

## CHAPTER THREE

### BIODIVERSITY



#### 3.1 Biodiversity

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

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

3.1.3. Biodiversity conservation efforts have many facets – scientific surveys, policy reforms, legislative initiatives, international co-operation, public participation etc. National agencies like the Forest Survey of India, Botanical Survey of India, Zoological Survey of India carry out extensive studies continuously to assess the extent of diversity and the change trends across habitats, flora and fauna. The country has enacted a number of legislations which have direct impact on biodiversity conservation efforts like the Indian Forest Act 1927, the Wildlife Protection Act 1972, the Forest (Conservation) Act 1980, the Environmental Protection Act 1986 and The Biological Diversity Act 2002 being the most important among them. By amending the Constitution, protection of forests and wildlife has been made one of the Fundamental Duties. Because of being incorporated in the Concurrent List, Forests and Wildlife has been accorded a national perspective in policy making and legislation. India is signatory and zealous participant in international efforts of biodiversity conservation like the Convention on International Trade in Endangered Species (CITES), the Convention on Biodiversity (CBD) and the country has evolved a National Action Plan for Combating Climate Change.

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

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

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

Table 3.1.1. India's Major Biogeographic Zones				
Sl. No.	Name	Biotic Province	Total Area (sq.km)	%
1	Trans Himalaya		174225	
		Ladakh	98618	3.3
		Tibetan Plateau	75607	2.3
2	Himalaya		210385	
		North-Western	69033	2.1
		Western	52596	1.6
		Central	6575	0.2
		Eastern	82182	2.5
3	Desert		213672	
		Kachchh	36160	1.1
		Thar	177512	5.4
4	Semi-Arid		545686	
		Central India	121629	3.7
		Gujarat-Rajputana	424057	12.9
5	Western Ghats		131491	
		Malabar coast	65745	2.0
		Western Ghat Mountains	65745	2.0
6	Deccan Peninsula		1377363	
		Deccan South Plateau	341875	10.4
		Deccan Central Plateau	410908	12.5
		Eastern Plateau	207098	6.3
		Chhota Nagpur	177512	5.4
		Central Highlands	239970	7.3
7	Gangetic Plain		355024	
		Upper Gangetic	207098	6.3
		Lower Gangetic	147927	4.5
8	Coasts		82182	
		East Coast	62458	1.9
		West Coast	19724	0.6
9	North East		170938	
		Brahmaputra Valley	65745	2.0
		North-Eastern Hills	105192	3.2
10	Island		12971	
		Andaman Islands	6575	0.2
		Nicobar Islands	3287	0.1
		Lakshadweep Islands	3110	0.1
	Marine Influenced Area:		10440	0.3
	<b>Grand Total</b>		<b>3284378</b>	

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

### 3.2 Plant and animal Biodiversity

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

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

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

Table 3.2.1 : Number and status of plant species in India											
Sl. No.	Type	No. of Known Species in the World		No. of Known Species in India		Percentage of Occurrence in India		No. of Endemic Species		No. of Threatened Species	
		2013	2014	2013	2014	2013	2014	2013	2014	2013	2014
1	2	3	4	5	6	7	8	9	10	11	12
I	<b>Flowering Plants</b>										
1	Gymnosperms	1021	1021	74	75	7.25	7.35	8	8	7	7
2	Angiosperms	268600	268600	17926	18043	6.67	6.72	ca. 4045	ca. 4036	1700	1700
II	<b>Non-flowering Plants</b>										
1	Bryophytes	16236	16236	2504	2523	15.42	15.54	629	629	ca.80	ca.80
2	Pteridophytes	12000	12000	1265	1268	10.54	10.57	47	47	414	414
III	<b>Others</b>										
1	Virus & Bacteria	11813	11813	986	1036	8.35	8.77	Not Known	Not Known	Not Known	Not Known
2	Algae	40000	40000	7244	7284	18.11	18.21	1924	1924	Not Known	Not Known
3	Fungi	98998	98998	14756	14883	14.91	15.03	ca.4100	ca.4100	ca.580	ca.580
4	Lichens	17000	17000	2390	2401	14.06	14.12	ca.520	ca.520	Not Known	Not Known

Source : Botanical Survey of India, Kolkata.

Note: World figures are based on the Second edition of the "Numbers of Living Species in Australia and the World" (Chapman, 2009); data on the number of species in India are taken from 'Plant Discoveries 2013- New Genera, Species and New Records' compiled and edited by Paramjit Singh, D.K. Singh and S.S. Dash, published by Botanical Survey of India in 2014.

**Table 3.2.2 : Threatened vascular plants**

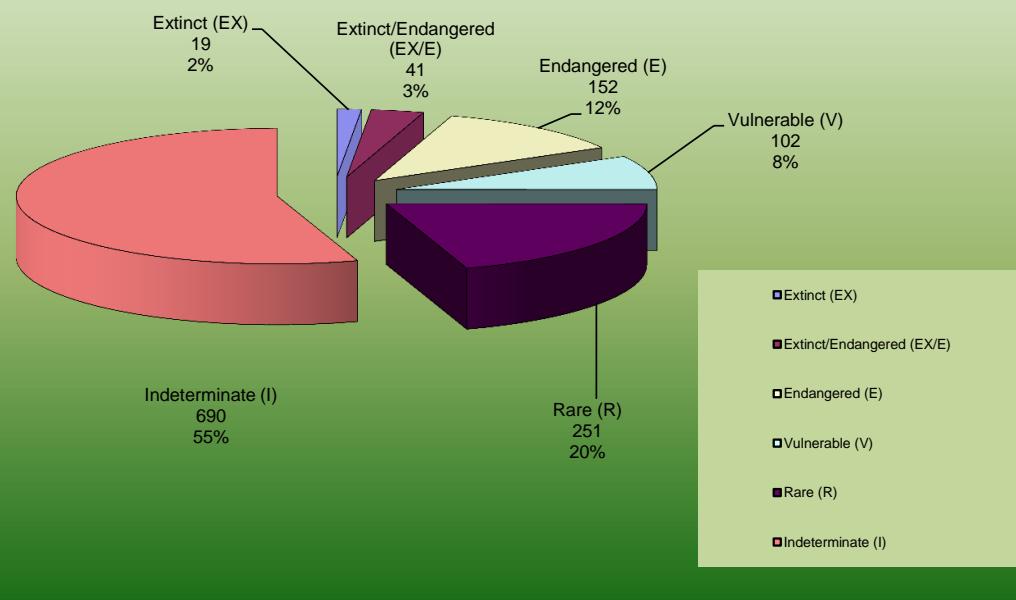
Status	Global	India
Extinct (EX)	380	19
Extinct/Endangered (EX/E)	371	41
Endangered (E)	6522	152
Vulnerable (V)	7951	102
Rare (R)	14505	251
Indeterminate (I)	4070	690
<b>Total under threat</b>	<b>33779</b>	<b>1255</b>
<b>Total number of species</b>	<b>242013</b>	<b>16000</b>
<b>Percentage under threat</b>	<b>13.8</b>	<b>7.7</b>

Source : Botanical Survey of India, Kolkata.

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

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

**Chart 3.2.2 : Category wise threat status of vascular plants in India**



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

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

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

CLASS*	EX	EW	CR	EN	VU	LR/ cd	NT	DD	LC	Total
ANTHOCEROTPSIDA	0	0	0	2	0	0	0	0	0	2
BRYOPSIDA	2	0	12	13	7	0	1	3	3	41
CHAROOHYACEAE	0	0	0	0	0	0	0	3	8	11
CHLOROPHYCEAE	0	0	0	0	0	0	0	1	0	1
CYCADOPSIDA	0	4	53	65	74	0	63	3	45	307
EQUISETOPSIDA	0	0	0	0	0	0	0	0	5	5
FLORIDEOPHYCEAE	1	0	6	0	3	0	0	44	4	58
GINKGOOPSIDA	0	0	0	1	0	0	0	0	0	1
GNETOPSIDA	0	0	0	1	3	0	7	10	76	97
ISOETOPSIDA	0	0	8	4	2	0	3	6	5	28
JUNGERMANNIOPSIDA	1	0	10	11	12	0	1	0	10	45
LILIOPSIDA	3	4	394	592	600	16	253	428	1693	3983
LYCOPODIOPSIDA	0	0	1	2	9	0	3	0	5	20
MAGNOLIOPSIDA	93	28	1789	2662	4514	193	1177	1050	3717	15223
MARATTIOPSIDA	0	0	1	0	0	0	0	0	0	1
MARCHANTIOPSIDA	0	0	1	3	2	0	0	4	1	11
PINOPSIDA	0	0	28	96	79	0	98	7	298	606
POLYPODIOPSIDA	2	1	44	58	68	0	16	50	69	308
PSILOTOPSIDA	0	0	0	0	0	0	0	0	3	3
SPHAGNOPSIDA	0	0	0	0	2	0	0	0	0	2
TAKAKIOPSIDA	0	0	0	0	1	0	0	0	0	1
ULVOPHYCEAE	0	0	0	0	0	0	0	1	0	1
<b>TOTAL</b>	<b>102</b>	<b>37</b>	<b>2347</b>	<b>3510</b>	<b>5376</b>	<b>209</b>	<b>1622</b>	<b>1610</b>	<b>5942</b>	<b>20755</b>

Source : IUCN Website

\*Plants: Anthocerotopsida (hornworts); Bryopsida, Sphagnopsida and Takakiopsida (true mosses); Charophyaceae, Chlorophyceae and Sellaginellopsida (spike mosses).

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

**EX** - Extinct

**EW** - Extinct in the Wild

**CR** - Critically Endangered

**EN** - Endangered

**VU** - Vulnerable

**LR/cd** - Lower Risk/conservation dependent

**NT** - Near Threatened

**DD** - Data Deficient

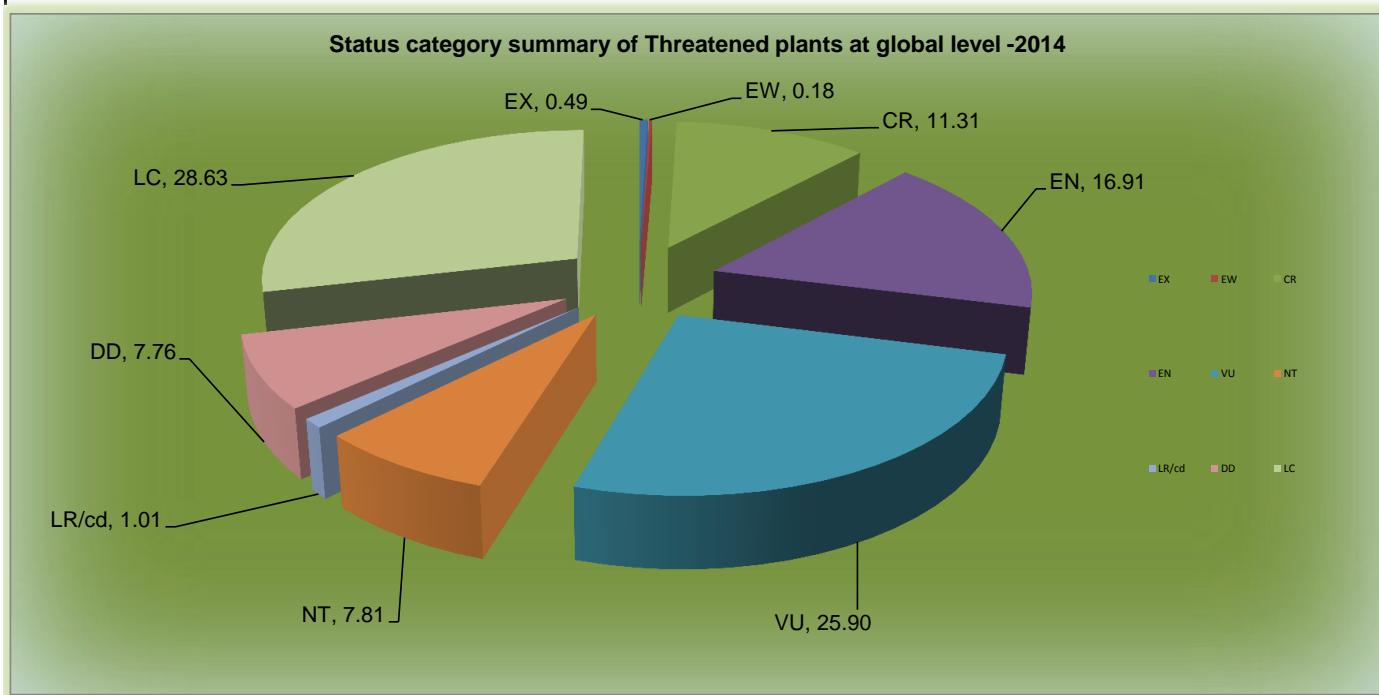
**LC** - Least Concern (includes **LR/lc** - Lower Risk, Least Concern).

**Table 3.2.4 : Status category summary at global level (plants)**

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

Source : IUCN

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



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

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

Source :Zoological Survey of India-2014

**Table 3.2.6 : Estimated number of described fauna from India**

Taxonomic group	No. of species		% in India
	World	India	
<b>PROTISTA (Protozoa)</b>	<b>31259</b>	<b>3509</b>	<b>11.23</b>
<b>ANIMALIA</b>			
Mesozoa	71	10	14.08
Porifera	5000	500	10.00
Cnidaria	10107	1052	10.41
Ctenophora	100	12	12.00
Platyhelminthes	17513	1653	9.44
Rotifera	2044	370	18.10
Gastrotricha	3000	100	3.33
Kinorhyncha	100	10	10.00
Nematoda	30034	2911	9.69
Acanthocephala	800	229	28.63
Sipuncula	145	35	24.14
Mollusca	66535	5178	7.78
Echiura	127	43	33.86
Annelida	17002	1002	5.89
Onychophora	100	1	1.00
<b>Arthropoda</b>	<b>1169866</b>	<b>73439</b>	<b>6.28</b>
Crustacea	60003	3565	5.94
Insecta	1020169	63706	6.24
Arachnida	73470	5882	8.01
Pycnogonida	600	17	2.83
Chilopoda	8000	101	1.26
Diplopoda	7500	162	2.16
Sympyla	120	4	3.33
Merostomata	4	2	50.00
Phoronida	11	3	27.27
Bryozoa (Ectoprocta)	4000	200	5.00
Entoprocta	60	10	16.67
Brachiopoda	300	4	1.33
Chaetognatha	111	30	27.03
Tardigrada	514	30	5.84
Echinodermata	6600	779	11.80
Hemichordata	120	12	10.00
Chordata	<b>64669</b>	<b>5665</b>	<b>8.76</b>
Suphylum Cephalochordata	33	6	18.18
Tunicata	2073	113	5.45
Vertebrata	62563	5546	8.86
Pisces	32156	3092	9.62
Amphibia	6776	371	5.48
Reptilia	9232	530	5.74
Aves	9026	1234	13.67
Mammalia	5416	423	7.81
<b>Total (Animalia)</b>	<b>1398972</b>	<b>93382</b>	<b>6.68</b>
<b>Grand (Protista+ Animalia)</b>	<b>1430231</b>	<b>96891</b>	<b>6.77</b>

Source: Zoological Survey of India.

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

**Table 3.2.7 : Recent addition in the list of threatened/ endangered species**

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

**1 Schedule 1  
PART I**

**MAMMALS**

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

**PART IIA**

**\*\*FISHES**

2. Shark and Ray
  - (i) *Anoxypristis cuspidata*
  - (ii) *Carcharhinus hemiodon*
  - (iii) *Glyptius gangeticus*
  - (iv) *Glyptius glyptius*
  - (v) *Himantura fluviatilis*
  - (vi) *Pristis microdon*
  - (vii) *Pristis zijsron*
  - (viii) *Rhychobatus djiddensis*
  - (ix) *Urogymnus asperimus*

**PART III**

**BIRDS**

\*19. Swiftlets (*Collocalia unicolor* and *Collacalia fusiphaga*)

**Part IV B- \*\*Mollusca**

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

**Schedule II**

**PART II**

\*16. Mongooses (All species of genus *Herpestes*)

**2 Schedule IV**

\* 6- A. Small Game - Omitted

**19. \*\*Mollusca**

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

Continued...

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

Concluded.

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

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

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

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

**Table 3.2.8 : Rare and threatened species (vertebrates)**

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

Source : Zoological Survey of India-2014



**Table 3.2.9 : Definitions -rare and threatened species**

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

**Extinct (EX)**

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

**Extinct in the Wild (EW)**

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

**Critically Endangered (CR)**

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

**Endangered (EN)**

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

**Vulnerable (VU)**

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

**Near Threatened (NT)**

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

**Least Concern (LC)**

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

**Data Deficient (DD)**

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

**Not Evaluated (NE)**

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

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

### 3.3 Forests, Trees and Mangroves

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

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

3.3.3 It is evident from Table 3.3.2 that the total forest cover of the country is only 21.35% of the total geographic area and as much as 77.4% is classified non forest. Area wise, Madhya Pradesh has the largest forest cover (Table 3.3.3) where as in terms of percentage of forest cover with respect to total geographical area, Mizoram with 88.93% has highest forest cover.

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

(Sq.km)

Sl. No.	State/UT	Geographic Area	Recorded Forest Area			Total Forest Area	Percentage of Forest to Geo. Area
			Reserved Forests	Protected Forests	Unclassed Forests		
1	2	3	4	5	6	7	8
1	Andhra Pradesh	160204	31959	5069	230	37258	23.26
2	Arunachal Pradesh	83743	10589	9779	31039	51407	61.39
3	Assam	78438	17864	0	8968	26832	34.21
4	Bihar	94163	693	5779	1	6473	6.87
5	Chhattisgarh	135191	25782	24036	9954	59772	44.21
6	Delhi	1483	78	24	0	102	6.88
7	Goa	3702	253	0	972	1225	33.09
8	Gujarat	196022	14373	2886	4388	21647	11.04
9	Haryana	44212	249	1158	152	1559	3.53
10	Himachal Pradesh	55673	1898	33130	2005	37033	66.52
11	Jammu & Kashmir	222236	17643	2551	36	20230	9.10
12	Jharkhand	79714	4387	19185	33	23605	29.61
13	Karnataka	191791	28690	3931	5663	38284	19.96
14	Kerala*	38863	11309	0	0	11309	29.10
15	Madhya Pradesh	308245	61886	31098	1705	94689	30.72
16	Maharashtra	307713	49546	6733	5300	61579	20.01
17	Manipur	22327	1467	4171	11780	17418	78.01
18	Meghalaya	22429	1113	12	8371	9496	42.34
19	Mizoram	21081	4483	0	1158	5641	26.76
20	Nagaland	16579	86	508	8628	9222	55.62
21	Odisha	155707	26329	15525	16282	58136	37.34
22	Punjab	50362	44	1137	1903	3084	6.12
23	Rajasthan	342239	12475	18217	2045	32737	9.57
24	Sikkim	7096	5452	389	0	5841	82.31
25	Tamil Nadu	130058	20293	1782	802	22877	17.59
26	Telangana	114865	20353	5939	612	26904	23.42
27	Tripura	10486	4175	2	2117	6294	60.02
28	Uttar Pradesh	240928	12071	1157	3354	16582	6.88
29	Uttarakhand	53483	26547	9885	1568	38000	71.05
30	West Bengal	88752	7054	3772	1053	11879	13.38
<b>Union Territories</b>							
31	A. & N. Islands	8249	5613	1558	0	7171	86.93
32	Chandigarh	114	32	0	3	35	30.70
33	Dadra & Nagar Haveli	491	199	5	0	204	41.55
34	Daman & Diu	112	0	0	8	8	7.14
35	Lakshadweep	32	0	0	0	0	0.00
36	Puducherry	480	0	2	11	13	2.71
<b>Total</b>		<b>3287263</b>	<b>424985</b>	<b>209420</b>	<b>130141</b>	<b>764546</b>	<b>23.26</b>

Source : India State of Forest Report 2015

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

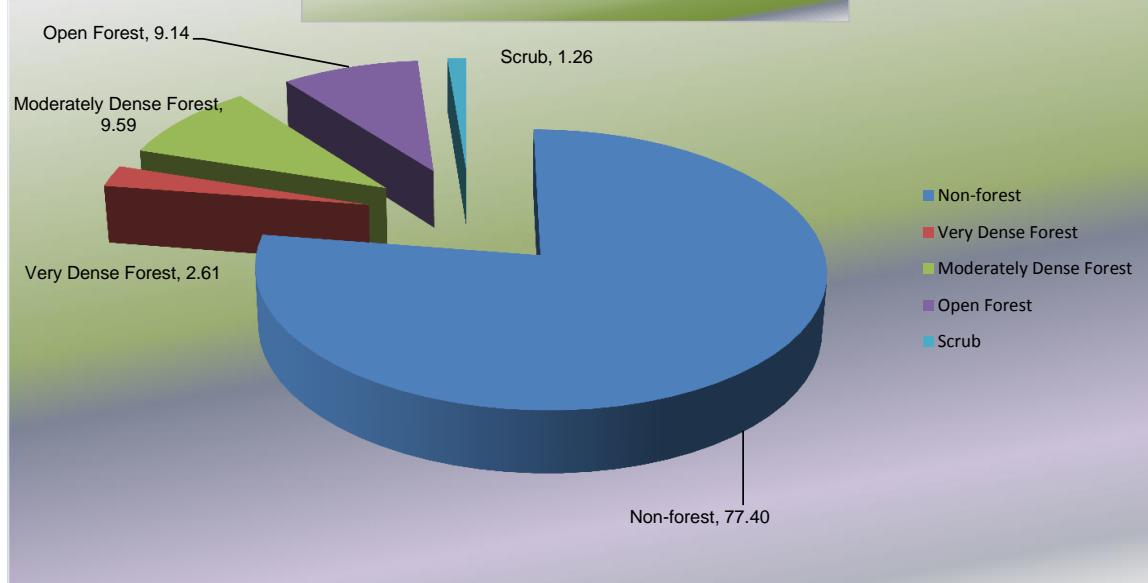
**Table 3.3.2 : Forest cover in India 2015- classwise**

Class	Area ( Sq. Km)	Percentage of Geographic Area
1	2	3
<b>Forest Cover</b>		
Very Dense Forest	85904	2.61
Moderately Dense Forest	315374	9.59
Open Forest	300395	9.14
<b>Total Forest Cover*</b>	<b>701673</b>	<b>21.35</b>
Scrub	41362	1.26
Non-forest	2544228	77.40
<b>Total Geographic Area</b>	<b>3287263</b>	<b>100</b>

Source : India State of Forest Report 2015

\* Includes 4740 Sq km area under mangroves

**Chart 3.3.2 : Forest cover of India-2015**



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

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

Source:India State of Forest Report 2015

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

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

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

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

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

Source:India State of Forest Report, 2015

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

Table 3.3.5: State/UT wise forest cover in tribal districts								
Sl. No.	State/UT	Number of Tribal Districts	Geographic Area (GA)	Forest Cover				Percentage of Geographic Area
				Very Dense Forest	Moderately Dense Forest	Open Forest	Total	
1	2	3	4	5	6	7	8	9
1	Andhra Pradesh	5	42086	89	5353	3822	9264	22.01
2	Arunachal Pradesh	13	83743	20804	31301	15143	67248	80.30
3	Assam	16	50137	647	4532	6746	11925	23.78
4	Chhattisgarh	9	92656	3605	24422	11964	39991	43.16
5	Gujarat	8	48409	322	2937	3516	6775	14.00
6	Himachal Pradesh	3	26764	950	1067	1219	3236	12.09
7	Jharkhand	8	44413	1705	6008	6590	14303	32.20
8	Karnataka	5	26597	1250	7624	4225	13099	49.25
9	Kerala	9	27228	1142	6754	6429	14325	52.61
10	Madhya Pradesh	18	139448	6629	34902	35931	77462	55.55
11	Maharashtra	12	144233	7256	11762	11670	30688	21.28
12	Manipur	9	22327	727	5925	10342	16994	76.11
13	Meghalaya	7	22429	449	9584	7184	17217	76.76
14	Mizoram	8	21081	138	5858	12752	18748	88.93
15	Nagaland	8	16579	1296	4695	6975	12966	78.21
16	Odisha	12	86124	5206	14409	14205	33820	39.27
17	Rajasthan	5	38218	0	2436	3884	6320	16.54
18	Sikkim	4	7096	500	2160	697	3357	47.31
19	Tamil Nadu	6	30720	726	2809	3630	7165	23.32
	Telangana	3	45004	176	10836	4616	15628	34.73
20	Tripura	4	10486	113	4609	3089	7811	74.49
21	Uttar Pradesh	1	7680	777	165	360	1302	16.95
22	West Bengal	11	69403	2934	3734	7909	14577	21.00
23	Andaman & Nicobar	2	8249	5686	685	380	6751	81.84
24	Dadra & Nagar Haveli	1	491	0	80	126	206	41.96
25	Daman & Diu	1	72	0	3.03	14.83	18	24.81
26	Lakshadweep	1	32	0	17	10	27	84.38
<b>Total</b>		<b>189</b>	<b>1111705</b>	<b>63127</b>	<b>204667</b>	<b>183429</b>	<b>451223</b>	<b>40.59</b>

Source: India State of Forest Report 2015

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

Sl. No.	State/UT	Total Forest Area in Sq.Km														
		1987	1988	1989	1991	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Andhra Pradesh	63771	63771	63771	63726	63814	63814	63814	63814	63821	63821	63814	63814	63814	63814	37258
2	Arunachal Pradesh	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51540	51541	51407
3	Assam	30708	30708	30708	30708	30708	30708	30708	27018	27018	26832	26832	26832	26832	26832	26832
4	Bihar	29230	29230	29230	29226	29226	29226	29226	6078	6473	6473	6473	6473	6473	6473	6493
5	Chhattisgarh#								59285	59772	59772	59772	59772	59772	59772	59772
6	Delhi	42	42	42	42	42	42	85	85	85	85	85	85	85	85	102
7	Goa	1053	1053	1053	1256	1424	1424	1424	1224	1224	1224	1224	1224	1224	1225	1225
8	Gujarat	18777	18777	18777	19388	19393	19393	19393	18999	19113	18962	18927	18927	18927	21647	21647
9	Haryana	1685	1685	1685	1687	1673	1673	1673	1551	1558	1559	1559	1559	1559	1559	1559
10	Himachal Pradesh	21325	21325	21325	37591	35407	35407	35407	37033	37033	37033	37033	37033	37033	37033	37033
11	Jammu & Kashmir	20892	20892	20892	20174	20182	20182	20182	20230	20230	20230	20230	20230	20230	20230	20230
12	Jharkhand#								23605	23605	23605	23605	23605	23605	23605	23605
13	Karnataka	38644	38644	38644	38646	38724	38724	38724	43084	38284	38284	38284	38284	38284	38284	38284
14	Kerala	11222	11222	11222	11222	11221	11221	11221	11268	11265	11265	11265	11265	11265	11309	11309
15	Madhya Pradesh	155414	155414	155414	155414	154497	154497	154497	95221	95221	94689	94689	94689	94689	94689	94689
16	Maharashtra	64055	64055	64055	63861	63842	63842	63842	61939	61939	61939	61939	61939	61939	61357	61579
17	Manipur	15155	15155	15155	15154	15154	15154	15154	17418	17418	17418	17418	17418	17418	17418	17418
18	Meghalaya	8514	8514	8514	9496	9496	9496	9496	9496	9496	9496	9496	9496	9496	9496	9496
19	Mizoram	15935	15935	15935	15935	15935	15935	15935	16717	16717	16717	16717	16717	16717	16717	5641
20	Nagaland	8625	8625	8625	8625	8629	8629	8629	8629	9222	9222	9222	9222	9222	9222	9222
21	Odisha	59555	59555	59555	59555	57184	57184	57184	58135	58136	58136	58136	58136	58136	58136	58136
22	Punjab	2803	2803	2803	2842	2901	2901	2901	3059	3084	3084	3084	3084	3084	3084	3084
23	Rajasthan	31151	31151	31151	31559	31700	31700	31700	32494	32488	32488	32639	32639	32639	32737	32737
24	Sikkim	2650	2650	2650	2650	2650	2650	2650	5765	5841	5841	5841	5841	5841	5841	5841
25	Tamil Nadu	22319	22319	22319	22699	22628	22628	22628	22871	22877	22877	22877	22877	22877	22877	22877
26	Telangana**															26904
27	Tripura	6280	6280	6280	6292	6293	6293	6293	6293	6294	6294	6294	6294	6294	6294	6294
28	Uttar Pradesh	51269	51269	51269	51502	51663	51663	51663	16826	16826	16796	16583	16583	16583	16583	16582
29	Uttarakhand#								34662	34662	34651	34651	34651	34651	34651	38000
30	West Bengal	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879	11879
31	A & N Islands	7144	7144	7144	7171	7171	7171	7171	7171	7171	7171	7171	7171	7171	7171	7171
32	Chandigarh	6	6	6	31	31	31	31	32	34	33	34	34	34	35	35
33	Dadra and Nagar Haveli	203	203	203	207	203	203	203	203	204	204	204	204	204	204	204
34	Daman & Diu	*	*	*	*	*	NA	0.7	1	1	6	8	8	8	8	8
35	Lakshadweep	nil	nil	nil	nil	nil	NA	0	0	0	0	0	0	0	0	0
36	Puducherry	nil	nil	nil	nil	nil	NA	0	0	0	0	13	13	13	13	13
	Total	751846	751346	751846	770078	765210	765210	765253	768436	774740	769626	769538	769512	769538	771821	764566

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

\* Included in Goa

\*\*Included in Andhra Pradesh for 1987-2013

#values included in Madhya Pradesh, Bihar, Uttar Pradesh respectively from 1987-1999

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

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

Source: India State of Forest Report 2015

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

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

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

Source :India State of Forest Report, 2015



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

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

**Table 3.3.9 : Physiographic zone wise tree cover estimate**

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

Source : India State of Forest Report-2015



**Table 3.3.10: State/UT wise tree cover estimates**

Sl. No.	State/UT	Geographic Area (Km <sup>2</sup> )	Tree Cover	
			Area (Km <sup>2</sup> )	% of Geog. Area
1	2	3	4	5
1	Andhra Pradesh	160204	3965	2.47
2	Arunachal Pradesh	83743	761	0.91
3	Assam	78438	1613	2.06
4	Bihar	94163	2182	2.32
5	Chhattisgarh	135191	3629	2.68
6	Delhi	1483	111	7.48
7	Goa	3702	325	8.78
8	Gujarat	196022	7914	4.04
9	Haryana	44212	1355	3.06
10	Himachal Pradesh	55673	757	1.36
11	Jammu & Kashmir	222236	8354	3.76
12	Jharkhand	79714	2783	3.49
13	Karnataka	191791	5552	2.89
14	Kerala	38863	2951	7.59
15	Madhya Pradesh	308245	7773	2.52
16	Maharashtra	307713	9558	3.11
17	Manipur	22327	243	1.09
18	Meghalaya	22429	710	3.17
19	Mizoram	21081	535	2.54
20	Nagaland	16579	381	2.30
21	Odisha	155707	3986	2.56
22	Punjab	50362	1544	3.07
23	Rajasthan	342239	8269	2.42
24	Sikkim	7096	35	0.49
25	Tamil Nadu	130058	4505	3.46
26	Telangana	114865	2549	2.22
27	Tripura	10486	233	2.22
28	Uttar Pradesh	240928	7044	2.92
29	Uttarakhand	53483	752	1.41
30	West Bengal	88752	2088	2.35
31	A. & N. Islands	8249	37	0.45
32	Chandigarh	114	9	8.51
33	Dadra & Nagar Haveli	491	28	5.95
34	Daman & Diu	112	10	8.46
35	Lakshadweep	32	4	16.69
36	Puducherry	480	27	5.63
<b>Total</b>		<b>3287263</b>	<b>92571</b>	<b>2.82</b>

Source :India State of Forest Report, 2015

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

**Table 3.3.11: Physiographic Zone Wise Growing Stock**

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

Source :India State of Forest Report, 2015

**Table 3.3.12 : States/UTs wise growing stock**

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

Source :India State of Forest Report, 2015

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

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

**Table 3.3.13: State-wise list of mangrove areas**

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

Source : Ministry of Environment & Forests

Table 3.3.14: State/UT wise Mangrove Cover assessment- Time Series																
Sl No.	State/UT	Year													(Sq. km)	
		1987	1989	1991	1993	1995	1997	1999	2001	2003	2005	2009	2011	2013	2015	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
1	Andhra Pradesh	495	405	399	378	383	383	397	333	329	354	353	352	352	1057	
2	Goa	0	3	3	3	3	5	5	5	16	16	17	22	22	61	
3	Gujarat	427	412	397	419	689	901	1031	911	916	991	1046	1058	1103	3207	
4	Karnataka	0	0	0	0	2	3	3	2	3	3	3	3	3	9	
5	Maharashtra	140	114	113	155	155	124	108	118	158	186	186	186	186	558	
6	Odisha	199	192	195	195	195	211	215	219	203	217	221	222	213	656	
7	Tamil Nadu	23	47	47	21	21	21	21	23	35	36	39	39	39	117	
8	West Bengal*	2076	2109	2119	2119	2119	2123	2125	2081	2120	2136	2152	2155	2097	6404	
9	Andaman & Nicobar	686	973	971	966	966	966	966	789	658	635	615	617	604	1836	
10	Puducherry	0	0	0	0	0	0	0	1	1	1	1	1	1	3	
11	Kerala	0	0	0	0	0	0	0	0	8	5	5	6	6	17	
12	Daman & Diu	0	0	0	0	0	0	0	0	1	1	1	1.56	1.63	4.19	
<b>Total</b>		<b>4046</b>	<b>4255</b>	<b>4244</b>	<b>4256</b>	<b>4533</b>	<b>4737</b>	<b>4871</b>	<b>4482</b>	<b>4448</b>	<b>4581</b>	<b>4639</b>	<b>4663</b>	<b>4628</b>	<b>13929</b>	

Source: India State of Forest Report 2015

\*: As per the West Bengal Forest Department, mangrove area in Sundarban is 4200 sq. km.

which is almost double of the area estimated by FSI.

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

Source: India State of Forest Report 2015

#### 3.4 Conservation Measures of Agro Biodiversity

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

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

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

Source : Botanical Survey of India, Kolkata.

\* Index Herbarium online

3.4.2 The National Bureau of Plant Genetic Resources (NBGR) established in 1976 as an institution under Indian Council of Agricultural Research (ICAR) emerged as an important organization dealing with various establishments of plant genetic resources. The organization is entrusted with the vital responsibility of germ plasm, exchange with appropriate quarantine measures, survey exploration, their organization, planning and coordination, comprising evaluation, documentation and conservation of diverse plant genetic resources. The National Gene Bank has also been established within the complex. Within the new trade related intellectual property rights (TRIPS) within World Trade Organisation related agreements, documentation of our genetic resources is very important.

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

**Tables 3.4.2 : Status of germplasm holding in the base collection (-18° C) at National Genebank (as December 31, 2014)**

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

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

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

\*\* The figure includes 172 released varieties and 89 genetic stocks.

**Table 3.4.3 : Status of in-vitro conserved germplasm**

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

NA: Not Available

Source : National Bureau of Plant Genetic Resources, New Delhi

**Table 3.4.4 : Status of cryopreserved germplasm**

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

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

\* included in respective Categories stored as orthodox seeds.

**Table 3.4.5 : Status of germplasm at national cryobank**

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

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

### 3.5 Conservation measures in India

3.5.1 Areas rich in biodiversity and encompassing unique and representative ecosystems are identified and designated as Biosphere Reserves. The goal is to facilitate conservation of representative landscape and India's immense biological diversity as described above. Till date, 15 Biosphere Reserves have been set up. The last one was set up in 29.01.2008 at Kachchh covering parts of Kachchh, Rajkot, Surendranagar and Patan civil districts of Gujarat State. The List of Biosphere reserves set up in India are shown in Table 3.5.1. Summary of protected areas is given in Table 3.5.2

3.5.2 The wild life Act provided for setting up National parks and sanctuaries for wild life. The basic idea in trying to encourage wild life is that human welfare is initially linked with it. The Government of India has pledged for all out efforts to conserve which not only seeks to protect and preserve what remains of wild fauna and flora but also seeks to augment this priceless national heritage. Details of tiger reserve are given in Table 3.5.3 and Table 3.5.4 Estimated Population of Elephants in the wild is presented in Table 3.5.5. Location of major zoos in India & growth of wild life sanctuaries & national parks is given yearwise in Table 3.5.6 and Table 3.5.7 respectively.

**Table 3.5.1 : Biosphere Reserves setup in India**

Sl. No.	Name of Biosphere Reserve	Area (in sq.km.)	Date of Notification	Location in the States/UT
1	2	3	4	5
1	Nilgiri	5520.00	01.08.1986	Part of Wynad, Nagarhole, Bandipur and Mudumalai, Nilambur, Silent Valley and Siruvani hills (Tamil Nadu, Kerala and Karnataka)-Western Ghats
2	Nanda Devi	5860.69	18.01.1988	Part of Chamoli, Pithoragarh & Almora Districts and valley of flowers (Uttarakhand)-West Himalayas
3	Nokrek	820.00	01.09.1988	Part of Garo Hills (Meghalaya)-East Himalayas
4	Manas	2837.00	14.03.1989	Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamrup and Darang districts (Assam)-East Himalayas
5	Sunderbans	9630.00	29.03.1989	Part of Delta of Ganges & Barahamaputra river system (West Bengal)-Gigantic Delta
6	Gulf of Mannar	10500.00	18.02.1989	Indian part of Gulf of Mannar between India and Sri Lanka (Tamil Nadu)-Coasts
7	Great Nicobar	885.00	06.01.1989	Southern Most Islands of Andaman and Nicobar (A&N Islands)-Islands
8	Similipal	4374.00	21.06.1994	Part of Mayurbhanj district (Orissa)-Deccan Peninsula
9	Dibrugarh	765.00	28.07.1997	Part of Dibrugarh and Tinsukia districts (Assam)-East Himalayas
10	Dehang Debang	5111.50	02.09.1998	Part of Siang and Debang Valley in Arunachal Pradesh-East Himalayas
11	Pachmarhi	4981.72	03.03.1999	Part of Betul, Hoshangabad and Chhindwara Districts of Madhya Pradesh-Semi-Arid-Gujarat Rajputana
12	Khangchendzonga	2931.00	07.02.2000	Parts of North and West Sikkim
13	Agasthyamalai	3500.36	12.11.2001	Part of Thirunelveli and Kanya Kumari Districts in Tamil Nadu and Thiruvananthapuram, Kollam and Pathanmthita of Kerala (Tamil Nadu & Kerala)
14	Achanakmar-Amarkantak	3835.31	30.3.2005	Part of Anuppur and Dindori Distt., of MP, part of Bilaspur distts., of Chhattisgarh State (Madhya Pradesh & Chattisgarh)
15	Kachchh	12454.00	29.01.2008	Parts of Kachchh, Rajkot, Surendranagar and Patan Civil Districts of Gujarat State
16	Cold Desert	7770.00	28.08.2009	Pin Valley National Park and surroundings; Chandratal and Sarchu & Kibber Wildlife Sanctuary in Himachal Pradesh.
17	Seshachalam	4755.99	20.09.2010	Seshachalam hill range in Eastern Ghats encompassing part of Chador and Kakapo district in Andhra Pradesh
18	Pinna	2998.98	25.08.2011	Part of Panna and Chhattarpur district in Madhya Pradesh

Source: Ministry of Environment and Forests

**Table 3.5.2 - Summary of Protected Area Statistics in India**

<b>States/UT's</b>	<b>No. of NPS</b>	<b>Area Sq Km</b>	<b>No. of WLS</b>	<b>Area Sq Km</b>	<b>No. of PAs</b>	<b>Area Sq Km</b>
Andhra Pradesh	6	1388.39	21	11618.12	27	13006.51
Arunachal Pradesh	2	2290.82	11	7487.75	13	9778.57
Assam	5	1977.79	18	1932.01	23	3909.80
Bihar	1	335.65	12	2851.67	13	3187.32
Chhattisgarh	3	2899.08	11	3583.19	14	6482.27
Goa	1	107.00	6	647.91	7	754.91
Gujarat	4	479.67	23	16619.81	28	17326.48
Haryana	2	48.25	8	233.21	12	330.18
Himachal Pradesh	5	2271.38	32	7745.48	37	10016.86
Jammu and Kashmir	4	3925.00	15	10243.11	53	14997.86
Jharkhand	1	226.33	11	1955.82	12	2182.15
Karnataka	5	2472.18	22	4003.42	30	6482.52
Kerala	6	558.16	16	1822.86	23	2382.52
Madhya Pradesh	9	3656.36	25	7158.41	34	10814.77
Maharashtra	6	1273.60	35	14152.70	42	15429.79
Manipur	1	40.00	1	184.40	2	224.40
Meghalaya	2	267.48	3	34.20	5	301.68
Mizoram	2	150.00	8	1090.75	10	1240.75
Nagaland	1	202.00	3	20.34	4	222.36
Odisha	2	990.67	18	6969.15	20	7959.85
Punjab	0	0.00	12	323.70	16	344.72
Rajasthan	5	3947.07	25	5379.26	33	9548.60
Sikkim	1	1784.00	7	399.10	8	2183.10
Tamil Nadu	5	307.85	21	3521.95	27	3829.83
Tripura	2	36.71	4	566.93	6	603.64
Uttar Pradesh	1	490.00	23	5221.88	24	5711.88
Uttarakhand	6	4915.44	6	2418.61	15	7376.32
West Bengal	5	1693.25	15	1203.28	20	2896.53
Andaman & Nicobar	9	1153.94	96	389.39	105	1543.33
Chandigarh	0	0.00	2	26.01	2	26.01
Dadra and Nagar Haveli	0	0.00	1	92.16	1	92.16
Daman and Diu	0	0.00	1	2.19	1	2.19
Delhi	0	0.00	1	27.82	1	27.82
Lakshadweep	0	0.00	1	0.01	1	0.01
Puducherry	0	0.00	1	3.90	1	3.90
<b>India</b>	<b>102</b>	<b>39888.07</b>	<b>515</b>	<b>119930.50</b>	<b>670</b>	<b>161221.59</b>

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

Source: Ministry of Environment and Forests

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

Sl. No.	Year of Creation	Name of Tiger Reserve	State	Area in sq. Kms.		
				Area of core/critical tiger habitat	Area of the buffer/peripher al	Total area
1	2	3	4	5	6	7
1	1973-74	Bandipur	Karnataka	872.24	584.06	1456.30
2	1973-74	Corbett	Uttarakhand	821.99	466.32	1288.31
		Amangarh (buffer of Corbett TR)	Uttar Pradesh		80.60	80.60
3	1973-74	Kanha	Madhya Pradesh	917.43	1134.36	2051.79
4	1973-74	Manas	Assam	840.04	2310.88	3150.92
5	1973-74	Melghat	Maharashtra	1500.49	1268.03	2768.52
6	1973-74	Palamau	Jharkhand	414.08	715.85	1129.93
7	1973-74	Ranthambore	Rajasthan	1113.36	297.93	1411.29
8	1973-74	Simlipal	Odisha	1194.75	1555.25	2750.00
9	1973-74	Sunderbans	West Bengal	1699.62	885.27	2584.89
10	1978-79	Periyar	Kerala	881.00	44.00	925.00
11	1978-79	Sariska	Rajasthan	881.11	332.23	1213.34
12	1982-83	Buxa	West Bengal	390.58	367.32	757.90
13	1982-83	Indravati	Chhattisgarh	1258.37	1540.70	2799.07
14	1982-83	Namdapha	Arunachal Pradesh	1807.82	245.00	2052.82
15	1987-88	Dudhwa	Uttar Pradesh	1093.79	1107.98	2201.77
16	1988-89	Kalakad-Mundanthurai	Tamil Nadu	895.00	706.54	1601.54
17	1988-89	Valmiki	Bihar	598.45	300.93	899.38
18	1989-90	Pench	Madhya Pradesh	411.33	768.30	1179.63
19	1992-93	Tadoba-Andhari	Maharashtra	625.82	1101.77	1727.59
20	1993-94	Bandhavgarh	Madhya Pradesh	716.90	820.04	1536.94
21	1993-94	Panna	Madhya Pradesh	576.13	1021.97*	1598.10
22	1994-95	Dampa	Mizoram	500.00	488.00	988.00
23	1994-95	Bhadra	Karnataka	492.46	571.83	1064.29
24	1998-99	Pench	Maharashtra	257.26	483.96	741.22
25	1999-2000	Pakke	Arunachal Pradesh	683.45	515.00	1198.45
26	1999-2000	Nameri	Assam	320.00	144.00	464.00
27	1999-2000	Satpura	Madhya Pradesh	1339.26	794.04	2133.31
28	2008-09	Anamalai	Tamil Nadu	958.59	521.28	1479.87
29	2008-09	Udanti-Sitanadi	Chhattisgarh	851.09	991.45	1842.54
30	2008-09	Satkosia	Odisha	523.61	440.26	963.87
31	2008-09	Kaziranga	Assam	625.58	548.00	1173.58
32	2008-09	Achanakmar	Chhattisgarh	626.20	287.82	914.02
33	2008-09	Dandeli-Anshi	Karnataka	814.88	282.63	1097.51
34	2008-09	Sanjay-Dubri	Madhya Pradesh	812.57	861.93	1674.50
35	2008-09	Mudumalai	Tamil Nadu	321.00	367.59	688.59

Continued

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

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

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

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



**Table 3.5.4 : Population estimates of Tiger**

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

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

+ From scat DNA

\$ From camera trap data and scat DNA



**Table 3.5.5 : Estimated Population of Wild Elephants**

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

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

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

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

NA: Not available.

**Table 3.5.6: State wise location of major zoos**

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

Continued....

**Table 3.5.6: State wise location of major zoos**

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

**Concluded.**

Source : Central Zoo Authority, Ministry of Environment & Forests



Year	National Parks		Wildlife Sanctuaries		Total Area
	Number	Area	Number	Area	
1995	80	34684.53	441	114164.58	148849.11
1999	87	34021.15	485	113163.03	147184.18
2004	90	36881.53	502	120051.88	156933.41
2006	100	38024.11	514	117913.77	155980.15
2010	102	39888.00	515	119930	159818.00
2014	102	39888.00	517	120208	160096.00
2015*	103	40500.00	531	117607	158107.00

Source: M/o Environment & Forests

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



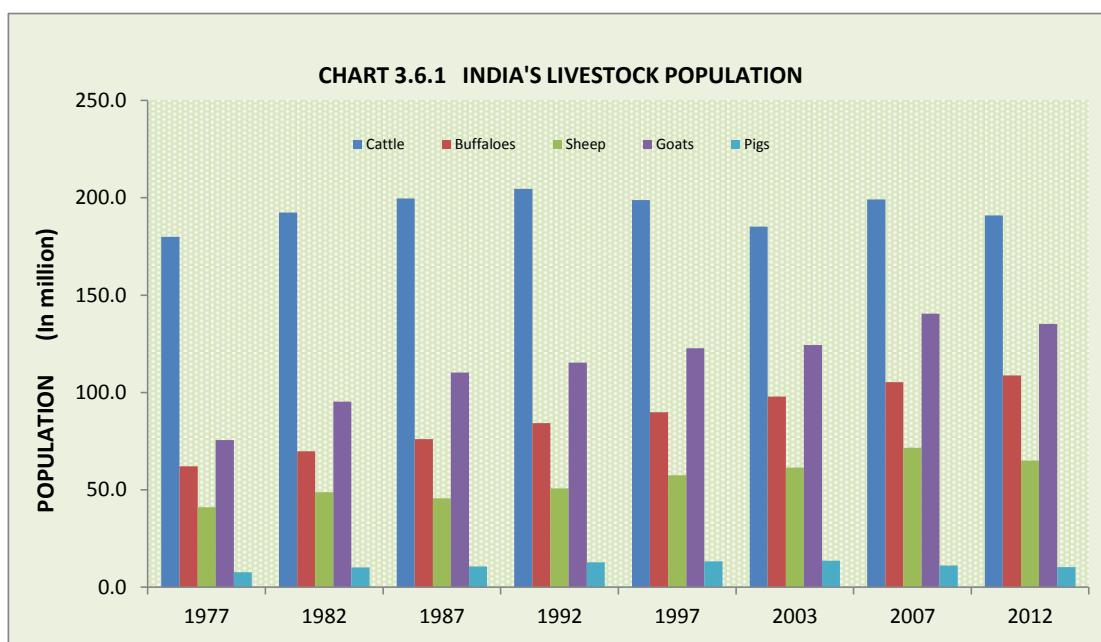
### 3.6 Livestock

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

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

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

Source : Live Stock Census, Ministry of Agriculture



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

Continued free access to the forest area which has resulted in high rates of growth of livestock population causing land degradation and arresting the development of markets for forage crops. Overgrazing impedes regeneration, retards growth of vegetation, and leads to extinction of good palatable grasses which are replaced by less palatable and inferior grasses. Extensive areas have been invaded by bushes which are not browsed, excessive trampling makes the soil compact and impervious and prevents circulation of air, water, thus exposing the soil to erosion by wind and water.

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

**Table 3.6.2 Total Livestock in 2007 and 2012**

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

Continued

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

Concluded

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

# Excluding stray cattle and stray dogs.



**Table 3.6.3 Species-wise incidence of livestock diseases in India during 2015**

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

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

\*Birds Culled

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

### 3.7 Fishery

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

Table 3.7.1 : Marine fishery resources of India					
Sl. No.	State/Union Territory	Approx. length of coast line (Kms)	Continental Shelf ('000 Sq Kms.)	Number of Landing Centres	Number of Fishing Villages
1	Andhra Pradesh	974	33	353	555
2	Goa	104	10	33	39
3	Gujarat	1600	184	121	247
4	Karnataka	300	27	96	144
5	Kerala	590	40	187	222
6	Maharashtra	720	112	152	456
7	Odisha	480	26	73	813
8	Tamil Nadu	1076	41	407	573
9	West Bengal	158	17	59	188
10	Andaman & Nicobar Islands	1912	35	16	134
11	Daman & Diu	27	-	5	11
12	Lakshadweep	132	4	10	10
13	Puducherry	45	1	25	40
<b>TOTAL</b>		<b>8118</b>	<b>530</b>	<b>1537</b>	<b>3432</b>

Source: Annual report 2014-15, Department of Animal Husbandry and Dairying, Ministry of Agriculture (Marine Fisheries Census,2005)



3.7.2 The fish production (marine & inland) at all India level over the years, is presented at Table 3.7.2. It is pertinent to mention that, though the marine and inland fish production are showing an overall increasing trend, the marine fish production is lower than the inland production in recent years.

<b>Table 3.7.2 : Year Wise Fish Production-India</b>				
<b>Sl No.</b>	<b>Year</b>	<b>Marine</b>	<b>Inland</b>	<b>Total</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
1	1950-51	5.34	2.18	7.52
2	1960-61	8.80	2.80	11.60
3	1970-71	10.86	6.70	17.56
4	1980-81	15.55	8.87	24.42
5	1981-82	14.45	9.99	24.44
6	1982-83	14.27	9.40	23.67
7	1983-84	15.19	9.87	25.06
8	1984-85	16.98	11.03	28.01
9	1985-86	17.16	11.60	28.76
10	1986-87	17.13	12.29	29.42
11	1987-88	16.58	13.01	29.59
12	1988-89	18.17	13.35	31.52
13	1989-90	22.75	14.02	36.77
14	1990-91	23.00	15.36	38.36
15	1991-92	24.47	17.10	41.57
16	1992-93	25.76	17.89	43.65
17	1993-94	26.49	19.95	46.44
18	1994-95	26.92	20.97	47.89
19	1995-96	27.07	22.42	49.49
20	1996-97	29.67	23.81	53.48
21	1997-98	29.50	24.38	53.88
22	1998-99	26.96	26.02	52.98
23	1999-00	28.52	28.23	56.75
24	2000-01	28.11	28.45	56.56
25	2001-02	28.30	31.26	59.56
26	2002-03	29.90	32.10	62.00
27	2003-04	29.41	34.58	63.99
28	2004-05	27.79	35.25	63.05
29	2005-06	28.16	37.56	65.72
30	2006-07	30.24	38.45	68.69
31	2007-08	29.20	42.07	71.27
32	2008-09	29.78	46.38	76.16
33	2009-10	31.03	48.94	79.13
34	2010-11	32.50	49.81	82.90
35	2011-12	33.72	52.95	86.66
36	2012-13	33.21	57.19	90.40
37	2013-14	34.39	61.32	95.72

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

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

Sl. No.	States/UT's	('000 Tonnes)									
		2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	2	3	4	5	6	7	8	9	10	11	12
1	Andhra Pradesh	853.05	891.09	856.93	1010.09	1252.78	1293.86	1368.20	1603.17	1808.08	2018.42
2	Arunachal Pradesh	2.70	2.75	2.77	2.83	2.88	2.65	3.15	3.30	3.71	3.63
3	Assam	186.31	188.01	181.48	190.32	206.15	218.82	227.24	228.62	254.27	266.70
4	Bihar	267.51	279.53	267.04	319.10	300.65	297.40	299.91	344.47	400.14	432.30
5	Goa	990.44	104.95	102.39	33.43	86.21	85.36	93.27	89.96	77.88	114.06
6	Gujarat	635.21	733.81	747.33	721.91	765.90	771.52	774.90	783.72	788.49	798.49
7	Haryana	42.05	48.20	60.08	67.24	76.29	100.46	96.20	106.00	111.48	105.58
8	Himachal Pradesh	6.90	7.30	6.89	7.85	7.79	7.85	7.38	8.05	8.56	9.83
9	Jammu & Kashmir	19.10	19.15	19.20	17.33	19.27	19.30	19.70	19.85	19.95	20.00
10	Karnataka	251.23	297.57	292.46	297.69	361.85	408.05	526.58	546.44	525.57	555.31
11	Kerala	678.31	636.89	677.63	667.33	685.99	663.12	681.61	693.21	679.74	708.65
12	Madhya Pradesh	62.06	61.08	65.04	63.89	68.47	66.12	56.45	75.41	85.17	96.26
13	Maharashtra	548.02	580.54	595.94	556.45	523.10	538.35	595.25	578.79	586.37	602.68
14	Manipur	17.80	18.22	18.61	18.60	18.80	19.20	20.20	22.22	24.50	28.54
15	Meghalaya	5.64	4.12	5.49	4.00	3.96	4.21	4.56	4.77	5.42	5.75
16	Mizoram	3.68	3.75	3.76	3.76	2.89	3.04	2.90	2.93	5.43	5.94
17	Nagaland	4.90	5.50	5.80	5.80	6.18	6.36	6.59	6.84	7.13	7.47
18	Odisha	315.59	325.45	342.04	349.48	374.82	370.54	386.19	381.18	410.14	413.79
19	Punjab	77.70	85.64	86.70	78.73	86.21	122.86	97.04	97.62	99.13	104.02
20	Rajasthan	16.39	18.50	22.20	25.70	24.10	26.91	28.20	47.85	55.16	35.10
21	Sikkim	0.14	0.15	0.15	0.18	0.17	0.17	0.18	0.28	0.49	0.42
22	Tamil Nadu	459.43	463.03	542.28	559.36	534.17	534.17	614.81	611.49	620.40	624.30
23	Tripura	19.84	23.87	28.63	36.25	36.00	42.27	49.23	53.34	57.46	61.95
24	Uttar Pradesh	277.07	289.58	306.73	325.95	349.27	392.93	417.48	429.72	429.95	464.48
25	West Bengal	1215.00	1250.00	1359.10	1447.26	1484.00	1505.00	1443.26	1472.05	1490.02	1580.65
26	A & N Islands	32.68	12.10	28.68	28.69	32.49	33.16	33.92	35.26	36.62	36.95
27	Chandigarh	0.08	0.09	0.17	0.21	0.24	0.24	0.24	0.10	0.05	0.11
28	Dadar & Nagar Haveli	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
29	Daman & Diu	12.51	17.79	16.41	26.36	14.14	15.88	16.98	17.43	19.01	19.86
30	Delhi	1.41	0.70	0.61	0.61	0.72	0.72	0.82	0.74	0.69	0.88
31	Lakshadweep	11.96	11.96	11.75	11.04	12.59	12.37	12.37	12.37	12.37	18.72
32	Pondicherry	36.75	21.45	39.66	39.01	40.30	41.95	41.95	42.40	41.07	42.08
33	Chattisgarh	120.07	131.75	137.75	139.37	158.70	174.25	228.21	250.70	255.61	284.96
34	Uttaranchal	2.57	2.79	3.03	3.09	3.16	3.49	3.82	3.83	3.85	3.89
35	Jharkhand	22.00	34.27	34.27	67.89	75.80	70.50	71.89	91.68	96.60	104.82
<b>Total</b>		<b>6304.75</b>	<b>6571.63</b>	<b>6869.05</b>	<b>7126.83</b>	<b>7616.09</b>	<b>7851.61</b>	<b>8230.71</b>	<b>8666.49</b>	<b>9040.36</b>	<b>9572.27</b>

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