

CHAPTER FOUR

ATMOSPHERE

4.1 Introduction

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

Table 4.1.1 : Average gaseous composition of dry air in the troposphere

Sl. No.	Gas	Percent by Volume	Parts Per Million (ppm)
1	2	3	4
1	Nitrogen	78.080000	780840.00
2	Oxygen	20.946000	209460.00
3	Argon	0.934000	9340.00
4	Carbon dioxide	0.039000	390.00
5	Neon	0.001818	18.18
6	Helium	0.000524	5.24
7	Methane	0.000179	1.79
8	Krypton	0.000114	1.14
9	Hydrogen	0.000055	0.55
10	Xenon	0.000009	0.09
11	Ozone	Variable	~0.001- 0.3 (variable)

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

4.2 Atmospheric Pollution – Main Sources

4.2.1 The atmosphere consists of a mixture of gases that completely surround the earth. It extends to an altitude of 800 to 1000 kms above the earth's surface, but is deeper at the equator and shallow at the poles. About 99.9% of the mass occurs below 50 Km and 0.0997% between 50 and 100 km altitude. Major polluting gases/ particles are confined to the lowermost layer of atmosphere known as Troposphere that extends between 8 and 16 Kms above the earth surface.

4.2.2 The **main sources of atmospheric pollution** may be summarized as follows:

- a) The combustion of fuels to produce energy for heating and power generation both in the domestic sector as well as in the industrial sector.
- b) The exhaust emissions from the transport vehicles that use petrol, diesel oil, etc.
- c) Waste gases, dust and heat from many industrial sites including chemical manufacturers, electrical power generating stations, etc.

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

4.2.4 The primary aim of the ambient air quality standards is to provide a basis for protecting public health from adverse effects of air pollution and for eliminating or reducing to a minimum, those contaminants of air that are known or likely to be hazardous to human being, animals, vegetation and historical monuments. **The national ambient air quality standards (NAAQS) is available in table 4.2.1**

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

- a. With respect to Sulphur dioxide it is observed that annual average is well within the limit in all States. There are some occasional pulses in the States of Andhra Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal.
- b. With respect to NO_2 Values, the annual average are well with in limit except in some Cases. The maximum value indicates that of Andhra Pradesh, Delhi, Bihar, Maharashtra, Tamil Nadu and West Bengal are higher.
- c. In case of RSPM average value indicates that except few States such as Goa, Kerala, Mizoram, and Pondicherry, Tamil Nadu all are exceeding the limit. The maximum value indicates that except Mizoram all are high. States like Rajasthan also is high as 829 micro gram per metre cube.
- d. With respect to industrial area sulphur dioxide are again within the limit and so is the with Nitrogen Oxide.
- e. With respect to RSPM the trend shows that 13 States are exceeding the limits.



The details of State level air quality monitored under National Ambient Air Quality Monitoring Programme (NAMP) during 2008 in residential areas is presented in table 4.2.2.

Table 4.2.1 : National ambient air quality standards (NAAQS)

Sl. No.	Pollutant	Sulphur Dioxide (SO ₂)		Oxides of Nitrogen (NO ₂)		Suspended Particulate Matter (SPM)		Respirable Particulate Matter (RPM) (size less than 10 µm)		Lead		Carbon Monoxide (CO)		Ammonia #	
		3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Time Weighted Average	Annual *	24 hours**	Annual *	24 hours**	Annual *	24 hours**	Annual *	24 hours**	Annual *	24 hours**	8 hours**	1 hours	Annual *	24 hours**
		Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (µg/m ³)	Average (mg/m ³)	Average (mg/m ³)
2	Industrial Area	80	120	80	120	360	500	120	150	1.00	1.50	5.00	10.00	0.10	0.40
3	Residential, Rural and Other Area	60	80	60	80	140	200	60	100	0.75	1.00	2.00	4.00	0.10	0.40
4	Sensitive Area	15	30	15	30	70	100	50	75	0.50	0.75	1.00	2.00	0.10	0.40
5	Methods of Measurement	1. Improved West & Gaeke Method 2. Ultraviolet Fluorescence		1. Jacob & Hochheiser Modified (Na- arsenic) Method 2. Gas phase Chemiluminescence		High volume sampling (Average flow rate not less than 1.1 m ³ /minute)		Respirable particulate matter sampler		AAS Method after sampling using EPM 2000 or equivalent filter paper		Non- Dispersive infra-red Spectroscopy		-----	

Source : Central Pollution Control Board

* : Annual Arithmetic Mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval.

** : 24-hourly / 8 -hourly values should be met 98% of the time in a year. However 2% of time, it may exceed but not on two consecutive days.

µm : Micrometer

µg : Microgram

Note :

1. National Ambient Air Quality Standards : The level of air quality necessary with an adequate margin of safety necessary to protect the public health, vegetation and property
2. Whenever and wherever two consecutive values exceed the limits specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigations.
3. The standards for H₂S and CS₂ have been notified separately vide GSR No. 7, dated December 22, 1998 under Rayon Industry. continuous monitoring and further investigations.

Table 4.2.2 : State wise level of SO₂, NO₂ and RSPM in residential areas under national ambient air quality monitoring programme (NAMP) during 2008.

Sl	Name of the State	SO ₂ µg/m ³ (Annual)			NO ₂ µg/m ³ (Annual)			RSPM µg/m ³ (Annual)		
		Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.
1	Andhra Pradesh	74	2	8	108	7	26	425	12	85
2	Assam	21	2	6	33	5	13	450	16	89
3	Bihar	14	2	7	93	8	39	402	25	120
4	Chandigarh	2	2	2	49	5	14	217	21	89
5	Chhattisgarh	28	3	16	63	13	28	261	68	126
6	Delhi	31	2	5	138	23	55	630	18	209
7	Goa	11	2	2	30	4.5	13	197	14	57
8	Gujarat	45	4	12	40	4.5	18	293	33	83
9	Haryana	24	4	9	36	5	13	293	45	121
10	Himachal Pradesh	20	2	2	25	5	12	218	15	71
11	Jharkhand	30	11	19	66	20	38	454	31	152
12	Karnataka	49	2	10.5	66	8	27	381	28	77
13	Kerala	31	2	5	72	5	20	280	11	48
14	Madhya Pradesh	38	2	9	47	5	19	609	7	110
15	Maharashtra	90	2	16	159	5	31	579	3	101
16	Meghalaya	22	2	2	37	5	34	113	29	73
17	Mizoram	2	2	2	10	5	15	61	15	37
18	Manipur	6	2	3	38	14	19	125	34	84
19	Nagaland	5	2	2	62	7	14	133	16	72
20	Odisha	13	2	4	41	6	16	203	14	80
21	Punjab	64	5	10	158	57	30	387	62	193
22	Puducherry	10	2	4	21	5	10	182	25	45
23	Rajasthan	18	2	7	74	5	28	829	10	122
24	Tamil Nadu	80	2	12	106	5	20	302	11	58
25	Uttar Pradesh	68	4	12	64	5	30	442	50	170
26	Uttarakhand	61	21	27	31	23	28	159	73	126
27	West Bengal	70	2	9	137	5	66	514	6	101

Source : Central Pollution Control Board

Note : Data available as on date 15.04.09

µg/m³ : Micrograms per metre cube

4.3 Industrial Emissions

4.3.1 Air borne emissions emitted from various industries are a cause of major concern. These emissions are of two forms, viz. solid particles (SPM) and gaseous emissions (SO₂, NO_x, CO, etc.). Liquid effluents, generated from certain industries, containing organic and toxic pollutants are also a cause of concern. Heavily polluting industries were identified which are included under the 17 categories of highly polluting industries for the purpose of monitoring and regulating pollution from them. The Ministry of Environment and Forests has, developed standards for regulating emissions from various industries and emission standards for all the polluting industries including thermal power stations, iron and steel plants, cement plants, fertilizer plants, oil refineries, pulp and paper, petrochemicals, sugar, distilleries and tanneries have been prescribed. The industrial units in India are largely located in the States of Gujarat, Maharashtra, Uttar Pradesh, Bihar, West Bengal and

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

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

Sl	Name of the State	SO ₂ µg/m ³ (Annual)			NO ₂ µg/m ³ (Annual)			RSPM µg/m ³ (Annual)		
		Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.
1	Andhra Pradesh	2	83	6	6	121	27	9	493	87
2	Chandigarh	2	5	2	4.5	52	20	22	254	123
3	Chhattisgarh	12	22	17	33	51	42	129	288	212
4	Delhi	2	66	8	20	139	61	49	633	225
5	Goa	2	11	3	4.5	28	11	10	212	52
6	Gujarat	9	30	16	12	89	26	43	598	127
7	Haryana	7	23	15	12	89	28	102	598	267
8	Himachal Pradesh	2	6	2	4.5	21	12	17	649	134
9	Jharkhand	12	78	28	30	71	47	44	517	170
10	Karnataka	2	20	10	4.5	69	25	7	442	85
11	Kerala	2	43	6	4.5	48	11	6	320	45
12	Maharashtra	2	104	24	4.5	121	41	3	802	108
13	Madhya Pradesh	2	52	15	4.5	47	18	16	507	160
14	Odisha	2	21	8	10	37	21	19	276	95
15	Punjab	48	35	11	11	66	35	99	666	229
16	Puducherry	3	10	6	4.5	18	13	33	95	54
17	Rajasthan	4	24	8	11	72	31	10	538	135
18	Tamil Nadu	2	90	13	4.5	73	21	14	364	81
19	Uttar Pradesh	5	71	17	4.5	75	27	60	575	197
20	Uttarakhand	16	21	20	19	27	21	88	98	93
21	West Bengal	2	65	10	4.5	162	73	16	604	119

Source : Central Pollution Control Board

Note : Data available as on date 15.04.09

µg/m³ : Micrograms per metre cube



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

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

($\mu\text{g}/\text{m}^3$)				
City	SO ₂	NO _x	SPM	RSPM
Ahmedabad	12.3	20.0	220	88
Banglore	15.2	40.8	273	100
Chennai	9.5	15.4	142	63
Delhi	6.6	56.7	433	214
Hyderabad	5.5	26.2	225	85
Kolkata	7.7	64.0	225	103
Mumbai	8.7	39.3	260	127

Source: Central Pollution Control Board

SPM : Suspended particulate matter; RSPM : Respirable Suspended Particulate Matter

SO₂ : Sulphur dioxide No_x : Oxides of nitrogen

* Provisional

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

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

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



Table 4.3.3: Year wise ambient air quality in major cities

(µg/m³)

Sulphur dioxide (SO₂)											
City	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2008(P)
Ahmedabad	32.0	25.0	15.1	-	12.2	8.4	10	12.3	16	15.7	12.3
Banglore	-	20.7	27.9	20.3	38.2	20.7	20	13.4	12	8.5	15.2
Chennai	21.7	8.1	15.9	12.6	11.9	12.5	17	19.9	15	12.2	9.5
Delhi	23.5	17.3	16.3	15.4	17.5	15.2	13	11.3	10	9.89	6.6
Hyderabad	17.2	16.8	16.4	11.8	14	12.4	10	7.27	6	5.63	5.5
Kolkata	35.7	21.3	0	34.3	44.5	17.4	18	11.4	17	9.33	7.7
Mumbai	31.1	18	25.1	11.5	14.9	12.1	16	9.07	8	6.67	8.7

(µg/m³)

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

(µg/m³)

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

(µg/m³)

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

Source: Central Pollution Control Board

SPM : Suspended particulate matter; (P) : Provisional

RSPM : Respirable suspended particulate matter

SO₂ : Sulphur dioxide NO_x : Oxides of nitrogen µg/m³ : Micrograms per metre cube

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

Table 4.3.4 : Number of registered factories by manufacturing industries

Sl. No.	Year	Manufacturing	Electricity, Gas & Water	Repair Services & Cold Storage	All Activities
1	2	3	4	5	6
1	1987-88	98379	458	3759	102596
2	1988-89	99724	481	3872	104077
3	1989-90	103373	493	4126	107992
4	1990-91	105511	518	4150	110179
5	1991-92	107454	505	4327	112286
6	1992-93	113890	961	4643	119494
7	1993-94	116227	542	4825	121594
8	1994-95	117564	554	4892	123010
9	1995-96	125281	4013	5277	134571
10	1996-97	125166	4160	5230	134556
11	1997-98	126272	3856	5423	135551
12	1998-99*	130222	143	1341	131706
13	1999-2000*	130035	158	1365	131558
14	2000-01*	127036	163	4069	131268
15	2001-02*	124099	170	4279	128548
16	2002-03*	123401	182	4374	127957
17	2003-04	124277	219	4578	129074
18	2004-05	131232	275	4846	136353
19	2005-06	134669	259	5232	140160
20	2006-07	138968	313	5429	144710
21	2007-08	140355	385	5645	146385
22	2008-09	145727	504	9090	155321
23	2009-10	149130	496	9251	158877
24	2010-11	161458	585	10134	172177

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

Note: Factories registered under Factory Act 1948

Source : Central Statistics Office

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

Table 4.3.5 : Maximum permissible limits for industrial effluent discharges

(mg/Litre)

Sl. No.	Parameter	Into Inland Surface Waters Indian Standards 2490 (1974)	Into Public Sewers Indian Standards: 3306 (1974)	On land for Irrigation Indian Standards: 3307 (1974)	Marine Coastal Area
1	2	3	4	5	6
1	pH	5.5-9.0	5.5-9.0	5.5-9.0	5.5-9.1
2	Biological oxygen demand (for 5 days at 20°C)	30.00	350.00	100.00	100.00
3	Chemical oxygen demand	250.00	-	-	250
4	Suspended solids	100.00	600.00	200.00	-
5	Total dissolved solids (inorganic)	2100.00	2100.00	2100.00	-
6	Temperature (°C)	40.00	45.00	-	45.00
7	Oil and grease	10.00	20.00	10.00	20.00
8	Phenolic Compounds	1.00	5.00	-	5.00
9	Cyanides	0.20	2.00	0.20	0.20
10	Sulphides	2.00	-	-	5.00
11	Fluorides	2.00	15.00	-	15.00
12	Total residual chlorine	1.00	-	-	1.00
13	Pesticides	-	-	-	-
14	Arsenic	0.20	0.20	0.20	0.20
15	Cadmium	2.00	1.00	-	2.00
16	Chromium (hexavalent)	0.10	2.00	-	1.00
17	copper	3.00	3.00	-	3.00
18	Lead	0.10	1.00	-	1.00
19	Mercury	0.01	0.01	-	0.01
20	Nickel	3.00	3.00	-	5.00
21	Selenium	0.05	0.05	-	0.05
22	Zinc	5.00	15.00	-	15.00
23	Chlorides	1000.00	1000.00	600.00	-
24	Boron	2.00	2.00	2.00	-
25	Sulphates	1000.00	1000.00	1000.00	-
26	Sodium (%)	-	60.00	60.00	-
27	Ammoniacal nitrogen	50.00	50.00	-	50
28	Radioactive materials				
29	Alpha emitters (milli curie/millilitre)	10 ⁻⁷	10 ⁻⁷	10 ⁻⁸	10 ⁻⁷
30	Beta emitters (µ curie/millilitre)	10 ⁻⁶	10 ⁻⁶	10 ⁻⁷	10 ⁻⁶

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

4.4 Important industries and the effluent standards in India

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

Table 4.4.1 : Effluent standards for sugar industry

Sl. No.	Parameter	Permissible Limits (mg/Litres)	
		Disposal on Land	Disposal in Surface Water
1	2	3	4
1	Biological Oxygen Demand (5 days at 20°C)	100	30
2	Suspended Solids	100	30

Source : Environment Protection Rules-1986.

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

Table 4.4.2 : Effluent standards for large pulp and paper industries

Capacity (Tonnes a year)	Parameter	Permissible Limits
1	2	3
Above 24,000	pH	7.0-8.5
	Biological Oxygen Demand at 20°C	30 mg/litre
	Chemical Oxygen Demand	350 mg/litre
	Suspended solids	50 mg/litre
	Total organic chloride	2.0 kg/tonne of paper produced
	Flow (total waste water discharge)	--
	Large pulp and paper ^a	200 m ³ /tonne of paper produced
	Large rayon grade newsprint	150 m ³ /tonne of paper produced

Source : Central Pollution Control Board

a : the standards with respect to total waste water discharge for large pulp and paper mills established from 1992 will meet the standards of 100 m³/tonne of paper produced

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

Table 4.4.3 : Effluent standards for oil refineries

(Mg/Litre)			
Sl. No.	Parameter	Permissible Limit	Quantum (Kg/Thousand Tonnes of Crude Processed)
1	2	3	4
1	Oil and grease	10.0	7.00
2	Phenol	1.0	0.70
3	Sulphide	0.5	0.35
4	Biological Oxygen Demand (5 days at 20°C)	15.0	10.50
5	Suspended Solids	20.0	14.00
6	pH	--	6.00-8.50

Environment protection rule, 1986

Source : Central Pollution Control Board

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

Table 4.4.4: Effluent standards for aluminium industry

Sl. No.	Plant	Parameters	Permissible Limits
1	2	3	4
1	Aluminium Plant Raw material handling	Primary and secondary crusher particulate matter	150 mg/m ³
	Precipitation area : calcination	Particulate matter Carbon Mono-oxide Stack Height ^a	250 mg/m ³ 1 % maximum
2	Smelter plant Green anode shop	Particulate matter	150 mg/m ³
	Anode bake oven	Particulate matter Total fluoride	150 mg/m ³ 0.3kg/tonne at Al
3	Potroom	Particulate matter	150 mg/m ³
		Total fluoride	
		Vertical stud soderberg	4.7 kg/tonne of Al produced
		Horizontal stud soderberg	6.0 kg/tonne of Al produced
		Prebacked side worked	2.5 kg/tonne of Al produced
Prebacked centre worked	1.0 kg/tonne of Al produced		
		Stack Height ^a	

Source : Central Pollution Control Board

a $H = 14 Q^{0.3}$, where Q is the emission rate of sulphur dioxide in Kg/h and H is the stack height in meters.

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

TABLE 4.4.5: Effluent standards for petro-chemical (Basic & intermediates)Industry

<i>(Mg/Litre)</i>		
Sl. No.	Parameter	Permissible Limit
1	2	3
1	pH	6.5-8.5
2	Biological Oxygen Demand (5 days at 20 ⁰ C) ^a	50.0
3	Phenol ^b	5.0
4	Sulphide (as S)	2.0
5	Chemical Oxygen Demand	250.0
6	Cyanide (as CN)	0.2
7	Fluoride (as F) ^c	15.0
8	Total Suspended Solids	100.0
9	Hexavalent Chromium	0.1
10	Total Chromium (as Cr) ^d	2.0

Source : Central Pollution Control Board, Environment protection rules, 1986

- a :** The state board may prescribe the biological oxygen demand value of 30 mg/l if the recipient system so demands.
- b :** The limit for phenol shall be confirmed at the outlet of effluent treatment of phenol plant. However, at the final disposal point, the limit shall be less than 1 mg/l
- c :** The limit for fluoride shall be confirmed at the outlet of the chrome removal unit. However, at the disposal point, fluoride concentration shall be lower than 5 mg/l
- d :** The limits for total and hexavalent chromium shall be confirmed at the outlet of the chromate removal. This implies that in the final treated effluent total, and hexavalent chromium shall be lower than prescribed herein

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

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

(As on 31.03.2010)

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

Source : Ministry of Environment & Forests,(CPCB)

4.6 Measures Taken for Controlling Air Pollution from Industries

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

- a. Emission standards have been notified under the Environment (Protection) Act, 1986 to check pollution
- b. Industries have been directed to install necessary pollution control equipment in a time bound manner and legal action has been initiated against the defaulting units.
- c. 24 critically polluted areas have been identified. Action Plan has been formulated for restoration of environmental quality in these areas.
- d. Environmental guidelines have evolved for citing of industries.
- e. Environmental clearance is made compulsory for 29 categories of development projects involving public hearing/NGO participation as an important component of Environmental Impact Assessment process.
- f. Environmental audit in the form of environmental statement has been made mandatory for all polluting industries.
- g. Preparation of zoning Atlas for setting of industries based on environmental considerations in various districts of the country has been taken up.
- h. Power plants (coal based) located beyond 1000 kms from the pit-head are required to use low ash content coal (not exceeding 34%) with effect from 1.6.2002. Power plants located in the sensitive areas are also required to use low ash coal irrespective of their distance from the pit head.

4.6.2 Up-coming initiatives

- a. Monitoring using automatic analysers is being initiated in 16 polluted cities identified by Hon'ble Supreme Court.
- b. Action Plan are being formulated and implemented by the Central/ States Pollution Control Boards in 16 cities identified by Hon'ble Supreme Court as polluted cities.
- c. Road map given by Auto fuel policy for vehicular pollution control is being implemented.
- d. Corporate Responsibility for Environmental protection (CREP) is being implemented by industries for controlling industrial pollution.
- e. Source apportionment studies have been initiated and it is planned to carry out such studies initially in six cities.
- f. Monitoring of hazardous air pollutants such as benzene, PAHs etc. has been initiated and it is proposed to carry out there monitoring in other cities also.

4.7 Road Transport

4.7.1 Road vehicles are the second major source of pollution. They emit CO, HCs, NO_x, SO₂, and other toxic substances such as TSP and lead. Diesel engines are much less polluting than petrol engines. Both types of engines are not very efficient converters of fuel energy. However, diesel types with a conversion efficiency of around 30% must be more efficient and use less fuel than petrol types with a 15-20% conversion efficiency. Both types of engines have incomplete combustion of fuel, so the major pollutant is CO, amounting to 91% by weight of all vehicle emissions. The primary pollutants produced in vehicle emissions undergo a series of complex interrelated chemical reactions in the troposphere and lower stratosphere to form secondary products.

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTs

Sl. No.	States/UT	Transport													
		Multi-axied/Articulated Vehicles/Trucks & Lorries							Light Motor Vehicles (Goods)						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Andhra Pradesh	181832	196703	218733	233415	236211	241663	253,415	85112	131782	165918	194746	219332	257147	302,124
2	Arunachal Pradesh*	2355	2355	2355	2355	2355	...	...	601	601	601	601	601	...	...
3	Assam	91801	97790	105565	114485	124132	136090	144,183	19371	22587	25451	29703	32473	35788	47,296
4	Bihar	50016	52005	54414	58012	66485	73472	83,191	0	48123	54153	62576	...	...	...
5	Chhattisgarh	51716	59112	67634	73843	78488	83674	91,068	21858	25515	29803	33948	38434	43936	50,373
6	Goa (c)	34043	33120	33596	35495	37040	39422	42,395	0	4220	6316	7260	8218	9402	11,447
7	Gujarat	204362	223022	239404	247772	259231	276290	301,533	253340	285858	314388	338826	367113	402514	448,958
8	Haryana	176046	200977	220470	230858	249991	275162	292,735	74494	83921	90793	96558	102541	114384	124,897
9	Himachal Pradesh	31803	27239	30409	47339	49582	51899	53,763	20623	21738	24097	39058	42877	47395	43,092
10	Jammu & Kashmir	33174	35697	38977	41696	35109	35414	38,482	16843	20004	22674	24768	43238	46792	51,412
11	Jharkhand	68915	97967	106463	116835	156196	172371	191,253	0	53866	59451	66160	160778	180934	202,638
12	Karnataka	210432	181587	198955	205497	200316	217113	233,422	65581	130685	145809	161100	177179	198378	221,160
13	Kerala	264262	64454	65707	66868	68777	72534	76,330	0	247799	271763	291514	251471	288447	323,891
14	Madhya Pradesh	83293	88755	94661	99242	105025	112954	121,916	39943	46754	55057	62984	72029	82673	95,702
15	Maharashtra	287230	316502	344267	366642	374705	389941	411,418	334741	383854	436725	478975	521692	583847	656,407
16	Manipur	6746	7078	7216	7216	7639	8249	8,599	1854	2005	2245	2245	2871	3207	4,054
17	Meghalaya	17060	17937	18572	19747	21372	23064	25,451	2565	3222	3781	4425	4955	6058	7,210
18	Mizoram	4475	3000	3167	3343	3507	3844	4,285	5	2566	2981	3397	4003	4862	6,194
19	Nagaland	47089	51466	55974	60684	65729	77968	84,008	11804	13319	14043	15068	16345	25158	17,799
20	Odisha	74432	83093	91154	100279	109804	119145	130,030	47843	56534	66429	78370	86729	100546	109,719
21	Punjab	68154	119630	129797	139065	149367	149367	125,898	59566	20186	20186	20186	20186	20186	75,860
22	Rajasthan	206381	152223	169486	179631	198089	222959	362,028	22966	116861	127937	138487	148892	162837	69,509
23	Sikkim	1915	2270	2490	2755	3214	3457	3,930	489	585	605	750	795	823	947
24	Tamil Nadu	315564	340950	366658	387336	404652	433579	467,225	231491	243904	254321	261800	280388	311084	353,883
25	Tripura	8138	8593	9000	9524	10432	10934	11,166	2535	3336	4037	4819	6199	7568	8,452
26	Uttarakhand	12092	14816	17014	17354	18026	19474	23,786	8336	7086	8481	10453	16393	19695	26,670
27	Uttar Pradesh	106760	107559	115552	122520	137436	150670	162,813	77668	85906	100273	117913	131181	156388	176,164
28	West Bengal	235269	256072	253389	251120	222716	248776	281,995	--	\$	\$	\$	\$	\$	\$
	Union Territory:	2875355	2841972	3061079	3240928	3395626	3649575	4,026,318	1399629	2062817	2308318	2546690	2756913	3110049	3,435,858
1	A & N Islands	1716	2152	2303	2355	2366	2429	2,484	76	0	0	0	...	...	...
2	Chandigarh	1766	1775	1865	1952	2210	2490	2,689	8039	8455	8725	9586	15466	21841	23,015
3	Dadra & Nagar Haveli	6072	6537	7123	7604	8048	8591	8,935	1750	2043	2298	2496	2761	3036	3,380
4	Daman & Diu	2223	2568	2791	2934	3112	3646	3,818	2316	2670	2854	2973	3130	3274	3,434
5	Delhi	57682	82525	83770	84114	85384	86301	4,792	67144	91698	105331	124180	140872	156030	124,547
6	Lakshadweep	0	0	0	0	0	0	0	347	419	452	452	494	590	728
7	Puducherry	6965	7517	7622	7671	7745	7832	7,849	4903	5732	6407	6989	7799	8811	10,544
	Uts	76424	103074	105474	106630	108865	111289	30,567	84575	111017	126067	146676	170522	193582	165,648
	Total	2951779	2945046	3166553	3347558	3504491	3760864	4,056,885	1484204	2173834	2434385	2693366	2927435	3303631	3,601,506

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

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

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

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

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

\$\$ Includes Omni Buses

(Note: for website: <http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf>.)

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTs

Sl. No.	States/UT	Transport													
		Buses						2012 23	Taxis						
		2006 17	2007 18	2008 19	2009 20	2010 21	2011 22		2006 24	2007 25	2008 26	2009 27	2010 28	2011 29	2012 30
1	Andhra Pradesh	18368	45359	49480	53820	56664	60,622	70,075	113693	71559	84150	95554	103290	114923	129,322
2	Arunachal Pradesh*	682	682	682	682	682	...	..	343	343	343	343	343	...	..
3	Assam	11378	11936	12570	13257	13859	14,741	15,787	12671	14343	16382	19680	24088	28161	33,999
4	Bihar	16271	17192	18533	19654	21209	22,703	24,097	22698	24024	27066	30857	38204	43623	52,218
5	Chhattisgarh	24955	33033	36814	41098	7658	8,596	12,049	5036	5241	5811	6589	7499	8723	13,515
6	Goa (c)	5689	6376	6770	7644	8332	8,907	9,513	9361	10241	11901	12768	13143	13306	14,338
7	Gujarat	54446	54214	56214	58253	60023	62,386	67,546	47914	53237	58412	62915	67740	74512	83,038
8	Haryana	19986	22101	26906	29516	33520	35,646	39,153	16344	17738	13869	14791	15081	19978	23,793
9	Himachal Pradesh	6859	3265	3681	5398	5714	6,186	14,592	14542	14407	15718	20582	21993	23791	25,030
10	Jammu & Kashmir	21435	22161	23149	24051	23480	25,858	25,785	13656	14715	16815	18971	15939	21307	25,577
11	Jharkhand	10238	10792	11270	11699	12256	12,847	13,561	24693	34464	37439	41828	259542	296771	333,420
12	Karnataka	40819	45211	49586	44308	53874	58,012	62,501	67385	85064	137064	147489	115410	129272	142,700
13	Kerala	127574	396980	414678	430162	383229	390,430	396,826	119753	63992	69263	75313	84792	96666	108,877
14	Madhya Pradesh	27997	29177	30516	31520	35105	36,647	40,551	72760	77723	85295	94199	99241	110730	122,969
15	Maharashtra	66754	71187	77042	79073	83816	89,861	100,097	122389	133309	149526	157916	168307	168496	175,797
16	Manipur	2570	2634	2727	2727	2769	2,776	2,868	377	407	412	412	1595	1896	2,567
17	Meghalaya	3497	3639	3779	3905	4007	4,116	4,323	8432	9579	10385	11352	12607	14507	16,205
18	Mizoram	704	907	954	1003	1036	1,088	1,141	4988	5323	5763	5992	6465	7246	8,183
19	Nagaland	4060	4262	4422	4694	5041	5,573	5,542	5004	5246	5435	5921	6428	6716	6,970
20	Odisha	15996	16951	17694	18464	19335	20,616	21,917	30426	33540	36123	38716	41828	44585	56,464
21	Punjab	21136	22373	24457	25682	27146	27,146	30,160	9937	12940	13538	14314	15837	15837	18,539
22	Rajasthan	60979	63320	65605	69298	73257	77,980	83,345	42679	47701	54321	60941	67542	76317	89,053
23	Sikkim	365	429	434	294	524	586	613	6052	6499	6745	7108	7569	8011	8,816
24	Tamil Nadu	89991	97396	105897	114671	123999	134,887	144,251	134580	149774	170377	188795	209689	243425	278,005
25	Tripura	1961	2079	2182	2223	2194	2,295	2,312	1316	1370	1373	1380	3199	3468	3,530
26	Uttarakhand	5949	2780	3745	4032	7527	8,066	8,504	16069	11458	15008	17058	18660	20896	25,415
27	Uttar Pradesh	26549	25134	25339	26331	28124	31,922	34,428	28443	25762	39274	34107	38629	47364	59,379
28	West Bengal	43599	42737	35924	35023	31996	34,184	35,603	68926	72702	65153	66240	73696	80012	84,591
	Union Territory:	730807	1054307	1111050	1158482	1126376	1,184,677	1,267,120	1020467	1002701	1152961	1252131	1538356	1720539	1,942,310
1	A & N Islands	658	757	775	811	825	846	903	246	439	439	489	489	489	489
2	Chandigarh	2307	2141	2252	2375	3062	3,684	5,170	1771	2273	2606	2810	3017	3275	3,491
3	Dadra & Nagar Haveli	176	214	262	278	295	314	321	123	126	129	133	142	146	151
4	Daman & Diu	420	422	439	451	461	474	512	43	43	44	44	45	46	49
5	Delhi	25963	38500	39622	41142	43250	45,757	20,142	15569	35041	43887	50351	55530	62839	62,335
6	Lakshadweep	13	15	19	19	0	0	0	0	0	0	0	105	140	207
7	Puducherry	1997	2066	2149	2235	2373	2,493	2,596	1626	1724	1796	1847	1892	1943	1,990
	Uts	31534	44115	45518	47311	50266	53,568	29,644	19378	39646	48901	55674	61220	68878	68,712
	Total	762341	1098422	1156568	1205793	1176642	1,238,245	1,296,764	1039845	1042347	1201862	1307805	1599576	1789417	2,011,022

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways
 # Included in Tractors ^ : Included other vehicles not covered in 'transport vehicles'
 \$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries
 (c) : LMV (passengers) includes 6538 Motorcycles on hire also.
 * : includes Motor cycles on hire ^: included in Cars
 \$\$ Includes Omni Buses

(Note: for website: <http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf>.)

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTs

Sr. No.	States/UT	(Number)													
		Light Motor Vehicles (Passengers)							Transport						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1	Andhra Pradesh	299776	275124	323293	381488	434448	513266	576,480	4284790	720527	841574	959023	1049945	1187621	1,331,416
2	Arunachal Pradesh*	1449	1449	1449	1449	1449	...	..	21358	5430	5430	5430	5430	...	..
3	Assam	34906	37691	41267	45266	51185	59742	67,921	1304479	184347	201235	222391	245737	274522	309,186
4	Bihar	45365	0	0	0	74968	92390	113,088	1026169	141344	154166	171099	200866	232188	272,594
5	Chhattisgarh	9194	10669	12245	13589	15047	17566	17,913	975223	133570	152307	169067	147126	162495	184,918
6	Goa (c)	10035	11667	12826	14863	4238	4309	3,853	450310	65624	71409	78030	84134	90751*	100,749 *
7	Gujarat	336695	371792	396828	426616	464862	511270	561,740	5360170	988123	1065246	1134382	1218969	1326972	1,462,815
8	Haryana	45858	52620	63914	73134	83745	94770	103,995	2708123	377357	415952	444857	484878	539940	584,573
9	Himachal Pradesh	2825	2459	2611	2744	2771	2805	3,963	715515	69108	76516	115121	122937	132076	140,440
10	Jammu & Kashmir	15919	16562	18440	19673	10958	12420	13,759	793098	109139	120055	129159	128724	141791	154,995
11	Jharkhand	46834	0	0	0	160778	180934	202,638	2791503	197089	214623	236522	766936	863333*	965,287 *
12	Karnataka	213721	214574	243034	247077	237295	259429	285,408	3939654	657121	774448	805471	887999	973110^^	1,062,081 ^^
13	Kerala	342527	381872	410637	448649	491879	544485	601,507	5854905	1155097	1232048	1312506	1394162	1507041^^	1,622,543 * ^^
14	Madhya Pradesh	51049	54561	57395	60751	67488	76207	86,068	2106495	296970	322924	348696	378888	419211	467,206
15	Maharashtra	534535	555118	574625	598013	626332	640700	640,040	8065081	1459970	1582185	1680619	1774852	1872845	1,983,759
16	Manipur	2721	3787	4071	4071	7266	9954	11,854	100714	15911	16671	16671	22140	26082	29,942
17	Meghalaya	3569	4081	4433	4842	5348	6000	6,744	35123	38458	40950	44271	48290	53746*	59,934 *
18	Mizoram	1534	1758	1931	2105	2219	2477	2,955	101992	13554	14796	15840	17230	19517	22,758
19	Nagaland	9548	10408	12939	13143	13403	14284	14,429	641354	84701	92813	99510	106946	129699	128,748
20	Odisha	34360	38436	43265	49896	57456	62830	74,313	1701162	228554	254665	285725	315152	347722	392,443
21	Punjab	43280	46399	50428	53670	57879	57879	66,734	1439998	221528	238406	252917	270415	270415	317,191
22	Rajasthan	79576	88509	95899	103270	112986	123328	134,345	3290244	468614	513248	551627	600766	663421	738,280
23	Sikkim	0	0	0	0	...	...	...	79116	9783	10274	10907	12102	12967	14,306
24	Tamil Nadu	174646	186290	202995	215542	238682	291605	301,982	7013266	1018314	1100248	1168144	1257410	1414580	1,545,346
25	Tripura	13237	14544	15829	16968	15749	18074	19,203	148902	29922	32421	34914	37773	42339	44,663
26	Uttarakhand	7906	9641	10971	12755	11622	13820	13,004	392801	45781	55219	61652	72229	81951	97,379
27	Uttar Pradesh	91346	97696	87549	105096	123706	146351	175,649	2310988	342057	367987	405967	459076	532695	608,433
28	West Bengal	40315	42195	37121	42312	48370	58633	63,424	2560094	413706	391587	394695	376778	421605	465,613
	Union Territory:	2492726	2529902	2725995	2956982	3422129	3815528	4,163,009	60466137	9491699	10359403	11155213	12487890	13740635	15,107,598
1	A & N Islands	2997	2441	2705	2884	2950	3248	3,803	27535	5789	6222	6539	6630	7012	7,679
2	Chandigarh	2000	0	0	0	...	...	0	152112	14644	15448	16723	23755	31290	34,365
3	Dadra & Nagar Haveli	539	557	568	579	605	620	632	74029	9477	10380	11090	11851	12707	13,419
4	Daman & Diu	976	1091	1120	1151	1173	1216	1,230	46220	6794	7248	7553	7921	8668*	9,043
5	Delhi	96149	158242	168073	179640	182784	190693	68,653	1970457	406006	440683	479427	507820	541620	280,469
6	Lakshadweep	273	291	321	321	321	366	420	4285	725	792	792	920	1096	1,355
7	Puducherry	4665	4925	5039	5062	5124	5217	5,221	137792	21964	23013	23804	24933	26296	28,200
	Uts	107599	167547	177826	189637	192957	201360	79,959	2412430	465399	503786	545928	583830	628689	374,530
	Total	2600325	2697449	2903821	3146619	3615086	4016888	4,242,968	62878567	9957098	10863189	11701141	13071720	14369324	15,482,128

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

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

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

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

* : includes Motor cycles on hire

^ : included in Cars

\$\$ Includes Omni Buses

(Note: for website: <http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf>.)

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTs

Sl. No.	States/UT	Non-Transport													
		Two Wheelers							Cars						
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	45	46	47	48	49	50	51	52	53	54	55	56	57	58
1	Andhra Pradesh	5707383	4686543	5262086	5851893	6514593	7488771	9,291,132	576329	535649	619092	701920	777746	880817	1,058,184
2	Arunachal Pradesh*	11112	11112	11112	11112	11112	...	...	2595	2595	2595	2595	2595	...	...
3	Assam	541275	610529	667788	740420	830836	958935	1,101,265	145029	165255	184088	203000	232546	269605	311,917
4	Bihar	964594	1077579	1197875	1364757	1606613	1899017	2,230,069	76896	84305	92528	103077	188031	136845	160,340
5	Chhattisgarh	1247658	1395935	1553104	1686424	1964769	2232929	2,503,781	59591	69080	79616	92437	108326	131862	154,529
6	Goa	375571	408269	436662	467827	502042	541934	589,377	89547	99191	109215	120425	133717	149869	167,544
7	Gujarat	6352109	7003860	7579457	8087416	8716981	9507556	10,512,304	703968	784686	869808	952400	1057383	1218030	1,411,898
8	Haryana	1881174	2172669	2463672	2768197	2975418	3370426	3,755,349	373659	449285	541380	618942	720441	855596	989,519
9	Himachal Pradesh	187883	188166	200163	249994	283081	331418	384,832	58005	61928	69482	80224	95791	116176	171,382
10	Jammu & Kashmir	297656	320754	341834	363029	407928	446791	480,815	98309	112135	128398	145060	172071	198238	230,328
11	Jharkhand	1164854	1302967	1428934	1570575	1738566	1947572	1,851,060	113500	126179	139053	154803	174320	201269	227,386
12	Karnataka	4512910	3755719	4230864	4796587	6404905	7033045	7,737,366	635205	694252	791014	892160	1005291	1131201	1,269,430
13	Kerala	2099652	2056472	2367602	2612341	2900238	3294953	3,811,343	498472	533494	603842	692628	826538	985736	1,151,566
14	Madhya Pradesh	3526416	3895557	4292649	4691218	5165023	5783120	6,411,155	185700	208052	237022	272009	314464	366674	424,644
15	Maharashtra	7691856	8573679	9394869	10212360	11181762	12429011	13,921,763	1165365	1308088	1462518	1603728	1790259	2027080	2,307,841
16	Manipur	86931	93595	105465	105465	139650	145286	148,942	11233	11475	12077	12077	15113	17019	17,299
17	Meghalaya	31008	36112	40953	45747	51709	56790	65,712	22351	25268	28335	32995	37981	43901	49,728
18	Mizoram	24737	27776	30062	32267	39902	47978	60,278	6286	8061	8716	9326	10382	11583	13,839
19	Nagaland	42851	45961	48976	52119	55208	61085	61,546	37513	40574	43129	45549	47984	50249	53,074
20	Odisha	1530295	1701981	1874644	2052980	2302694	2614980	2,946,118	82686	90258	99350	112490	133529	161024	186,323
21	Punjab	2975198	3173433	3385088	3581837	3956279	3956279	4,729,594	335284	367655	406966	444465	484064	484064	616,549
22	Rajasthan	3393916	3833746	4261695	4715835	5230454	5859719	6,629,743	269561	310101	355122	402239	455924	520385	591,069
23	Sikkim	5282	5549	5793	5956	6308	6843	7,447	3053	3759	4226	5704	8905	12264	13,933
24	Tamil Nadu	7936778	8689876	9446469	10223233	11156048	12393788	13,846,378	840433	911752	996220	1091231	1204156	1350722	1,504,735
25	Tripura	61968	69830	76952	85455	97895	117486	129,343	6656	7798	8836	9966	10095	11224	12,390
26	Uttarakhand	486734	474666	533443	570359	583927	708595	897,651	59368	74101	84706	98355	119859	147591	188,152
27	Uttar Pradesh	6083655	7138789	7737237	8521198	9493677	10563850	12,410,064	615739	641939	703071	775569	873251	10563850	1,108,100
28	West Bengal	1833820	2081355	1748253	2017198	1864861	2260657	2,717,713	556230	602420	547738	560875	435352	492454	575,085
	Union Territory:	61055276	64832479	70723701	77483799	86182479	96058814	109,232,140	7628563	8329335	9228143	10236249	11436114	12956415	14,966,784
1	A & N Islands	23079	34458	37993	42386	43762	48819	54,220	2441	5803	6785	8263	10988	12863	14,632
2	Chandigarh	454308	474595	493380	511568	686316	711007	737,263	176387	188786	203052	218857	239014	265135	286,584
3	Dadra & Nagar Haveli	23607	27541	31424	35059	38635	43010	48,550	11820	13402	15728	17210	17507	19687	21,762
4	Daman & Diu	33379	38751	42373	42861	43991	47247	52,339	15007	15952	17191	18297	19332	20501	22,175
5	Delhi	2851920	3377073	3616417	3846721	4107912	4395086	4,661,714	1222706	1536897	1668880	1802251	1956574	2116107	2,172,069
6	Lakshadweep	4822	5227	5639	5639	6206	6888	7,698	38	44	48	48	64	87	122
7	Puducherry	296735	338638	385090	434072	488490	553711	625,251	52593	56249	60315	64631	69813	76678	85,418
	Total	64743126	69128762	75336017	82402105	91597791	101864582	115,419,175	9109555	10146468	11200142	12365806	13749406	15467473	17,569,546

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways
 # Included in Tractors ^ : Included other vehicles not covered in 'transport vehicles'
 \$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries
 (c) LMV (passengers) includes 6538 Motorcycles on hire also.
 * : includes Motor cycles on hire ^ : included in Cars
 \$\$ Includes Omni Buses

(Note: for website: <http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf>.)

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTs

Sl. No.	States/UT	Non-Transport													
		Jeeps						Omni Buses							
		2006	2007	2008	2009	2010	2011	2012	2006	2007	2008	2009	2010	2011	2012
1	2	59	60	61	62	63	64	65	66	67	68	69	70	71	72
1	Andhra Pradesh	65377	27500	28476	29494	29587	29652	30,400	45214	38722	41959	45421	49130	53531	60,897
2	Arunachal Pradesh*	2284	2284	2284	2284	2284	...	...	0	0	0	0	0	...	...
3	Assam	15080	15230	15347	18131	20742	20861	20,968	0	1155	1162	1203	1225	1243	1,248
4	Bihar	41863	46293	50522	56270	66132	75878	84,949	0	0	0	0	...	...	...
5	Chhattisgarh	8575	9392	10395	11637	13277	15062	16,561	0	0	0	0	30879	33739	33,739
6	Goa	@	357	730	1065	^	...	^	0	0	0	0	0	0	0
7	Gujarat	122864	128247	135014	141565	152985	160800	167,991	0	0	0	0	...	...	...
8	Haryana	95450	101735	108885	111602	115852	113384	121,202	0	0	0	0	0	0	0
9	Himachal Pradesh	9544	13497	14589	18932	20693	22756	12,704	402	201	259	262	634	949	...
10	Jammu & Kashmir	11058	11222	11295	11402	11601	118301	24,920	219	219	219	219	1219	1818	2,687
11	Jharkhand	30962	35762	40269	45455	52155	59892	67,139	0	0	0	0	...	...	...
12	Karnataka	41989	36739	38319	39669	40225	41229	42,179	54808	53991	60972	70708	105503	109075	113,204
13	Kerala	73158	120300	128082	137547	137547	137547	137,547	0	3252	3559	3712	3748	3798	3,798
14	Madhya Pradesh	38291	37449	38181	39652	41396	49566	51,197	0	0	0	0	...	...	...
15	Maharashtra	300023	322053	341782	356986	373958	394647	423,305	0	18238	18158	18477	18752	18677	19,021
16	Manipur	8568	8937	9146	9146	11472	11901	12,241	801	915	1250	1250	1524	1600	1,605
17	Meghalaya	11300	12229	12917	13652	14328	15011	15,682	0	0	0	0	1	1	3
18	Mizoram	3712	7486	7888	8233	8813	9211	4,082	0	0	0	0	0	0	0
19	Nagaland	22481	23372	24433	25211	25888	26313	27,083	350	421	474	478	497	501	505
20	Odisha	30547	31555	32591	34111	36726	41966	44,396	2567	2784	2989	3220	3451	3668	3,668
21	Punjab	41670	46957	49555	52193	54798	54798	63,527	0	0	0	0	...	...	...
22	Rajasthan	147840	157574	169601	182922	203692	227910	254,840	0	0	0	0	...	...	...
23	Sikkim	3769	4177	4310	4557	4869	5251	6,086	1070	1380	1384	1389	1393	1399	1,484
24	Tamil Nadu	55673	56461	56825	57207	57417	58080	58,718	19957	19957	19957	19957	19957	19957	19,957
25	Tripura	4358	4485	4733	4977	12340	14434	15,542	13	18	18	18	...	...	...
26	Uttarakhand	6944	4526	4269	4385	8103	8876	9,762	1629	1292	5612	1651	1289	1302	1,903
27	Uttar Pradesh	112837	109981	122120	135149	159128	984937	200,316	19015	16982	20240	19305	18740	984937	23,473
28	West Bengal	@	@	@	#	^	^	^	0	0	0	0	...	...	...
	Union Territory:	1306217	1375800	1462558	1553434	1676008	1889724	1,913,337	146045	159527	178212	187270	257942	272817	287,192
1	A & N Islands	779	1948	2181	2235	^	...	^	335	0	0	0	^	...	^
2	Chandigarh	0	0	0	0	...	...	^	51	71	104	119	130	287	...
3	Dadra & Nagar Haveli	460	471	0	447	549	561	568	6	6	0	0	20	22	0
4	Daman & Diu	307	342	401	78884	477	499	542	38	38	38	38	42	42	51
5	Delhi	65028	77847	78711	94	79418	79488	68,648	80277	89320	89345	89367	89367	89368	89,373
6	Lakshadweep	88	90	94	3881	95	99	121	73	87	87	87	0	0	0
7	Puducherry	3865	3866	3880	3881	3881	3882	3,882	2918	2784	2867	2931	2958	3045	3,123
		70527	84564	85267	85541	84420	84529	73,761	83698	92306	92441	92542	92517	92764	92,547
	Total	1376744	1460364	1547825	1638975	1760428	1974253	1,987,098	229743	251833	270653	279812	350459	365581	379,739

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways
: Included in Tractors ^ : Included other vehicles not covered in transport vehicles
\$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries
(c) LMV (passengers) includes 6538 Motorcycles on hire also.
* : includes Motor cycles on hire ^ : included in Cars
\$\$: Includes Omni Buses

(Note: for website: <http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf>.)

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTs

(Number)

Sr. No	States/UT	Non- Transport													
		Tractors							Trailers						
		2006 73	2007 74	2008 75	2009 76	2010 77	2011 78	2012 79	2006 80	2007 81	2008 82	2009 83	2010 84	2011 85	2012 86
1	Andhra Pradesh	66613	184441	212904	242305	261509	292427	342,416	51881	167206	193524	218860	229149	242270	289,422
2	Arunachal Pradesh*	345	345	345	345	345	...	..	155	155	155	155	155	...	..
3	Assam	11270	12231	13170	14586	16177	18714	19,655	9050	9386	9830	10307	10805	11620	15,290
4	Bihar	130477	136637	144801	156004	175500	196555	219,509	75594	80875	86233	93743	104272	115214	126,618
5	Chhattisgarh	58733	66077	73489	82175	91621	102699	115,524	50684	56248	61412	67077	72839	78940	85,129
6	Goa	..	0	0	20	2562	2890	3,114	..	0	0	0	...	...	#
7	Gujarat	311385	336986	362799	386951	410516	442737	495,136	217790	232509	248751	263807	278921	294885	317,509
8	Haryana	382581	405605	430365	473438	490828	487321	516,658	0	0	0	0	0	0	0
9	Himachal Pradesh	0	7424	8197	9039	9292	9576	20,916	0	1423	1689	1834	1836	1853	220
10	Jammu & Kashmir	12818	14109	15615	16640	11640	13538	15,574	587	610	622	633	2861	3242	3,289
11	Jharkhand	20968	23977	26785	30665	35431	41116	47,114	16819	0	0	0	...	...	...
12	Karnataka	166685	132142	142521	152964	318844	341559	363,993	167622	122749	138919	143629	215575	233297	251,553
13	Kerala	15162	9644	10207	10641	10665	11209	11,602	2264	3196	3503	3653	3653	3656	3,656
14	Madhya Pradesh	376771	394356	411424	432618	458445	498997	545,115	192742	200719	206640	210903	215333	219731	224,033
15	Maharashtra	229362	250950	276438	302249	331694	371075	419,291	204733	220284	238080	252409	270078	293576	324,824
16	Manipur	1446	1604	1686	1686	3155	3185	3,326	612	626	664	664	680	715	394
17	Meghalaya	487	516	525	567	609	665	751	2607	2613	2649	2680	2713	2765	2,794
18	Mizoram	246	199	209	216	227	252	274	264	70	70	86	90	92	79
19	Nagaland	1891	1998	2073	2163	2260	2340	2,482	772	786	821	943	1020	1023	1,072
20	Odisha	42189	47327	52070	57384	64354	74439	83,079	34679	39577	44318	48771	55370	65016	73,110
21	Punjab	472873	478057	485044	491358	497551	497551	517,743	481	564	737	862	966	966	1,172
22	Rajasthan	464443	504002	537735	569807	605539	644305	699,881	59564	62086	65088	67134	69287	70525	71,665
23	Sikkim	24	34	38	38	49	59	76	...	0	0	0	0	0	2
24	Tamil Nadu	102744	115260	126358	137829	150432	167066	186,670	44015	49607	54652	58175	62260	66269	71,403
25	Tripura	89	97	127	189	976	1010	1,015	100	101	102	103	326	349	357
26	Uttarakhand	34155	29215	30934	32271	42921	46164	41,847	1401	2710	3228	3536	1508	839	5,883
27	Uttar Pradesh	791411	797990	847329	893683	953959	176398	1,064,284	14579	9549	10245	10696	15373	176398	15,278
28	West Bengal	58828	#	#	@	51233	57505	70,980	#	63430	59298	54516	...	#	...
	Union Territory:	3753996	3951223	4213188	4497831	4998334	5303581	5,808,025	1148995	1327079	1431230	1515176	1615070	1721969	1,884,752
1	A & N Islands	229	0	0	0	^	...	^	22	0	0	0	^	...	^
2	Chandigarh	0	0	0	0	149	173	196	0	0	0	0	0	0	#
3	Dadra & Nagar Haveli	57	86	0	0	152	177	36	46	46	0	0	77	77	186
4	Daman & Diu	224	248	273	287	300	313	352	138	165	176	186	195	205	213
5	Delhi	4706	5027	5091	5206	5294	5384	1,343	99	99	99	99	99	99	...
6	Lakshadweep	63	72	78	78	72	84	102	0	0	0	0	0	0	0
7	Puducherry	478	567	705	793	900	993	1,077	1655	1683	1702	1722	1732	1759	1,781
		5757	6000	6147	6364	6867	7124	3,106	1960	1993	1977	2007	2103	2140	2,180
	Total	3759753	3957223	4219335	4504195	5005201	5310705	5,811,131	1150955	1329072	1433207	1517183	1617173	1724109	1,886,932

Source : Motor Transport Statistics of India, Transport Research Wing, Ministry of Road Transport & Highways
 # : Included in Tractors ^ : Included other vehicles not covered in transport vehicles
 \$: Included in Multi-Axled/Articulated Vehicles/Trucks & Lorries
 (c) L MV (passengers) includes 6538 Motorcycles on hire also.
 * : includes Motor cycles on hire ^ : included in Cars
 \$\$: Includes Omni Buses

(Note: for website: <http://morth.nic.in/writereaddata/mainlinkFile/File838.pdf>.)

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTS

Sr. No.	States/UT	Non- Transport Others						
		2006	2007	2008	2009	2010	2011	2012
		87	88	89	90	91	92	93
1	Andhra Pradesh	6617	6268	8331	10032	11480	14258	20,461
2	Arunachal Pradesh*	180	180	180	180	180	...	...
3	Assam	22192	22903	23802	24713	25653	26628	27,591
4	Bihar	8569	10350	13015	14603	15572	17512	18,801
5	Chhattisgarh	2849	3507	4548	5772	6936	8311	9,857
6	Goa	4773	5310	5943	6542	4587	4631	4,825
7	Gujarat	17417	22926	27981	32130	36818	42155	46,064
8	Haryana	21434	21646	13030	8185	4408	10336	10,809
9	Himachal Pradesh	1042	0	0	18992	4077	6910	6,110
10	Jammu & Kashmir	1869	2114	2209	2303	2861	3242	4,290
11	Jharkhand	7268	0	0	0	...	...	...
12	Karnataka	43213	33343	40318	51363	65634	67967	69,795
13	Kerala	15880	75837	81386	86890	121101	128079	151,259
14	Madhya Pradesh	13665	13990	14618	15595	17027	18403	20,809
15	Maharashtra	29446	17729	21331	24080	27066	27188	32,557
16	Manipur	270	423	435	435	718	714	774
17	Meghalaya	1240	1339	1660	1965	2482	2858	3,234
18	Mizoram	4925	3758	3914	3914	3812	4015	520
19	Nagaland	353	12273	13044	13900	929	1443	1,908
20	Odisha	5975	6278	9805	12680	20556	29223	29,393
21	Punjab	7581	5662	6783	7899	10181	10181	17,163
22	Rajasthan	5822	0	0	0	...	...	...
23	Sikkim	...	0	0	0	...	...	...
24	Tamil Nadu	108041	119441	128814	135221	153853	167783	179,041
25	Tripura	5397	7310	7723	8201	714	831	908
26	Uttarakhand	2802	10910	13440	15143	1536	1843	1,465
27	Uttar Pradesh	21132	28412	17902	17245	15145	21559	15,326
28	West Bengal	34812	37391	15008	16335	18914	28403	31,350
	Union Territory:	394764	469300	475220	534318	572240	636954	704,310
1	A & N Islands	8237	97	107	306	394	406	532
2	Chandigarh	0	0	0	0	...	...	...
3	Dadra & Nagar Haveli	0	0	0	0	41	116	0
4	Daman & Diu	31	31	31	69	84	113	141
5	Delhi	169	187	195	212	364	519	76,504
6	Lakshadweep	546	495	497	497	498	499	499
7	Puducherry	5850	6330	6427	6414	6422	6439	6,544
		14833	7140	7257	7498	7803	8092	84,220
	Total	409597	476440	482477	541816	580043	645046	788,530

TABLE 4.7.1 : TOTAL REGISTERED MOTOR VEHICLES IN INDIA BY STATES/UTs

Sr. No.	States	Total Non- Tpt.							Grand Total (Transport +Non- Tpt.)						
		2006 94	2007 95	2008 96	2009 97	2010 98	2011 99	2012 100	2006 101	2007 102	2008 103	2009 104	2010 105	2011 106	2012 107
1	Andhra Pradesh	53529045	5646329	6366372	7099925	7873194	9001726	11,092,912	57813835	6366856	7207946	8058948	8923139	10189347	12,424,328
2	Arunachal Pradesh*	82641	16671	16671	16671	16671	...	..	103999	22101	22101	22101	22101	144534	151,279
3	Assam	7300375	836689	915187	1012360	1137984	1307606	1,497,934	8604854	1021036	1116422	1234751	1383721	1582128	1,807,120
4	Bihar	13455046	1436039	1584974	1788454	2156120	2441021	2,840,286	14481215	1577383	1739140	1959553	2356986	2673209	3,112,880
5	Chhattisgarh	14528808	1600239	1782564	1945522	2288647	2603542	2,919,120	15504031	1733809	1934871	2114589	2435773	2766037	3,104,038
6	Goa	469891	513127	552550	595879	642908	699324	764,860	920201	578751	623959	673909	727042	790075	865,609
7	Gujarat	70385442	8509214	9223810	9864269	10653604	11666163	12,950,902	75745612	9497337	10289056	10998651	11872573	12993135	14,413,717
8	Haryana	27912091	3150940	357332	3980364	4306947	4837063	5,393,537	30620214	3528297	3973284	4425221	4791825	5377003	5,978,110
9	Himachal Pradesh	2668315	272639	294379	379277	415404	489638	596,164	3383830	341747	370895	494398	538341	621714	736,604
10	Jammu & Kashmir	4063422	461163	500192	539286	610181	785170	761,903	4856520	570302	620247	668445	738905	926961	916,898
11	Jharkhand	12722848	1488885	1635041	1801498	2000472	2249849	2,192,699	15514351	1685974	1849664	2038020	2767408	3113182	3,157,986
12	Karnataka	48673860	4828935	5442927	6147080	8155977	8957373	9,847,520	52613514	5486056	6217375	6952551	9043976	9930483	10,909,601
13	Kerala	25447102	2802195	3198181	3547412	4003490	4564978	5,270,771	31302007	3957292	4430229	4859918	5397652	6072019	6,893,314
14	Madhya Pradesh	40670969	4750123	5200534	5661995	6211688	6936491	7,676,953	42777464	5047093	5523458	6010691	6590576	7355702	8,144,159
15	Maharashtra	91708790	10711021	11753176	12770289	13993569	15561254	17,448,602	99773871	12170991	13335361	14450908	15768421	17434099	19,432,361
16	Manipur	1022744	117575	130723	130723	172312	180420	184,581	1123458	133486	147394	147394	194452	206502	214,523
17	Meghalaya	687946	78077	87039	97606	109823	121991	137,904	723069	116535	127989	141877	158113	175737	197,838
18	Mizoram	387971	47350	50859	54042	63226	73131	79,072	489963	60904	65655	69882	80456	92648	101,830
19	Nagaland	885879	125385	132950	140363	133786	142954	147,670	1527233	210086	225763	239873	254483	272653	291438&
20	Odisha	1728938	1919760	2115767	2321636	2616680	2990316	3,366,087	3430100	2148314	2370432	2607361	2931832	3338038	3,758,530
21	Punjab	32713822	4072328	4334173	4578614	5003839	5003839	5,945,748	34153820	4293856	4572579	4831531	5274254	5274254	6,262,939
22	Rajasthan	4341446	4867509	5389241	5937937	6564896	7322844	8,247,198	7631690	5336123	5902489	6489564	7165662	7986265	8,985,478
23	Sikkim	137929	14899	15751	17644	21524	25816	29,028	217045	24682	26025	28551	33626	38783	43,334
24	Tamil Nadu	83632752	9962354	10829295	11722853	12804123	14223665	15,866,902	90646018	10980668	11929543	12890997	14061533	15638245	17,412,248
25	Tripura	777243	89639	98491	108909	122346	145334	159,555	926145	119561	130912	143823	160119	187673	204,218
26	Uttarakhand	5368542	597420	675632	725700	759143	915210	1,146,663	5761343	643201	730851	787352	831372	997161	1,244,042
27	Uttar Pradesh	85955534	8743642	9458144	10372845	11529273	21559	14,836,841	88266522	9085699	9826131	10778812	11988349	978627	15,445,274
28	West Bengal	18744697	2784596	2370297	2648924	2370360	2839019	3,395,128	21304791	3198302	2761884	3043619	2747138	3260624	3,860,741
	Union Territory:	650004088	80444743	87712252	96008077	106738187	118840274	134,796,540	710216715	89936442	98071655	107163290	119239828	132725443	150,070,437
1	A & N Islands	362461	42306	47066	53190	55144	62088	69,384	389996	48095	53288	59729	61774	69100	77,063
2	Chandigarh	5647538	663452	696536	730544	925609	976602	1,024,043	5799650	678096	711984	747267	949364	1007892	1,058,408
3	Dadra & Nagar Haveli	369001	41552	47152	52716	56981	63650	71,102	443030	51029	57532	63806	68832	76357	84,521
4	Daman & Diu	514453	55527	60483	140622	64421	68920	75,813	560673	62321	67731	148175	72342	77588	84,856
5	Delhi	40430807	5086450	5458738	5743950	6239028	6686051	7,069,651	42401264	5492456	5899421	6223377	6746848	7227671	7,350,120
6	Lakshadweep	48485	6015	6443	10230	6935	7657	8,542	52770	6740	7235	11022	7855	8753	9,897
7	Puducherry	3654984	410117	460986	510563	574196	646507	727,076	3792776	432081	483999	534367	599129	672803	755,276
		51027729	6305419	6777404	7241815	7922314	8511475	9,045,611	53440159	6770818	7281190	7787743	8506144	9140164	9,420,141
	Total	701031817	86750162	94489656	103249892	114660501	127351749	143,842,151	763656874	96707260	105352845	114951033	127745972	141865607	159,490,578

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

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

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

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

* : includes Motor cycles on hire

\$\$ Includes Omni Buses

: Category wise break up not reported

& : Includes 15020 Government Vehicles (for which category wise break up is not available)

^ : included in Cars

(Note: for website: <http://morth.nic.in/writeraddata/mainlinkFile/File838.pdf>.)

- 4.7.2 Four factors make pollution from the vehicles more serious in developing countries.
- (i) Poor quality of vehicles creating more particulates and burning fuels inefficiently.
 - (ii) Lower quality of fuel being used leads to far greater quantities of pollutants.
 - (iii) Concentration of motor vehicles in a few large cities.
 - (iv) Exposure of a larger percentage of population that lives and moves in the open.

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

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

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

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

: Includes omni buses since 2001.

4.7.3 With the increasing urbanization and industrialization, the transport demand has also increased consequently. This has increased the vehicular pollution in manifold. The different factors of the pollution are the types of engines used, the age of the vehicles, poor road conditions and congested traffic. The principal vehicular pollutants are Carbon Monoxide, Oxides of Nitrogen, Hydrocarbons, suspended and particulate matters, a varying amount of Sulphur Dioxide depending on the Sulphur content of the fuel and lead compounds.

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

(in number)

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

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

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

* Includes motor cycles on hire

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

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

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

Source: Transport year book- 2011-12

... : no \$: Included in Multi-axled/Articulated vehicles ^ : Included in cars

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

* Includes motor cycles on hire

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

4.8 Harmful Effects of Emissions

4.8.1 The high concentration of particulates in the atmosphere over large urban and industrial areas can produce a number of general effects. Smoke and fumes can increase the atmospheric turbidity and reduce the amount of solar radiation reaching the ground. The overall effect of air pollution upon the biosphere and the built environment can be broadly considered under 3 headings: The effect upon-

- (i) buildings and materials,
- (ii) soil, vegetation, crops and animal life,
- (iii) human beings.

i) **Buildings and Materials:** The fabric of buildings that are surrounded by heavily polluted air for years undergo chemical changes. Gradual erosion takes place and this is only too evident when grimy upper surface is removed. A good example is that of the famous historical monument 'Taj Mahal' at Agra, which, on account of reaction of Sulphur-dioxide emitted from neighbouring industries, has had limestone slowly turning yellow. As a result, on Court's directives, a number of measures have been taken to protect our national heritage monument, e.g. closure of neighbouring heavy polluting industries, operation of only non-polluting vehicles like battery buses, tonga, in the vicinity of Taj Mahal.

ii) **Soil, vegetation and Animal Life:** The presence of gaseous pollutants in the air and deposition of particulates to the soil can effect plants. It can effect the cattle and animals too as they have been found to develop breathing difficulties and suffer from low yield of milk, lameness and joint stiffness in a polluted environment.

iii) **Human beings:** Smoke and SO₂ cause the general and most widespread effects of air pollution on people. Atmospheric smoke contains potentially carcinogenic organic compounds similar to those that occur in cigarette tobacco smoke. The CO affects the cardiovascular system, NO_xs affect the respiratory system, Ozone causes increased sensitivity to infections, lung diseases, irritation in eyes, nose and throat, etc.

4.9 Areas of Concern

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

4.10 Non-attainment Cities

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

4.11 Measures taken for Control of Air Pollution from Vehicles

A) Vehicular Emission Norms

The vehicle emission norms in India are detailed below.

- a) During 1990-91 India for the first time notified mass emission norms for the vehicles at the manufacturing stage as well as for in-use vehicles. These norms were notified under EPA, more vehicles rules and Air Act.
- b) The emission norms introduced in 1996 have been crucial in controlling vehicular pollution because of stringency of emission norms along with specifications on fuel quality in 1996. for the first time crankcase emission norms and evaporative emission norms were introduced.
- c) From April 1995 passenger cars were allowed to register only if they are fitted with a catalytic converter in four metros-Delhi, Mumbai, Kolkata and Chennai. Emission norms for such vehicles were stricter by 50 percent compared to 1996 norms.
- d) The testing method for passenger car norms were changed from hot start to cold start, which is also a stringent measure, compared to the earlier one.

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

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

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

B) Fuel Quality Specifications

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

C) Lubricants Quality:

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

D) Alternate Fuels:

a) Custom duty on CNG kit has been exempted for promotion of CNG vehicles.

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

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

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

E) Restriction of Grossly polluting Vehicles

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

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

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

F) Traffic Management

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

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

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

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

G) Public Transport Systems:

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

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

H) Technology

- a. Fitment of catalytic converter for new petrol passenger cars has been made compulsory from 1.4.1995 in four metros and 45 cities from 1.9.1998.
- b. Two wheeler scooters with four stroke engine are being introduced in the market from October 1998.
- c. Registration of only rear engine auto rickshaws is being allowed from May 1996 onwards.
- d. More four stroke two wheelers are being registered in Delhi.

I) Mass Awareness

- a. Messages/articles related to vehicular emissions are disseminated through newsletters, pamphlets, newspapers, magazines, Television, Radio, internet, Workshops and Summer Exhibitions.
- b. Display of ambient air quality data through display system near ITO, Newspapers, daily news and internet.
- c. NGOs working on vehicular pollution control are being encouraged for mass awareness companies.

4.12 Environment Pollution due to Energy Use

4.12.1 A considerable amount of air pollution results from burning of fossil fuels. Fuels are primarily derived from fossilized plant material and consist mainly of carbon and/or its compounds. The household sector is the largest consumer of energy in India. More than 60 percent of Indian households depend on traditional sources of energy like fuel wood, dung and crop residue for meeting their cooking and heating needs. Out of total rural energy consumption about 65 per cent is met from fuel wood. Fuel wood consumption during 2001-02 was estimated at 223 million tones, 180 millions tones of which is for household consumption and the balance for cottage industry, big hotels etc. Burning of traditional fuels introduces large quantities of CO₂ when the combustion is complete, but if there is incomplete combustion and oxidation then Carbon monoxide (CO) is produced, in addition to hydrocarbons. Incomplete combustion of coal produces smoke consisting of particles of soot or carbon, tarry droplets of unburnt hydrocarbons and CO. Fossil fuels also contain 0.5–4.0% of sulphur which is oxidized to SO₂ during combustion.

4.12.2 The environmental effects of various fuels, namely, coal, oil, nuclear etc. are of growing concern owing to increasing consumption levels. The combustion of these fuels in industries and vehicles has been a major source of pollution. Coal production through opencast mining, its supply to and consumption in power stations, and industrial boilers leads to particulate and gaseous pollution which can cause pneumoconiosis, bronchitis, and respiratory diseases. Another major impact of coal mining is land degradation, especially of forest areas.

4.12.3 In India, Lignite production is mainly in Tamil nadu, Gujrat and Rajasthan. Coal is the most abundant source of commercial energy in India. Coal resources are continually assessed by the Geological Survey of India through regional mapping and exploratory drilling. **The State wise Lignite and Coal production over the last ten years is presented in table 4.12.1**

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

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

4.12.7 One of the major constraints on the profitability of the coal sector is the low productivity levels in underground mines. The underground mines employ 80% of manpower, but contribute to only 30% of the total output. **The productivity in Coal mines in the year 2007 can be viewed in Table 4.12.4**

4.12.8 Since the nationalisation of the coal industry, India's mine planners have chosen opencast mining over underground methods, to enhance productivity and meet production targets. The drawback of extracting the majority of the coal with opencast methods is that its quality is unavoidably affected by contamination of overburden mixes into the coal. **The detail of production of Coal and Lignite from opencast working by mechanization and overburden removed during the year 2007 is presented in table 4.12.5**

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

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

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

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

(as on 31st March, 2010)

Contd.

(Number)

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

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

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

* Includes motor cycles on hire

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

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

Contd.

(Number)

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

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

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

* Includes motor cycles on hire

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

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

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

Source: Transport year book- 2011-12

... : not reported

\$: Included in Multi-axled/Articulated vehicles ^ : Included in cars

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

* Includes motor cycles on hire

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

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

(as on 31st March, 2010)

Contd.

(Number)

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

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

Includes other

* Includes motor cycles on hire

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

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

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

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

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

* Includes motor cycles on hire

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

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

Confd.

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

Source: Transport year book- 2011-12

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

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

* Includes motor cycles on hire

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

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

Table: 4.7.5 : Working of States Transport Undertaking

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

Source: Ministry of Road Transport and Highways

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

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

Sl. No.	Category	1991	1996	2000 (Euro II)	2005 (Euro III)	2008
1	2	3	4	5	6	7
1	Petrol Vehicles : (in grams/km)					
	I. Two wheelers					
	(a) CO	12-30	4.5	2.0	1.5	1
	(b) HC	8-12	-	-	-	-
	(c) (HC+NO _x)	-	3.6	2.0	1.5	1
	II. Three Wheelers					
	(a) CO	12-30	6.75	4.0	2.25	1.25
	(b) HC	8-12	-	-	-	-
	(c) (HC+NO _x)	-	5.40	2.0	2.0	1.25
	III. Cars with CC :					
	(a) CO	-	4.34-6.20	2.72	2.2	-
	(b) HC	-	-	-	-	-
	(c) (HC+NO _x)	-	1.5-2.18	0.97	0.5	-
	IV. Cars without CC :					
	(a) CO	14.3-27.1	8.68-12.4	2.72	2.2	-
	(b) HC	2.0-2.9	-	-	-	-
	(c) (HC+NO _x)	-	3.00-4.36	0.97	0.5	-
2	Diesel Vehicles :					
	A : Gross Vehicles Weight > 3.5 ton (Heavy Duty Vehicles)-in grams/kWh					
	(a) CO	14.0	11.2	4.5	4	-
	(b) HC	3.5	2.4	1.1	1.1	-
	(c) NO _x	18.0	14.4	8.0	7	-
	(d) PM > 85 KW/g/KWh	-	-	0.36	0.15	-
	(e) PM < 85 KW/g/KWh	-	-	0.61	0.15	-
	B : Gross Vehicles Weight < 3.5 ton (Light duty Vehicles)*-in grams/km					
	(a) CO	14.3-27.1	5.0-9.0	2.72-6.90	1.06	-
	(b) (HC+NO _x)	2.7-6.9	2.0-4.0	0.97-1.70	0.71	-
	(c) NO _x	-	-	-	0.566	-
	(d) PM	-	-	0.14-0.25	0.080	-

Source : The Energy Resources Institute.

CO : Carbon Monoxide

CC : Catalytic Converter

HC : Hydrocarbon

PM : Particulate matter

NO_x : Oxides of Nitrogen

* : The test cycle is as per 13 mode cycle or a chasis dynamometer.

Euro I w.e.f. 1-6-99 and Euro II w.e.f. 1-4-2000 for private (non-commercial) vehicles in NCR.

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

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

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

(P): Provisional

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

(in Million Tonnes)

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

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

(P): Provisional



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

(in Million Tonnes)

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

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

(P): Provisional

Table 4.12.2 (a) : Statewise inventory of geological reserves of coal

(Million tonnes)

SI No.	State	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
1	Andhra Pradesh (Gondawana)	1-1-2003	7944	6122	2518	16584
		1-1-2004	8091	6092	2514	16697
		1-1-2005	8263	6079	2584	16926
		1-1-2006	8403	6158	2585	17146
		1-4-2007	8791	6266	2658	17715
		1-4-2008	9007	6711	2979	18697
		1-4-2009	9194	6748	2985	18927
		1-4-2010	9257	9730	3029	22016
		1-4-2011	9297	9728	3029	22054
		1-4-2012	9567	9554	3034	22155
2	Arunachal Pradesh (Tertiary)	1-1-2003	31	40	19	90
		1-1-2004	31	40	19	90
		1-1-2005	31	40	19	90
		1-1-2006	31	40	19	90
		1-1-2007	31	40	19	90
		1-1-2008	31	40	19	90
		1-1-2009	31	40	19	90
		1-1-2010	31	40	19	90
		1-1-2011	31	40	19	90
		1-1-2012	31	40	19	90
3	Assam (Tertiary)	1-1-2003	279	27	34	340
		1-1-2004	279	27	34	340
		1-1-2005	279	24	34	337
		1-1-2006	315	24	34	373
		1-1-2007	315	24	34	373
		1-1-2008	315	24	34	373
		1-1-2009	349	33	3	385
		1-1-2010	349	33	3	385
		1-1-2011	465	43	3	511
		1-1-2012	465	43	3	511
4	Assam (Gondawana)	1-1-2005	0	3	0	3
		1-1-2006	0	3	0	3
		1-1-2007	0	3	0	3
		1-4-2008	0	3	0	3
		1-4-2009	0	3	0	3
		1-4-2010	0	3	0	3
		1-4-2011	0	3	0	3
		1-4-2012	0	3	0	3

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

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

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

Note: (i) Data may not add up to respective total due to rounding off.

(ii) Singrimari coalfield of Assam (Non- coking) is included in Gondawana coalfield, not considered in Gondawana coalfield, not considered in Tertiary coalfields.

Source : Geological Survey of India

Table 4.12.2(b) : Inventory of geological reserves of coal by type

(Million tonnes)

Sl. No.	Types of Coal	As on	Proved	Indicated	Inferred	Total
1	2	3	4	5	6	7
1	Coking					
	I. Prime coking	1-1-2003	4614	699	0	5313
		1-1-2004	4614	699	0	5313
		1-1-2005	4614	699	0	5313
		1-1-2006	4614	699	0	5313
		1-4-2007	4614	699	0	5313
		1-4-2008	4614	699	0	5313
		1-4-2009	4614	699	0	5313
		1-4-2010	4614	699	0	5313
		1-4-2011	4614	699	0	5313
		1-4-2012	4614	699	0	5313
		1-4-2013	4614	699	0	5313
	II. Medium coking	1-1-2003	11325	11839	1889	25053
		1-1-2004	11325	11839	1889	25053
		1-1-2005	11417	11765	1889	25070
		1-1-2006	11445	11751	1881	25077
		1-4-2007	11853	11601	1880	25334
		1-4-2008	12308	12136	1880	26324
		1-4-2009	12448	12064	1880	26393
		1-4-2010	12573	11940	1880	26393
		1-4-2011	12573	12001	1880	26454
		1-4-2012	12837	11951	1800	26669
		1-4-2013	13269	11893	1879	27041
	III. Blendable/semi-coking	1-1-2003	482	907	222	1610
		1-1-2004	482	1003	222	1707
		1-1-2005	482	1003	222	1707
		1-1-2006	482	1003	222	1707
		1-4-2007	482	1003	222	1707
		1-4-2008	482	1003	222	1707
		1-4-2009	482	1003	222	1707
		1-4-2010	482	1003	222	1707
		1-4-2011	482	1003	222	1707
		1-4-2012	482	1003	222	1707
		1-4-2013	482	1003	222	1707
2	Non-coking (Including High Sulphur)	1-1-2003	73664	99168	35940	208772
		1-1-2004	75096	102736	35787	213619
		1-1-2005	76447	103623	35686	215756
		1-1-2006	78858	106210	35195	220263
		1-4-2007	81624	107362	36042	225027
		1-4-2008	84425	110378	36388	231191
		1-4-2009	88175	109804	35819	233798
		1-4-2010	92129	117012	34257	243398
		1-4-2011	96333	123768	32287	252388
		1-4-2012	100211	128515	31082	259808
		1-4-2013	104816	129037	30999	264852
		1-1-2003	90085	112613	38050	240748
		1-1-2004	91517	116277	37898	245692
		1-1-2005	92960	117090	37797	247847
		1-1-2006	95399	119663	37298	252360
		1-4-2007	98573	120665	38144	257382
		1-4-2008*	101829	124216	38490	264535
		1-4-2009*	105720	123570	37921	267211
		1-4-2010*	109798	130654	36359	276811
		1-4-2011*	114002	137471	34389	285862
		1-4-2012*	118145	142169	33183	293497
		1-4-2013*	123182	142632	33100	298914

Source : Office of the Coal Controller, Kolkata

* Including Sikkim

Table 4.12.3: Estimated potential for renewable energy technologies in India

Sl. No.	Resource	Estimated Potential (In MW _{av})
1	Solar Energy	20 MW/sq.km
2	Wind Power	48.500 ²
3	Small Hydro Power (up to 25 MW)	15.000 ³
4	Bio Power	
	Agro- Residues	16.000 ⁴
	Cogeneration-Bagasse	5.000 ⁵
	Waste to Energy	
	- Municipal Solid Waste to Energy	1700 ⁶
	-Industrial Waste to Energy	1,000
	Total	87.200 ⁷

Source: Ministry of Non-Conventional Energy Sources

- (1): Not all of this potential may be suitable for grid -interactive power for technical and/or economic reasons.
- (2): Potential based on areas having wind power density (wpd) greater than 200 W/m² assuming land availability in potential areas @ 1% and requirement of wind farms @ 12 ha/MW. The lower end of the potential might be suitable for off-grid applications.
- (3): Technically feasible hydro potential of all sites upto 25 MW station capacity.
- (4): Based on surplus agro-residues,
- (5): With new sugar mills and modernization of existing ones, technically feasible potential is assessed at 5000Mwe.
- (6): With expansion of urban population post census 2001, current technically feasible municipal waste-to energy potential is assessed at 1700 Mwe,
- (7): Estimates do not include potential for solar power that is dependent on future developments that might make solar technology cost-competitive for grid -interactive power generation applications.

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

Table 4.12.4 :Productivity in coal mines

(Tonnes)

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

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

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

(Tonnes)

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

Source : Directorate General of Mines Safety, Dhanbad

Table 4.12.6 : Domestic production of petroleum products in India

('000 Tonne)

Sl. No.	Year	Light Distillates			Middle Distillates			
		Liquified Petroleum Gas @	Motor Gasoline (Petrol)	Naphtha	Kerosene	Aviation Turbine Fuel	High Speed Diesel oil	Light Diesel Oil
1	2	3	4	5	6	7	8	9
1	1970-71	169	1526	1205	2896	710	3840	986
2	1971-72	195	1615	1217	2995	808	4356	1065
3	1972-73	227	1581	1330	2813	801	4598	1010
4	1973-74	259	1647	1438	2613	875	5039	1079
5	1974-75	278	1298	1720	2052	837	6034	1084
6	1975-76	331	1275	1910	2439	925	6285	946
7	1976-77	363	1340	1986	2581	1001	6399	1047
8	1977-78	383	1423	2120	2450	1077	7129	1224
9	1978-79	403	1515	2262	2514	1177	7350	1227
10	1979-80	406	1512	2415	2539	1104	7975	1230
11	1980-81	366	1519	2115	2396	1001	7371	1108
12	1981-82	410	1614	3004	2907	1009	9042	949
13	1982-83	406	1797	2986	3393	1137	9761	1121
14	1983-84	514	1937	3578	3528	1195	10862	1081
15	1984-85	596	2144	3470	3364	1297	11086	1253
16	1985-86	867	2309	4955	4030	1519	14624	1177
17	1986-87	995	2515	5437	4912	1553	15450	1172
18	1987-88	1026	2662	5462	5104	1695	16296	1259
19	1988-89	1034	2822	5378	5201	1753	16656	1468
20	1989-90	1179	3328	5227	5700	1575	17737	1540
21	1990-91	1221	3552	4859	5471	1801	17185	1509
22	1991-92	1250	3420	4546	5339	1539	17404	1482
23	1992-93	1249	3709	4586	5199	1636	18289	1453
24	1993-94	1314	3843	4666	5270	1788	18809	1474
25	1994-95	1432	4129	5662	5261	1968	19593	1364
26	1995-96	1539	4462	5975	5267	2127	20661	1351
27	1996-97	1598	4704	6123	6236	2119	22202	1286
28	1997-98	1666	4849	6103	6701	2147	23354	1246
29	1998-99	1724	5573	6081	5341	2289	26716	1336
30	1999-00	2487	6232	8170	5735	2292	34793	1624
31	2000-01	4088	8070	9908	8714	2513	39052	1481
32	2001-02	4778	9699	9180	9681	2595	39899	1703
33	2002-03	4903	10361	9650	10028	3053	40207	2079
34	2003-04	5348	10999	11317	10187	4289	43316	1659
35	2004-05	5570	11057	14100	9298	5201	45903	1546
36	2005-06	5525	10502	14509	9078	6196	47572	923
37	2006-07	6315	12539	16660	8491	7805	53465	803
38	2007-08*	6732	14167	16440	7794	9107	58361	671
39	2008-09	6996	16020	14826	8223	8071	62889	606
40	2009-10	8091	22537	17105	8545	9296	73281	472
41	2010-11	7541	26138	17535	7702	9570	78040	590
42	2011-12(P)	7335	26890	17176	7475	10057	81901	502

@ : Excludes LPG production from natural gas.

(contd...)

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

* : Estimated from calendar year figures

(P) : Provisional

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

(*'000 Tonne*)

Sl. No.	Year	Heavy Ends				Others**	Total
		Fuel Oil	Lubricants	Petroleum Coke	Bitumen		
1	2	10	11	12	13	14	15
1	1970-71	4090	231	151	805	501	17110
2	1971-72	4098	140	142	1009	999	18639
3	1972-73	3688	304	132	1109	267	17860
4	1973-74	3931	318	131	1093	1072	19495
5	1974-75	4243	387	137	873	668	19611
6	1975-76	5083	342	160	697	436	20829
7	1976-77	4728	368	163	945	511	21432
8	1977-78	5332	413	155	992	521	23219
9	1978-79	5644	490	122	962	527	24193
10	1979-80	6351	487	99	1103	573	25794
11	1980-81	6120	426	86	1082	533	24123
12	1981-82	6908	407	141	1298	493	28182
13	1982-83	7964	434	149	1397	528	31073
14	1983-84	8000	470	136	1069	556	32926
15	1984-85	7886	414	181	944	601	33236
16	1985-86	7955	501	192	1107	645	39881
17	1986-87	8011	491	264	1224	737	42761
18	1987-88	8466	478	257	1370	653	44728
19	1988-89	8171	497	275	1548	896	45699
20	1989-90	8952	547	275	1671	959	48690
21	1990-91	9429	561	229	1603	1142	48562
22	1991-92	9637	390	216	1710	1416	48349
23	1992-93	10403	533	221	1862	1219	50359
24	1993-94	10304	489	233	1874	1020	51084
25	1994-95	9822	504	259	1845	1088	52927
26	1995-96	9579	633	256	2032	1199	55081
27	1996-97	10298	619	246	2283	1291	59005
28	1997-98	11080	593	282	2158	1129	61308
29	1998-99	11030	586	286	2419	1163	64544
30	1999-00	11352	728	465	2485	3048	79411
31	2000-01	11392	684	2473	2721	4518	95614
32	2001-02	12227	651	2784	2561	4246	100004
33	2002-03	12167	684	2659	2941	5408	104140
34	2003-04	13372	666	2743	3397	6170	113463
35	2004-05	14970	646	3162	3349	3777	118579
36	2005-06	14305	677	3182	3576	3705	119750
37	2006-07	15697	825	3779	3891	4990	135260
38	2007-08*	15804	881	4129	4507	6337	144930
39	2008-09	17684	874	4241	4713	5373	150516
40	2009-10	18346	950	4889	3709	12547	179768
41	2010-11	NA	884	2711	4476	NA	
42	2011-12 (P)	NA	994	4480	4610	NA	

Source : Ministry of Petroleum & Natural Gas.

* : Estimated from calendar year figures

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

(P) : Provisional N.A: Not available

Table 4.12.7: Availability of crude oil and petroleum products in India

('000 Tonne)

Sl. No.	Year	Crude Oil			Petroleum Products		
		Production	Net Imports	Gross Availability	Production @	Net Imports	Gross Availability
1	2	3	4	5	6	7	8
1	1970-71	6822	11683	18505	17110	752	17862
2	1971-72	7299	12951	20250	18639	2011	20650
3	1972-73	7321	12084	19405	17830	3399	21229
4	1973-74	7189	13855	21044	19495	3387	22882
5	1974-75	7684	14016	21700	19603	2473	22076
6	1975-76	8448	13624	22072	20829	2048	22877
7	1976-77	8898	14048	22946	21432	2550	23982
8	1977-78	10763	14507	25270	23219	2832	26051
9	1978-79	11633	14657	26290	24193	3834	28027
10	1979-80	11766	16121	27887	25794	4636	30430
11	1980-81	10507	16248	26755	24123	7253	31376
12	1981-82	16194	14460	30654	28182	4829	33011
13	1982-83	21063	12397	33460	31073	4233	35306
14	1983-84	26020	10445	36465	32926	2856	35782
15	1984-85	28990	7164	36154	33236	5159	38395
16	1985-86	30168	14616	44784	39881	1902	41783
17	1986-87	30480	15476	45956	42761	556	43317
18	1987-88	30357	17734	48091	44728	739	45467
19	1988-89	32040	17815	49855	45699	4200	49899
20	1989-90	34087	19490	53577	48690	3971	52661
21	1990-91	32160	20699	52859	48562	6012	54574
22	1991-92	30345	23994	54339	48349	6509	54858
23	1992-93	26950	29247	56197	50359	7564	57923
24	1993-94	27026	30822	57848	51084	8042	59126
25	1994-95	32494	27349	59843	52927	10697	63624
26	1995-96	35168	27342	62510	55081	16900	71981
27	1996-97	32900	33906	66806	59005	17103	76108
28	1997-98	33858	34493	68351	61308	20589	81897
29	1998-99	32722	39808	72530	64544	23052	87596
30	1999-00	31949	57805	89754	79411	15862	95273
31	2000-01	32426	74097	106523	95614	902	96516
32	2001-02	32032	78706	110738	100004	-3056	96948
33	2002-03	33044	81989	115033	104140	-3061	101079
34	2003-04	33373	90434	123807	113463	-6619	106844
35	2004-05	33981	95861	129842	118579	-9383	109196
36	2005-06	32190	99409	131599	119750	-10020	109730
37	2006-07	33988	11502	145490	135260	-15758	119296
38	2007-08	34118	121672	155791	144930	-18377	126612
39	2008-09	33508	132775	166283	150516	-20378	132271
40	2009-10	33690	159259	192949	179768	-36309	143456
41	2010-11	37684	163595	201306	190316	-42262	148570
42	2011-12(P)	38090	17129	20961	196707	-45840	150867

Source : Ministry of Petroleum & Natural Gas.

(P) : Provisional

'@ :Excludes LPG production from natural gas.

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

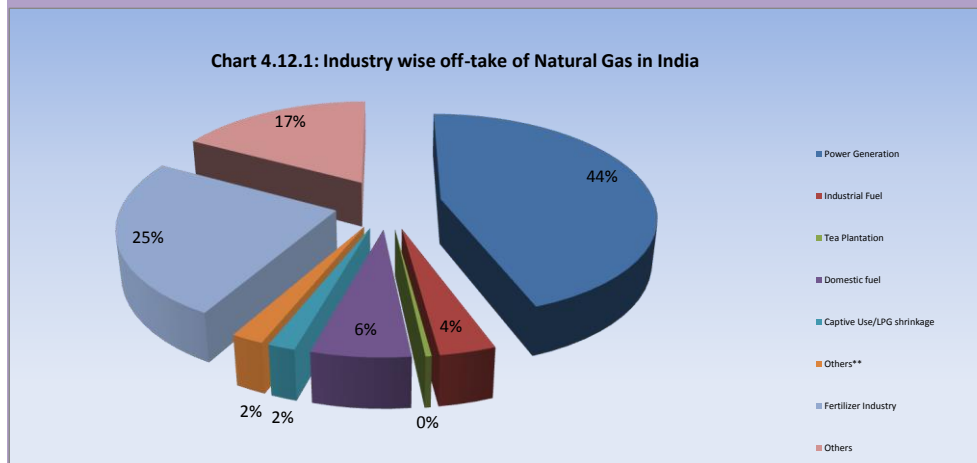
4.12.10 Natural gas is also an important fuel in India as evident from the following table 4.12.8.



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

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

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



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

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

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

Source : Ministry of Petroleum & Natural Gas.

(P) : Provisional

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

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

Source : Ministry of Petroleum & Natural Gas.

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

(P) :Provisional

** Sponge iron use.

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

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

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

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

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

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

4.13 Power Sector

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

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

Table 4.13.2 : Electricity generation

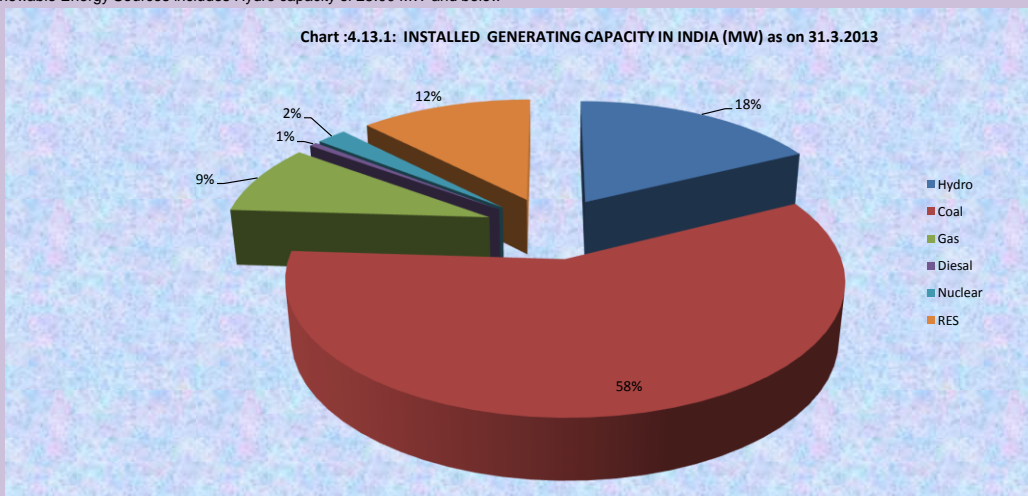
Sr. No	Parameter	(Gigawatt)							
		2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-2011	2011-12
	1	2	3	5	6	7	8	9	
1	Total (Utilities)	594456.20	623819.53	670654.16	722625.50	741167.36	799850.60	844748.21	922451.19
2	Public sector	535839.94	562056.45	603851.13	641693.47	651369.69	679932.71	703870.97	723051.66
3	Private sector	58616.26	61763.08	66803.03	80932.03	89797.67	119917.89	140877.24	199399.53

Source : Central Electricity Authority

Table 4.13.3 : Growth of installed generating capacity in India

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

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



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

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

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

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

Table 4.13.4 : Cumulative comparison of power supply position

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

Source : Central Electricity Authority

Concluded

MU : Million Units

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

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

Table 4.13.4 : Cumulative comparison of power supply position

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

Source : Central Electricity Authority

Continued

MU : Million Units

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

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

Table 4.13.4 : Cumulative comparison of power supply position

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

Source : Central Electricity Authority

Continued ../-

MU : Million Units

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

Table 4.13.4 : Cumulative comparison of power supply position

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

Source : Central Electricity Authority

Continued.../-

MU : Million Units

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

Table 4.13.4 : Cumulative comparison of power supply position

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

Source : Central Electricity Authority

Continued .../-

MU : Million Units

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

Table 4.13.4 : Cumulative comparison of power supply position

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

Source : Central Electricity Authority
 MU : Million Units

Continued .../-

Table 4.13.4 : Cumulative comparison of power supply position

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

Source : Central Electricity Authority
 MU : Million Units

Continued.../-

Table 4.13.5: Annual gross generation of power by source**(in MU units)**

Sl. No.	Year	Hydro **	Steam @	Diesel & Wind @	Gas \$	Nuclear	Thermal*	Total
1	2	3	4	5	6	7	8	9
1	1980-81	46541.8	60713.8	61.5	522.0	3001.3	-	110840.4
2	1985-86	51020.6	112540.1	50.6	1756.9	4981.9	-	170350.1
3	1990-91	71641.3	178321.7	111.3	8113.2	6141.1	-	264328.6
4	1991-92	72757.1	197163.2	134.0	11450.0	5524.4	-	287028.7
5	1992-93	69869.2	211123.5	162.3	13480.4	6726.3	-	301361.7
6	1993-94	70462.7	233150.7	310.9	14727.6	5397.7	-	324049.6
7	1994-95	82712.0	243110.2	545.2	18474.8	5648.2	-	350490.4
8	1995-96	72759.2	273743.5	714.4	24858.4	7981.7	-	380057.2
9	1996-97	68900.8	289378.3	1554.3	26984.9	9071.1	-	395889.4
10	1997-98	74581.7	300730.5	1929.3	34423.2	10082.6	-	421747.3
11	1998-99	82690.0	308056.0	2136.0	43480.0	12015.0	353662.0	448367.0
12	1999-00	80637.0	377814.0	3989.0	49773.0	13267.0	386776.0	480680.0
13	2000-01	74481.0	357006.0	3822.0	48311.0	16928.0	408139.0	499548.0
14	2001-02	73579.9	370883.5	6402.7	47098.6	19474.6	424385.8	517439.2
15	2002-03	64014.0	389550.3	7052.4	52686.6	19390.0	449289.3	532693.3
16	2003-04	75242.5	407283.8	6867.0	57928.4	17780.0	472079.2	565101.7
17	2004-05	84495.3	424083.2	2518.7	59473.6	16845.3	486075.5	587416.1
18	2005-06	103057.3	435096.6	1987.7	60128.0	17238.9	497214.3	617510.4
19	2006-07	116368.9	461340.0	2488.8	63718.6	18606.8	527547.4	662523.0
20	2007-08	128702.1	486763.2	3297.3	68930.6	16776.9	558990.1	704469.0
21	2008-09	118980.7	512527.1	4708.6	72865.1	14712.6	590100.8	723793.6
22	2009-10	112038.2	539982.4	4243.4	96650.6	18636.4	640876.5	771551.1
23	2010-11	119868.3	561757.0	2993.9	100257.2	26266.4	665008.1	811142.8
24	2011-12	135794.0	612880.2	2461.3	93464.4	32286.6	708805.9	876886.5
25	2012-13	118514.7	691555.1	2284.7	66835.9	32866.1	760715.8	912056.7

Source: Monthly Generation Report of Central Electricity Authority

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

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

\$: Includes generation from liquid fired Gas Turbine stations.

MU : Million Units

** : Includes imports from Bhutan

Table 4.13.6 : Plan wise growth of electricity sector in India

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

.Source: Central Electricity Authority , 2013

- * Provisional
- + Figures 10th Plan onwards are as per revised definition of village electrification.
- \$ As per UN methodology (Gross Electrical Energy Availability/Population)
- @: Includes 440 Volts Distribution Lines
- N.A. : Not available.
- ^ Figure have been reconciled

Chart 4.13.2 : Planwise Growth of Electricity Sector in India

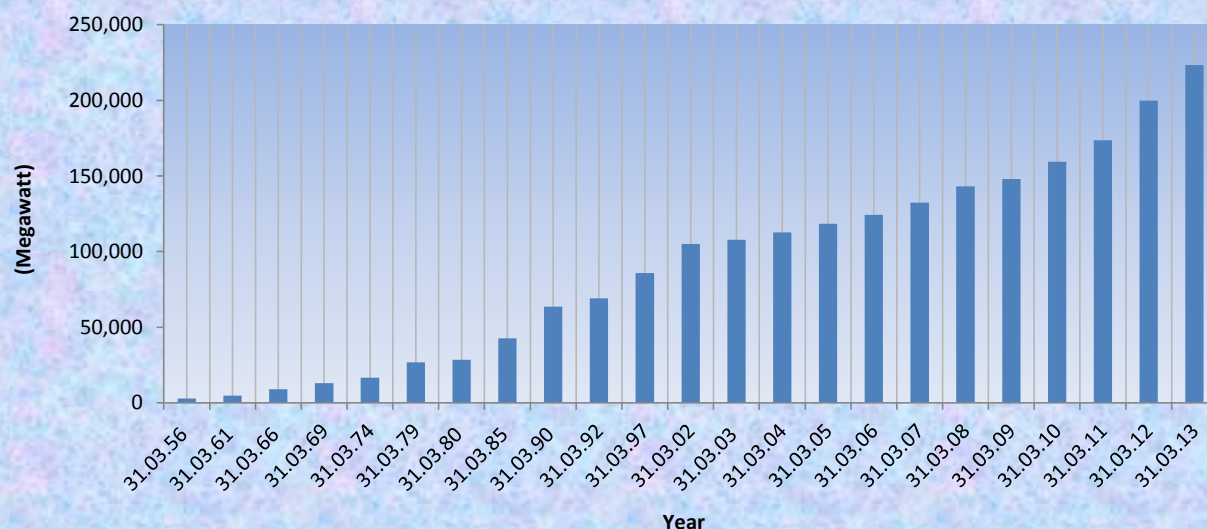


Table 4.13.7 : Plan wise progress of village electrification

Period	No of villages electrified upto the period ending
Upto August 1947	1500
Upto August 1951	3061
First Plan (1951-56)	7294
Second Plan (1956-61)	21754
Third Plan (1961-66)	45148
Annual Plan (1966-69)	73739
Fourth Plan (1969-74)	156729
Fifth Plan (1974-78)	216863
Annual Plan (1978-80)	249799
Sixth Plan (1980-85)	370332
Seventh Plan (1985-90)	470838
Annual Plan (1990-91)	481124
Annual Plan (1991-92)	487170
Eight Plan (1992-97)	498836\$
Ninth Plan (1997-2002)	489699*
Tenth Plan (2002-2007)	482864#
Eleventh Plan (2007-12)	557439
31.3.2013 (1st year or the 12th Plan)	560552

Source : Central Electricity Authority

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

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

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

Table 4.13.8 : Number of towns and villages electrified in India*(As on 31.03.2013)*

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

Source : Central Electricity Authority

* Based on information furnished by State Government/Discoms

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

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

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

Table 4.13.9 a: Total absolute emissions of CO₂ from the power sector by region for the year 2005-06 TO 2011-12

(Million tonne CO ₂)							
Grid	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
NEWNE	368.2	385.7	406.9	430.5	453.1	468.4	491.7
Southern	101.6	109	113.6	117.9	126.8	129.1	145.3
India	469.7	494.7	520.5	548.4	579.9	597.5	637.0

Table 4.13.9 (b): Emission factors of CO₂ for 2011-12

(in tonne CO ₂ /MWh)				
Grid	Average	OM	BM	CM
NEWNE	0.78	0.97	0.92	0.94
Southern	0.76	0.96	0.85	0.91
India	0.78	0.97	0.90	0.93

Note: Average is the average emission of all stations in the grid, weighted by net generation.

OM is the average emission from all stations excluding the low cost/must run sources.

BM is the average emission of the 20% (by net generation) most recent capacity addition in the grid.

CM is a weighted average of the OM and BM (here weighted 50:50)

OM: operating margin

BM: build margin

CM: combined margin

Table 4.13.9 (c): Specific emissions (weighted average) of CO₂ for fossil fuel -fired stations in 2011-12

(tCO ₂ /MWh)						
Grid	Coal	Diesel	Gas	Lignite	Naphtha	Oil
NEWNE	1.06	1.07	0.45	1.42	0.38	0.65
Southern	1.00	0.58	0.43	1.43	0.72	0.62
India	1.05	0.59	0.45	1.42	0.38	0.64

Source : Central Electricity Authority

Note: NEWNE Grid : Integrated Grid of Northern, Eastern, Western and North Eastern Region.

4.13.8 Carbon dioxide and other air polluting particles are collecting in the atmosphere like a thickening blanket trapping the Sun’s heat and causing the earth to warm up. **The table 4.13.10 at presents the details of global average temperature and atmospheric concentrations of CO₂.**

Table 4.13.10 : Global average temperature and atmospheric concentrations of CO2

Sl. No.	Year	Temperature (°C)	Carbon Dioxide (Parts Per Million)	Emissions from Fossil Fuel Burning (Million Tonnes of Carbon)
1	2	3	4	5
1	1950	13.87	--	1612
2	1955	13.88	--	2013
3	1960	14.01	316.80	2535
4	1965	13.90	319.90	3087
5	1966	13.96	321.20	3222
6	1967	14.00	322.00	3334
7	1968	13.94	322.90	3501
8	1969	14.03	324.50	3715
9	1970	14.02	325.50	3997
10	1971	13.89	326.20	4143
11	1972	14.00	327.30	4305
12	1973	14.13	329.50	4538
13	1974	13.89	330.10	4545
14	1975	13.94	331.00	4518
15	1976	13.86	332.00	4776
16	1977	14.11	333.70	4910
17	1978	14.02	335.30	4962
18	1979	14.09	336.70	5249
19	1980	14.16	338.50	5177
20	1981	14.22	339.80	5004
21	1982	14.06	341.00	4961
22	1983	14.25	342.60	4944
23	1984	14.07	344.20	5116
24	1985	14.03	345.70	5277
25	1986	14.12	347.00	5439
26	1987	14.27	348.70	5561
27	1988	14.29	351.30	5774
28	1989	14.19	352.70	5882
29	1990	14.37	354.00	5953
30	1991	14.32	355.50	6023
31	1992	14.14	356.40	5907
32	1993	14.14	357.00	5904
33	1994	14.25	358.90	6055
34	1995	14.37	360.90	6187
35	1996	14.23	362.60	6326
36	1997	14.40	363.80	6422
37	1998	14.56	366.60	6407
38	1999	14.32	368.30	6239
39	2000	14.31	369.40	6315
40	2001	14.36	370.90	6378
41	2002	14.52	372.90	6443

Source: The Energy and Resources Institute

P : Provisional

4.14 Renewable energy

4.14.1 Renewable energy sources are important to tackle the pollution as well the exhaustion problems of other energy sources. Radioactive emissions from nuclear power plants are of grave concern as they can cause serious impact both in terms of spatial and inter-generational concerns. In addition, two key problems are long-term waste disposal and the eventual decommissioning of plants. Due to limited reserves of petroleum, main emphasis needs to be given to non-conventional energy sources such as wind energy, solar energy and ocean energy. The estimated potential and cumulative achievements of various renewable energy programmes in India is depicted in table 4.14.1

Table 4.14.1 : Estimated potential and cumulative achievements

(Data as on 31.3.2012)

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

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

Note: MWe = Megawatt equivalent;
kW_p = kilowatt peak;

MW = Me; kW = kilowatt;
sq. m. = square meter

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

2. Potential based on areas having wind power density (wpd) greater than 200 W/m² assuming land availability in potential areas @ 1 per cent and requirement of wind farms @ 12 ha/MW, all of which may not be technically feasible or economically viable for grid-interactive wind power. This economically viable potential could get enhanced with higher level of land availability than what has been assumed. Areas having lower wpds might be suitable for off-grid applications. Further, preliminary surveys do not at this juncture suggest a sizeable grid-interactive off-shore wind power potential.

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

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

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

6. Not all of this renewable energy potential may be suitable for grid-interactive power for technical and/or economic reasons. Further, estimate excludes potential for solar power which is dependent on future developments that might make solar technology cost-competitive for grid-interactive power generation applications. However, insolation in the country varies between 4- 7 kWh/m²/day.

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

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

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

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

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



4.14.3 Bio mass Power Plants

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

Table 4.14.3: The status of biomass projects

Sl. No.	Project Status	Biomass Power		Cogeneration		Total	
		MW	Nos	MW	Nos	MW	Nos
1	2	3	4	5	6	7	8
1	Commissioned	1150.1	145	1985.2	182	3135.33	327

Source :Ministry of New and Renewable Energy

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

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

Source: Ministry of New and Renewable Energy

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

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

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

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

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

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

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

Source: Ministry of New and Renewable Energy

MW - megawatt

kW - kilowatt;

km² - kilometre square

MWp - megawatt peak;

m² - square metre;

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

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

Source: Ministry of New And Renewable Energy

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

(as on 31.03.2012)

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

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

SLS : Street Lighting System

SL: Solar Lanterns

kWp: Kilowatt peak

HLS : Home Lighting System

MW : Mega Watt

PP: Power plants

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

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

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

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

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

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

Source : Annual Report , Ministry of New and Renewable Energy

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

Table 4.14.10 : State wise renewable energy club

		as on 31.03.2012
S. No	State	No. of Renewable Energy Clubs
1	Andhra Pradesh	40
2	Bihar	6
3	Chandigarh Administration	4
4	Chhattisgarh	8
5	Goa	1
6	Gujrat	27
7	Haryana	14
8	Himachal Pradesh	2
9	Jammu & Kashmir	3
10	Karnataka	89
11	Madhya Pradesh	31
12	Maharashtra	66
13	Odisha	13
14	Pondicherry	5
15	Punjab	15
16	Rajasthan	10
17	Tripura	8
18	Tamil Nadu	124
19	Uttar Pradesh	64
20	West Bengal	24
Total		554

Source : Annual Report , Ministry of New and Renewable Energy

4.15 Noise Pollution

4.15.1 Of late, noise has been recognized as a pollutant which until recently was considered only as a nuisance. According to study on occupational hazards, even short exposures to intense noise can shift upward the hearing threshold while prolonged exposure or intermittent exposure over a long period produces a damaging effect on hearing resulting in a permanent threshold shift. Accordingly, the Central Pollution Control Board (CPCB) has notified the ambient noise standards in 1987 under section 20 of the Air (Prevention and Control of Pollution) Act, 1981.

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

Table 4.15.1 : Ambient air quality standards in respect of noise

Sl. No.	Area	Limits in dB(A) L_{eq}^*	
		Day Time	Night Time
1	2	3	4
1	Industrial Area	75	70
2	Commercial Area	65	55
3	Residential Area	55	45
4	Silence Zone	50	40

Source : Central Pollution Control Board

Notes :

- 1 Day Time -- 06.00 hour to 22.00 hour (16 hours)
- 2 Night time --22.00 hour to 06.00 hour (08 hours)
- 3 Areas upto 100 metres around certain premises like hospitals, educational institutions and courts, religious places or any other area which is declared as silence zones by the competent authority.
- 4 Mixed categories of areas may be declared as one of four aforesaid categories by the competent Authority.

- ***** dB (A) L_{eq} denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.
- A "decibel" is a unit in which noise is measured.
- "A", in dB (A) L_{eq} denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.
- L_{eq} : It is an energy mean of the noise level over a specified period.

4.15.2 The increasing noise pollution may be attributed to increase in no. of vehicles, urbanization and industrialization. **The noise pollution has already reached at a high level in most of the metropolitan cities in all the residential, commercial, industrial and silence zones as evident from table 4.15.2.**

Table 4.15.2 : Average noise levels in various metropolitan cities

(dB[A])

Sl. No.	Metropolitan Cities	Day/ Night	Industrial Area	Commercial Area	Residential Area	Silence Area
1	2	3	4	5	6	7
1	Kolkata	Day	78	82	79	79
		Night	67	75	65	65
2	Mumbai	Day	76	75	70	66
		Night	65	66	62	52
3	Chennai	Day	71	78	66	63
		Night	66	71	48	49
4	Bangalore	Day	78	76	67	67
		Night	53	57	50	--
5	Hardwar*	Day	-	77	66	71
		Night	-	75	58	66
6	Kanpur*	Day	-	79	75	75
		Night	-	78	72	66

Source : Central Pollution Control Board

* : 2003 Figures

Table 4.15.3 : Effects of noise pollution on human health

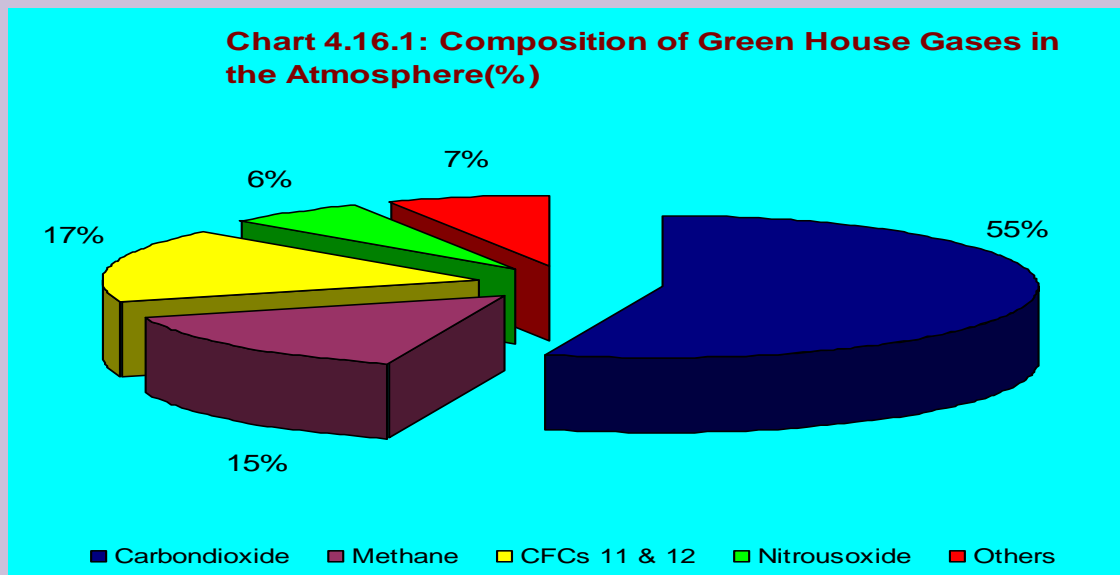
A. Noise Hazards	
Stage : I Threat to Survival (a) Communication interference (b) Permanent hearing loss	Stage : II Causing Injury (a) Neural -humoral stress response (b) Temporary hearing loss (c) Permanent hearing loss
B. Noise Nuisances	
Stage III Curbing Efficient Performance (a) Mental Stress (b) Task Interference (c) Sleep Interference	Stage IV Diluting Comfort and Enjoyment (a) Invasion of Privacy (b) Disruption of Social Interaction (c) Hearing Loss

Source: West Bengal Pollution Control Board

4.16 Green House Gases and Their Effects

4.16.1 The greenhouse effect plays a crucial role in regulating the heat balance of the earth. It allows the incoming short-wave solar radiation to pass through the atmosphere relatively unimpeded; but the long-wave terrestrial radiation emitted by the earth's surface is partially absorbed and then re-emitted by a number of trace gases in the atmosphere. These gases known as Greenhouse Gases (GHGs) are: water vapor, carbon dioxide, methane, nitrous oxide and ozone in the troposphere and in the stratosphere. This natural greenhouse effect warms the lower atmosphere.

4.16.2 If the atmosphere were transparent to the outgoing long wave radiation emanating from the earth's surface, the equilibrium mean temperature of the earth's surface would be considerably lower and probably below the freezing point of water. Mere incidence of GHG's in the atmosphere, by itself, is no concern. What is more important is that their concentration should stay within reasonable limits so that global ecosystem is not unduly affected. However, by increasing the concentrations of natural GHG's and by adding new GHG's like chloro-flouro carbons, the global average and the annual mean surface-air temperature (referred to as the global temperature) can be raised, although the rate at which it will occur is uncertain. This is the enhanced greenhouse effect, which is over and above that occurring due to natural greenhouse concentration. Such a rise in the atmospheric concentration of GHG's has led to an upward trend in global temperature.



Source : Central Pollution Control Board

4.16.3 While it is required to follow the general commitments under the Framework Convention on Climate Change, India is not required to adopt any GHG reduction targets. Irrespective of international commitments, it seems prudent to be ready with

- Inventory of sinks and sources of GHG emission
- Predict the cumulative impact of national and international GHG emissions to plan for temperature and sea level rise
- Devise land use plans for the coastal areas likely to be affected
- Devise water and land management strategies especially agricultural sector.

4.17 Ozone Depletion

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

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

4.18 Action Plan to combat Air Pollution

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

4.18.1 Major City Specific Action Plan in Delhi

A) Vehicular Pollution Control

- a. Public transport (buses, auto, taxis) in Delhi has been converted to CNG mode.
- b. Sulphur content in diesel has been reduced in a phased manner.
- c. The lead content in petrol has been progressively reduced to make it unleaded.
- d. Bharat Stage-III norms have been implemented in Delhi.
- e. Pre-mix 2T oil dispensers have been installed at all petrol filling stations.
- f. Grossly polluting old commercial vehicles have been phased out .
- g. Restriction has been made on plying of goods commercial vehicles during day time.
- h. Metro rail has been introduced to have a more efficient public transport system.

(B) Industrial Pollution Control

- (i) Directions under Section 5 of E(P)A, 1986 have been issued on April 1996 and July 1996 to all the three power plants located in Delhi for completing the following in a time bound manner.
- Comply with emission and liquid effluent standard.
 - Submission of action plan for switching over the beneficiated coal with an ash content of not more than 34%.
 - Submission of action plan to achieve 20% utilization of fly-ash by Dec. 1997.
 - Installation of opacity meter in all units to ensure compliance with the standards.
 - Coverage of abandoned ash ponds with top soil.
- (ii) All stone crushers have been closed down in Delhi and shifted to Pali in Rajasthan.
- (iii) All the hot mix plants have been closed down and shifted to other states.
- (iv) As per the directions of Hon'ble Supreme Court, 168 hazardous industries have been closed down in Delhi.

4.18.2 Major City Specific Action Plan in Mumbai

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

4.18.3 Major City Specific Action Plan in Ahmedabad

A) Vehicular Pollution Control

The measures include following

- (i) Banning of old buses of more than 15 years old
- (ii) Bharat Stage- III norms have been introduced in Ahmedabad.
- (iii) Banning of diesel run rickshaw within city limits.
- (iv) Diversion of heavy vehicles such as trucks/luxury buses/trailers/tankers/tractors/lorries, etc. away from the city.
- (v) Improvement of road condition and making the roads pucca upto the footpath not leaving any uncovered space on either sides of the roads.

Strict enforcement of smoke test/vehicle test protocol

- (vi) Surveillance of vehicles with higher black smoke emission
- (vii) Third party audits of PUC Centres including calibration audits
- (ix) To launch a drive to stop usage of kerosene in vehicles particularly three wheelers and commercial vehicles.

(B) Industrial Pollution Control

The measures include following

- (i) Intensifying monitoring by special vigilance squad under the Air Act, 1981.
- (ii) Determining efficacy of APC system & taking remedial action(s) including upgradation of existing Air Pollution Control Measures wherever needed.
- (iii) Implementation of CREP Action Plan for highly pollution industries as decided by MOEF.
- (iv) Ban on burning of off specification materials/wastes by scrap traders.

4.18. Major City Specific Action plan in Bangalore

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

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

4.18. Major City Specific Action Plan in Chennai

- Bharat Stage – III norms have been introduced in Chennai.
- Unleaded gasoline and low sulphur diesel are being supplied in Chennai.
- Pollution Under Control Certificate has been made mandatory.
- Pre mixed 2T oil dispensers have been installed in most of the retail outlets in Chennai City.
- The Motor Spirit and High Speed Diesel (Regulation & Supply and Distribution and Prevention of malpractices) order 1998 has been republished by the Government of Tamilnadu with the intention to curb malpractices such as adulteration etc.,
- LPG supply is being implemented by oil companies, Oil companies have promised to setup 28 Auto ALP dispensing station (ALDS). Presently five ALDS are functioning.
- Mass Rapid Transit System (MRTS) and electric trains are operated by Southern Railways.
- Power plants have been insisted to provide scrubber for the control of emissions
- For all the process emission sources and boiler of higher capacity air pollution control measures such as dust collectors and wet scrubbers are insisted by Tamil Nadu Pollution Control Board.
- The industrial units are also insisted to switch over to cleaner fuels such as LSHS, LDO etc., to control the SO₂ emission.

4.18.5 Major City Specific Action Plan in Kolkata

A) Vehicular Pollution Control

- i. Bharat State –III norms have been introduced in Kolkata
- ii. Supply, Distribution and Selling of Loose 2T oil in Kolkata Metropolitan Area (KMA) has been
- iii. Unleaded Petrol and Low Sulphur Petrol and Diesel made available within Kolkata and Howrah and adjoining agglomeration.

- iv. Availability of Cleaner Automotive Fuel like LPG ensured in Kolkata.
- v. Introduced Upgraded Auto Emission Testing Centre (PUC Centre)

B) Industrial Pollution Control

- i. Stricter Locational Policy for New Industrial Units
- ii. Ensuring Regulatory Compliance by Grossly Polluting Industries
- iii. Introduction of Stricter Emission Standard for Boilers, Ceramic, Kilns, Foundries and Rolling Mills operating within Kolkata Metropolitan Areas.
- iv. Mandatory Use of Cleaner Fuel in Small Boilers, Ceramic Kilns and Rolling Mills operating within Kolkata Metropolitan Area.
- v. Discontinuance of Coal Supply to the industries which have been ordered to discontinue the use of coal.
- vi. Environmental compliance by Cluster of Small Scale Industries is also ensured

4.18.6 Major City Specific Action Plan in Hyderabad

The measures include following

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

Table 4.17.1: Production of ozone depleting substances in India

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

Source : Ozone cell, Ministry of Environment and Forests

ODS: Ozone Depleting Substances

* : For EUN # : Recovered and recycled

CFC :Chloro-Floro-Carbon

CTC : Carbon Terachloride

HCFC : Hydro Chloro Fluoro Carbon

Table 4.17.2: Total consumption of ozone depleting substances

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

Source : Ozone cell, Ministry of Environment and Forests

ODS: Ozone Depleting Substances