5				0				0
6	6	0	0	0	0				0
7	7				0				0
8	8				0				0
9	9	282	139	183	238	602	639	549	692
10	10	275	181	33	423	1034	859	881	1011
11	11	68	0	4	65	555	7	18	544
12	12	0		0	0				0
13	13				0				0
14	14				0				0
15	15	0	0	0	0				0
16	16				0				0
17	17				0				0
18	18				0				0
19	19				0				0
20	20	1	54	0	54				0
21	21				0				0
22	22	234	3	3	234				0
23	23				0				0
24	999	139	79	139	79	1153	1730	1153	1730
<b>Grand Total</b>		<b>4215</b>	<b>701</b>	<b>701</b>	<b>4215</b>	<b>6031</b>	<b>3753</b>	<b>3753</b>	<b>6031</b>
<b>Wastelands Total</b>		<b>4076</b>	<b>622</b>	<b>563</b>	<b>4136</b>	<b>4878</b>	<b>2023</b>	<b>2600</b>	<b>4301</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	NAGALAND				ODISHA			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1				0	547	50	3	594
2	2				0	15	0	0	15
3	3	885	713	282	1316	4997	204	228	4974
4	4	1894	950	766	2078	3231	235	165	3301
5	5				0	258	53	17	294
6	6				0	42	3	41	4
7	7				0	6	5	0	11
8	8				0	20	0	5	15
9	9	1415	780	1216	979	852	360	357	856
10	10	903	591	812	681	497	413	102	809
11	11	0	0	0	0	5158	232	84	5307
12	12	2	0	0	2	1720	9	116	1613
13	13				0	0		0	0
14	14				0		0		0
15	15				0	3	3	2	4
16	16				0	62	5	5	62
17	17				0				0
18	18				0				0
19	19				0				0
20	20	4	1	0	5	10	8	1	17
21	21				0	30	10	0	40
22	22	4	0	0	4	508	0	0	508
23	23				0				0
24	999	301	343	301	343	601	135	601	135
<b>Grand Total</b>		<b>5407</b>	<b>3377</b>	<b>3377</b>	<b>5407</b>	<b>18558</b>	<b>1727</b>	<b>1727</b>	<b>18558</b>
<b>Wastelands Total</b>		<b>5106</b>	<b>3035</b>	<b>3076</b>	<b>5064</b>	<b>17957</b>	<b>1592</b>	<b>1126</b>	<b>18422</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	PUNJAB				RAJASTHAN			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	32	0	10	22	1011	0	29	981
2	2				0	328	0	10	318
3	3	113	1	28	86	20776	1582	5421	16936
4	4	106	17	19	104	15624	4024	2447	17201
5	5	54	1	22	33	18	1	1	18
6	6	23	1	16	7	85	1	9	78
7	7	24	5	15	14	440	14	6	448
8	8	13	0	7	7	333	23	4	351
9	9				0				0
10	10				0				0
11	11	75	0	3	73	11187	30	425	10792
12	12	0	0	0	1	185	144	0	330
13	13				0	3524	0	343	3181
14	14				0	1	0	0	1
15	15	58	2	30	31	108	1	6	103
16	16				0				0
17	17	243	1	159	85	3017	2	550	2469
18	18				0	9487	0	142	9345
19	19		0		0	12970	11	1255	11726
20	20	0	0	0	0	3	11	1	13
21	21				0	13	4	0	16
22	22				0	4548	6	10	4544
23	23				0		0		0
24	999	9	288	9	288	80	4884	80	4884
<b>Grand Total</b>		<b>751</b>	<b>317</b>	<b>317</b>	<b>751</b>	<b>83735</b>	<b>10739</b>	<b>10739</b>	<b>83735</b>
<b>Wastelands Total</b>		<b>742</b>	<b>29</b>	<b>308</b>	<b>462</b>	<b>83655</b>	<b>5855</b>	<b>10659</b>	<b>78851</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	SIKKIM				TAMIL NADU			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1				0	181	3	2	183
2	2				0	1	0	0	1
3	3				0	1974	1	31	1944
4	4	19	0	2	16	2185	42	12	2214
5	5				0	57	0	0	57
6	6				0	49	0	0	49
7	7				0	263	2	5	261
8	8				0	20	0	0	19
9	9				0				0
10	10				0				0
11	11	59	35	2	92	2229	0	13	2216
12	12				0	71	0	0	71
13	13	3	0	0	3	233	0	3	230
14	14				0	23	2	0	25
15	15				0	28	0	1	26
16	16				0	142	1	13	131
17	17				0				0
18	18				0				0
19	19				0	75	0	0	75
20	20				0	347	13	4	357
21	21				0	13	6	0	19
22	22	804	448	135	1117	339	14	7	345
23	23	2341	176	450	2066				0
24	999	74	4	74	4	6	13	6	13
<b>Grand Total</b>		<b>3299</b>	<b>663</b>	<b>663</b>	<b>3299</b>	<b>8235</b>	<b>98</b>	<b>98</b>	<b>8235</b>
<b>Wastelands Total</b>		<b>3225</b>	<b>658</b>	<b>589</b>	<b>3295</b>	<b>8229</b>	<b>85</b>	<b>91</b>	<b>8222</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	TELANGANA				TRIPURA			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	128	0	0	128	0	0	0	0
2	2	0	0	0	0				0
3	3	2462	19	81	2400	188	29	12	205
4	4	2713	54	84	2683	241	11	38	215
5	5	0	1	0	1	2	0	0	2
6	6	1	1	0	2	6	0	0	6
7	7	304	7	7	304				0
8	8	128	4	1	131				0
9	9				0	30	2	2	31
10	10				0	65	2	3	64
11	11	4424	30	2	4453	373	6	7	372
12	12	2743	391	0	3134	16	0	0	16
13	13	30	0	3	28				0
14	14	2	0	0	2	5	1	0	6
15	15	3	0	0	3	4	0	0	4
16	16				0				0
17	17				0				0
18	18				0				0
19	19	0	0	0	0				0
20	20	147	48	0	194				0
21	21	8	2	0	10	0	0	0	0
22	22	770	0	2	768				0
23	23				0				0
24	999	497	119	497	119	11	22	11	22
<b>Grand Total</b>		<b>14360</b>	<b>678</b>	<b>678</b>	<b>14360</b>	<b>942</b>	<b>73</b>	<b>73</b>	<b>942</b>
<b>Wastelands Total</b>		<b>13863</b>	<b>558</b>	<b>181</b>	<b>14241</b>	<b>931</b>	<b>51</b>	<b>62</b>	<b>921</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	UTTAR PRADESH				UTTARAKHAND			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	844	11	50	805				0
2	2	261	16	16	261				0
3	3	660	54	244	470	311	0	3	308
4	4	1786	175	336	1625	791	13	3	801
5	5	398	9	84	323				0
6	6	607	21	200	428	3	0	0	3
7	7	2031	43	372	1703				0
8	8	489	9	71	427				0
9	9				0				0
10	10				0				0
11	11	1993	26	60	1958	718	0	2	716
12	12	220	13	10	223	44	0	0	44
13	13	1	0	0	1	662	0	0	662
14	14	10	0	1	9	2	0	0	2
15	15	42	5	33	13	12	7	0	19
16	16				0				0
17	17				0				0
18	18				0				0
19	19				0				0
20	20	46	6	1	51	4	1	0	5
21	21	12	11	0	23				0
22	22	220	1	2	219	3038	0	0	3038
23	23				0	7129	0	0	7129
24	999	110	1192	110	1192	21	6	21	6
<b>Grand Total</b>		<b>9729</b>	<b>1592</b>	<b>1592</b>	<b>9729</b>	<b>12732</b>	<b>28</b>	<b>28</b>	<b>12732</b>
<b>Wastelands Total</b>		<b>9619</b>	<b>399</b>	<b>1481</b>	<b>8537</b>	<b>12712</b>	<b>21</b>	<b>7</b>	<b>12726</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	WEST BENGAL				DELHI			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1	20	1	4	17				0
2	2	1	0	0	1				0
3	3	482	45	219	307	6	0	0	6
4	4	802	139	172	769	69	0	0	69
5	5	16	2	10	9	3	0	0	4
6	6	13	13	1	25	1	0	1	0
7	7				0				0
8	8		3		3				0
9	9				0				0
10	10				0				0
11	11	519	30	182	366	1	0	0	1
12	12	5	9	1	13				0
13	13				0				0
14	14	2	2	0	4				0
15	15	8	2	3	7		1		1
16	16	13	10	8	15				0
17	17				0				0
18	18				0				0
19	19				0				0
20	20	27	19	1	45	1	0	0	1
21	21	14	10	0	24				0
22	22	51	0	0	51				0
23	23				0				0
24	999	135	488	135	488	1		1	0
<b>Grand Total</b>		<b>2109</b>	<b>770</b>	<b>736</b>	<b>2143</b>	<b>81</b>	<b>1</b>	<b>1</b>	<b>81</b>
<b>Wastelands Total</b>		<b>1974</b>	<b>282</b>	<b>601</b>	<b>1655</b>	<b>81</b>	<b>1</b>	<b>1</b>	<b>81</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.

## State-wise Wasteland Account

(Area in Sq.km)

Sl. No.	Wastelands Categories	UNION TERRITORIES				INDIA			
		Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)	Opening Stock (2008-09)	Addition to Stock	Reduction in Stock	Closing Stock (2015-16)
1	1				0	6586	97	199	6484
2	2				0	3117	19	28	3109
3	3	7	0	2	5	80646	4343	11017	73972
4	4	12	6	1	17	97320	9400	7118	99602
5	5	2	0	0	2	1785	116	274	1627
6	6				0	6265	391	1457	5199
7	7	3	0	0	3	5169	142	587	4723
8	8				0	1634	68	116	1586
9	9				0	4397	2506	3032	3871
10	10				0	4051	2749	2225	4575
11	11	259	5	12	252	86954	1091	1634	86411
12	12	21	0	0	21	20821	1129	260	21691
13	13				0	6867	4	421	6450
14	14				0	252	15	18	249
15	15	2	0	0	2	3165	105	149	3121
16	16	3	1	1	3	710	28	66	671
17	17				0	8324	583	715	8192
18	18				0	9488	0	142	9345
19	19				0	13045	11	1255	11801
20	20	0	0	0	0	1819	453	16	2256
21	21	0	0	0	0	205	114	1	317
22	22				0	92166	6629	4311	94484
23	23				0	111287	4401	7760	107928
24	999	10	13	10	13	6131	14536	6131	14536
<b>Grand Total</b>		<b>320</b>	<b>26</b>	<b>26</b>	<b>320</b>	<b>572202</b>	<b>48932</b>	<b>48932</b>	<b>572202</b>
<b>Wastelands Total</b>		<b>310</b>	<b>12</b>	<b>16</b>	<b>306</b>	<b>566070</b>	<b>34396</b>	<b>42801</b>	<b>557666</b>

Source: National Remote Sensing Centre

Note: Totals may not match due to rounding off.



## Extent and condition accounts of Croplands in India

State	Andhra Pradesh			Arunachal Pradesh			Assam			Bihar			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	10745.0	11186.5	6208.6	205.5	213.0	226.5	2753.0	2810.6	2801.5	5556.2	5258.7	5204.9
Total Cropped Area	T.H.	13362.1	14512.3	7531.6	266.0	278.0	301.1	3949.0	4159.5	4059.9	7396.5	7194.0	7572.4
Total Cultivable Land	T.H.	15772.0	15821.4	9018.3	418.4	423.8	423.3	3224.0	3211.2	3342.7	6637.8	6590.7	6578.0
Cultivated land	T.H.	13179.2	13415.2	7618.7	241.2	252.6	262.4	2879.4	2889.2	2895.5	6222.4	6179.0	6166.3
Un-cultivable land	T.H.	11668.0	11683.1	7278.4	6860.8	6818.1	6804.6	4626.0	4638.8	4501.1	2721.8	2768.8	2781.6
Un-cultivated land	T.H.	14260.8	14089.3	8678.0	7038.0	6989.3	6965.5	4970.6	4960.8	4948.3	3137.2	3180.6	3193.3
<b>Intensification</b>													
Area sown more than once	T.H.	2617.0	3325.8	1323.0	60.5	65.0	74.6	1196.1	1348.9	1258.5	1840.3	1935.3	2367.5
Cropping Intensity	%	124.4	129.7	121.3	129.4	130.5	132.9	143.4	148.0	144.9	133.1	136.8	145.5
<b>Fragmentation</b>													
Operational holdings		2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16
Number in '000		12044	7621	8524	109	109	113	2750	2720	2742	14657	16191	16413
Area in '000 Hectares		14489	8096	8004	361	384	380	3049	2999	2976	6251	6388	6457
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	22.7	26.7	29.2	3.1	3.1	3.8	24.9	25.8	26.4	53.0	57.4	57.7
Small	%	25.8	27.8	29.2	9.1	6.8	8.1	23.6	22.9	23.4	19.6	18.6	18.3
Semi-medium	%	26.5	25.9	25.2	23.6	24.5	20.4	27.8	27.3	27.1	18.2	16.8	16.7
Medium	%	19.0	15.8	13.0	46.7	40.3	40.3	14.0	14.6	13.8	8.1	6.5	6.7
Large	%	6.1	3.8	3.5	17.5	25.3	27.5	9.8	9.4	9.4	1.2	0.7	0.7
<b>Gini Index of Land Concentration</b>		0.52	0.50	0.51	0.49	0.47	0.52	0.52	0.53	0.53	0.52	0.50	0.48
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	44.9	49.3	47.1	18.9	20.3	18.6	3.6	4.1	9.6	58.5	61.8	69.3
Area Irrigated more than once	T.H.	1604.2	2119.4	803.7	0.2	0.0	0.4	1.8	8.3	90.9	1164.1	1417.4	2288.4
<b>Crop Diversity</b>													
Effective Number of Species	Number	14.2	12.8	14.6	5.9	5.0	6.5	5.8	5.8	5.7	5.7	6.1	5.7

T.H. : Thousand Hectares

## Extent and condition accounts of Croplands in India

State	Chhattisgarh			Delhi			Goa			Gujarat			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	4763.9	4696.5	4651.0	27.6	22.1	21.9	136.8	131.0	130.1	9722.2	10301.8	10301.8
Total Cropped Area	T.H.	5745.8	5671.5	5640.3	43.9	44.5	58.5	170.3	159.9	157.3	11494.7	12257.3	11521.6
Total Cultivable Land	T.H.	5589.6	5579.8	5561.4	58.0	53.3	52.8	197.2	197.2	197.2	12408.9	12660.5	12660.5
Cultivated land	T.H.	5013.7	4949.5	4932.2	39.4	34.0	33.6	143.9	144.1	144.1	10418.2	10680.7	10680.7
Un-cultivable land	T.H.	8200.2	8210.1	8228.4	89.5	94.2	94.7	163.9	163.9	163.9	6459.1	6408.0	6408.0
Un-cultivated land	T.H.	8776.2	8840.4	8857.6	108.1	113.4	113.9	217.2	217.0	217.0	8449.8	8387.8	8387.8
<b>Intensification</b>													
Area sown more than once	T.H.	981.9	974.9	989.3	16.3	22.3	36.6	33.6	28.9	27.2	1772.5	1955.5	1219.8
Cropping Intensity	%	120.6	120.8	121.3	159.2	200.9	267.1	124.5	122.1	120.9	118.2	119.0	111.8
<b>Fragmentation</b>													
Operational holdings		2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16
Number in '000		3461	3746	4011	25	20	21	53	78	75	4661	4886	5321
Area in '000 Hectares		5210	5084	4992	38	30	29	61	89	82	10269	9898	9978
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	16.1	18.7	20.8	15.8	16.2	18.0	20.5	31.6	28.6	7.7	8.9	10.8
Small	%	20.7	23.2	24.8	20.8	20.1	26.4	11.8	19.8	16.4	19.1	21.0	23.4
Semi-medium	%	26.8	26.5	26.4	26.0	27.1	25.1	11.1	18.8	17.1	29.3	30.2	31.8
Medium	%	25.5	22.7	20.6	29.8	29.0	23.9	11.2	13.9	17.2	32.9	29.6	28.1
Large	%	10.9	8.9	7.5	7.6	7.7	6.7	45.4	15.9	20.8	11.0	10.3	5.9
<b>Gini Index of Land Concentration</b>		0.55	0.54	0.53	0.55	0.55	0.52	0.75	0.56	0.64	0.49	0.50	0.46
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	23.9	28.3	31.1	73.1	72.6	63.7	22.2	22.8	24.5	41.4	45.8	52.4
Area Irrigated more than once	T.H.	127.2	248.3	277.2	7.9	10.1	15.4	14.1	0.0	0.0	856.8	1382.4	1804.2
<b>Crop Diversity</b>													
Effective Number of Species	Number	4.0	3.8	3.8	5.1	5.0	4.8	6.1	5.8	6.1	15.5	14.9	16.0

T.H. : Thousand Hectares

## Extent and condition accounts of Croplands in India

State	Haryana			Himachal Pradesh			Jammu & Kashmir			Jharkhand			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	3566.1	3518.1	3522.1	539.0	543.4	551.3	733.7	731.6	754.2	1405.9	1085.4	1385.6
Total Cropped Area	T.H.	6503.7	6504.9	6510.4	943.5	938.6	932.6	1100.9	1139.8	1158.9	1548.3	1249.2	1811.6
Total Cultivable Land	T.H.	3784.5	3680.7	3797.6	818.7	811.2	815.7	1048.2	1060.6	1076.9	4299.5	4288.5	4312.6
Cultivated land	T.H.	3735.3	3640.2	3615.2	601.8	600.9	605.2	816.0	832.8	868.4	2856.5	2814.2	2796.1
Un-cultivable land	T.H.	587.2	689.7	573.9	3726.1	3764.5	3761.4	2837.1	2966.0	2980.7	3670.6	3681.6	3657.4
Un-cultivated land	T.H.	636.4	730.3	756.3	3943.0	3974.8	3972.0	3069.3	3193.8	3189.2	5113.6	5155.9	5173.9
<b>Intensification</b>													
Area sown more than once	T.H.	2937.6	2986.8	2988.2	404.5	395.3	381.3	367.2	408.2	404.8	142.5	163.8	426.0
Cropping Intensity	%	182.4	184.9	184.8	175.0	172.7	169.2	150.1	155.8	153.7	110.1	115.1	130.7
<b>Fragmentation</b>													
Operational holdings		2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16
Number in '000		1603	1617	1628	933	961	997	1378	1449	1417	0	2709	2803
Area in '000 Hectares		3583	3646	3609	968	955	944	923	895	842	0	3165	3091
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	9.7	9.9	10.9	26.7	28.6	30.2	44.1	46.5	47.2	NA	24.1	24.4
Small	%	12.5	12.7	12.7	25.3	25.6	25.7	25.7	26.2	26.2	NA	18.7	18.4
Semi-medium	%	22.3	22.3	22.2	24.8	24.1	23.7	20.9	19.1	18.3	NA	24.5	24.4
Medium	%	33.1	32.5	32.4	17.0	16.4	15.5	8.0	6.9	7.1	NA	22.9	22.9
Large	%	22.4	22.6	21.8	6.2	5.3	5.0	1.3	1.3	1.3	NA	9.8	9.8
<b>Gini Index of Land Concentration</b>		0.59	0.59	0.59	0.54	0.53	0.53	0.49	0.49	0.49	-	0.57	0.58
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	83.7	85.2	91.4	19.7	20.6	22.1	41.6	42.0	44.7	9.4	12.0	13.0
Area Irrigated more than once	T.H.	2510.0	2656.6	2992.3	81.9	83.1	86.4	146.0	158.3	162.6	39.0	24.6	22.6
<b>Crop Diversity</b>													
Effective Number of Species	Number	7.4	7.1	6.1	6.3	6.0	6.3	6.7	6.9	6.8	3.7	4.4	4.8

T.H. : Thousand Hectares

## Extent and condition accounts of Croplands in India

State	Karnataka			Kerala			Madhya Pradesh			Maharashtra			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	10509.4	10522.7	10006.3	2132.5	2071.5	2023.1	14971.0	15119.4	15149.4	17473.3	17406.3	17191.7
Total Cropped Area	T.H.	13026.7	13062.2	12008.6	2985.7	2647.5	2627.6	19607.6	22045.6	23714.0	22555.8	23174.8	23467.0
Total Cultivable Land	T.H.	12905.1	12848.6	12800.4	2323.5	2294.8	2250.5	17337.0	17307.3	17249.5	21167.0	21121.3	21062.0
Cultivated land	T.H.	11741.9	11721.8	11459.6	2202.6	2147.5	2093.1	15561.6	15622.7	15710.1	18800.4	18772.4	18668.6
Un-cultivable land	T.H.	6144.5	6201.2	6249.6	1562.8	1591.5	1635.8	13418.8	13448.9	13506.8	9591.3	9637.0	9695.9
Un-cultivated land	T.H.	7307.6	7328.0	7590.5	1683.6	1738.8	1793.2	15194.1	15133.5	15046.2	11957.9	11985.9	12089.3
<b>Intensification</b>													
Area sown more than once	T.H.	2517.3	2539.5	2002.2	853.2	576.0	604.5	4636.6	6926.1	8564.6	5082.5	5768.5	6275.3
Cropping Intensity	%	124.0	124.1	120.0	140.0	127.8	129.9	131.0	145.8	156.5	129.1	133.1	136.5
<b>Fragmentation</b>													
Operational holdings		2005-06	2010-11	2015-16	2005-06	2010-11							
Number in '000		7581	7832	8681	6904	6831	7583	7908	8872	10003	13716	13699	15285
Area in '000 Hectares		12385	12161	11805	1555	1511	1395	15994	15836	15670	20005	19767	20506
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	13.3	15.2	17.6	57.6	58.6	61.4	9.9	12.1	15.1	14.0	16.1	16.8
Small	%	23.2	24.8	26.3	18.3	18.7	17.4	19.2	21.9	24.5	26.2	29.0	28.1
Semi-medium	%	28.0	27.9	27.0	11.5	10.5	10.2	26.9	28.5	28.9	30.6	29.2	29.4
Medium	%	25.9	23.9	21.8	5.1	4.2	4.3	31.8	28.7	25.6	24.4	20.2	20.0
Large	%	9.6	8.2	7.3	7.5	7.9	6.8	12.1	8.8	6.0	4.7	5.5	5.7
<b>Gini Index of Land Concentration</b>		0.52	0.50	0.52	0.53	0.52	0.49	0.52	0.50	0.49	0.48	0.48	0.49
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	27.9	32.8	31.2	15.4	17.7	18.4	30.0	33.7	42.3	17.9	19.4	20.2
Area Irrigated more than once	T.H.	662.2	789.0	499.3	58.6	52.3	69.8	196.9	281.4	744.1	775.2	1240.5	1520.9
<b>Crop Diversity</b>													
Effective Number of Species	Number	20.1	21.0	21.0	11.2	11.0	10.6	11.5	10.9	9.7	15.8	14.7	14.7

T.H. : Thousand Hectares

## Extent and condition accounts of Croplands in India

State	Manipur			Meghalaya			Mizoram			Nagaland			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	225.0	348.2	437.2	211.6	283.9	245.4	97.6	120.8	144.7	308.9	362.2	383.9
Total Cropped Area	T.H.	225.0	348.2	437.2	257.5	337.9	302.6	97.6	120.8	188.4	386.8	452.5	503.7
Total Cultivable Land	T.H.	231.9	355.1	444.1	1057.8	1051.7	1007.5	219.0	413.8	367.3	643.5	672.6	694.6
Cultivated land	T.H.	225.2	348.4	437.4	277.7	341.7	304.9	121.3	187.4	191.3	391.2	416.9	434.0
Un-cultivable land	T.H.	1736.9	1756.3	1727.7	1169.3	1183.7	1184.7	1733.1	1685.5	1671.7	938.4	952.4	958.4
Un-cultivated land	T.H.	1743.6	1763.0	1734.4	1949.4	1893.7	1887.2	1830.8	1912.0	1847.7	1190.7	1208.1	1218.9
<b>Intensification</b>													
Area sown more than once	T.H.	0.0	0.0	0.0	45.9	54.0	57.3	0.0	0.0	43.7	77.9	90.2	119.8
Cropping Intensity	%	100.0	100.0	100.0	121.7	119.0	123.3	100.0	100.0	130.2	125.2	124.9	131.2
<b>Fragmentation</b>													
Operational holdings													
Number in '000		150	151	150	203	210	232	90	92	90	169	178	197
Area in '000 Hectares		172	172	172	241	287	300	110	105	112	1173	1074	956
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	23.2	23.4	23.4	22.7	16.1	18.6	24.4	28.8	24.2	0.5	0.3	0.5
Small	%	36.5	36.5	36.5	30.5	26.8	26.5	37.1	36.0	31.2	1.4	2.2	3.9
Semi-medium	%	32.1	32.1	32.1	30.3	39.4	36.3	29.1	22.9	28.2	7.9	11.6	17.7
Medium	%	7.9	7.8	7.8	14.1	16.4	17.1	6.4	8.5	13.3	39.7	44.8	45.1
Large	%	0.3	0.3	0.3	2.4	1.4	1.4	3.0	3.8	3.3	50.6	41.2	32.9
<b>Gini Index of Land Concentration</b>		0.37	0.37	0.37	0.44	0.47	0.47	0.34	0.36	0.37	0.49	0.45	0.42
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to													
Total Cropped Area	%	22.7	21.0	16.7	24.9	22.0	42.1	19.3	10.0	16.3	27.4	20.2	22.7
Area Irrigated more than once	T.H.	0.0	0.0	0.0	8.9	11.6	47.8	2.5	0.0	14.5	38.8	8.1	10.9
<b>Crop Diversity</b>													
Effective Number of Species	Number	3.2	4.8	5.7	11.6	10.8	13.3	5.4	10.8	10.6	10.0	10.2	10.5

T.H. : Thousand Hectares

## Extent and condition accounts of Croplands in India

State	Odisha			Punjab			Rajasthan			Sikkim			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	5691.0	4682.0	4197.9	4192.0	4157.8	4137.3	16836.5	18349.0	18024.4	78.0	77.2	77.2
Total Cropped Area	T.H.	8928.4	5428.8	4802.6	7867.5	7883.0	7871.6	21699.3	26001.8	25013.7	123.5	151.5	136.7
Total Cultivable Land	T.H.	7473.0	6866.0	6647.9	4248.1	4202.4	4244.6	25621.2	25565.1	25503.7	98.5	96.5	96.5
Cultivated land	T.H.	6165.0	5559.0	5225.9	4233.0	4190.9	4213.8	18746.1	19584.2	19621.8	83.0	84.2	84.2
Un-cultivable land	T.H.	8098.0	8605.5	8778.5	784.6	830.3	788.1	8644.9	8705.0	8763.7	336.9	345.9	345.9
Un-cultivated land	T.H.	9406.0	9912.5	10200.5	799.7	841.8	818.9	15519.9	14685.9	14645.6	352.4	358.2	358.2
<b>Intensification</b>													
Area sown more than once	T.H.	3237.4	746.8	604.7	3675.5	3725.2	3734.3	4862.9	7652.8	6989.3	45.5	74.3	59.5
Cropping Intensity	%	156.9	116.0	114.4	187.7	189.6	190.3	128.9	141.7	138.8	158.3	196.2	177.0
<b>Fragmentation</b>													
Operational holdings													
Number in '000		4356	4667	4866	1004	1053	1093	6186	6888	7655	73	75	72
Area in '000 Hectares		5019	4852	4619	3963	3967	3954	20939	21136	20873	109	107	91
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	26.7	39.6	44.5	2.1	2.6	2.4	4.9	5.9	7.1	13.8	13.9	19.9
Small	%	31.6	30.9	30.4	6.5	6.8	7.3	9.1	10.2	11.4	19.2	19.1	19.5
Semi-medium	%	24.9	18.9	17.1	21.6	21.6	24.9	17.1	17.9	19.1	25.3	25.2	31.7
Medium	%	13.1	7.9	6.2	42.9	43.2	43.8	32.5	32.7	33.1	27.2	30.2	22.0
Large	%	3.6	2.7	1.9	26.9	25.9	21.7	36.6	33.3	29.3	14.4	11.5	7.0
<b>Gini Index of Land Concentration</b>		0.44	0.43	0.40	0.45	0.46	0.44	0.59	0.59	0.59	0.59	0.57	0.56
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	33.6	28.3	29.9	97.6	98.0	98.6	36.0	32.0	42.2	15.1	9.7	11.5
Area Irrigated more than once	T.H.	966.1	255.3	204.2	3660.2	3654.3	3627.9	1524.1	1661.1	2624.4	4.2	0.0	0.0
<b>Crop Diversity</b>													
Effective Number of Species	Number	6.8	2.5	2.1	4.5	4.2	4.0	10.9	12.3	11.7	8.2	11.7	10.9

T.H. : Thousand Hectares

## Extent and condition accounts of Croplands in India

State	Tamil Nadu			Telangana			Tripura			Uttar Pradesh			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	5243.8	4953.7	4832.7		4174.5	280.0	255.4	255.5	16633.1	16592.6	16469.2	
Total Cropped Area	T.H.	6032.7	5752.7	6074.2		4893.1	280.0	470.0	485.7	25307.3	25614.7	26203.3	
Total Cultivable Land	T.H.	8163.7	8131.8	8110.4		6869.7	310.8	275.9	271.8	19267.9	19125.8	18863.3	
Cultivated land	T.H.	6002.7	5968.6	5821.8		5752.9	283.1	256.9	256.6	17903.4	17807.5	17629.7	
Un-cultivable land	T.H.	4862.9	4901.3	4922.7		4338.1	739.5	773.3	777.4	4933.4	5044.6	5307.1	
Un-cultivated land	T.H.	7024.0	7064.5	7211.3		5454.9	767.2	792.3	792.6	6297.9	6362.9	6540.7	
<b>Intensification</b>													
Area sown more than once	T.H.	788.9	799.0	1241.5		718.6	0.0	214.6	230.2	8674.2	9022.1	9734.1	
Cropping Intensity	%	115.0	116.1	125.7		117.2	100.0	184.0	190.1	152.2	154.4	159.1	
<b>Fragmentation</b>													
Operational holdings													
Number in '000		8193	8118	7938		5554	5948	565	578	573	22458	23325	23822
Area in '000 Hectares		6824	6488	5971		6197	5972	280	285	282	17906	17622	17450
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	33.5	35.3	36.3		25.3	28.6	49.7	49.0	52.8	38.9	40.7	41.8
Small	%	25.2	25.3	26.1		30.2	33.1	26.6	26.6	24.9	24.2	24.1	23.9
Semi-medium	%	21.5	20.9	20.4		25.6	24.6	16.4	19.0	17.5	21.2	20.6	20.4
Medium	%	14.0	13.1	12.0		15.0	11.5	3.7	4.9	4.5	13.3	12.5	11.9
Large	%	5.7	5.4	5.3		4.0	2.3	3.6	0.4	0.4	2.4	2.2	2.0
<b>Gini Index of Land Concentration</b>		0.54	0.54	0.54	0.00	0.49	0.47	0.51	0.51	0.46	0.49	0.49	0.49
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	56.3	58.2	58.8		41.4	36.0	22.7	24.2	75.0	76.6	79.7	
Area Irrigated more than once	T.H.	477.2	435.4	741.9		541.4	35.7	38.1	35.9	5895.3	6185.5	6650.5	
<b>Crop Diversity</b>													
Effective Number of Species	Number	13.6	14.1	13.3		8.5	1.6	6.7	7.7	8.3	8.1	7.9	

T.H. : Thousand Hectares

## Extent and condition accounts of Croplands in India

State	Uttarakhand			West Bengal			Andaman and Nicobar Islands			Chandigarh			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	767.6	723.2	698.4	5294.7	4981.2	5243.4	12.8	14.7	14.7	1.3	1.1	1.2
Total Cropped Area	T.H.	1212.3	1169.7	1082.7	9532.6	8832.3	9881.4	14.2	19.0	48.1	2.0	1.7	1.3
Total Cultivable Land	T.H.	1503.6	1546.9	1547.2	5749.1	5665.6	5647.8	47.1	27.8	27.8	1.6	1.3	1.5
Cultivated land	T.H.	809.5	766.5	755.5	5613.9	5565.5	5571.5	13.9	17.3	17.3	1.3	1.1	1.2
Un-cultivable land	T.H.	4162.1	4125.7	4445.4	2933.8	3018.5	3036.3	747.9	729.6	729.6	5.5	5.7	5.6
Un-cultivated land	T.H.	4856.3	4906.2	5237.1	3069.0	3118.6	3112.6	781.1	740.0	740.0	5.7	5.9	5.8
<b>Intensification</b>													
Area sown more than once	T.H.	444.8	446.5	384.3	4237.9	3851.1	4638.0	1.5	4.2	33.4	0.7	0.6	0.1
Cropping Intensity	%	157.9	161.7	155.0	180.0	177.3	188.5	111.5	128.8	327.2	151.5	156.2	110.6
<b>Fragmentation</b>													
Operational holdings													
Number in '000		922	913	881	6992	7123	7243	12	12	12	1	1	1
Area in '000 Hectares		847	816	747	5526	5510	5487	22	22	21	1	1	1
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	30.7	36.2	37.9	50.7	52.5	53.4	9.8	9.3	11.2	25.6	22.6	22.6
Small	%	26.7	27.6	27.6	28.9	28.3	28.3	14.7	15.9	17.6	22.5	20.6	20.9
Semi-medium	%	24.8	21.5	20.8	14.0	13.3	12.8	35.7	37.7	37.1	22.2	24.2	25.8
Medium	%	13.8	11.6	10.6	2.5	2.0	1.5	33.0	31.6	28.9	25.5	29.0	27.2
Large	%	3.9	3.1	3.1	4.0	4.0	4.0	6.9	5.6	5.2	4.2	3.6	3.5
<b>Gini Index of Land Concentration</b>		0.52	0.48	0.48	0.40	0.39	0.39	0.48	0.47	0.47	0.56	0.54	0.55
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	45.3	48.0	50.0	57.7	59.7	64.0	0.0	1.7	0.7	69.3	17.0	2.1
Area Irrigated more than once	T.H.	206.0	225.6	211.2	2365.6	2314.0	3220.8	0.0	0.2	0.2	0.4	0.0	0.0
<b>Crop Diversity</b>													
Effective Number of Species	Number	8.5	8.2	8.4	5.1	5.9	6.0	5.1	7.2	6.8	3.1	2.5	1.5

T.H. : Thousand Hectares



## Extent and condition accounts of Croplands in India

State	Dadra and Nagar Haveli			Daman and Diu			Lakshadweep			Puducherry			
	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	2005-06	2010-11	2015-16	
<b>Extent</b>													
Net area Sown	T.H.	22.0	17.5	18.9	2.3	3.1	2.7	2.3	2.1	2.1	20.7	18.6	15.0
Total Cropped Area	T.H.	27.7	21.8	23.4	2.3	3.1	2.8	2.8	2.8	2.3	36.4	31.4	25.7
Total Cultivable Land	T.H.	24.3	24.3	23.8	2.5	3.8	3.0	2.3	2.1	2.1	30.8	30.0	28.9
Cultivated land	T.H.	23.4	19.9	21.2	2.4	3.3	2.8	2.3	2.1	2.1	22.9	21.8	20.3
Un-cultivable land	T.H.	24.6	24.6	25.0	0.1	0.3	0.2	0.8	1.0	0.5	17.9	18.6	19.8
Un-cultivated land	T.H.	25.5	29.0	27.6	0.3	0.8	0.3	0.8	1.0	0.5	25.8	26.9	28.3
<b>Intensification</b>													
Area sown more than once	T.H.	5.8	4.3	4.5	0.0	0.0	0.1	0.4	0.6	0.2	15.7	12.9	10.7
Cropping Intensity	%	126.3	124.8	123.8	100.0	100.0	102.8	118.6	130.4	107.1	175.7	169.3	170.8
<b>Fragmentation</b>													
Operational holdings													
Number in '000		14	15	15	8	8	8	10	10	10	31	33	34
Area in '000 Hectares		21	20	21	4	3	3	3	3	3	24	22	21
<b>Percentage distribution of area operated by size of operational holdings</b>													
Marginal	%	19.2	20.4	21.8	46.9	56.8	58.1	62.6	62.2	63.2	30.1	45.1	39.3
Small	%	25.5	26.3	24.8	21.8	19.8	19.8	13.1	13.2	12.8	22.1	18.7	23.6
Semi-medium	%	24.8	24.6	25.0	15.0	11.2	12.4	11.7	11.8	12.4	21.5	19.0	20.5
Medium	%	21.6	20.7	20.9	10.2	7.2	7.0	5.7	5.8	6.4	18.1	11.8	12.9
Large	%	8.9	7.9	7.5	6.2	5.1	2.8	6.9	7.0	5.3	8.2	5.5	3.8
<b>Gini Index of Land Concentration</b>		0.50	0.50	0.49	0.55	0.51	0.49	0.48	0.48	0.45	0.61	0.51	0.56
<b>Status of Irrigation</b>													
Percentage of Gross Irrigated Area to Total Cropped Area	%	26.7	33.3	33.1	0.0	0.0	0.7	0.0	0.0	0.0	80.7	81.0	82.1
Area Irrigated more than once	T.H.	0.0	3.1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	11.4	10.7	8.2
<b>Crop Diversity</b>													
Effective Number of Species	Number	6.4	6.1	5.7	1.5	3.8	3.6	2.2	2.3	1.0	4.5	4.3	4.4

T.H. : Thousand Hectares

**Annexure 3.1(a): Extent and condition accounts of Forests in India**

States/UTs	Geographical Area (GA)			Type of Protection			Growing Stock		Wetlands Within RFA			
	Recorded Forest Area (RFA)		% of GA	Reserved Forests (RF)	Protected Forest (PF)	Unclassified Forests	Volume of Growing Stock		Density of growing stock cum/ha	Number	Area (in ha)	% of RFA
	sq km	sq km		sq km	million cum	% share						
Andhra Pradesh	1,62,968	37,258	22.86	31,959	5,069	230	119.02	2.79	31.94	1,174	72,358	1.91
Arunachal Pradesh	83,743	51,407	61.39	10,589	9,779	31,039	458.00	10.72	89.09	1,343	68,022	1.07
Assam	78,438	26,832	34.21	17,864	0	8,968	115.40	2.70	43.01	1,584	67,857	2.46
Bihar	94,163	6,877	7.30	693	6,183	1	26.73	0.63	38.87	285	3,992	0.63
Chhattisgarh	1,35,192	59,772	44.21	25,782	24,036	9,954	358.96	8.40	60.05	3,698	64,398	1.22
Delhi	1,483	102	6.88	78	24	0	0.54	0.01	52.94	17	18	0.18
Goa	3,702	1,225	33.09	253	0	972	11.16	0.26	91.10	71	1,025	0.78
Gujarat	1,96,244	21,647	11.03	14,373	2,886	4,388	48.31	1.13	22.32	3,529	12,10,675	39.88
Haryana	44,212	1,559	3.53	249	1,158	152	4.22	0.10	27.07	78	1,885	3.33
Himachal Pradesh	55,673	37,033	66.52	1,898	33,130	2,005	347.07	8.12	93.72	113	8,221	0.59
Jammu & Kashmir	2,22,236	20,230	9.10	17,643	2,551	36	291.63	6.82	144.16	481	36,262	1.31
Jharkhand	79,716	23,605	29.61	4,387	19,185	33	96.22	2.25	40.76	1,662	16,528	0.87
Karnataka	1,91,791	38,284	19.96	28,690	3,931	5,663	334.08	7.82	87.26	2,038	53,119	1.71
Kerala	38,852	11,309	29.11	11,309	0	0	147.10	3.44	130.07	359	23,157	2.03
Madhya Pradesh	3,08,252	94,689	30.72	61,886	31,098	1,705	342.62	8.02	36.18	8,540	1,62,573	1.83
Maharashtra	3,07,713	61,579	20.01	49,546	6,733	5,300	231.76	5.42	37.64	8,821	1,16,837	2.07
Manipur	22,327	17,418	78.01	1,467	4,171	11,780	42.03	0.98	24.13	206	12,424	0.71
Meghalaya	22,429	9,496	42.34	1,113	12	8,371	31.28	0.73	32.94	244	21,470	1.22
Mizoram	21,081	5,641	26.76	4,483	0	1,158	21.30	0.50	37.76	206	12,456	0.60
Nagaland	16,579	8,623	52.01	234	0	8,389	29.52	0.69	34.23	197	11,522	1.08
Odisha	1,55,707	61,204	39.31	36,049	25,133	22	299.04	7.00	48.86	4,127	64,627	1.52

States/UTs	Geographical Area (GA)			Recorded Forest Area (RFA)			Type of Protection			Growing Stock		Wetlands Within RFA		
				Reserved Forests (RF)	Protected Forest (PF)	Unclassified Forests	Volume of Growing Stock		Density of growing stock cum/ha	Number	Area (in ha)	% of RFA		
	sq km	sq km	% of GA	sq km	sq km	sq km	million cum	% share						
Punjab	50,362	3,084	6.12	44	1,137	1,903	11.12	0.26	36.06	119	3,068	3.32		
Rajasthan	3,42,239	32,737	9.57	12,475	18,217	2,045	24.39	0.57	7.45	3,826	56,341	1.70		
Sikkim	7,096	5,841	82.31	5,452	389	0	35.32	0.83	60.47	74	2,609	0.95		
Tamil Nadu	1,30,060	22,877	17.59	20,293	1,782	802	96.97	2.27	42.39	1,523	45,219	2.09		
Telangana	1,12,077	26,904	24.00	20,353	5,939	612	80.96	1.89	30.09	1,070	28,239	1.05		
Tripura	10,486	6,294	60.02	4,175	2	2,117	19.74	0.46	31.36	710	3,879	0.66		
Uttar Pradesh	2,40,928	16,582	6.88	12,071	1,157	3,354	96.04	2.25	57.92	2,351	42,224	3.14		
Uttarakhand	53,483	38,000	71.05	26,547	9,885	1,568	406.08	9.50	106.86	221	54,129	2.12		
West Bengal	88,752	11,879	13.38	7,054	3,772	1,053	54.87	1.28	46.19	11,515	4,38,476	32.68		
Andaman and Nicobar Islands	8,249	7,171	86.93	5,613	1,558	0	90.82	2.13	126.65	2,267	89,022	13.19		
Chandigarh	114	35	30.70	32	0	3	0.29	0.01	82.86	4	60	6.09		
Dadra and Nagar Haveli	491	204	41.55	199	5	0	0.74	0.02	36.27	5	322	1.53		
Daman and Diu	111	8	7.21	0	0	8	0.09	0.00	112.50					
Lakshadweep	30	0	0.00	0	0	0	0.00	0.00	0.00					
Puducherry	490	13	2.65	0	2	11	0.05	0.00	38.46	8	127	41.64		
<b>Total</b>	<b>32,87,469</b>	<b>7,67,419</b>	<b>23.34</b>	<b>4,34,853</b>	<b>2,18,924</b>	<b>1,13,642</b>	<b>4273.47</b>	<b>100.00</b>	<b>55.69</b>	<b>62,466</b>	<b>27,93,141</b>	<b>3.83</b>		

Source: India State of Forest Report 2019

### Annexure 3.1(b): Extent and condition accounts of Forests in India

States/UTs	Carbon Stock						Carbon Stock per hectare						Biodiversity Assessment					
	Total	AGB	BGB	Dead Wood	Litter	SOC	Total	AGB	BGB	Dead Wood	Litter	SOC	Total Number of species*			Effective Number of species		
													Herbs	Shrubs	Trees	Herbs	Shrubs	Trees
Andhra Pradesh	2,19,528	60,972	24,206	629	3,074	1,30,647	75.34	20.93	8.31	0.22	1.05	44.84	58	64	242	49.28	54.64	150.57
Arunachal Pradesh	10,51,323	3,30,856	1,00,379	7,816	15,436	5,96,836	157.65	49.61	15.05	1.17	2.31	89.50	192	435	110	149.52	297.39	75.22
Assam	2,70,149	85,844	21,148	1,102	7,223	1,54,832	95.37	30.30	7.47	0.39	2.55	54.66	153	149	143	131.61	106.84	93.21
Bihar	55,239	15,007	5,428	127	746	33,931	75.61	20.54	7.43	0.17	1.02	46.44	52	42	113	43.36	37.70	52.77
Chhattisgarh	4,80,250	1,45,912	46,908	1,858	9,969	2,75,603	86.36	26.24	8.43	0.33	1.79	49.56	50	48	129	26.93	31.73	45.35
Delhi	1,236	277	98	2	21	838	63.26	14.19	5.03	0.11	1.06	42.86	36	11	16	29.37	7.92	7.45
Goa	25,338	9,010	2,617	172	665	12,874	113.24	40.27	11.70	0.77	2.97	57.54	38	50	118	33.07	40.18	63.44
Gujarat	1,07,247	27,737	9,636	315	1,556	68,003	72.18	18.67	6.49	0.21	1.05	45.77	73	37	102	53.90	26.11	45.31
Haryana	10,466	2,455	929	18	137	6,927	65.31	15.32	5.80	0.11	0.86	43.23	50	43	45	24.17	27.39	21.69
Himachal Pradesh	2,52,360	1,10,045	30,745	2,559	2,711	1,06,300	163.51	71.30	19.92	1.66	1.76	68.87	109	99	116	80.40	81.10	73.99
Jammu & Kashmir	3,90,195	1,70,222	47,806	3,813	3,706	1,64,648	165.25	72.09	20.25	1.62	1.57	69.73	272	133	73	176.30	124.26	46.19
Jharkhand	1,78,012	48,994	19,899	423	2,826	1,05,870	75.39	20.75	8.43	0.18	1.20	44.84	40	26	111	32.26	13.56	23.73
Karnataka	3,83,763	1,28,882	38,742	1,993	8,931	2,05,215	99.49	33.41	10.04	0.52	2.32	53.20	40	140	325	34.17	87.04	235.73
Kerala	2,12,956	67,979	19,070	1,017	5,001	1,19,889	100.72	32.15	9.02	0.48	2.36	56.70	81	158	238	68.09	101.92	149.47
Madhya Pradesh	5,88,727	1,65,067	64,630	1,535	8,156	3,49,339	75.98	21.30	8.34	0.20	1.05	45.09	72	79	146	47.99	36.47	44.49
Maharashtra	4,40,508	1,31,249	40,380	1,586	10,687	2,56,606	86.75	25.85	7.95	0.31	2.10	50.53	54	135	170	45.37	70.05	94.04
Manipur	1,78,723	44,723	13,317	508	3,924	1,16,251	106.08	26.55	7.90	0.30	2.33	69.00	56	89	43	39.12	83.46	38.59
Meghalaya	1,80,966	52,302	14,963	731	4,328	1,08,642	105.71	30.55	8.74	0.43	2.53	63.46	42	176	93	33.60	157.54	57.91
Mizoram	1,56,554	44,973	9,925	451	4,516	96,689	86.95	24.98	5.51	0.25	2.51	53.70	56	96	87	58.32	70.04	37.88
Nagaland	1,35,527	35,850	9,612	522	2,897	86,646	108.54	28.71	7.70	0.42	2.32	69.39	113	137	56	98.22	115.02	47.77
Odisha	4,32,288	1,26,656	39,066	1,647	9,062	2,55,857	83.75	24.54	7.57	0.32	1.76	49.57	105	90	192	96.14	72.20	57.90
Punjab	13,344	3,529	1,367	25	125	8,298	72.18	19.09	7.40	0.14	0.67	44.89	37	31	50	25.57	25.69	27.26
Rajasthan	1,08,363	26,155	10,865	191	928	70,224	65.17	15.73	6.53	0.12	0.56	42.23	8	30	65	7.46	19.29	19.75

States/UTs	Carbon Stock						Carbon Stock per hectare						Biodiversity Assessment					
	Total	AGB	BGB	Dead Wood	Litter	SOC	Total	AGB	BGB	Dead Wood	Litter	SOC	Total Number of species*			Effective Number of species		
													Herbs	Shrubs	Trees	Herbs	Shrubs	Trees
<b>Sikkim</b>	57,180	17,645	5,372	505	664	32,994	171.04	52.78	16.07	1.51	1.99	98.69	29	35	59	35.65	53.35	39.23
<b>Tamil Nadu</b>	2,16,782	62,092	21,433	776	4,107	1,28,374	82.23	23.55	8.13	0.29	1.56	48.69	87	313	252	66.11	199.19	188.16
<b>Telangana</b>	1,51,842	41,389	17,227	333	2,031	90,862	73.77	20.11	8.37	0.16	0.99	44.15	33	67	167	23.46	45.56	63.11
<b>Tripura</b>	76,057	25,061	5,513	297	2,169	43,017	98.44	32.44	7.14	0.38	2.81	55.68	22	37	89	51.63	24.53	39.06
<b>Uttar Pradesh</b>	1,15,690	32,498	10,374	372	1,893	70,553	78.14	21.95	7.01	0.25	1.28	47.65	86	71	84	55.01	49.46	52.64
<b>Uttarakhand</b>	3,70,912	1,52,540	40,975	2,948	4,904	1,69,545	152.62	62.77	16.86	1.21	2.02	69.76	94	73	112	86.57	58.59	48.06
<b>West Bengal</b>	1,47,705	40,388	12,193	447	2,533	92,144	87.39	23.90	7.21	0.26	1.50	54.52	65	103	113	55.68	79.00	56.98
<b>Andaman and Nicobar Islands</b>	1,12,666	49,468	15,823	1,116	2,912	43,347	167.09	73.36	23.47	1.66	4.32	64.29	79	102	89	76.89	87.68	59.02
<b>Chandigarh</b>	189	57	18	0	3	111	86.08	25.91	8.10	0.21	1.58	50.28	7	4	21	4.76	3.42	4.95
<b>Dadra and Nagar Haveli</b>	1,800	500	113	7	47	1,133	86.91	24.14	5.47	0.35	2.25	54.70	11	8	25	5.77	2.64	11.94
<b>Daman and Diu</b>	152	35	10	0	2	105	74.64	17.23	4.91	0.13	1.21	51.15						
<b>Lakshadweep</b>	236	67	15	0	5	149	86.98	24.73	5.42	0.17	1.77	54.89						
<b>Puducherry</b>	403	97	22	1	7	276	76.87	18.54	4.22	0.12	1.42	52.57						
<b>Total</b>	71,24,676	22,56,533	7,00,824	35,842	1,27,902	40,03,575	100.03	31.68	9.84	0.50	1.80	56.21	2300	3111	3794			

Source: India State of Forest Report 2019

Note: \*Biodiversity data have been collected from 8,500 sub-plots spread in all the States/UTs among sixteen type groups. The total number of species gives the observed number in these sub-plots.

### Annexure 3.1(c): Extent and condition accounts of Forests in India

States/UTs	No. of Patches								
	Patch Size Range (in sq. km)								
	>=0.01 <=1.0	>1.0 <=10	>10 <=100	>100 <=500	>500 <=1000	>1000 <=5000	>5000 <=10000	>10000	Total
Andhra Pradesh	17,409	644	132	18	3	2	2		18,210
Arunachal Pradesh	30,524	509	51	2	1	2	0	2	31,091
Assam	47,610	764	111	22	1	1	0	1	48,510
Bihar	29,504	162	14	6	2	1			29,689
Chhattisgarh	31,468	1,033	165	23	3	8	2		32,702
Delhi	1,081	15	3						1,099
Goa	2,045	52	13	0	0	1			2,111
Gujarat	69,749	1,676	159	6	1				71,591
Haryana	5,822	104	12	2					5,940
Himachal Pradesh	22,082	554	76	9	4	4			22,729
Jammu & Kashmir	41,872	798	97	15	4	5			42,791
Jharkhand	34,725	597	73	19	1	3			35,418
Karnataka	38,215	1,011	136	10	1	3	1	1	39,378
Kerala	32,038	523	42	3	2	2			32,610
Madhya Pradesh	48,950	1,387	260	42	10	58	5		50,712
Maharashtra	2,35,087	5,666	380	22	4	1			2,41,160
Manipur	3,364	100	4	0	0	0	0	1	3,469
Meghalaya	6,871	88	6	0	0	1	0	1	6,967
Mizoram	1,225	16	0	0	0	0	0	1	1,242
Nagaland	4,413	36	1	0	0	0	0	1	4,451
Odisha	37,175	1,344	174	22	6	5	1	1	38,728
Punjab	6,086	92	3	3	1				6,185
Rajasthan	33,955	1,094	145	10	6				35,210
Sikkim	675	13	4	0	0	1			693
Tamil Nadu	41,335	907	112	12	0	6			42,372
Telangana	13,150	583	106	16	4	4			13,863
Tripura	3,316	81	5	2	0	0	1		3,405
Uttar Pradesh	64,469	728	97	20	4				65,318
Uttarakhand	12,017	322	47	6	3	1	1	1	12,398
West Bengal	66,713	1,151	194	7	1	2			68,068
Andaman and Nicobar Islands	798	49	21	5	2	3			878
Chandigarh	161	4							165
Dadra and Nagar Haveli	168	10	5						183
Daman and Diu	151	3							154
Lakshadweep	13	8							21
Puducherry	853	3							856
<b>Total</b>	<b>7,27,380</b>	<b>16,444</b>	<b>2,183</b>	<b>257</b>	<b>57</b>	<b>42</b>	<b>14</b>	<b>9</b>	<b>7,46,386</b>

Source: India State of Forest Report 2017

**Annexure 3.1(c): Extent and condition accounts of Forests in India**

**(Contd.)**

States/UTs	Area (Sq km)								
	Patch Size Range (in sq. km)								Total
	>=0.01 <=1.0	>1.0 <=10	>10 <=100	>100 <=500	>500 <=1000	>1000 <=5000	>5000 <=10000	>10000	
Andhra Pradesh	1,425	1,894	4,063	3,183	2,467	3,537	11,578		28,147
Arunachal Pradesh	2,019	1,500	1,470	846	585	3,070	0	57,474	66,964
Assam	3,423	2,090	3,247	5,005	637	2,150	0	11,553	28,105
Bihar	2,028	358	315	1,481	1,366	1,751			7,299
Chhattisgarh	2,510	2,746	4,686	4,813	2,390	20,787	17,615		55,547
Delhi	78	44	71						192
Goa	186	113	210	0	0	1,720			2,229
Gujarat	5,051	3,998	3,659	1,263	786				14,757
Haryana	557	235	466	330					1,588
Himachal Pradesh	1,578	1,482	2,276	1,635	3,020	5,109			15,100
Jammu & Kashmir	2,900	2,067	2,754	3,120	2,874	9,526			23,241
Jharkhand	2,247	1,684	2,055	5,209	965	11,393			23,553
Karnataka	3,137	2,819	3,712	1,770	947	5,529	8,389	11,246	37,550
Kerala	2,083	1,309	1,006	687	1,180	14,056			20,321
Madhya Pradesh	3,143	3,260	5,895	7,497	5,528	24,935	27,156		77,414
Maharashtra	18,506	14,148	9,478	4,212	2,626	1,712			50,682
Manipur	265	255	165	0	0	0	0	16,661	17,346
Meghalaya	398	224	135	0	0	1,215	0	15,174	17,146
Mizoram	79	28	0	0	0	0	0	18,079	18,186
Nagaland	212	93	12	0	0	0	0	12,172	12,489
Odisha	1,338	3,690	5,158	4,511	4,461	14,580	5,480	12,127	51,345
Punjab	451	222	65	548	551				1,837
Rajasthan	3,308	2,819	3,805	2,367	4,273				16,572
Sikkim	48	37	119	0	0	3,140			3,344
Tamil Nadu	3,288	2,461	2,871	3,019	0	14,642			26,281
Telangana	1,258	1,699	2,544	3,155	2,792	8,971			20,419
Tripura	253	211	140	363	0	0	6,759		7,726
Uttar Pradesh	3,627	1,934	2,508	4,086	2,524				14,679
Uttarakhand	972	862	1,372	1,040	2,017	1,166	5,153	11,713	24,295
West Bengal	4,583	3,089	5,025	1,155	517	2,478			16,847
Andaman and Nicobar Islands	70	155	628	709	1,493	3,687			6,742
Chandigarh	12	10							22
Dadra and Nagar Haveli	20	21	166						207
Daman and Diu	12	8							20
Lakshadweep	4	24							27
Puducherry	49	5							54
<b>Total</b>	<b>54,082</b>	<b>43,639</b>	<b>58,052</b>	<b>51,298</b>	<b>39,628</b>	<b>85,407</b>	<b>90,028</b>	<b>2,86,139</b>	<b>7,08,273</b>

Source: India State of Forest Report 2017

**Annexure 3.1(c): Extent and condition accounts of Forests in India**

**(Contd.)**

States/UTs	Percentage								Average Patch Size Sq km	Proportion of small patches (≥0.01sq km to ≤1 sq km) %
	Patch Size Range (in sq. km)									
	>=0.01 <=1.0	>1.0 <=10	>10 <=100	>100 <=500	>500 <=1000	>1000 <=5000	>5000 <=10000	>10000		
Andhra Pradesh	5.06	6.73	14.44	11.31	8.76	12.57	41.13		1.55	95.60
Arunachal Pradesh	3.02	2.24	2.19	1.26	0.87	4.59	0.00	85.83	2.15	98.18
Assam	12.18	7.44	11.55	17.81	2.27	7.65	0.00	41.10	0.58	98.14
Bihar	27.78	4.90	4.32	20.30	18.71	23.99			0.25	99.38
Chhattisgarh	4.52	4.94	8.44	8.67	4.30	37.42	31.71		1.70	96.23
Delhi	40.44	22.90	36.66						0.18	98.36
Goa	8.34	5.07	9.42	0.00	0.00	77.17			1.06	96.87
Gujarat	34.23	27.09	24.79	8.56	5.33				0.21	97.43
Haryana	35.08	14.80	29.34	20.78					0.27	98.01
Himachal Pradesh	10.45	9.82	15.07	10.83	20.00	33.83			0.66	97.15
Jammu & Kashmir	12.48	8.89	11.85	13.42	12.37	40.99			0.54	97.85
Jharkhand	9.54	7.14	8.73	22.12	4.10	48.37			0.67	98.04
Karnataka	8.35	7.51	9.89	4.71	2.52	14.72	22.34	29.95	0.95	97.05
Kerala	10.25	6.44	4.95	3.38	5.81	69.17			0.62	98.25
Madhya Pradesh	4.06	4.21	7.62	9.68	7.14	32.21	35.08		1.53	96.53
Maharashtra	36.51	27.92	18.70	8.31	5.18	3.38			0.21	97.48
Manipur	1.53	1.47	0.95	0.00	0.00	0.00	0.00	96.05	5.00	96.97
Meghalaya	2.32	1.30	0.79	0.00	0.00	7.09	0.00	88.50	2.46	98.62
Mizoram	0.44	0.15	0.00	0.00	0.00	0.00	0.00	99.41	14.64	98.63
Nagaland	1.70	0.74	0.10	0.00	0.00	0.00	0.00	97.46	2.81	99.15
Odisha	2.61	7.19	10.05	8.79	8.69	28.40	10.67	23.60	1.33	95.99
Punjab	24.55	12.08	3.54	29.83	30.00				0.30	98.40
Rajasthan	19.96	17.02	22.96	14.28	25.78				0.47	96.44
Sikkim	1.43	1.11	3.56	0.00	0.00	93.90			4.83	97.40
Tamil Nadu	12.51	9.36	10.92	11.49	0.00	55.72			0.62	97.55
Telangana	6.16	8.32	12.46	15.45	13.68	43.93			1.47	94.86
Tripura	3.27	2.73	1.81	4.70	0.00	0.00	87.49		2.27	97.39
Uttar Pradesh	24.71	13.17	17.09	27.84	17.19				0.22	98.70
Uttarakhand	4.00	3.55	5.65	4.28	8.30	4.80	21.21	48.21	1.96	96.93
West Bengal	27.20	18.33	29.83	6.86	3.07	14.71			0.25	98.01
Andaman and Nicobar Islands	1.04	2.30	9.31	10.52	22.14	54.69			7.68	90.89
Chandigarh	54.87	45.13							0.13	97.58
Dadra and Nagar Haveli	9.67	10.14	80.19						1.13	91.80
Daman and Diu	58.71	41.29							0.13	98.05
Lakshadweep	13.14	86.86							1.29	61.90
Puducherry	90.42	9.58							0.06	99.65
<b>Total</b>	<b>7.64</b>	<b>6.16</b>	<b>8.20</b>	<b>7.24</b>	<b>5.59</b>	<b>12.06</b>	<b>12.71</b>	<b>40.40</b>	<b>0.95</b>	<b>97.45</b>

Source: India State of Forest Report 2017



## State-wise wetland distribution (type-wise) in India

Year 2006-07 (Area in Ha)

Sr. No.	State	Wetland Type										Wetland Type									Sub-total	Wetland (<2.25 ha)	Total Wetland Area (in ha)
		Lake/pond	Ox-bow lake/ Cut-off meander	High altitude wetland	Riverine wetland	Waterlogged (Natural)	River/Stream	Reservoir/Barrage	Tank/Pond	Waterlogged (Man-made)	Salt pan	Lagoon	Creek	Sand/Beach	Intertidal mud flat	Salt Marsh	Mangrove	Coral Reef	Salt pan	Aquaculture pond			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Andhra Pradesh	21843	-	-	-	2714	385839	404499	201677	4178	-	47407	9594	15891	31767	4002	41486	-	17725	240474	1429096	18037	1447133
2	Arunachal Pradesh	18	520	11422	-	8146	134244	164	95	-	-	-	-	-	-	-	-	-	-	-	154609	1119	155728
3	Assam	51257	14173	-	4258	47141	637164	2833	921	544	-	-	-	-	-	-	-	-	-	-	758291	6081	764372
4	Bihar	20281	16172	-	2118	34878	298408	8612	4822	336	-	-	-	-	-	-	-	-	-	-	385627	17582	403209
5	Chhattisgarh	-	26	-	174	-	179088	90389	40226	240	-	-	-	-	-	-	-	-	-	-	310143	27823	337966
6	Delhi*	49	-	-	-	380	1074	479	260	228	-	-	-	-	-	-	-	-	-	-	2470	301	2771
7	Goa	499	6	-	-	-	9362	2363	396	17	41	-	-	519	3286	-	1752	-	2929	-	21170	167	21337
8	Gujarat	23550	6	-	-	20660	275877	248979	73873	13951	1295	22289	149898	6508	2260365	144268	90475	33547	90878	8823	3465242	9708	3474950
9	Haryana	801	24	-	-	1412	17025	1775	7573	3339	-	-	-	-	-	-	-	-	-	-	31949	10529	42478
10	Himachal Pradesh	52	-	387	-	47	55558	41817	134	30	-	-	-	-	-	-	-	-	-	-	98025	471	98496
11	Jammu & Kashmir	13762	-	109170	9594	-	231597	25132	6	-	-	-	-	-	-	-	-	-	-	-	389261	2240	391501
12	Jharkhand	3204	83	-	1629	231	97743	48177	5688	61	8	-	-	-	-	-	-	-	-	-	156824	13227	170051
13	Karnataka	638	-	-	1051	2045	179731	213527	222030	2403	-	72	97	1897	1663	-	967	-	812	2779	629712	13864	643576
14	Kerala	2643	-	-	410	20305	65162	26167	2435	-	-	38442	80	2354	-	-	-	-	-	-	157998	2592	160590
15	Madhya Pradesh	208	93	-	7	157	315526	392455	64768	-	-	-	-	-	-	-	-	-	-	-	773214	44952	818166
16	Maharashtra	9003	15	-	2	284	299730	368135	208669	310	-	-	41636	4873	22249	614	30238	-	7025	71	992854	21668	1014522
17	Manipur	39123	64	-	-	3525	16677	856	187	-	-	-	-	-	-	-	-	-	-	2643	63075	541	63616
18	Meghalaya	501	461	-	1272	1028	24841	1562	150	5	-	-	-	-	-	-	-	-	-	-	29820	167	29987
19	Mizoram	185	-	-	-	133	13497	27	-	-	-	-	-	-	-	-	-	-	-	-	13842	146	13988
20	Nagaland	3	9	-	-	423	19254	1547	41	-	-	-	-	-	-	-	-	-	-	-	21277	267	21544
21	Orissa	712	728	-	980	12925	223522	189972	29301	934	-	89023	-	6046	25514	-	23395	-	1726	19952	624730	66174	690904
22	Punjab	1934	373	-	306	2032	59864	11858	3526	1341	-	-	-	-	-	-	-	-	-	-	81234	5049	86283
23	Rajasthan	38269	-	-	-	16856	312570	190600	151027	7636	12283	-	-	-	18950	-	-	-	-	-	748191	34123	782314
24	Sikkim	15	-	3050	-	-	4131	-	-	-	-	-	-	-	-	-	-	-	-	-	7196	281	7477
25	Tamil Nadu	316091	-	-	127	3928	136878	56419	237613	10811	-	25057	3404	9798	33164	6108	7315	3899	22889	10739	884240	18294	902534
26	Tripura	300	387	-	-	2946	7420	3320	186	-	-	-	-	442	-	-	-	-	-	-	14559	2983	17542
27	Uttar Pradesh	122531	51371	-	61100	76263	607315	105641	33263	87694	-	-	-	-	-	-	-	-	-	-	1145178	97352	1242530
28	Uttarakhand	2081	63	142	-	9	80133	20319	108	211	-	-	-	-	-	-	-	-	-	-	103066	816	103882
29	West Bengal	58654	19550	82	8654	56603	559192	22672	20470	1435	71	-	-	3338	2726	-	209330	-	4866	1557	969200	138707	1107907
30	Andaman & Nicobar Islands*	45	-	-	-	-	6571	280	16	-	-	56	1777	10063	12399	6029	66101	49378	-	-	152715	94	152809
31	Chandigarh*	160	-	-	-	-	167	-	14	-	-	-	-	-	-	-	-	-	-	-	341	9	350
32	Dadra & Nagar Haveli*	-	-	-	-	-	732	1286	13	-	-	-	-	-	-	-	-	-	-	-	2031	39	2070
33	Daman & Diu*	-	-	-	-	-	380	125	88	-	-	24	-	204	1054	57	63	-	63	-	2058	10	2068
34	Lakshadweep*	-	-	-	-	-	-	-	-	-	-	23674	-	733	-	-	-	55179	-	-	79586	0	79586
35	Puducherry*	1120	-	-	-	20	2113	-	867	-	-	-	212	809	505	66	285	-	-	194	6191	144	6335
	<b>Total</b>	<b>729532</b>	<b>104124</b>	<b>124253</b>	<b>91682</b>	<b>315091</b>	<b>5258385</b>	<b>2481987</b>	<b>1310443</b>	<b>135704</b>	<b>13698</b>	<b>246044</b>	<b>206698</b>	<b>63033</b>	<b>2413642</b>	<b>161144</b>	<b>471407</b>	<b>142003</b>	<b>148913</b>	<b>287232</b>	<b>14705015</b>	<b>555557</b>	<b>15260572</b>

Source: National wetland Atlas; [http://saconenviis.nic.in/publication%5CNWIA\\_National\\_atlas.pdf](http://saconenviis.nic.in/publication%5CNWIA_National_atlas.pdf)

\* - Union Territories

## Wetland Ecosystem Health Score

2019-20

Sr. No.	Wetland	State/ UT	Area (in ha)	Conversion to non-wetlands use	Hydrological regimes				Biodiversity		Governance			Frequency					Notification status	Wetland Health Score Value	Wetland Health Score
				I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	A	B	C	D	E				
1	Kolleru	Andhra Pradesh	90,100	D	B	A	E	B		A	D	C	2	2	1	2	1	Partially	0.65	D	
2	Perali Poguru Baptala	Andhra Pradesh	370	D	B	B	A	C		C	C	C	2	2	4	1	0	Yes	0.71	C-	
3	Coringa	Andhra Pradesh	23,570	A	A	A	A	A		A	A	C	7	0	1	0	0	Yes	0.95	A-	
4	Pulicat	INTERSTATE	48,000	C	B	C	B			C	D	E	0	2	3	1	1	Partially	0.57	E	
5	Nelapattu	Andhra Pradesh	459	A	A	A		B	A	A	A	A	7	1	0	0	0	Yes	0.98	A+	
6	Shungaster	Arunachal Pradesh	11	A	A	A		A		D	D	D	4	0	0	3	0	No	0.74	C-	
7	Pasang Sonam Tso Lake	Arunachal Pradesh	7	A	A	A		A		D	D	E	4	0	0	2	1	No	0.71	C-	
8	Urpada beel	Assam	1,000	B	B	B	A	C	B	C	E		1	1	2	0	1	Partially	0.64	D	
9	Deepor beel	Assam	4,014	E	D	D	E	E	A	E	E	C	1	0	1	2	5	Yes	0.38	E	
10	Kanwar	Bihar	6,311	B	E	B	A	B	A	A	B	A	4	2	0	0	1	No	0.83	B-	
11	Kusheharsthan	Bihar	2,921	A	A	A	A	A		B	D	A	6	1	0	1	0	Yes	0.90	B+	
12	Baraila	Bihar	1,289		D	C	E	B	A	A	B	A	3	2	1	1	1	Partially	0.73	C-	
13	Govindam water tank	Chhattisgarh	25	E	C	A	A	C	B	D	D	D	2	1	2	3	1	No	0.60	E	
14	Pidhi	Chhattisgarh	8	A	A	A	A	A	A	A	D	D	7	0	0	2	0	No	0.87	B+	
15	Upanpal	Chhattisgarh	3	E	B	A	A	B	A	E	E	E	3	2			4	No	0.60	E	
16	Sanjay	Delhi	17	A	B		E	B		A	D	C	2	2	1	1	1	No	0.69	D	
17	Hauz khas	Delhi	7	A	B		E	B		A	D	C	2	2	1	1	1	No	0.69	D	
18	Bhalswa lake	Delhi	34	B	B		E	B		A	D	C	1	3	1	1	1	No	0.66	D	
19	Smritivan lake (Kondli lake)	Delhi	3	A	B		E	B		A	D	C	2	2	1	1	1	No	0.69	D	
20	Smritivan lake (Vasant kunj lake)	Delhi	2	A	B		E	B		A	D	C	2	2	1	1	1	No	0.69	D	
21	Chandrabhaga Wetland	Gujarat	488	A	A	A	A			B	A	C	5	1	1	0	0	No	0.91	A+	
22	Chhari Dhandh	Gujarat	8,000	A	A	A	A			A	A	A	7	0	0	0	0	Yes	1.00	A+	
23	Great Rann of Kachchh	Gujarat	750,000	B	A	A				A	A	A	5	1	0	0	0	Yes	0.97	A+	
24	Khijadiya Bird Sanctuary	Gujarat	995	A	A	A	A			A	A	A	7	0	0	0	0	Yes	1.00	A+	
25	Little Rann of Kachchh	Gujarat	495,400	B	A	A				A	A	A	5	1	0	0	0	Yes	0.97	A+	
26	Mokar Sagar Wetland	Gujarat	10,300	A	A	A	B			A	D	D	4	1	0	2	0	No	0.80	C+	
27	Nal Sarovar Bird Sanctuary	Gujarat	12,000	A	A	A	A			A	A	A	7	0	0	0	0	Yes	1.00	A+	
28	Pariej	Gujarat	754	A	A	A	A			A	A	A	7	0	0	0	0	No	1.00	A+	
29	Wadhvana Wetland	Gujarat	579	A	A	A	A	B	A	A	A	B	7	2	0	0	0	No	0.96	A+	
30	Bhindawas	Haryana	412	A	B	A	D	D	E	A	C	A	4	1	1	2	1	Partially	0.71	C-	
31	Chandertal Lake	Himachal	49	A	A	A		A	A	A	B	A	7	1	0	0	0	Yes	0.98	A+	
32	Khajiar lake	Himachal	0	A	A	A	A	B	A	B	B	A	6	3	0	0	0	Yes	0.93	A-	
33	Pong	Himachal	15,662	A	A	A	E	B	A	A	B	A	6	2	0	0	1	Yes	0.87	B+	
34	Renuka	Himachal	20	A	A	A	E	B	A	A	B	A	6	2	0	0	1	Yes	0.87	B+	
35	Rewalsar lake	Himachal	36	A	A	A	A	B	B	B	B	A	5	4	0	0	0	No	0.91	A+	
36	Surinsar-Mansar	Jammu	350	A	A	A	B	A	A	C	D	A	6	1	1	1	0	Yes	0.87	B+	
37	Lalmatia	Jharkhand	8	A	A	A	C	A		D	D	E	4	0	1	2	1	No	0.70	D	
38	Barkipona	Jharkhand	4	A	A	A	C	A		D	D	E	4	0	1	2	1	No	0.70	D	
39	Tegaoan	Jharkhand	17	A	A	A	C	A		D	D	E	4	0	1	2	1	No	0.70	D	

## Wetland Ecosystem Health Score

2019-20

Sr. No.	Wetland	State/ UT	Area (in ha)	Conversion to non-wetlands use	Hydrological regimes				Biodiversity		Governance			Frequency					Notification status	Wetland Health Score Value	Wetland Health Score
					I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	A	B	C	D	E			
40	Rakmsera	Jharkhand	6	A	A	A	C	A		D	D	E	4	0	1	2	1	No	0.70	D	
41	Amboa dan	Jharkhand	30	A	A	A	C	A		D	D	E	4	0	1	2	1	No	0.70	D	
42	Hokersar Wildlife /Wetland Conservation Reserve	Kashmir	1,375	A	A	A	B	A	A	B	D	A	6	2	0	1	0	Yes	0.89	B+	
43	Wular	Kashmir	18,900	A	B	A	B	B		A	B	D	3	4	0	1	0	Yes	0.83	B-	
44	Bellandur	Karnataka	329	E	D	D	C	C		D	D	E	0	0	2	4	2	No	0.40	E	
45	Varathur	Karnataka	220	B	B	B	C	C		D	D	E	0	3	2	2	1	No	0.58	E	
46	Gudavi Bird Sanctuary	Karnataka	33	A	A	A	A	A		C	C	A	6	0	2	0	0	Yes	0.90	B+	
47	Aghnashini estuary	Karnataka	135,000	B	A	A	A	A		C	C	C	4	1	3	0	0	Yes	0.83	B-	
48	Heggeri Reservoir	Karnataka	102	B	A	A	A	C		C	D	A	4	1	2	1	0	No	0.80	C+	
49	Magadi	Karnataka	54	A	A	A	A	C		C	D	A	5	0	2	1	0	Yes	0.83	B-	
50	Bonal Bird Sanctuary	Karnataka	30	B	A	A	A	C		C	D	A	4	1	2	1	0	No	0.80	C+	
51	Hidkal Reservoir	Karnataka	6,338	A	A	A	A	A		C	D	A	6	0	1	1	0	Partially	0.88	B+	
52	Kokkare Bellur Bird Sanctuary	Karnataka	316	B	B	B	A	A		C	D	A	3	3	1	1	0	Yes	0.80	C+	
53	Rangantittu Bird Sanctuary	Karnataka	67	B	A	A	A	A		C	D	A	5	1	1	1	0	Yes	0.85	B-	
54	K G Koppa Wetland	Karnataka	55	B	B	B	D	C		C	D	A	1	3	2	2	0	No	0.68	D	
55	Vellayani Lake	Kerala	490	E			E		E	A	B	C	1	1	1	0	3	No	0.50	E	
56	Sasthamkotta	Kerala	373	A	A	A	A	A		A	A	C	7	0	1	0	0	Yes	0.95	A-	
57	Vernbanad kol	Kerala	15,125	A	B	A	E	A	A	A	A	C	6	1	1	0	1	Yes	0.84	B-	
58	Ashtamudi	Kerala	6,140	A	A	A	B	A		A	A	C	6	1	1	0	0	Yes	0.93	A-	
59	Sirpur	Madhya Pradesh	196	A	A	A	E	A		C	A		5	0	1	0	1	No	0.83	B-	
60	Bhoj (Upper & Lower lake)	Madhya Pradesh	3,210	A	A	A	D	A		C	B	C	4	1	2	1	0	Partially	0.80	B-	
61	Dhamapur Lake	Maharashtra	61	B	A	A	A	C		C	D		3	1	2	1	0	No	0.77	C+	
62	Powai	Maharashtra	210	E	C	D	A	C		B	B		1	2	2	1	0	No	0.70	D	
63	Vihar	Maharashtra	729	A	A	A	A	A		A	B		6	1	0	0	0	Yes	0.97	A+	
64	Lonar	Maharashtra	113	C	A	A	A	B		A	C		4	1	2	0	0	Yes	0.86	B+	
65	Nandur Madhmeshwar	Maharashtra	801	C	A	A	A	C		B	B		3	2	2	0	0	Yes	0.83	B-	
66	Ujjani Reservoir	Maharashtra	30,000	E	C	C	A	C		B	B		1	2	3	0	0	Yes	0.73	C-	
67	Rankala	Maharashtra	107	D	B	B	A	C		B	B		1	4	1	1	0	No	0.74	C-	
68	Loktak	Manipur	26,600	B	C	C	A	C		A	B	A	3	2	3	0	0	Yes	0.80	C+	
69	Pumlen	Manipur	8,440	C	C	C	A	C		C	C	D	1	0	6	1	0	Partially	0.63	D	
70	Umian	Meghalaya	10,100										0	0	0	0	0	No	0.81	C+	
71	Pala	Mizoram	1,500	A	B	A	B	B	B	A	A	D	4	4	0	1	0	Yes	0.90	B+	
72	Doyang Reservoir Wetland	Nagaland	1,532	A	A	A	B	A		B	D	A	5	2	0	1	0	No	0.88	B+	
73	Ansupa lake	Odisha	382	E	D	D	A	C	A	A	A	D	4	0	1	3	1	No	0.67	D	
74	Bhitarkanika Mangroves	Odisha	67,200	B	A	A	B	A	A	D	D	A	5	2	0	2	0	Yes	0.82	B-	
75	Chilika lagoon	Odisha	116,500	C	A	A	B	A	A	A	A	C	6	1	2	0	0	Partially	0.89	B+	
76	Harike confluence with Beas	Punjab	4,100	D	A	A	E	D	A	A	D	A	5	0	0	3	1	Yes	0.71	C-	
77	kanjli	Punjab	183		D	A	A	E		A	C	A	4	0	0	1	1	No	0.77	C+	
78	Keshopur	Punjab	344	A	A	A		D	A	C	D	A	5	0	1	2	0	Yes	0.80	C+	
79	Ropar	Punjab	1,365	A	A	A		A	A	A	C	D	6	0	0	1	0	Yes	0.91	A-	
80	Keoladeo National Park	Rajasthan	2,912	A	B		A	A		A	A	A	6	1	0	0	0	Yes	0.97	A+	

## Wetland Ecosystem Health Score

2019-20

Sr. No.	Wetland	State/ UT	Area (in ha)	Conversion to non-wetlands use	Hydrological regimes			Biodiversity		Governance			Frequency					Notification status	Wetland Health Score Value	Wetland Health Score
					I-1	I-2	I-3	I-4	I-5	I-6	I-7	I-8	I-9	A	B	C	D			
81	Sambhar	Rajasthan	24,294	A	A	A	D	B	A	E	E	E	4	1	0	1	3	Yes	0.64	D
82	Mansagar	Rajasthan	139	A	A	A	A	B	A	E	E	E	5	1	0	0	3	No	0.71	C-
83	Pichola	Rajasthan	696	A	A	A	A	C	A	E	E	E	5	0	1	0	3	No	0.68	D
84	Fateh Sagar	Rajasthan	400	A	A	A	A	B	A	E	E	E	5	1	0	0	3	No	0.71	C-
85	Udai Sagar	Rajasthan	687	A	A	A	D	C	A	E	E	E	4	0	1	1	3	No	0.62	D
86	Gurudongmar	Sikkim	109	A	A	A	B	B	B	C	D	A	4	3	1	1	0	No	0.82	B-
87	Khecheopalri Lake	Sikkim	9	A	A	A	A	A	A	D	D	D	6	0	0	3	0	Yes	0.80	C+
88	Tsomgo	Sikkim	24	A	A	A	A	A	A	B	D	D	5	1	0	2	0	No	0.83	B-
89	Pallikarani wetlands	Tamil Nadu	834	E	E	E	C	E		C	C	C	0	0	4	0	4	Yes	0.40	E
90	Koonthankulam	Tamil Nadu	72	A	A	A	C	B		A	C	B	4	2	2	0	0	Partially	0.85	B-
91	Point Calimere	Tamil Nadu	2,968	B	A	A	A	A		C	B	A	5	2	1	0	0	Yes	0.90	B+
92	Pakhal Wetland	Telangana	2,185	B	D	A	B	A	B	C	D	A	3	3	1	2	0	Yes	0.76	C+
93	Kapra Wetland	Telangana	46	B	A	A	D	C	D	C	D	D	2	1	2	4	0	No	0.62	D
94	Rudrasagar	Tripura	240	B	B			B		C	C	C	0	3	2	0	0	Yes	0.72	C-
95	Soor Sarovar Bird Sanctuary	Uttar Pradesh	409	A	A	A	D	A	A	D	B	A	6	1	0	2	0	Yes	0.84	B-
96	Patna Bird Sanctuary	Uttar Pradesh	109	A	C	C	C	D	A	D	B	A	3	1	3	2	0	Partially	0.71	C-
97	Saman Bird Sanctuary	Uttar Pradesh	526	A	B	C	D	E	A	D	B	A	3	2	1	2	1	Yes	0.69	D
98	Samaspur	Uttar Pradesh	800	A	C	C	A	D	A	A	A	A	6	0	2	1	0	Yes	0.84	B-
99	Nawabganj	Uttar Pradesh	225	A	C	C	E	D	A	A	A	A	5	0	2	1	1	Yes	0.76	C+
100	Parvati Arga Bird Sanctuary	Uttar Pradesh	1,084	E	B	B	A	C	A	A	A	A	5	2	1	0	1	Yes	0.82	B-
101	Upper Ganga Ramsar Site	Uttar Pradesh	26,590	A	B	A	E	E		A	C	D	3	1	1	1	2	Partially	0.65	D
102	Sandi	Uttar Pradesh	308	A	C	B	C	A	A	A	A	A	6	1	2	0	0	Yes	0.89	B+
103	Jhilmil Conservation Reserve	Uttarakhand	1,030	A	A	A		B		A	D	A	5	1	0	1	0	Yes	0.89	B+
104	Asan Conservation Reserve	Uttarakhand	444	A	A	A		A	A	A	A	A	8	0	0	0	0	Yes	1.00	A+
105	Sundarban Ramsar Site	West Bengal	423,000	A	B	A	A	A		A	A	A	7	1	0	0	0	Yes	0.98	A+
106	East Kolkata Wetland	West Bengal	12,500	B	A	A	D	B		A	C	A	4	2	1	1	0	No	0.83	B-
107	Saonjh	Uttar Pradesh	400	A	A	B	C	A	A	A	A	A	7	1	1	0	0	Yes	0.93	A-
108	Sarsai Nawar	Uttar Pradesh	690	A	A	B	C	E	A	A	A	A	6	1	1	0	1	Yes	0.84	B-
109	Bakhira	Uttar Pradesh	2,894	B	A	A	C	E	A	A	A	A	6	0	1	0	1	Yes	0.85	B+
110	Sheikha	Uttar Pradesh	25	A	A	A		E	A	A	E	A	6	0	0	0	2	Yes	0.80	C+
111	Surha Taal	Uttar Pradesh	3,432	A	A	A	C	C	E	D	A	A	5	0	2	1	1	Yes	0.76	C+

Data Source: Ministry of Environment, Forest and Climate Change, Government of India  
Based on first cycle of assessments of wetlands under the "Wetland Health Scheme"

I-1: % wetland converted to non-wetland use since 2000

I-2: Ratio of natural inlets choked and diverted to total number of natural inlets

I-3: Ratio of natural outlets choked & diverted to total number of natural outlets

I-4: % of samples conforming to desired BOD/DO levels

I-5: % wetland area covered by invasive macrophytes

I-6: Annual winter water bird count as a proportion of maximum count in last 10 years

I-7: Clearly demarcated wetlands map

I-8: Wetlands Management Plan

I-9: Wetlands Notification

Taxonomic diversity in the States												
Category	Taxonomic group	Andhra Pradesh	Arunachal Pradesh	Assam	Bihar	Goa	Gujarat	Haryana	Himachal Pradesh	Jammu & Kashmir		
FAUNA	<b>Protista</b>											
	Phylum Protozoa	512	72	46		103	14	43		34		
	<b>Animalia</b>											
	INVERTEBRATA	Phylum Mesozoa										
		Phylum Porifera			2		8		1		3	
		Phylum Cnidaria		1	1		22	19	1		2	
		Phylum Ctenophora					2					
		Phylum Platyhelminthes	264	8	33		6		52		90	
		Phylum Rotifera		58	146				42		16	
		Phylum Gastrotricha			3							
		Phylum Kinorhyncha										
		Phylum Nematoda	111	36	32		34	111	185		132	
		Phylum Acanthocephala	39	1					4		2	
		Phylum Sipuncula					1	19				
		Phylum Mollusca	480	210	39		64	239	17		73	
		Phylum Echiura										
		Phylum Annelida	163	42	32		78	90	49		60	
		Phylum Onychophora		1								
		Phylum Arthropoda	1337	4062	3811	70	471	448	1369		4543	158
		Phylum Phoronida										
		Phylum Bryozoa (Ectoprocta)		2	5							
		Phylum Entoprocta										
		Phylum Brachiopoda			75							
		Phylum Chaetognatha						6				
		Phylum Tardigrada										
	Phylum Nemertea			1		2						
	Phylum Echinodermata					6	46					
	Phylum Hemichordata											
	Phylum Protochordata											
	VERTEBRATA	Phylum Chordata										
		Class Pisces: Fresh water Fishes	180	259	185		58	119	74		83	
		Class Pisces: Marine and Estuarine Fishes	600				296	487				
Class Amphibia		23	76	70	14	28	18	14		44	14	
Class Reptilia		103	108	116	77	100	89	38			68	
Class Aves		527	539	950	465	458	452	509		447	358	
Class Mammalia		108	154	193	95	83	101	57		77	73	
<b>TOTAL FAUNAL SPECIES</b>	<b>4447</b>	<b>5629</b>	<b>5740</b>	<b>721</b>	<b>1826</b>	<b>2252</b>	<b>2455</b>	<b>5606</b>	<b>671</b>			
FLORA	Virus/Bacteria					200(V),2000(B)						
	Algae	50		252		146	1933					
	Fungi	300		213		3500	164					
	Lichens	126		300								
	Bryophytes	100		127			8					
	Pteridophytes	72		221		27	16			168		
	Gymnosperms	3	33	7		1	1			19		
	Angiosperms	3000	3010	3010	2963	1600	2106	1227	3380	4252		
<b>TOTAL FLORAL SPECIES</b>	<b>3651</b>	<b>3043</b>	<b>4130</b>	<b>2963</b>	<b>5274</b>	<b>4228</b>	<b>1227</b>	<b>3380</b>	<b>4439</b>			
<b>GRAND TOTAL (FLORA + FAUNA)</b>	<b>8098</b>	<b>8672</b>	<b>9870</b>	<b>3684</b>	<b>7100</b>	<b>6480</b>	<b>3682</b>	<b>8986</b>	<b>5110</b>			

Note: 1. Blank may not be treated as Nil. 2. Jharkhand is included in Bihar and Chhattisgarh data is included in Madhya Pradesh.

Source: Refer Annexure 5.1a

Taxonomic diversity in the States											
Category	Taxonomic group	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Manipur	Meghalaya	Mizoram	Nagaland	Odisha	
FAUNA	<b>Protista</b>										
	Phylum Protozoa		25		526	86	128		59	152	
	<b>Animalia</b>										
	INVERTEBRATA	Phylum Mesozoa									
		Phylum Porifera	12			22					5
		Phylum Cnidaria						3			2
		Phylum Ctenophora									
		Phylum Platyhelminthes						91	14		19
		Phylum Rotifera						111			69
		Phylum Gastrotricha									
		Phylum Kinorhyncha									
		Phylum Nematoda		57		81	34	76	102		28
		Phylum Acanthocephala						18			
		Phylum Sipuncula									
		Phylum Mollusca	29		72	737	127	223	65	21	378
		Phylum Echiura									
		Phylum Annelida	39	141		16		52			71
		Phylum Onychophora									
		Phylum Arthropoda	1442	4525	1272	3523	1766	3092	692	1433	987
		Phylum Phoronida									
		Phylum Bryozoa (Ectoprocta)									
		Phylum Entoprocta									
		Phylum Brachiopoda									
		Phylum Chaetognatha									
		Phylum Tardigrada									
		Phylum Nemertea									
	Phylum Echinodermata										
	Phylum Hemichordata										
	Phylum Protochordata										
	VERTEBRATA	Phylum Chordata									
		Class Pisces: Fresh water Fishes	213	229	172	215	141	152	89	108	186
		Class Pisces: Marine and Estuarine Fishes	570	855		653					722
Class Amphibia		88	175	35	53	14	33	13	10	29	
Class Reptilia		126	190	69	117	9	94	71	62	138	
Class Aves		536	521	449	556	586	541	370	428	524	
Class Mammalia		137	132	170	129	69	139	84	92	103	
<b>TOTAL FAUNAL SPECIES</b>	<b>3192</b>	<b>6850</b>	<b>2239</b>	<b>6628</b>	<b>2832</b>	<b>4753</b>	<b>1500</b>	<b>2213</b>	<b>3413</b>		
FLORA	Virus/Bacteria										
	Algae	1761								934	
	Fungi	1255								700	
	Lichens	527								276	
	Bryophytes	267	465							300	
	Pteridophytes	173	337				496	211	397	176	
	Gymnosperms	26	5				29	6	6	22*	
	Angiosperms	4827	4606	2317	3455	2376	4411	2141	1960	2630	
<b>TOTAL FLORAL SPECIES</b>	<b>8836</b>	<b>5413</b>	<b>2317</b>	<b>3455</b>	<b>2376</b>	<b>4936</b>	<b>2358</b>	<b>2363</b>	<b>5016</b>		
<b>GRAND TOTAL (FLORA + FAUNA)</b>	<b>12028</b>	<b>12263</b>	<b>4556</b>	<b>10083</b>	<b>5208</b>	<b>9689</b>	<b>3858</b>	<b>4576</b>	<b>8429</b>		

Note:1. Blank may not be treated as Nil. 2. Jharkhand is included in |  
Source: Refer Annexure 5.1a

Taxonomic diversity in the States				
Category	Taxonomic group	Punjab	Rajasthan	
FAUNA	<b>Protista</b>			
	Phylum Protozoa			
	<b>Animalia</b>			
	INVERTEBRATA	Phylum Mesozoa		
		Phylum Porifera		
		Phylum Cnidaria		
		Phylum Ctenophora		
		Phylum Platyhelminthes	12	
		Phylum Rotifera		
		Phylum Gastrotricha		
		Phylum Kinorhyncha		
		Phylum Nematoda	143	
		Phylum Acanthocephala		
		Phylum Sipuncula		
		Phylum Mollusca	36	
		Phylum Echiura		
		Phylum Annelida	59	
		Phylum Onychophora		
		Phylum Arthropoda	2384	
		Phylum Phoronida		
		Phylum Bryozoa (Ectoprocta)		
		Phylum Entoprocta		
		Phylum Brachiopoda		
		Phylum Chaetognatha		
		Phylum Tardigrada		
		Phylum Nemertea		
	Phylum Echinodermata			
	Phylum Hemichordata			
	Phylum Protochordata			
	VERTEBRATA	Phylum Chordata		
		Class Pisces: Fresh water Fishes	88	114
		Class Pisces: Marine and Estuarine Fishes		
Class Amphibia		8	14	
Class Reptilia		33	67	
Class Aves		547	510	
	Class Mammalia	46	87	
<b>TOTAL FAUNAL SPECIES</b>		<b>3356</b>	<b>792</b>	
FLORA	Virus/Bacteria			
	Algae			
	Fungi			
	Lichens			
	Bryophytes			
	Pteridophytes	16		
	Gymnosperms	20	1	
	Angiosperms	1886	1910	
<b>TOTAL FLORAL SPECIES</b>		<b>1922</b>	<b>1911</b>	
<b>GRAND TOTAL (FLORA + FAUNA)</b>		<b>5278</b>	<b>2703</b>	

Note: 1. Blank may not be treated as Nil. 2. Jharkhand is included in |  
Source: Refer Annexure 5.1a

Taxonomic diversity in the States									
Category	Taxonomic group	Sikkim	Tamil Nadu	Telangana	Tripura	Uttar Pradesh	Uttarakhand	West Bengal	
FAUNA	<b>Protista</b>								
	Phylum Protozoa	80			102	41	35	1136	
	<b>Animalia</b>								
	INVERTEBRATA	Phylum Mesozoa							
		Phylum Porifera		67					16
		Phylum Cnidaria							23
		Phylum Ctenophora							2
		Phylum Platyhelminthes		38		36		84	248
		Phylum Rotifera		158		112			147
		Phylum Gastrotricha							24
		Phylum Kinorhyncha							5
		Phylum Nematoda	42	80		115	140	196	306
		Phylum Acanthocephala	18			17			15
		Phylum Sipuncula							3
		Phylum Mollusca	89	32	480	48	47		247
		Phylum Echiura							3
		Phylum Annelida	26	100	163	24		77	194
		Phylum Onychophora							
		Phylum Arthropoda	3814	2708	1337	1386	1460	2264	6785
		Phylum Phoronida							1
		Phylum Bryozoa (Ectoprocta)							9
		Phylum Entoprocta							
		Phylum Brachiopoda							1
		Phylum Chaetognatha							
		Phylum Tardigrada							
		Phylum Nemertea							
	Phylum Echinodermata								
	Phylum Hemichordata							22	
	Phylum Protochordata								
	VERTEBRATA	Phylum Chordata							
		Class Pisces: Fresh water Fishes	50	160	180	129	152	132	207
		Class Pisces: Marine and Estuarine Fishes		789					403
Class Amphibia		50	77	22	11	25	20	39	
Class Reptilia		88	187	103	32	77	72	148	
Class Aves		579	493	486	259	358	743	846	
Class Mammalia		169	134	108	44	87	93	188	
<b>TOTAL FAUNAL SPECIES</b>	<b>5005</b>	<b>5023</b>	<b>2879</b>	<b>2315</b>	<b>2387</b>	<b>3716</b>	<b>11018</b>		
FLORA	Virus/Bacteria	500						NA/96	
	Algae	50	1263			301		865	
	Fungi	200	1077			935		860	
	Lichens	506	555			135		600	
	Bryophytes	743	712			72		550	
	Pteridophytes	362	275		72	41		450	
	Gymnosperms	24	4		13	6	19	21	
	Angiosperms	4500	5547	2800	1573	1442	4781	3580	
<b>TOTAL FLORAL SPECIES</b>	<b>6885</b>	<b>9433</b>	<b>2800</b>	<b>1658</b>	<b>2932</b>	<b>4800</b>	<b>7022</b>		
<b>GRAND TOTAL (FLORA + FAUNA)</b>	<b>11890</b>	<b>14456</b>	<b>5679</b>	<b>3973</b>	<b>5319</b>	<b>8516</b>	<b>18040</b>		

Note: 1. Blank may not be treated as Nil. 2. Jharkhand is included in  
Source: Refer Annexure 5.1a



Taxonomic diversity in the States									
Category	Taxonomic group	Andaman & Nicobar Islands	Chandigarh	Dadra & Nagar Haveli	Daman & Diu	Delhi	Lakshadweep		
FAUNA	<b>Protista</b>								
	Phylum Protozoa					44			
	<b>Animalia</b>								
	INVERTEBRATA	Phylum Mesozoa							
		Phylum Porifera							
		Phylum Cnidaria							
		Phylum Ctenophora							
		Phylum Platyhelminthes							
		Phylum Rotifera							
		Phylum Gastrotricha						15	
		Phylum Kinorhyncha							
		Phylum Nematoda					57	42	
		Phylum Acanthocephala							
		Phylum Sipuncula							
		Phylum Mollusca					23	424	
		Phylum Echiura							
		Phylum Annelida						127	
		Phylum Onychophora							
		Phylum Arthropoda	757					927	85
		Phylum Phoronida							
		Phylum Bryozoa (Ectoprocta)							
		Phylum Entoprocta							
		Phylum Brachiopoda							
		Phylum Chaetognatha							
		Phylum Tardigrada							
	Phylum Nemertea								
	Phylum Echinodermata							92	
	Phylum Hemichordata								
	Phylum Protochordata								
	VERTEBRATA	Phylum Chordata							
		Class Pisces: Fresh water Fishes					87		
		Class Pisces: Marine and Estuarine Fishes							
Class Amphibia						7			
Class Reptilia						25			
Class Aves						434			
Class Mammalia						32			
<b>TOTAL FAUNAL SPECIES</b>		<b>757</b>				<b>1636</b>	<b>785</b>		
FLORA	Virus/Bacteria								
	Algae	182							
	Fungi								
	Lichens	383							
	Bryophytes	63							
	Pteridophytes	139			3				
	Gymnosperms	9					2		
	Angiosperms	2440	574	407	404	962			
<b>TOTAL FLORAL SPECIES</b>		<b>3216</b>	<b>574</b>	<b>410</b>	<b>404</b>	<b>964</b>			
<b>GRAND TOTAL (FLORA + FAUNA)</b>		<b>3973</b>	<b>574</b>	<b>410</b>	<b>404</b>	<b>2600</b>	<b>785</b>		

Note:1. Blank may not be treated as Nil. 2. Jharkhand is included in  
Source: Refer Annexure 5.1a

Data Sources of Annexure 5.1

Data Source	Data Source for Fauna	Data Source for Flora
Andhra Pradesh	State fauna series Vol 5, Zoological Survey of India	Rao, B. R. P., Reddy, M. S., & Pullaiah, T. (2008). FLORA AND VEGETATION OF ANDHRA PRADESH. New Delhi Akademy of Sciences, 12, 1-13.
Arunachal Pradesh	State fauna series Vol 13, Zoological Survey of India	Assam, H.J Chowdhery, Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Assam	Status of Environment and Related Issues, ENVIS Centre: Assam	Assam, A.K. Baishya, Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Bihar	State fauna series Vol 11, Zoological Survey of India	Chapter 2; M. Das, R. P. Bhattacharya, V. Mudgal. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Goa	State fauna series Vol 16, Zoological Survey of India	N. P. Singh & M. J Kothari. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Gujarat	State fauna series Vol 8 Zoological Survey of India	Sharma, Diwakar & Gavali, Deepa & Shah, J. (2002). Plant Species Diversity in Gujarat. The Botanica. 52.
Haryana	State fauna series Vol 24, Zoological Survey of India	Source: S. Kumar. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Himachal Pradesh	Biodiversity Status and Initiatives in Himachal Pradesh, Himachal Pradesh State Biodiversity Board	Source: H. J. Choudhery. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Jammu & Kashmir	Biodiversity, Status of Environment & Related Issues, ENVIS Centre: J&K	Source: D.K. Singh, B. P. Uniyal & R. Mathur. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Karnataka	State fauna series Vol 21, Zoological Survey of India	N.P. Singh, P. V. Prasanna & B. G. Kulkarni. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Kerala	State fauna series Vol 1 to 24, Zoological Survey of India	M. Mohanan & V. J. Nair. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Madhya Pradesh	State fauna series Vol 15, Zoological Survey of India	D.M. Verma & V. Mudgal. Floristic Diversity and Conservation Strategies in India, P. Editors V. Mudgal & P.K. Hajra. 1999.
Maharashtra	State fauna series Vol 20, Zoological Survey of India	P.Lakshminarasimhan & W. Arisdason 2016. Plant diversity of Maharashtra State-An Overview Web publish ENVIS Center on Floral Diversity BSI Howrah
Manipur	State fauna series Vol 10, Zoological Survey of India	A.S. Chauhan. Floristic Diversity and Conservation Strategies in India. 1999. Vol.3 pp1153-1182 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Meghalaya	State fauna series Vol 4, Zoological Survey of India	A.A.Mao et al 2016. Check-list of Flora of Meghalaya. Meghalaya Biodiversity Board, Shillong.*K. Haridasan. 1999. Floristic Diversity and Conservation Strategies in India, Vol. 3.pp.1183-1216 Editors V. Mudgal & P.K. Hajra.
Mizoram	State fauna series Vol 14, Zoological Survey of India	K.P. Singh. Floristic Diversity and Conservation Strategies in India. V. Mudgal & P.K. Hajra (eds). Vol.3.1999
Nagaland	State fauna series Vol 12, Zoological Survey of India	T. M. Hynniewta. Floristic Diversity and Conservation Strategies in India. V. Mudgal & P.K. Hajra (eds). Vol.3.1999
Odisha	State fauna series Vol 1, Zoological Survey of India	A.K. Sahoo, D. D. Bahali & H. S. Mohapatra. Floristic Diversity and Conservation Strategies in India. V. Mudgal & P.K. Hajra (eds). Vol.3.1999
Punjab	State fauna series Vol 22, Zoological Survey of India	Source: Paramjit Singh. Floristic Diversity and Conservation Strategies in India. V. Mudgal & P.K. Hajra (eds). Vol.3.1999
Rajasthan	Biodiversity of Rajasthan, Rajasthan State Biodiversity Board	Source: V. Singh & R.P. Pandey. Floristic Diversity and Conservation Strategies in India. 1999. Vol.3 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Sikkim	State fauna series Vol 9, Zoological Survey of India	Source: Paramjit Singh & A.S. Chauhan. Floristic Diversity and Conservation Strategies in India, P. Editors V. Mudgal & P.K. Hajra. 1999.
Tamil Nadu	State fauna series Vol 17, Zoological Survey of India	Source: W. Arisdason & P. Lakshminarasimhan 2016. Diversity of Fungi, Lichen, Algae, nonflowering and flowering plants of Tamil Nadu State- An overview. Web publish. ENVIS Center on Floral Diversity, BSI, Howrah.
Telangana	Telangana State Biodiversity Profile, Telangana State biodiversity Board	<a href="http://www.tsbiodiversity.org/biodiversityprofile.html">http://www.tsbiodiversity.org/biodiversityprofile.html</a>
Tripura	State fauna series Vol 7, Zoological Survey of India	Source: A checklist of Plants of Tripura. Web. ENVIS center on Floral Diversity. Accessed on 14.08.2020
Uttar Pradesh	State fauna series Vol 22, Zoological Survey of India	Source: B.P. Uniyal, K.K. Khanna & Bipin Balodi. Floristic Diversity and Conservation Strategies in India. V. Mudgal & P.K. Hajra (eds). Vol.2.1999.
Uttarakhand	State fauna series Vol 18, Zoological Survey of India	Source: P.K. Pusalkar & S.K. Singh 2018. Flora of Uttarakhand Vol.I BSI, Kolkata

Data Sources of Annexure 5.1

Data Source	Data Source for Fauna	Data Source for Flora
West Bengal	State fauna series Vol 3, Zoological Survey of India	T.K. Paul 2016. An outline of Plant diversity in West Bengal Web publish ENVIS Center on Floral Diversity, BSI Howrah
Andaman & Nicobar Islands	State fauna series Vol 19, Zoological Survey of India	W. Arisdason & P. Lakshminarasimhan 2016. An outline of Plant diversity in the Andaman & Nicobar Islands. ENVIS Centre on Floral Diversity, BSI. Howrah
Chandigarh		Bipin Balodi, J. R. Sharma, B.P. Uniyal. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Dadra & Nagar Haveli		N. P. Singh & P. P. Sharma. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Daman & Diu		N. P. Singh, P. P. Sharma & P. G. Diwakar. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Delhi	State fauna series Vol 6, Zoological Survey of India	B. D. Naithani & B. P. Uniyal. Floristic Diversity and Conservation Strategies in India. 1999. Vol.2 V. Mudgal & P.K. Hajra(eds.) BSI, Kolkata
Lakshadweep	State fauna series Vol 2, Zoological Survey of India	

## State-wise number of Protected Areas

State	Geographical Area	Terrestrial Protected Areas									Marine Protected Areas					Percentage of the State's geographic area under Terrestrial Protection Area		
		No. of National Parks	Area under National Parks (km2)	No. of Wild life Sanctuaries	Area under Wildlife Sanctuaries (km2)	No. of Community Reserves	Area under Community Reserves (km2)	No. of Conservation Reserves	Area under Conservation Reserves (km2)	No. of Protected Areas	Total Area under Protected Area (km2)	No. of National Parks	Area under National Parks (km2)	No. of Sanctuaries	Area under Sanctuaries (km2)		No. of Community /conservation Reserves	Area under Community /Conservation Reserves (km2)
Andhra Pradesh	160,229	3	1,368.88	13	5,942.23					16	7,311.11			3	930.51			4.56
Arunachal Pradesh	83,743	2	2,290.82	11	7,487.75					13	9,778.57							11.68
Assam	78,438	5	1,977.79	18	1,840.14					23	3,817.93							4.87
Bihar	94,163	1	335.65	12	2,901.67					13	3,237.32							3.44
Chhattisgarh	135,191	3	2,899.08	11	3,760.29					14	6,659.37							4.93
Delhi	1,483	0	0.00	1	27.82					1	27.82							1.88
Goa	3,702	1	107.00	6	647.91					7	754.91			1	1.78			20.39
Gujarat	196,022	4	480.12	23	16,618.42			1	227	28	17,325.54	1.00	162.89	2	301.08			8.84
Haryana	44,212	2	48.25	8	233.21					2	48.72							0.75
Himachal Pradesh	55,673	5	2,271.28	28	6,116.10					3	19.17							15.10
Jammu & Kashmir	163,090	3	575.00	13	1,243.11					30	680.75							1.53
Jharkhand	79,714	1	226.33	11	1,955.82													2.74
Karnataka	191,791	5	2,795.76	31	7,517.69	1	3.12			13	151.02							5.46
Kerala	38,863	6	558.16	17	1,928.24	1	1.5											6.40
Madhya Pradesh	308,245	10	3,657.26	25	7,158.41													3.51
Maharashtra	307,713	6	1,273.60	48	7,592.31					6	460.52			2	46.03			3.03
Manipur	22,327	1	40.00	2	184.81													1.01
Meghalaya	22,429	2	267.48	4	94.10	65	136.97											2.22
Mizoram	21,081	2	150.00	9	1,184.75													6.33
Nagaland	16,579	1	202.02	3	20.34	93	662.73											5.34
Odisha	155,707	2	990.70	19	7,094.65													5.19
Punjab	50,362	0	0.00	13	326.60	3	29.02			4	25.71							0.76
Rajasthan	342,239	5	3,947.07	25	5,592.38					11	463.06							2.92
Sikkim	7,096	1	1,784.00	7	399.10													30.77
Tamil Nadu	130,058	5	307.85	29	6,157.12					2	4.88			1.00	6.23	2	326.27	4.97
Telangana	114,840	3	19.62	9	5,675.91													4.96
Tripura	10,486	2	36.71	4	566.93													5.76
Uttar Pradesh	240,928	1	490.00	26	5,829.20													2.62
Uttarakhand	53,483	6	4,915.02	7	2,690.12					4	212.45							14.62
West Bengal	88,752	6	1,981.65	16	1,456.21					5	1415.91			1	1,330.10	4.00	2,691.52	5.47
Andaman And Nicobar Island	8,249	6	1,216.95	96	389.39													19.47
Chandigarh	114	0	0.00	2	26.01													22.82
Dadra And Nagar Haveli	491	0	0.00	1	92.16													18.77
Daman & Diu	112	0	0.00	1	2.19									1	2.18			1.96
Ladakh	59,146	1	3,350.00	2	9,000.00					4	149							21.13
Lakshadweep	32	0	0.00	1	0					3	270.05				1	0.01	3.00	843.94
Puducherry	480	0	0.00	1	3.90													0.81
<b>Total</b>	<b>3,287,263</b>	<b>101</b>	<b>40,564</b>	<b>553</b>	<b>119,757</b>	<b>163</b>	<b>833</b>	<b>89</b>	<b>4,128</b>	<b>906</b>	<b>165,283</b>	<b>13</b>	<b>2,798</b>	<b>116</b>	<b>6,909</b>	<b>4</b>	<b>272</b>	

Source/ स्रोत: 1. Wildlife Institute of India and K Sivakumar, Coastal and Marine Biodiversity Protected Areas in India: Challenges and Way Forward, K. Venkataraman et al. (eds.), Ecology and Conservation of Tropical Marine Faunal Communities, Springer-Verlag Berlin Heidelberg 2013.

2. National Wildlife Database, March, 2020