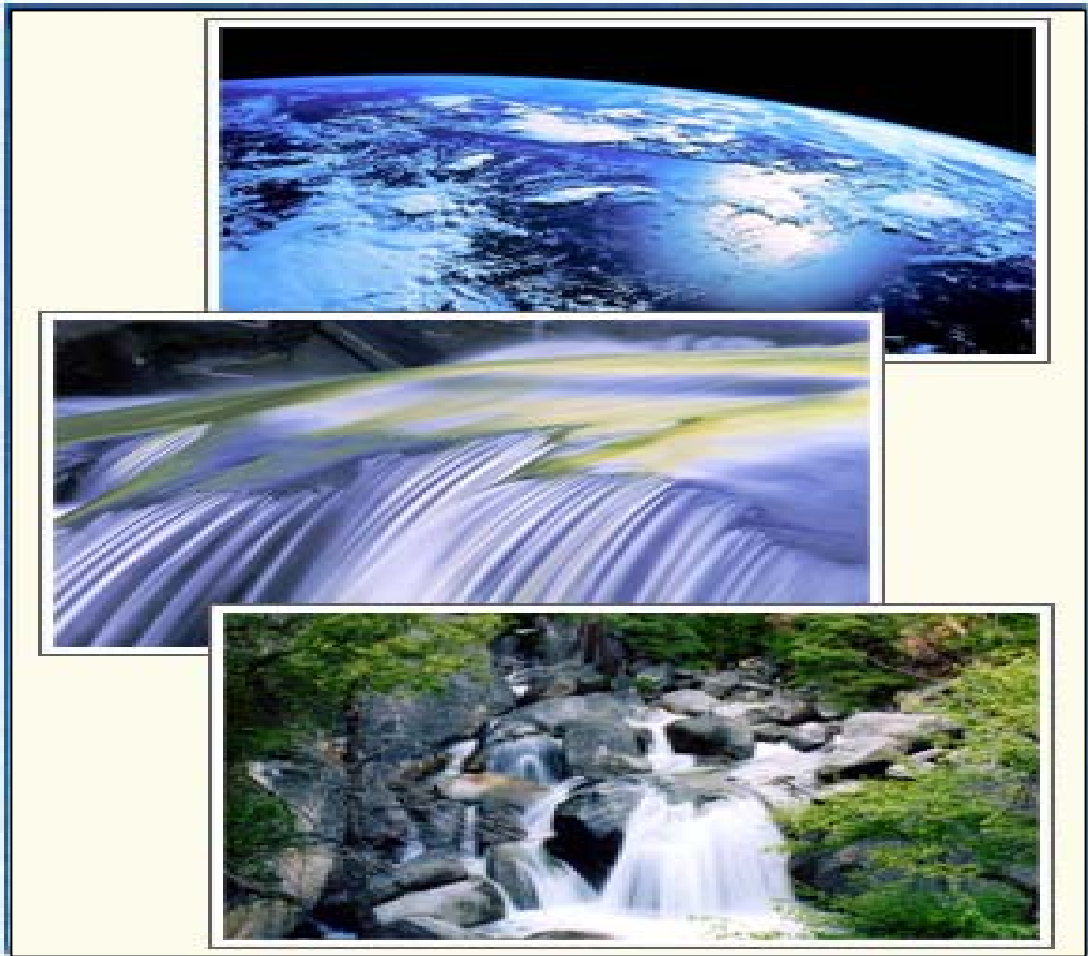


CHAPTER SIX



Water

CHAPTER SIX

WATER

6.1 India is rich in surface water resources. Average annual precipitation is nearly 4000 cubic km. and the average flow in the river system is estimated to be 1880 cubic km. Because of concentration of rains only in the three monsoon months, the utilizable quantum of water is about 690 cubic km. However, conditions vary widely from region to region. Whereas, some regions are drought affected, others are frequently flooded. With the rapid increase in the population, the demand for irrigation, human and industrial consumption of water has increased considerably, thereby causing depletion of water resources. The assumption that “Fresh water is a gift of God which would continue to be available in perpetuity and in abundance” is under challenge. The main preoccupation of water resources development in the country is the extension and improvement of irrigation and hydel power generation. Water requirements for industrial and domestic use are met partly from reservoirs constructed and managed by the irrigation department. The agriculture production technologies have put a lot of stress on underground water resources.

River Water

6.2 Rivers are the lifeline of majority of population in cities, towns and villages and most of these are considered as sacred. Every river stretch has a distinct water use like bathing, drinking, municipal supply, navigation, irrigation and fishing, sports, etc. Simultaneously, it is also used as receptacle for discharge of industrial effluent, municipal sewage and dumping of solid wastes. The Water (Prevention and Control of Pollution) Act, 1974 is aimed to support the quality

of various designated best uses of water bodies. The Water Quality Atlas of the Indian River System has been prepared by CPCB on the basis of five major uses of the river water such as:

- (a) Drinking water source without conventional treatment but after disinfection;
- (b) Outdoor bathing organized;
- (c) Drinking water source but with conventional treatment followed by disinfection;
- (d) Propagation of wildlife, fisheries;
- (e) Irrigation, industrial cooling, controlled waste disposal.

For maintaining the quality of river water, the pollution levels in rivers have been detected by monitoring limited number of the physico-chemical parameters, which could only determine the changes in chemical characteristics of water bodies. Deterioration in water quality, over the past several years has gradually rendered the river water quality unsuitable for various beneficial purposes.

Monitoring of Rivers

6.3 The Central Pollution Control Board in collaboration with State Pollution Control Board is operating the Water Quality Monitoring Network comprising of 784 stations in 26 States and 5 Union Territories spread over the country for monitoring of aquatic resources. The monitoring is undertaken on monthly/quarterly basis in surface water and half yearly basis in cases of groundwater. The monitoring network covers 168 rivers, 53 lakes, 5 tanks, 2 ponds, 3 creeks, 3 canals, 12 drains and 181 groundwater wells. This is done through three major schemes 1) Global

Environmental Monitoring System (GEMS)- 2) Monitoring of Indian National Aquatic Resources (MINARS) - and 3) Yamuna Action Plan (YAP)

6.4 The monitoring results obtained during year 2003 indicate that organic pollution continues to be the predominant form of pollution of aquatic resources. The organic pollution measured in terms of bio-chemical oxygen demand (BOD) & coliform count gives the indication of extent of water quality degradation in different parts of country. It is observed 67% of the observations, out of nearly 3000 observations are having BOD less than 3 mg/l, 18% between 3-6 mg/l & 15% above 6 mg/l. Similarly Total & Faecal coliform, which indicate presence of pathogens in water, are also of major concern. About 45% observations are having Total coliform and 58% observations are having Faecal coliform less than 500 MPN/100 ml.

Biological Water Quality Evaluation and Criteria

6.5 There are two methods adopted for water quality evaluation which are complementary to each other.

1. Saprobic Score (BMWP)

This methodology involves inventory of the presence of benthic macro-invertebrate fauna up to the family level with the taxonomic precision. All possible families having saprobic indicator value are classified on score scale of 1 to 10 according to their preference for saprobic water quality. The saprobic scores of all the families are registered and averaged to produce BMWP score.

2. Diversity Score (Sequential Comparison)

This method involves pairwise comparison of sequentially encountered individuals and the difference of two benthic animals can be observed upto the species level, where no taxonomic skill is required. The diversity is the ratio of total no. of different animals (runs) and the total number of organisms encountered. The ratio of diversity has a value between 0 and 1.

Water Pollution

6.6 The types and sources of water contamination include “point” sources of pollution which usually refers to wastes being discharged from a pipe; and “non point” sources, which means all other sources such as storm water runoff (which picks up oils and other contaminants from various areas), irrigation (which carries fertilizers and pesticides into groundwater), leaks from storage tanks and leakage from disposal sites. The non-point sources are technically the most difficult to regulate in India. Water pollution comes from three main sources: domestic sewage, industrial effluents and run-off from activities such as agriculture. Water pollution from domestic and human wastewater causes many severe water borne diseases. The problem of water pollution due to industries is because of the inadequate measures adopted for effluent treatment than to the intensity of industrial activities. The 13 major water polluting industries have been identified and are closely monitored by the Central Pollution Control Board.

6.7 Access to safe drinking water remains an urgent need as about 70.5% of the households in the urban area and 8.7 % in rural areas receive organized piped water-supply and the rest have to depend on surface or ground water which is untreated. The diseases commonly caused due to contaminated water are diarrhea, trachoma, intestinal worms,

hepatitis, etc. The most common contamination in the water is from the disease bearing human wastes, which is usually detected by measuring fecal coliform levels. Inadequate access to safe drinking water and sanitation facilities leads to higher infant mortality and intestinal diseases.

6.8 An uncontrolled disposal of urban waste into water bodies, open dumps and poorly designed landfills, causes contamination of surface water and ground water. For industries, surface water is the main source for drawing water and discharging effluents. Industrial wastes containing heavy metals such as mercury, chromium, lead and arsenic can threaten or destroy marine life besides polluting aquatic food resources.

TABLE 6.1.1 MONSOON PERFORMANCE

Sl. No.	Year	Number of Meteorological Sub-Divisions			Percentage of Districts With Normal/Excess Rainfall	Percentage of Long Period Average Rainfall for the Country as a Whole
		Normal	Excess	Deficient/Scanty		
1	2	3	4	5	6	7
1	1997*	20	6	3	81	102
2	1998*	20	13	2	81	106
3	1999*	25	3	7	67	96
4	2000*	23	5	7	66	92
5	2001*	29	1	5	68	92
6	2002	14	1	21	44	81
7	2003	26	7	3	75	102
8	2004	23	0	13	55	87
9	2005	24	8	4	73	99
10	2006	21	6	9	60	100

Source : India Meteorological Department

* Total No. of Met. Sub Div. is 35.

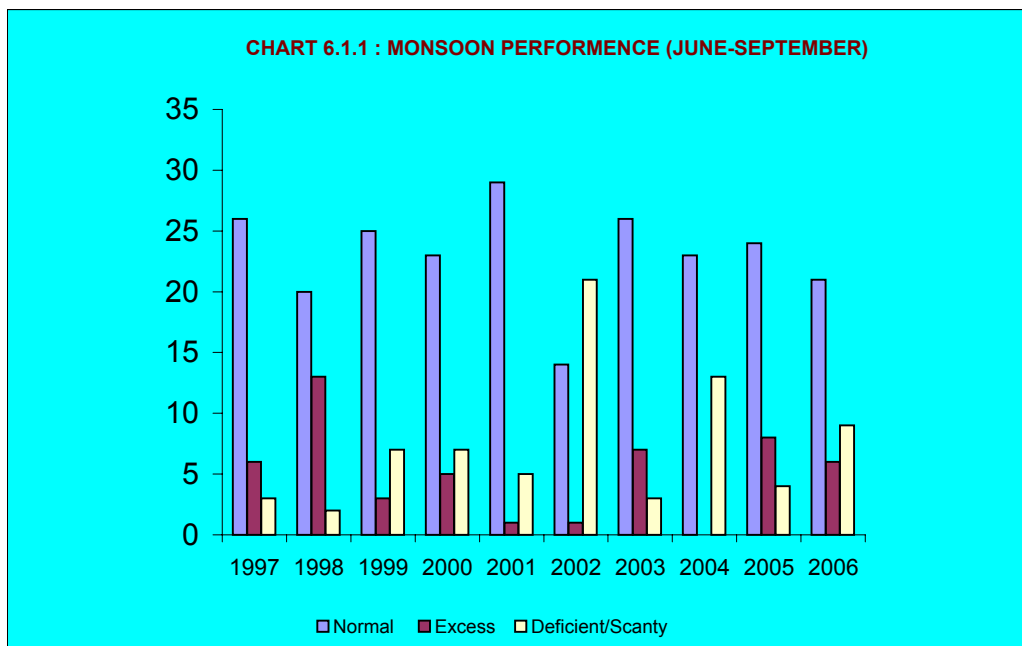


TABLE 6.1.2 : SUB DIVISIONAL ACTUAL AND NORMAL RAINFALL

(Millimetre)

Sl. No.	Sub Divisions	2002		2003		2004		2005		2006		2007	
		Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual	Normal
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Andaman & Nicobar Islands	2310.7	2945.5	2446.9	2945.7	2508.1	3060.7	2762.5	3001.8	2447.9	3001.8	2762.5	2447.9
2	Arunachal Pradesh	2559.6	3329.8	2761.2	3003.2	2922.6	2927.5	2542.5	2935.9	2107.9	2935.9	2542.5	2107.9
3	Assam and Meghalaya	2530.7	3163.1	2835.1	2817.2	3055.7	2792.9	2314.9	2802.0	1777.5	2817.1	2314.9	1777.5
4	Nagaland, Mizoram, Manipur & Tripura	1960.8	2154.1	2029.0	2100.2	2075.1	1969.5	1612.3	1920.6	1561.5	1920.6	1612.3	1561.5
5	Sub-Himalayan West Bengal & Sikkim	2820.1	2683.6	3288.5	2808.8	2768.3	2644.9	2670.8	2617.0	2304.5	2617.0	2670.8	2304.5
6	Gangetic West Bengal	1597.6	1518.7	1457.8	1461.3	1488.0	1494.1	1585.4	1494.6	1587.2	1494.6	1585.4	1587.2
7	Orissa	1166.5	1415.8	1750.6	1450.3	1337.7	1459.1	1549.7	1464.2	1810.0	1472.5	1549.7	1810
8	Jharkhand	1315.5	1293.3	1299.0	1296.3	1157.8	1328.8	859.4	1334.7	1356.0	1321.9	859.4	1356
9	Bihar	1193.3	1186.7	1454.8	1192.5	1077.0	1230.6	913.7	1282.0	1000.4	1233.2	913.7	1000.4
10	East Uttar Pradesh	795.8	1013.3	1177.1	1020.9	849.3	1038.3	828.3	1041.9	771.4	1041.9	828.3	771.4
11	West Uttar Pradesh	729.0	880.5	1129.5	873.3	647.2	887.1	752.6	888.8	510.6	888.8	752.6	510.6
12	Uttaranchal	2188.5	1556.0	1903.7	1586.2	1605.7	1553.8	1492.6	1582.6	1264.8	1582.6	1492.6	1264.8
13	Haryana, Chandigarh & Delhi	488.7	618.7	720.7	619.5	524.0	570.9	587.1	567.5	377.0	567.5	587.1	377
14	Punjab	446.1	643.2	645.0	652.2	445.1	649.1	603.6	648.8	544.7	648.8	603.6	544.7
15	Himachal Pradesh	1075.5	1370.7	1268.9	1396.1	766.4	1252.3	996.4	1323.8	895.8	1323.8	996.4	895.8
16	Jammu & Kashmir	750.5	900.5	1106.1	1030.0	919.5	1124.5	1309.8	1246.0	1477.3	1246.0	1309.8	1477.3
17	West Rajasthan	118.9	330.7	386.7	325.7	190.4	298.9	260.4	297.0	362.4	297.0	260.4	362.4
18	East Rajasthan	307.1	703.2	629.6	685.4	627.5	677.7	617.4	678.2	711.7	678.2	617.4	711.7
19	West Madhya Pradesh	807.8	991.2	1011.0	991.0	839.6	987.8	784.5	987.9	1140.5	987.9	784.5	1140.5
20	East Madhya Pradesh	1075.7	1254.0	1532.5	1252.3	946.8	1227.1	1408.6	1229.3	1007.7	1229.3	1408.6	1007.7
21	Gujarat Region	705.4	1002.6	1259.5	1084.0	1004.2	977.8	1385.4	979.0	1458.1	979.1	1385.4	1458.1
22	Saurashtra, Kutch	402.7	570.7	733.1	587.8	498.5	517.4	638.6	518.3	702.9	518.3	638.6	702.9
23	Konkan & Goa	2324.2	2964.4	2828.5	2985.5	2911.6	2981.7	3557.6	298.5	3379.0	2978.5	3557.6	3379
24	Madhya Maharashtra	711.6	926.3	740.3	902.6	883.3	852.7	1101.7	850.4	1180.5	850.4	1101.7	1180.5
25	Marathwada	704.7	803.5	645.2	833.9	676.4	838.8	864.3	840.4	819.2	840.4	864.3	819.2
26	Vidarbha	1045.4	1074.4	1032.9	1096.8	796.3	1104.7	1257.8	1104.6	1276.5	1104.6	1257.8	1276.5
27	Chhattisgarh	--	--	1702.7	1318.3	1174.3	1362.5	1305.2	1368.4	1231.4	1368.4	1305.2	1231.4
28	Coastal Andhra Pradesh	757.3	1000.7	1118.6	1015.9	933.6	1012.7	1238.9	1011.2	1067.2	1011.2	1238.9	1067.2
29	Telangana	767.7	945.7	1009.4	946.0	761.7	942.3	1230.9	942.7	1044.5	942.7	1230.9	1044.5
30	Rayalaseema	504.4	695.9	654.0	684.0	655.9	679.5	999.3	677.9	608.9	677.9	999.3	608.9
31	Tamilnadu & Pondicherry	723.4	918.6	925.0	960.7	1104.5	111.4	1314.0	910.7	911.8	911.6	1314	911.8
32	Coastal Karnataka	2920.9	3583.4	3086.5	3638.5	3061.6	3620.2	3274.9	3613.2	3865.9	3613.2	3274.9	3865.9
33	North Interior Karnataka	556.3	706.6	473.6	711.5	644.6	725.6	856.2	720.1	627.9	720.1	856.2	627.9
34	South Interior Karnataka	869.1	1305.8	817.9	1064.8	1028.3	1018.4	1356.9	1014.8	951.0	1014.8	1356.9	951
35	Kerala	2457.3	2863.7	2275.8	3065.5	2977.3	3158.6	3153.1	3095.8	3297.8	3097.5	3153.1	3297.8
36	Lakshadweep	1034.4	1579.5	1532.8	1582.3	2096.8	1583.4	1579.0	1584.7	1695.4	1584.7	1579	1695.4

Source : Indian Meteorological Department

**TABLE 6.1.3 : STATE-WISE DISTRIBUTION OF NUMBER OF DISTRICTS WITH EXCESS,
NORMAL, DEFICIENT, SCANTY AND NO RAINFALL**

(01-06-2005 To 30-09-2005)

SI. NO.	STATE/UT	E	N	D	S	NR	ND	Total
1	2	3	4	5	6	7	8	9
1	Andaman & Nicobar Islands	0	1	1	0	0	0	2
2	Arunachal Pradesh	4	3	1	2	0	3	13
3	Assam	1	12	8	0	0	1	22
4	Meghalaya	1	0	1	1	0	0	3
5	Nagaland	0	0	2	1	0	1	4
6	Manipur	0	1	0	0	0	2	3
7	Mizoram	0	1	0	0	0	1	2
8	Tripura	0	3	0	0	0	0	3
9	Sikkim	0	1	0	0	0	0	1
10	West Bengal	0	9	8	0	0	0	17
11	Orissa	5	21	4	0	0	0	30
12	Jharkhand	0	1	10	0	0	4	15
13	Bihar	3	10	12	1	0	6	32
14	Uttar Pradesh	10	28	22	2	0	2	64
15	Uttaranchal	2	8	1	1	0	0	12
16	Haryana	2	10	5	0	0	2	19
17	Chandigarh	1	0	0	0	0	0	1
18	Delhi	0	0	1	0	0	0	1
19	Punjab	3	6	5	0	0	2	16
20	Himachal Pradesh	0	6	5	0	0	1	12
21	Jammu & Kashmir	0	8	3	0	0	0	11
22	Rajasthan	2	18	11	1	0	0	32
23	Madhya Pradesh	14	20	11	0	0	0	45
24	Chhattisgarh	3	12	1	0	0	0	16
25	Gujarat	18	6	0	0	0	1	25
26	D. & N. Haveli & Daman	1	0	0	0	0	0	1
27	Diu	1	0	0	0	0	0	1
28	Goa	0	1	0	0	0	0	1
29	Maharashtra	7	22	4	0	0	0	33
30	Andhra Pradesh	10	11	2	0	0	0	23
31	Tamil Nadu	2	24	4	0	0	0	30
32	Pondicherry	0	1	0	0	0	0	1
33	Karnataka	16	9	2	0	0	0	27
34	Kerala	2	10	1	0	0	1	14
35	Lakshadweep	1	0	0	0	0	0	1
Total		109	263	125	9	0	27	533
Percent distribution of 506 districts received		21%	52%	25%	2%	0%		

Source : India Meteorological Department.

Legend :

E : Excess N : Normal

D : Deficient S : Scanty

NR : No Rainfall

TABLE 6.1.3 : STATE-WISE DISTRIBUTION OF NUMBER OF DISTRICTS WITH EXCESS, NORMAL, DEFICIENT, SCANTY AND NO RAINFALL

(01-06-2006 To 30-09-2006)

Sl. NO.	STATE/UT	E	N	D	S	NR	ND	Total
1	2	10	11	12	13	14	15	16
1	Andaman & Nicobar Islands	0	1	1	0	0	0	2
2	Arunachal Pradesh	0	5	3	2	0	3	13
3	Assam	0	9	12	0	0	1	22
4	Meghalaya	0	1	1	1	0	0	3
5	Nagaland	0	0	3	1	0	0	4
6	Manipur	0	1	1	0	0	1	3
7	Mizoram	1	1	0	0	0	0	2
8	Tripura	0	1	2	0	0	0	3
9	Sikkim	0	1	0	0	0	0	1
10	West Bengal	4	12	1	0	0	0	17
11	Orissa	21	8	1	0	0	0	30
12	Jharkhand	3	4	1	0	0	7	15
13	Bihar	0	14	9	0	0	9	32
14	Uttar Pradesh	0	18	40	4	0	2	64
15	Uttaranchal	1	4	5	1	0	1	12
16	Haryana	0	1	14	3	0	1	19
17	Chandigarh	0	0	1	0	0	0	1
18	Delhi	0	0	1	0	0	0	1
19	Punjab	2	4	7	0	0	3	16
20	Himachal Pradesh	1	5	5	1	0	0	12
21	Jammu & Kashmir	5	4	1	0	0	1	11
22	Rajasthan	10	6	16	0	0	0	32
23	Madhya Pradesh	15	13	17	0	0	0	45
24	Chhattisgarh	0	10	6	0	0	0	16
25	Gujarat	22	3	0	0	0	0	25
26	D. & N. Haveli & Daman	0	1	0	0	0	0	1
27	Diu	0	0	0	0	0	1	1
28	Goa	0	1	0	0	0	0	1
29	Maharashtra	14	18	1	0	0	0	33
30	Andhra Pradesh	6	10	7	0	0	0	23
31	Tamil Nadu	2	11	17	0	0	0	30
32	Pondicherry	0	0	1	0	0	0	1
33	Karnataka	3	10	14	0	0	0	27
34	Kerala	0	13	1	0	0	0	14
35	Lakshadweep	0	1	0	0	0	0	1
	Total	110	191	189	13	0	30	533
	Percent distribution of 503 districts received	22%	38%	37%	3%	0%		

Source : India Meteorological Department.

Legend :

E : Excess

N : Normal

D : Deficient

S : Scanty

NR : No Rainfall

Blank figures indicate nil

TABLE 6.1.4 : LIST OF DISTRICTS WITH DEFICIENT OR SCANTY RAINFALL

<i>June - Sept.2006</i>		<i>June - Sept.2005</i>	
Sub Division	Districts	Sub Division	Districts
1	2	1	2
A & N Islands	1 Andaman	A & N Islands	1 Nicobar
Arunachal Pradesh	1 Changlang	Arunachal Pradesh	1 Changlang
	2 Lower Subansiri		2 Lower Subansiri
	3 Twang		3 Twang
	4 Tirap	Assam & Meghalaya	
	5 Upper Suubansiri		1 Bongaigaon
Assam & Meghalaya			2 Dibrugarh
	1 Bongaigaon		3 East Garo Hills
	2 Cacher		4 Golaghat
	3 Dhubri		5 Jaintia Hill
	4 Dibrugarh		6 Jorhat
	5 East Garo Hills		7 Morigaon
	6 Golaghat		8 Nowgong
	7 Jaintia Hill		9 Sibsagar
	8 Jorhat		10 Sonitpur
	9 Kamrup	NMMT	
	10 Karbi-Anglong		1 Kohima
	11 Morigaon		2 Phek
	12 Nowgong		3 Tuensang
	13 Sibsagar	SHWB & Sikkim	
	14 Sonitpur		Darjeeling
NMMT		Gangetic WB	
	1 Imphal		1 Burdwan
	2 Kohima		2 Hooghly
	3 Mon		3 Howrah
	4 Phek		4 Murshidabad
	5 South Tripura		5 North 24 Paraganas N
	6 Tuensang		6 Nadia
	7 West Tripura		7 Purulia
SHWB & Sikkim		Orissa	
	Cooch Behar		1 Bolangir
Orissa			2 Deogarh
	Deogarh		3 Rayagada
Jharkhand		Jharkhand	
	Dhanbad		1 Dhanbad
Bihar			2 East Singhbhum
	1 Aurangabad		3 Giridih
	2 Bhojpur		4 Gumla
	3 Buxar		5 Hazaribagh
	4 Katihar		6 Palamau
	5 Kishanganj		7 Ranchi
	6 Madhubani		8 Santhal Parganas
	7 Monghyr	Bihar	
	8 Siwan		1 Aurangabad
	9 Vaishali		2 Begusarai
East UP			3 Bhabua
	1 Ambedkar Nagar		4 Bhojpur
	2 Ballia		5 Buxar
	3 Balrampur		6 Darbhanga
	4 Banda		7 Katihar
	5 Barabanki		8 Kishanganj
			9 Rudraprayag
			10 Monghyr
			11 Rohtas

TABLE 6.1.4 : LIST OF DISTRICTS WITH DEFICIENT OR SCANTY RAINFALL -Contd

<i>June - Sept.2006</i>		<i>June - Sept.2005</i>			
Sub Division	Districts	Sub Division	Districts		
1	2	1	2		
West UP	6 Deoria	East UP	12 Saharsa		
	7 Faizabad		13 Samastipur		
	8 Fatehpur		14 West Champaran		
	9 Gonda		1 Ballia		
	10 Hardoi		2 Balrampur		
	11 Kanpur City		3 Barabanki		
	12 Kheri		4 Deoria		
	13 Maharajganj		5 Farukhabad		
	14 Mau		6 Fetehpur		
	15 Pratappgarh		7 Gazipur		
	16 Rea Bareilly		8 Hardoi		
	17 Sahuji Maharajnagar		9 Kheri		
	18 Sant Ravidas nagar		10 Kushi Nagar		
	19 Sultanpur		11 Lucknow		
	20 Unnao		12 Maharajganj		
	Uttaranchal		1 Agra	West UP	13 Pratappgarh
			2 Aligarh		14 Rea Bareilly
		3 Auriya	15 Sitapur		
		4 Badaun	16 Sonbhadra		
		5 Baghpat	17 Unnao		
6 Bareilly		1 Agra			
7 Bijnore		2 Auriya			
8 Bulandshahr		3 Etah			
9 Etah		4 Etawah			
10 Etawah		5 Hamirpur			
11 Ghaziabad		6 Hjhanshi			
12 Hamirpur		7 Meerut			
13 Jalaun		8 Pilibhit			
14 Jhanshi		9 Rampur			
15 Lalitpur		10 Shahjahanpur			
16 Mahamaya Nagar		Uttaranchal	1 Pithoragarh		
17 Mathura			2 Rudraprayag		
18 Meerut			Har. Chd. & Delhi	1 Karnal	
19 Moradabad				2 Kurukshetra	
20 Muzaffarnagar				3 Mahendragarh	
21 Pilibhit		4 Panchkkula			
22 Rampur		5 Sirsa			
23 Saharanpur		Punjab	1 Hoshiarpur		
24 Sahahjahanpur			2 Moga		
Uttaranchal	Chmpawat		3 Sangrur		
	1 Dehradun		Himmachal Pradesh	1 Bilaspur	
	2 Garhwal Tehri			2 Chamba	
	3 Hardwar	3 Kangra			
	4 Nainital	4 Sirmur			
5 Rudraprayag	5 Solan				
Har. Chd. & Delhi	1 Ambala	Jammu & Kashmir	1 Baramula		
	2 Bhiwani		2 Jammu		
	3 Chandigarh				
	4 Delhi				
	5 Faridabad				
	6 Fatehabad				
	7 Gurgaon				

TABLE 6.1.4 : LIST OF DISTRICTS WITH DEFICIENT OR SCANTY RAINFALL -ConId

June - Sept.2006

June - Sept.2005

Sub Division	Districts		Sub Division	Districts				
1	2		1	2				
Punjab	8	Hissar	West Rajasthan	3	Kupwara			
	9	Jind		4	Leh			
	10	Kaithal		5	Pulwama			
	11	Karnal		1	Jodhpur			
	12	Kurukshetra		2	Pali			
	13	Mahendragarh		3	Sri Ganganagar			
	14	Panchkkula		1	Bundi			
	15	Panipat		2	Jhalawar			
	16	Rewari		3	Sawai Madhopur			
	17	Rohtak		4	Sikar			
	18	Sonepat		5	Tonk			
	19	Yamuna Nagar		1	Barwani			
	1	Bhatibda		2	Bhind			
	2	Hoshiarpur		3	Datia			
	3	Ludhiana		4	Dewas			
	4	Monga		5	Dhar			
	5	Nawashahar		6	Harda			
	6	Patiala		7	Jhabua			
	7	Sabgrur		8	Khandwa			
Himachal Pradesh	1	Chamba	9	Khargaon				
	2	Kinnaur	10	Rajgarh				
	3	Kulu	11	Sehore				
	4	Lahaul & Spiti	12	Shajapur				
	5	Sirmur	13	Ujjain				
	6	Solan	1	Sidhi				
Jammu & Kashmir	1	Ladakh (Leh)	2	Tikamgarh\				
West Rajasthan	1	Bikaner	Gujrat Region	1	Dahod			
	2	Churu		Madhya Maharashtra	1	Jalgaon		
	3	Jodhpur			Vidarbha	1	Buldana	
	4	Nagaur				Chhatisgarh	1	Baster
	5	Sri Ganganagar					2	Danteware
East Rajasthan	1	Alwar	3				Surguja	
	2	Bharatpur	Tamilnadu & Pondicherry	1			Chennai	
	3	Bundi		2	Kanchipuram			
	4	Dausa		3	Karur			
	5	Dholpur		4	Tuticorin			
	6	Jaipur		5	Villupuram			
	7	Jhunjunu		6	Virudunagar			
	8	Karauli		Kerala	1	Cannur		
	9	Sawai Madhopur			2	Kasargode		
	10	Sikar			3	Kozhikode		
	11	Tonk			4	Thiruvananthapuram		
	12	Bhind						
	13	Datia						
14	Gwalior							
15	Harda							
16	Khandwa							
17	Morena							
18	Sheopur							
19	Shivpuri							

TABLE 6.1.4 : LIST OF DISTRICTS WITH DEFICIENT OR SCANTY RAINFALL -Conld

June - Sept.2006

June - Sept.2005

Sub Division		Districts		Sub Division		Districts	
1		2		1		2	
East MP	20	Chhatarpur					
	21	Damoh					
	22	Dindori					
	23	Jabalpur					
	24	Katni					
	25	Panna					
	26	Rewa					
	27	Satna					
	28	Tikamgarh					
Marathwada	29	Osmanabad					
Chhattisgarh	1	Bilashpur					
	2	Durg					
	3	Jashpur					
	4	Korba					
	5	Kowardha					
	6	Raigarh					
Coastal AP	1	Guntur					
	2	Nellore					
	3	Prakasam					
Telangana	1	Mahabubnagar					
	2	Nalgonda					
Rayalaseema	1	Anantapur					
	2	Cuddapah					
Tamilnadu & Pondi	1	Coimbtore					
	2	Cuddalore					
	3	Kanchipuram					
	4	Karur					
	5	Krishnagiri					
	6	Madurai					
	7	Nagapatinam					
	8	Nilgiri					
	9	Perambalur					
	10	Pondicherry					
	11	Pudukottai					
	12	Ramanathapuram					
	13	Thanjavur					
	14	Theni					
	15	Tiruvannamalai					
	16	Tiruvarur					
	17	Tuticorin					
	18	Virudunagar					
N.I. Karnataka	1	Bagalkote					
	2	Gadag					
	3	Gulbarga					
	4	Koppal					
	5	Raichur					
S.I. Karnataka	1	Bangalore Rural					
	2	Bangalore Urban					
	3	Bellary					
	4	Chamarajnaraga					
	5	Chitradurga					
	6	Hassan Kolar					
	7	Mandya					
	8	Tumkur					
Kerala	1	Wynad					

TABLE 6.1.5(a) : NUMBER OF METEOROLOGICAL SUB-DIVISIONS WITH EXCESS/ NORMAL AND DEFICIENT/SCANTY RAINFALL (JUNE-SEPTEMBER)

Sl. No.	Year	No. of Sub-Divisions	
		Excess/Normal	Deficient/Scanty
1	2	3	4
1	1991	27	8
2	1992	32	3
3	1993	31	4
4	1994	25	10
5	1995	33	2
6	1996	32	3
7	1997	32	3
8	1998	33	2
9	1999	28	7
10	2000	28	7
11	2001	29	6
12	2002	15	21
13	2003	33	3
14	2004	23	13
15	2005	32	4
16	2006	27	9

Source : India Meteorological Department

TABLE 6.1.5(b) : PERCENTAGE OF DISTRICTS WITH EXCESS/NORMAL AND DEFICIENT/SCANTY RAINFALL (JUNE-SEPTEMBER)

Sl. No.	Year	Percentage of Districts	
		Excess/Normal	Deficient/Scanty
1	2	3	4
1	1991	68	32
2	1992	65	35
3	1993	78	22
4	1994	77	23
5	1995	79	21
6	1996	82	18
7	1997	81	19
8	1998	83	17
9	1999	67	33
10	2000	65	35
11	2001	68	32
12	2002	44	56
13	2003	75	25
14	2004	55	45
15	2005	73	27
16	2006	60	40

Source : India Meteorological Department

Chart 6.1.5 (a): Number of Metrological Sub-divisions with Excess/Normal and Deficient/Scanty rainfall (June-September)

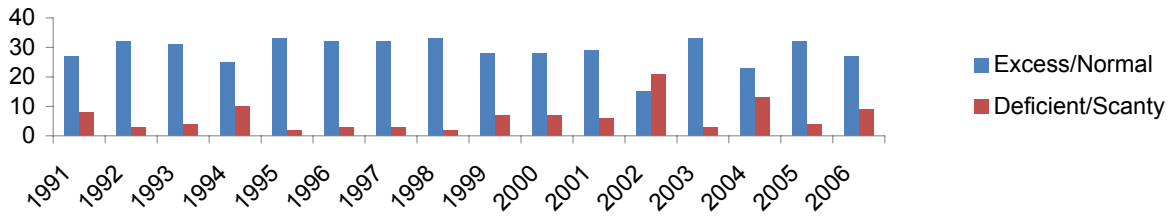
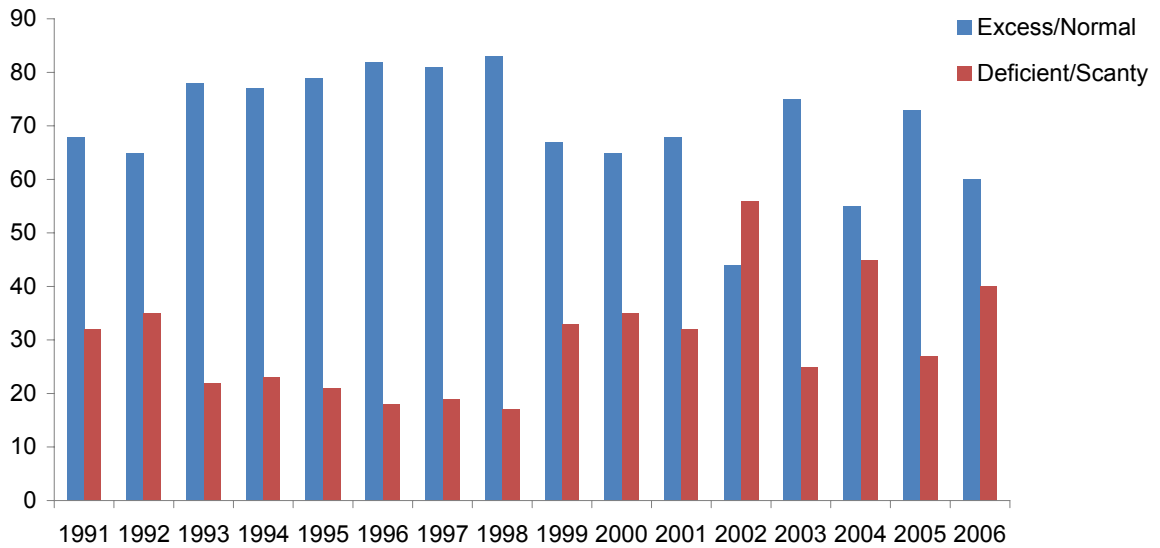


Chart 6.1.5 (b): Percentage of Districts with Excess/Normal and Deficient/Scanty (June-September)



Source : India Meteorological Department

TABLE 6.1.6 : WATER FLOW IN STREAM FOR THE PERIOD 2002-03 to 2005-2006

(Cusecs)

Sl. No.	Name of Basin/River	Name of Guage Station		No. of CWC Sites	Year for Which Data Given	Maximum Flow		Minimum Flow	
		First Site	Last Site			First Site	Last Site	First Site	Last Site
1	2	3	4	5	6	7	8	9	10
1	Mahi	Mataji	Khanpur	6	2003-2004	4000	1677	0.00	1.80
2	Tapi	Dedtalai	Ghala	12	2003-2004	1839	1286	0.00	16.63
3	Narmada	Dindori	Garudeshwar	25	2002-2003	666.3	2070	0.85	0.00
4	Godavari	Ghargaon	Polavaram	56	2005-2006	635.8	43703	0.00	13.23
5	Cauvery	Kudige	Musiri	31	2004-2005	1388	632.3	1.06	0.00
6	Krishna	Karad	Vijaywada	57	2002-2003	1121	158.7	0.00	2.87
7	Mahanadi	Baronda	Tikarpara	21	2002-003	406.7	12306	0.00	154.10
8	Subarnarekha	Muri	Ghatsila	3	2002-2003	7457	2037	0.42	11.33

Sources : Water year Books of different River Basins.(C.W.C.)
(Updated September. 2007)

TABLE 6.1.7 : STATE-WISE DETAILS OF INLAND WATER RESOURCES OF VARIOUS TYPES

(Lakh Hactares)

Sl. No.	Name of the State/UT.	Rivers & Canals (Length in Kms.)	Reservoirs	Tanks, Lakes & Ponds	Beels, Oxbow Lakes & Derelict Water Bodies	Brackish Water	Total Water Bodies
1	2	3	4	5	6	7	8
	States						
1	Andhra Pradesh	11514	2.34	5.17	-	0.60	8.11
2	Arunachal Pradesh	2000	-	2.76	0.42	-	3.18
3	Assam	4820	0.02	0.23	1.10	-	1.35
4	Bihar	3200	0.60	0.95	0.05	-	1.60
5	Goa	250	0.03	0.03	-	NEG	0.06
6	Gujarat	3865	2.43	0.71	0.12	1.00	4.26
7	Haryana	5000	NEG	0.10	0.10	-	0.20
8	Himachal Pradesh	3000	0.42	0.01	-	-	0.43
9	Jammu & Kashmir	27781	0.07	0.17	0.06	-	0.30
10	Karnataka	9000	4.40	2.90	-	0.10	7.40
11	Kerala	3092	0.30	0.30	2.43	2.40	5.43
12	Madhya Pradesh	17088	2.27	0.60	-	-	2.87
13	Maharashtra	16000	2.79	0.59	-	0.10	3.48
14	Manipur	3360	0.01	0.05	0.04	-	0.10
15	Meghalaya	5600	0.08	0.02	NEG	-	0.10
16	Mizoram	1395	-	0.02	-	-	0.02
17	Nagaland	1600	0.17	0.50	NEG	-	0.67
18	Orissa	4500	2.56	1.14	1.80	4.30	9.80
19	Punjab	15270	NEG	0.07	-	-	0.07
20	Rajasthan	5290	1.20	1.80	-	-	3.00
21	Sikkim	900	-	-	0.03	-	0.03
22	Tamil Nadu	7420	5.70	0.56	0.07	0.60	6.93
23	Tripura	1200	0.05	0.13	-	-	0.18
24	Uttar Pradesh	28500	1.38	1.61	1.33	-	4.32
25	West Bengal (P)	2526	0.17	2.76	0.42	2.10	5.45
26	Andaman & Nicobar Islands	115	0.01	0.03	-	1.20	1.24
27	Chandigarh	2	-	NEG	NEG	-	0.00
28	Dadra & Nagar Haveli	54	0.05	-	-	-	0.05
29	Daman & Diu	12	-	NEG	-	NEG	0.00
30	Delhi	150	0.04	-	-	-	0.04
31	Lakshadewwp	-	-	-	-	-	0.00
32	Pondicherry	247	-	NEG	0.01	NEG	0.01
33	Chhattisgarh	3573	0.84	0.63	-	-	1.47
34	Urraranchal	2686	0.20	0.01	0.00	-	0.21
35	Jharkhand	4200	0.94	0.29	-	-	1.23
TOTAL		195210	29.07	24.14	7.98	12.40	73.59

Source : Department of Animal Husbandary and Dairing, Ministry of Agriculture
NEG: Negligible

TABLE 6.1.8 : NAVIGABLE WATERWAYS IN INDIA, 2004-05

				(Km.)			
Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length	Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4	1	2	3	4
1	ANDHRA PRADESH			5	KERALA		
	Godavari	757	171		Manjeswar	16	3.2
	Krishna	386	35		Uppala	50	-
	Others *	1997	258		Shiriya	67	4.8
	Total	3140	464		Mogral	34	-
2	ASSAM				Chandragiri	105	12.8
	Brahmaputra	891	891		Chittari	25	-
	Borak	140	140		Nileswar	46	11.2
	Subansiri	35	20		Kariangoda	64	24
	Kapali	70	30		Kavvai	31	9.6
	Joljoli	35	15		Peruvamba	51	16
	Dhansiri	100	22		Ramapuram	19	6.4
	Dikhow	42	15		Kuppan	82	24
	Total	1313	1133		Valapattanam	110	44.8
3	BIHAR				Anjara Kandy	48	27.2
	Damodar	...	---		Teiciherry	28	21.6
	Ganga	510	510		Mahe	54	24
	Gandak	300	300		Kuthiadi	74	9.6
	Koshi	233	160		Korapuzha	40	24.8
	Ghaghra	100	100		Kallai	22	9.6
	Sone	226	31		Chaliyar	169	68.4
	Mahananda	140	--		Kadalundy	130	43.2
	Burhi Gandak	400	--		Tirur	48	9.6
	Punpun	200	--		Bharathappujha	209	40
	Phalgu Harihar	300	--		Keecheri	51	-
	Kiul	100	--		Puzhakkal	29	-
	Kari Koshi	150	--		Karivannur	48	24
	Chandan	100	--		Chalakkudy	130	16
	Karmnasha	144	--		Periyar	244	72
	Others	860	290		Muvattei Puzha	121	25.6
	Total	3763	NA		Meenachi	78	41.6
4	GOA				Manimale	90	54.4
	Mandovi	78	65		Pamba	176	73.6
	Zuari	56	45		Achan coil	128	32
	Mapusa	26	20		Dallickal	42	2
	Chapora	34	25		Kallada	121	40
	Tiracol	29	15		Ithikkara	56	16
	Sal	20	15		Ayroom	17	1
	Cumbarjua Canal	17	17		Va,ama[ira,	88	11.2
	Others	--	-		Mamom	27	1
	Total	260	202		Karamana	68	-
					Neyyar	56	-
					Total	3092	845.2

TABLE 6.1.8 : NAVIGABLE WATERWAYS IN INDIA, 2004-05

.....Contd.

(Km.)

Sl. No.	State/River/Canals/Lakes	Total Length	Navigable Length
1	2	3	4
6	JAMMU AND KASHMIR#		
7	GUJARAT		
	Narmada	230	160
	Tapti	200	45
	Others	--	72
	Total	430(b)	277(b)
8	ORISSA		
	Mahanadi	493	199
	Brahmani	541	277
	Baitarani	344	32
	Subarnarekha	--	50
	Budha Balanga	--	35
	Dhamara	--	20
	Salandi	--	17
	Panchputra	--	21
	Pernei	--	45
	Hatel	--	30
	Bansagadal	--	32
	Hansua	--	37
	Tirkota	--	18
	Jamboo	--	6
	Gobari	--	16
	Ramchandi	--	16
	Kharansi	--	14
	Batigharia	--	14
	Birupa	--	110
	Genguti	--	45
	Luna	--	37
	Devi	--	20
	Pradhi	--	15
	Kadha	--	30
	Kusavadra	--	25
	Daya	--	9
	Rajua	--	7
	Makara	--	11
	Ohers *	--	356
	Total	1378	1544

Sl. No.	State/River/Canals/Lakes	Total Length	Navigable Length
1	2	3	4
9	TAMIL NADU #		
10	KARNATAKA		
	Sharavathi	250	13
	Tungabhadra	375	375
	Malaprabha	230	230
	Ghataprabha	160	160
	Krishna	325	325
	Cauvery	270	34
	Kabini	117	22
	Arkavathi	32	6
	Hemavathi	174	16
	Bheema	860	125
	Sita	15	1
	Netravathi	15	1
	Total	2823	1308
11	UTTAR PRADESH #		
12	WEST BENGAL		
	Hooghly	580	580
	Mahananda	206	58
	Ajoy	174	174
	Jalangi	232	232
	Dwarka	129	129
	Bakreswar	102	102
	Damodar	437	437
	Dwarekeswar	103	103
	Silabati	135	135
	Kumari	308	308
	Ichamati	232	232
	Others @	2103	2103
	Total	4741	4593

**TABLE 6.1.8 : NAVIGABLE WATERWAYS IN INDIA,
2004-05Concl.**

Sl. No.	State/River/Canals/ Lakes	Total Length	Navigable Length
1	2	3	4
13	MAHARASHTRA		
	Dande River	2	1
	Pangere River	2	1
	Cirye River	3	1
	Kajali River	35	5
	Kalbadevi River	10	2
	Are River	6	1
	Jog River	10	5
	Kelshi River	10	3
	Savotro Rover (Bankot to Mahad)	45	40
	Kal River	6	4
	Vaitarna River	24	9
	Ulhas River	32.5	28
	Mahim River (Bay)	1.5	1
	Amba River	23	20
	Patalganga	11	6.5
	Kundalika River	16	16
	Mandad River (Rajpuri	14	10
	Mhasla River (Turmad	9	5
	Vashisti River (Dabhol	45	38
	Jagbudi River	20	20
	Shastri River/Jaigad	45	40
	Rajapur River	30	30
	Vagothan	38	22
	Gad River (Kalaval	13	7
	Terekhol River/Creek	28	28
	Others	129	105
		611	453

Source : Transport Research Wing, Ministry of Surface Transport

b Relates to 1994-95

* Including Canals

@ Includes 268 Kms pertaining to canals

- Not available

Data not received from the State Government

TABLE 6.1.9: GROUND WATER RESOURCE POTENTIAL AS PER BASIN (PRORATE BASIS)

Sl. No.	Basin	Total Replenishable Ground Water Resource (M.C.M/Yr)	Provision for Domestic Industrial & Other Uses (M.C.M/Yr)	Available for Irrigation (M.C.M/Yr)	Net Draft (M.C.M/Yr)	Balance for Future Use (M.C.M/Yr)	% Level of G.W. Development
1	2	3	4	5	6	7	8
1	Brahmaputra	26545.69	3981.35	22564.34	760.06	21804.29	3.37
2	Brahmani with Baitarni	4054.23	608.13	3446.09	291.22	3154.88	8.45
3	Cambai composite	7187.25	1078.09	6109.16	2449.06	3660.10	40.09
4	Caveri	12295.71	1844.35	10451.35	5782.85	4668.50	55.33
5	Ganga	170994.74	26030.47	144964.26	48593.67	96370.56	33.52
6	Godavari	40649.82	9657.69	30992.12	6054.23	24937.90	19.53
7	Indus	26485.42	3053.95	23431.47	18209.30	5222.17	77.71
8	Krishna	26406.97	5578.34	20828.63	6330.45	14498.19	30.39
9	Kutch & Saurashtra	11225.09	1738.10	9486.99	4851.87	4791.02	51.14
10	Madras & Southern	18219.72	2732.95	15486.77	8933.25	6553.52	57.68
11	Mahanadi	16460.55	2471.10	13989.45	972.63	13016.81	6.95
12	Meghna	8516.69	1277.48	7239.21	285.34	6953.87	3.94
13	Narmada	10826.54	1653.75	9172.79	1994.18	7178.61	21.74
14	Northeast Composite	18842.61	2826.39	16016.22	2754.93	13261.29	17.20
15	Pennar	4929.29	739.39	4189.89	1533.38	2656.51	36.60
16	Subranarekha	1819.41	272.91	1546.50	148.06	1398.43	9.57
17	Tapi	8269.50	2335.79	5933.70	1961.33	3972.38	33.05
18	Western Ghat	17693.72	3194.78	14499.18	3318.12	11181.06	22.88
Total		431422.93	71075.02	360348.15	115223.93	245280.08	31.92

Source: Central Ground Water Board
MCM/yr : Million Cubic Metre/Year

Out of the total replenishable ground water; about 84% is made available for agriculture and livestock, the rest 16% is made available for domestic consumption, industrial use and power generation. However, not all the water abstracted is effectively used. There are sizeable losses in conveyance and application of irrigated water. A large part of water used by industry and domestic purposes is returned to the streams as effluent waste; and most of the water drawn by power station is used for cooling purposes and is available for reuse.

The water pollution in India comes from three main sources : domestic sewage, industrial effluents and run off from activities such as agriculture. Major industrial sources of pollution in India include the fertilizer plants, refineries, pulp and paper mills, leather tanneries, metal plating and other chemical industries.

TABLE 6.1.10 : GROUND WATER RESOURCES

Sl. No.	States	Total Replenishable Ground Water Resource	Provision for Domestic Industrial & Other Uses	Available Ground Water Resource for Irrigation	Projected Net Draft (as on 2003)	Balance Ground Water Resource for Future Use (As on 2003)	Level of Ground Water Development (As on 2003)
1	2	3	4	5	6	7	8
		BCM/Yr	BCM/Yr	BCM/Yr	BCM/Yr	BCM/Yr	[%]
	States	43.4771	71.4020	363.3696	149.8151	213.5991	41.23
1	Andhra Pradesh	35.2909	5.2936	29.9973	8.5687	21.4286	28.56
2	Arunachal Pradesh	1.4385	0.2158	1.2227	-	1.2227	Neg.
3	Assam	22.4786	3.3718	19.1068	1.8390	17.2678	9.62
4	Bihar	26.9796	4.0470	22.9327	10.6284	12.3043	46.35
5	Chhattisgarh	16.0705	2.4106	13.6599	0.8102	12.8497	5.93
6	Delhi	0.2916	0.1939	0.0977	0.1180	0.0000	120.78
7	Goa	0.2182	0.0327	0.1855	0.0154	0.1701	8.30
8	Gujarat	20.3767	3.0566	17.3199	9.5546	7.7653	55.17
9	Haryana	11.1794	1.6769	9.5025	8.1316	1.3709	85.57
10	Himachal Pradesh	0.2926	0.0439	0.2487	0.0314	0.2173	12.61
11	Jammu & Kashmir	4.4257	0.6640	3.7620	0.0306	3.7314	0.81
12	Jharkhand	6.6045	0.9907	5.6138	1.8390	3.7751	32.75
13	Karnataka	16.1750	2.4186	13.7564	4.7599	8.9965	34.60
14	Kerala	7.9003	1.3135	6.5869	1.4606	5.1263	22.17
15	Madhya Pradesh	34.8186	5.2228	29.5958	8.0179	25.7793	27.09
16	Maharashtra	37.8677	12.3973	25.4704	9.4352	16.0352	37.04
17	Manipur	3.1540	0.4730	2.6810	Neg.	2.6810	Neg.
18	Meghalaya	0.5397	0.0810	0.4587	0.0182	0.4405	3.97
19	Mizoram	1.4000	0.2100	1.1900	Nil	1.1900	Neg.
20	Nagaland	0.7240	0.1090	0.0615	Neg.	0.0615	Neg.
21	Orissa	20.1287	3.0193	17.1094	3.6086	13.5008	21.09
22	Punjab	18.1923	1.8192	16.3730	16.3972	0.0000	100.15
23	Rajasthan	12.6021	1.9977	10.6044	9.2583	1.3462	87.31
24	Sikkim	0.0736	0.0108	0.0628	Neg.	0.0628	Neg.
25	Tamil Nadu	26.4069	0.3961	22.4458	14.4539	7.9929	64.39
26	Tripura	0.6634	0.0995	0.5639	0.1885	0.3754	33.43
27	Uttar Pradesh	82.5459	12.3819	70.1640	32.3337	37.8304	46.08
28	Uttaranchal	2.8411	0.4262	2.4149	0.8208	1.5941	33.99
29	West Bengal	23.0914	3.4637	19.6277	7.4967	12.1310	38.19
	Union Territories	0.8877	0.0976	0.5510	0.1600	0.1100	
1	Andaman & Nicobar	0.3263	0.0134	0.3129	Neg.	0.0319	Neg.
2	Chandigarh	0.0297	0.0044	0.0252	0.0245	0.0007	97.34
3	Dadar & Nagar Haveli	0.0422	0.0063	0.0359	0.0046	0.0313	12.74
4	Daman	0.0071	0.0011	0.0060	0.0048	0.0012	80.00
5	Diu	0.0037	0.0006	0.0031	0.0029	0.0002	94.84
6	Lakshadweep	0.3042	0.0456	0.0195	0.0077	0.0119	39.21
7	Pondicherry	0.1746	0.0262	0.1484	0.1155	0.0329	77.85
	Grand Total	435.6592	71.4997	364.1595	149.9751	213.7090	41.18

Source: Central Ground Water Board
 BCM/yr : Billion Cubic Metre/Year

Table 6.1.11 : PROJECTED ANNUAL REQUIREMENT OF WATER (BY DIFFERENT USES)*(In BCM)*

Sl. No.	Sector	Water Demand in Km ³ (or BCM)					
		Standing Sub-Committee of MOWR			NCIWRD		
		2010	2025	2050	2010	2025	2050
1	2	3	4	5	6	7	8
1	Domestic	688	910	1072	557	611	807
2	Irrigation	56	73	102	43	62	111
3	Industry	12	23	63	37	67	81
4	Energy	5	15	130	19	33	70
5	Others	52	72	80	54	70	111
Total		813	1093	1447	710	843	1180

Source : Central Water Commission

Working group Report on Water Resources for the XI Five Year Plan

BCM Billion Cubic Meter

TABLE 6.1.12 (a) : CATCHMENT AREA OF MAJOR RIVER BASINS

Sl. No.	Name of the River	Origin	Length (Km.)	Catchment Area (Sq. Km.)
1	2	3	4	5
1	Indus	Mansarovar (Tibet)	1114 (2880)	321289 (1165500)
2	a) Ganga	Gangotri (Uttaranchal)	2525	861452 (1186000)
	b) Brahmaputra	Kailash Range (Tibet)	916 (2900)	194413 (580000)
	c) Barak & other rivers flowing into Meghna like Gomti, Muhari, Fenny etc.	Manipur Hills (Manipur)		41723
3	Sabarmati	Aravalli Hills (Rajasthan)	371	21674
4	Mahi	Dhar (Madhya Pradesh)	583	34842
5	Narmada	Amarkantak (Madhya Pradesh)	1312	98796
6	Tapi	Betul (Madhya Pradesh)	724	65145
7	Brahmani	Ranchi (Bihar)	799	39033
8	Mahanadi	Nazri Town (Madhya Pradesh)	851	141589
9	Godavari	Nasik (Maharashtra)	1465	312812
10	Krishna	Mahabaleshwar (Maharashtra)	1401	258948
11	Pennar	Kolar (Karnataka)	597	55213
12	Cauvery	Coorg (Karnataka)	800	81155
Total				2528084

Source : Central Water Commission

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

6.1.12 (b): WATER RESOURCES POTENTIAL IN RIVER BASINS OF INDIA

SI No.	River Basin	Catchment Area (Sq. Km.)	Water Resources Potential (Mm3)		Ground Water Potential (unit)
			Average	75% Dependable	
1	Indus	321289+	73305*	-	25543
2	Ganga-Brahmaputra-Meghna				
	a) Ganga	861452+	525023*	4363121	171725
	b) Brahmaputra	194413+	537240*	491736!	27857
	c) Barak & Others	41723+	48357	-	1795
3	Godavari	312812	110540	80545	46762
4	Krishna	258948	78124	£9411	26646
5	Cauvery	81155	21358	19375	13598
6	Subernarekha	29196	12368	9855	2185
7	Brahamani & Baitarani	51822	28477	20051 !	5879
8	Mahanadi	141589	66879*	53786	21283
9	Pennar	55213	6316	.B93	5047
10	Mahi	34842	11020	5713	-
11	Sabarmati .	21674	3809	3146	7908
12	Narmada	98796	45639	30829	11890
13	Tapi	65145	14879	8860	8173
14	West Flowing Rivers From Tapi to Tadri	55940	87411	65663	9479
15	West Flowing Rivers From Tadri to Kanyakumari	56177	113532	85285	8810
16	East Flowing Rivers Between Mahanadi & Penar	86643	22520	187681	22788
17	East Flowing Rivers Between Pennar And Kanyakumari	100139	16458	13930	20907
18	West Flowing Rivers Of Kutch and Saurashtra including Lurii	321851	15098*	-	13948
19	Area of Inland drainage in Rajasthan desert	-	Neg!.	-	-
	Minor Rivers Draining into Myanmar(Burma) & Bangladesh	36302+	31 000*	-	- .
TOTAL			1869348		452233

Source: Reassessment of Water Resources Potential of India. ewe (1993),

* Earlier estimates reproduced from CWC Publication NO.30/88 " Water Resources of India" April 198R + Area in Indian Territory

Table 6.1.13 : PRIMARY WATER QUALITY CRITERIA

Sl. No.	Designated Best Use	Class of Water	Criteria
1	2	3	4
1	Drinking Water Source without Conventional Treatment but after Disinfection	A	1 Total Coliforms Organised MPN/100ml shall be 50 or less 2 pH between 6.5 & 8.5 3 Dissolved Oxygen 6mg/l or more 4 Biochemical Oxygen Demand 5 days 20°C 2mg/l or less.
2	Outdoor bathing (organised)	B	1 Total Coliforms Organism MPN/100ml shall be 500 or less 2 pH between 6.5 & 8.5 3 Dissolved Oxygen 5mg/l or more 4 Biochemical Oxygen demand 5 days 20°C 3mg/l or less.
3	Drinking Water Source	C	1 Total Coliforms Organism MPN/100ml shall be 5000 or less 2 pH between 6 & 9 3 Dissolved Oxygen 4mg/l or more 4 Biochemical Oxygen demand 5 days 20°C 3mg/l or less.
4	Propagation of Wild Life	D	1 pH between 6.5 & 8.5 Fisheries 2 Dissolved Oxygen 4mg/l or more 3 Free Ammonia (as N) 1.2 mg/l or less
5	Irrigation, Industrial Cooling, Controlled Waste	E	1 pH between 6.0 or 8.5 2 Electrical conductivity at 25°C Micro mhos/cm Max 2250. 3 Sodium Absorption Ratio, Max 26 4 Boron, Max 2mg/l

Source : Water Quality - Status & Statistics (1996 & 1997), Central Pollution Control Board

The water quality at any location is determined as the one which is satisfied at least 80% of time by all the criteria parameters. To further elucidate on this if at a location, 80% of the time Dissolved Oxygen, pH were in the range specified for class A, BOD for class B and total coliforms for class C, then the existing status is determined as C.

TABLE 6.1.14 : BIOLOGICAL WATER QUALITY CRITERIA (BWQC)

Sl. No.	Taxonomic Groups	Range of Saprobic Score (BMWP)	Range of Diversity Score	Water Quality Characteristics	Water Quality Class	Indicator Colour
1	2	3	4	5	6	7
1	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Diptera	7 and more	0.2 - 1	Clean	A	Blue
2	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Planaria, Odonata, Diptera	6 - 7	0.5 - 1	Slight Pollution	B	Light Blue
3	Ephemeroptera, Plecoptera, Trichoptera, Hemiptera, Odonata, Crustacea, Mollusca, Polychaeta, Coleoptera, Diptera, Hirudinea, Oligochaeta	3 - 6	0.3 - 0.9	Moderate Pollution	C	Green
4	Hemiptera, Mollusca, Coleoptera, Diptera, Oligochaeta	2 - 5	0.4 & less	Heavy Pollution	D	Orange
5	Diptera, Oligochaeta, No Animal	0 - 2	0 - 0.2	Severe Pollution	E	Red

Source : Central Pollution Control Board

TABLE 6.1.15 : PHYSICO - CHEMICAL AND BIOLOGICAL WATER QUALITY OF POLLUTED STRETCH OF RIVER YAMUNA AND AGRA CANAL

Sl. No.	Location	Water Quality Class		Water Quality (Biological)
		Physico - Chemical (PWQC)	Biological (BWQC)	
1	2	3	4	5
1.	Okhla Barrage (River Yamuna)	E	E	Severe Pollution
2.	Inlet of BTPP at Agra Canal	E	E	Severe Pollution
3.	Mixing of BTPP outlet at Agra Canal	E	E	Severe Pollution

Source : Central Pollution Control Board
BTPP : Badarpur Thermal Power Plant

TABLE 6.1.16 : WASTE WATER GENERATION, COLLECTION, TREATMENT IN METRO CITIES : STATUS

Sl. No.	Name of Metro City	Total Population	Municipal Population	Volume of Waste Water Generated (mld)			Waste Water Collected		Capacity (mld)	Treatment		Mode of Disposal
				Domestic	Industrial	Total	Volume (mld)	%		Primary	Secondary	
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Ahmedabad	3312216	2876710	520.0	36.0	556.0	445.0	80.0	430.0	Y	Y	Sabarmati river
2	Bangalore	4130288	4130288	375.0	25.0	400.0	300.0	75.0	290.0	Y	Y	V. Valley,Ksc Valley
3	Bhopal	1062771	1062771	189.3	--	189.3	94.6	50.0	87.0	Y	Y	Agriculture
4	Bombay	12596243	12288519	2228.1	227.9	2456.0	2210.0	90.0	109.0	Y	Y	Sea
5	Kolkata	11021918	9643211	1383.8	48.4	1432.2	1074.9	75.1	--	--	--	Hughly river/ Fish Farm
6	Coimbatore	1100746	816321	60.0	--	60.0	45.0	75.0	--	--	--	Nayal river, Irrigation
7	Delhi	8419084	8419084	1270.0	--	1270.0	1016.0	80.0	981.0	Y	Y	Agriculture, Yamuna River
8	Hyderabad	4344437	4098734	348.3	25.0	373.3	299.0	80.1	115.0	Y	--	River, Irrigation
9	Indore	1109056	1091674	145.0	--	145.0	116.0	80.0	14.0	Y	--	Khan River, Irrigation
10	Jaipur	1518235	1458483	220.0	--	220.0	165.0	75.0	27.0	Y	Y	Agriculture
11	Kanpur	2029889	1874409	200.0	--	200.0	150.0	75.0	41.0	Y	Y	Ganga, Sewage
12	Kochi	1140605	670009	75.0	--	75.0	45.0	60.0	--	--	--	Cochin Back waters
13	Lucknow	1669204	1619115	106.0	--	106.0	80.0	75.5	--	--	--	Gomati River
14	Ludhiana	1042740	1042740	94.4	--	94.4	47.0	49.8	--	--	--	Agriculture
15	Madras	5421985	4752974	276.0	--	276.0	257.0	93.1	257.0	Y	Y	Agriculture, Sea
16	Madurai	1085914	940989	48.0	--	48.0	33.6	70.0	--	--	--	Agriculture
17	Nagpur	1664006	1624752	204.8	--	204.8	163.0	79.6	45.0	Y	Y	Agriculture
18	Patna	1099647	917243	219.0	--	219.0	164.0	74.9	105.0	Y	N	River, Fishries
19	Pune	2493987	2244196	432.0	--	432.0	367.0	85.0	170.0	Y	Y	River
20	Surat	1518950	1498817	140.0	--	140.0	112.0	80.0	70.0	Y	-	Garden/Creek
21	Vadodara	1126824	1031346	120.0	20.0	140.0	105.0	75.0	81.0	Y	Y	river, Agriculture
22	Varanasi	1030863	1030863	170.0	--	170.0	127.0	74.7	101.0	Y	Y	Ganga, Agriculture
23	Vishakhapatnam	1057118	752037	68.0	--	68.0	55.0	80.9	--	--	--	--
Total		70996726	65885285	8892.7	382.3	9275.0	7471.1	80.6	2923.0			

Source : Central Pollution Control Board
Note : Data Collected During 1995-96

Y = Yes N = No

Table 6.1.17 (a): Water Quality in Indian Rivers-2002

Sl. No.	Name of Basin/River	Length (km)	No. of Monitoring locations	Observed Range of Water Quality Parameters							
				Temperature °C	PH	Conductivity (µmhos/cm)	DO (mg/l)	BOD (mg/l)	COD (mg/l)	Total Coliform (MPN/100 ml)	Faecal Coliform (MPN/100 ml)
1	2	3	4	5	6	7	8	9	10	11	12
1	Ganga	2525	34	3-34	6.4-9.0	19-2720	2.7-11.5	0.5-16.8	1-30	300-25x10 ⁵	20-11x10 ⁵
2	Yamuna	1376	23	3-34	6.7-9.8	56-1959	0.1-22.7	1.0-36	1-112	27-26x10 ⁶	11-17.2x10 ⁵
3	Sabarmati	371	8	12-32	2.9-8.6	269-13530	0.6-7.9	0.8-475	4-1794	210-28x10 ⁵	28-28x10 ⁵
4	Mahi	583	7	19-34	7.1-9.2	175-5720	0.2-8.5	0.1-3.0	9-163	3-2400	3-75
5	Tapi	724	10	20-40	7.4-9.0	76-700	4.8-8.8	0.6-10.0	8-40	40-2100	2-210
6	Narmada	1312	14		6.9-9.3	102-1341	5.8-9.8	0.1-3.8	6-47	9-2400	2-64
7	Godavari	1465	11	22-35	7.0-9.0	118-1400	3.1-10.9	0.5-78.0	3-96	8-5260	2-3640
8	Krishna	1401	17	18-33	6.8-9.5	28-11050	2.9-10.9	0.2-10.0	3-88	17-33300	3-10000
9	Cauvery	800	20	21-37	2.0-9.2	31-53100	0.1-12.6	0.1-26.6	30	39-160000	2-28000
10	Mahanadi	851	16	18-38	7.3-8.9	114-15940	1.3-10.4	1.0-7.6	7-39	15-30000	50-17000
11	Brahmani	799	11	20-38	7.0-8.4	81-376	5.2-9.8	1.5-6.0	8-13	80-90000	40-60000
12	Baitarni		5	24-36	7.3-8.3	54-78400	6.8-9.3	2.0-6.8	7	900-22000	700-11000
13	Subarnarekha	395	6	18-36	6.5-8.0	113-355	5.2-8.5	0.2-12.0	4-96	150-1800	70-540
14	Brahmaputra	916	6	15-32	6.5-9.0	104-684	1.1-10.5	0.1-3.9	6-11	360-240000	300-24000
15	Pennar	597	4	-	7.5-8.7	364-978	6.0-9.3	1.0-2.9	14-16	-	-
16	Satluj	1078	20	9-32	6.8-8.8	131-819	3.8-11.4	0.1-45.0	1-80	8-35000	2-3500
17	Beas	460	19	3-32	7.1-8.7	53-517	5.2-11.5	0.3-5.0	1-13	2-2400	2-1600
18	Ghaggar	291	15	11-33	7.0-9.5	320-1012	2.6-9.6	1-180	4-560	43-14000	9-2500
19	Amlakhedi	-	1	27-32	1.7-7.2	7160-16770	0-0	485-1561.6	1821-3860	28-1100	3-28
20	Kali East	-	2	15-30	7.2-8.7	24-1930	6.7-11.9	1.9-67.0	66-421	2100-4800000	100000-360000

Source: Status of Water Quality in India 2002-2003

COD : Chemical oxygen Demand
BOD : Biological oxygen Demand

Table 6.1.17 (b) Water Quality Status of Indian Rivers-2003													
Sl. No.	Name of Basin/River	Temperature °C		PH		Conductivity (µmhos/cm)		DO (mg/l)		BOD (mg/l)		COD (mg/l)	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Beas	4	29	7.3	8.9	76	559	7.0	12.0	0.1	6.0	1.0	18.0
2	Satluj	5	30	6.9	8.9	164	1226	3.4	11.5	0.1	24.0	0.8	61.0
3	Jhelum	6	38	7.2	8.6	78	629	4.9	11.8	0.1	1.2	1.0	18.0
4	Ganga	4	34	6.8	8.9	49	1323	4.0	11.0	0.8	24.8	2.0	47.2
5	Yamuna	2	38	6.6	10.0	45	3500	0.3	22.8	1.0	58.0	1.0	187.0
6	Gandak	10	39	6.4	8.6	21	2390	0.8	11.5	0.6	149.0	8.8	552.0
7	Dohad	2	36	6.2	9.3	119	8800	1.0	10.8	0.3	30.0	2.0	46.0
8	Rupnarayan	22	39	6.9	8.9	209	11660	3.5	9.9	0.4	6.0	10.0	34
9	Brahmaputra	-	-	6.4	8.4	77	570	1.2	11.5	0.4	3.5	4.8	27.4
10	Dhansiri	-	-	6.4	8.2	53	508	2.5	17.3	0.5	10.6	9.6	9.6
11	Teesta	-	-	5.9	7.0	30	320	14.0	26.0	1.0	12.0	-	-
12	Ranichu+	-	-	6	8.8	30	760	1.4	30.0	0.4	76.0	4.3	97.3
13	Mahi*	-	-	7.0	8.8	97	750	2.9	10.1	0.5	3.9	7.0	30.2
14	Sabarmati #	-	-	5.6	9.1	278	31400	1.2	17.5	0.6	1867.0	4.0	6437.0
15	Narmada and Chota Tawa	-	-	7.1	8.5	95	441	4.5	9.5	0.4	3.3	7.0	29.0
16	Tapi and Girna	18	36	3.1	9.2	119	1130	3.1	10.4	1.0	10.0	10.0	44.0
17	Mahanandi	17	37	6.5	8.6	77	83600	4.7	10.1	0.3	5.6	10.0	70.0
18	Seonath^	19	36	6.5	8.5	55	425	4.5	14.2	0.3	5.1	9.5	40.0
19	Brahmani	17	34	6.6	8.4	69	501	6.1	10.2	0.2	3.3	4.2	4.2
20	Baitarni	18	36	6.7	7.8	75	54802	5.4	11.3	0.3	3.5	230.0	9000
21	Subarnarekha	22	35	7.3	8.3	133	346	6.4	8.4	1	2	-	-
22	Godavari	17	44	6.9	9.0	90	1350	3.2	9.3	1.0	53.0	5.0	188.0
23	Krishna	18	35	6.7	8.9	36	40000	0.7	12.6	0.7	17.0	10.5	68.0
24	Maneru>	18	40	6.1	9.8	60	2750	1.3	10.5	0.1	84.0	13.2	99.0
25	Penneru	21	30	7.1	8.5	387	987	5.7	8.4	1.0	6.3	15.0	16.0
26	Cauvery	8	34	5.4	9.3	18	57200	2.1	13.5	0.2	10.0	3.2	128.0

Source: Status of Water Quality in India 2002-2003

+ Including Subansiri, Burhidihing, Disang, Jhanji, Bhogdoi, Mora Bharali, Borak, Digboi, Bharalu, Deepar Bill, Dickchu, Maney Khola

* Includings Tributaries Panam ad Anas

Includings Tributaries Shedi and Khari

^ Includings Kharoon, Hasdeo, IB, Kuakhai, Kathajodi and Biruo

>Including Bhima, Panchganga, Ghatprabha, Malprabha, Nira, Tynghadhra, Tunga, Bhadra, Musi, Palleru

Table 6.1.17 (b): Water Quality Status of Indian Rivers-2003 (concl'd)

Sl. No.	Name of Basin/River	Faecal Coliform (MPN/100 ml)		Total Coliform (MPN/100 ml)		Nitrite (mg/l)		Nitrate (mg.l)		Ammonical Nitrogen (mg/l)	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
1	2	15	16	17	18	19	20	21	22	23	24
1	Beas	2	1600	2	2400	0.10	0.20	-	-	0.10	2.6
2	Satluj	1	1300	3	30000	0.06	0.60	-	-	0.10	2.0
3	Jhelum	2	810	5	1600	0.20	-	-	-	0.2	0.20
4	Ganga	26	1200000	47	4500000	0.002	1.800	0.002	8.29	0.006	5.00
5	Yamuna	40	203000000	110	890000000	0.001	0.374	0.01	7.5	0.078	2.621
6	Gandak	40	46000000	52	190000000	0.002	3.54	0.045	12.6	0.004	48.41
7	Dohad	9	220000	7.0	14500000	0.002	0.008	0.020	0.380	0.020	0.6
8	Rupnarayan	200	1100000	800.0	4500000	0.001	0.688	0.142	1.611	0.120	0.156
9	Brahmaputra	300	240000	360.0	240000	-	-	-	-	-	-
10	Dhansiri	360	240000	1500	240000	-	-	-	-	-	-
11	Teesta	30	240	40	300	-	-	-	-	-	-
12	Ranichu+	23	240000	360	240000	-	-	-	-	-	-
13	Mahi*	2	28	4	2400	-	-	-	-	-	-
14	Sabarmati #	4	24000000	9	24000000	-	-	-	-	-	-
15	Narmada and Chota	1	110	4	1600	-	-	-	-	-	-
16	Tapi and Girna	2	230	40	930	0.005	0.290	0.062	5.017	0.006	1.250
17	Mahanandi	50	28000	4	35000	0.001	4.900	0.001	2.584	0.101	0.710
18	Seonath^	130	24000	6	92000	0.001	5.23	0.001	2.173	0.073	2.000
19	Brahmani	60	14000	90	24000	0.001	2.355	0.018	7.056	-	-
20	Baitarni	230	9000	.001	16000	0.002	4.932	0.002	0.152	-	-
21	Subarnarekha	130	3300	300	7900	0.002	0.025	0.014	0.896	-	-
22	Godavari	4	18400	10	64000	0.003	0.634	0.021	10.63	0.038	2.031
23	Krishna	2	20000	6	12000	0.001	9.91	0.006	59.540	0.006	3.190
24	Maneru>	4	4000	35	44000	0.001	9.00	0.036	57.30	0.060	0.590
25	Penneru	2	3	58	1100	0.440	2.420	-	-	-	-
26	Cauvery	2	4000	4	22000	0.001	1.210	0.030	4.000	0.001	0.018

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Source: Status of Water Quality in India 2002-2003

+ Including subansiri, Burhidihing, Disang, Jhanji, Bhogdoi, Mora Bharali, Borak, Digboi, Bharalu, Deepar Bill, Dickchu, Maney Khola

* Includings Tributaries Panam ad Anas

Includings Tributaries Shedi and Khari

^ Includings Kharoon, Hasdeo, IB, Kuakhai, Kathajodi and Biruo

>Including Bhima, Panchganga, Ghatprabha, Malprabha, Nira, Tyngbhadra, Tunga, Bhadra, Musi, Palleru

TABLE 6.1.18 (a): WATER QUALITY IN MAJOR RIVER BASINS

Sr. No	Name of Basin/River	Name of the Site		Year for which data given	pH				Specific Conductance				Calcium (Ca ^{**})			
		First Site	Last Site		Tolerance Limits (Units)->				Max= 2250.00 (Micromho/cm)				Max= 80.00 (mg/l)			
					8.5		6.5-		Minimum		Maximum		Minimum		Maximum	
		First Site	Last Site		First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Mahanadi	Baronda	Tikarpara	2003.2004	7.44	6.7	8.48	8	61	143	430	510	0.399	0.64	0.798	2.8
2	Brahmani	Jenapur	Tilga	2002-2003	7.2	7.1	8.1	7.8	101	50	290	150	0.48	0.24	1.36	0.64
3	Godavari	Ghargaon	Polavaram	2005-2006	6.5	7	8.5	8.5	-	-	-	-	28	10	71	30
4	Krishna	Karad	Vijaywada	2004-2005	7.34	7.14	8.61	8.62	70	512	528	742	0.37	1.5	182	2.59
5	Cauvery	Kudige	Musiri	2004-2005	7.2	7.94	770	8.66	116	295	279	765	0.25	88	0.54	2.16
6	Tapi	Dedtalai	Ghala	2001-2002	7.8	7.9	8.6	8.6	130	218	368	550	1.321	1.44	1.681	1690
7	Narmada	Dindori	Chandwada	2003-2004	8.01	7.8	8.6	8.52	150	220	380	388	0.863	1.522	1.647	1.6
8	Pennar	Nellore	Nagalamadike	2001-2002	NA	N.A.	NA	NA	NA	NA	NA	NA	NA	N.A	NA	NA
9	Sabarmati	Kheroj	Nabhoi	2001-2002	NA	NA	NA.	NA.	NA	NA	NA	NA	NA	N.A	NA	NA
10	Mahi	Mataji	Khanpur	2001-2002	7.8	7.6	8.3	8.5	176	316	360	711	1321	1.522	1.6	1.726

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TABLE 6.1.18 (a): WATER QUALITY IN MAJOR RIVER BASINS....contd

Sr. No	Name of Basin/River	Name of the Site		Year for which data given	Magnesium (Mg ^{**})				Iron (Fe ^{***})				Free Amonia (NH ₄ ^{**})			
		First Site	Last Site		Tolerance Limits (Units)->				Max = 50.00 (mg/l)				Max= 1.20			
					Minimum		Maximum		Minimum		Maximum		Minimum		Maximum	
		First Site	Last Site		First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site
1	2	3	4	5	18	19	20	21	22	23	24	25	26	27	28	29
1	Mahanadi	Baronda	Tikarpara	2003.2004	0.41	0.12	0.905	1.64	0.001	0.001	-	0.014	-	0	-	0.014
2	Brahmani	Jenapur	Tilga	2002-2003	0.16	0.08	0.8	0.48	0.001	0.003	0.009	0.009	0.001	0.002	0.041	0.016
3	Godavari	Ghargaon	Polavaram	2005-2006	3.9	1.5	11.2	15.6	0	0	0.3	0.6	0.02	0	2.38	0.08
4	Krishna	Karad	Vijaywada	2004-2005	0.04	0.99	1.82	2.55	0	0	0.009	0	0	0	0	0
5	Cauvery	Kudige	Musiri	2004-2005	0.31	1.2	0.57	2.4	0.003	0.003	-	0.004	0	0.002	0.04	0.006
6	Tapi	Dedtalai	Ghala	2001-2002	0.313	0.395	0.641	0.789	0.003	0.002	0.01	0.012	0	0	0.002	0.003
7	Narmada	Dindori	Chandwada	2003-2004	0.28	0.395	1.564	0.56	0	0	0	0	0	0	0	0
8	Pennar	Nellore	Nagalamadike	2001-2002	N.A.	NA	N.A.	N.A.	NA	N.A.	NA	N.A.	NA	NA	NA	NA
9	Sabarmati	Kheroj	Nabhoi	2001-2002	N.A.	NA	NA.	NA	NA	NA	NA	i.A.	NA	NA	NA	NA
10	Mahi	Mataji	Khanpur	2001-2002	0.317	0.477	0.641	0.944	0.001	0.001	0.002	0.008	0	0	0.001	0.003

TABLE 6.1.18 (a): WATER QUALITY IN MAJOR RIVER BASINScontd

Sr. No	Name of Basin/River	Name of the Site		Year for which data given	Chloride (Cl)				Fluoride (F)				Sulphate (SO ₄)			
		Tolerance Limits (Units)-			Max =600.00 (mg/l)				Max =1.50 (mg/l)				Max= 1000.00 (mg/l)			
					Minimum		Maximum		Minimum		Maximum		Minimum		Maximum	
		First Site	Last Site		First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site
1	2	3	4	5	30	31	32	33	34	35	36	37	38	39	40	41
1	Mahanadi	Baronda	Tikarpara	2003-2004	282	0.272	1.072	0.78	0.007	0	0.095	0	0.24	0.017	0.167	0.11
2	Brahmani	Jenapur	Tilga	2002-2003	0.217	0.163	0.657	0.295	NA	0	0	0.009	0.012	0.087	63	
3	Godavari	Ghargaon	Polavaram	2005-2006	15	6.5	74.5	19	1.2	0.1	5.8	0.54	15	0	35	13
4	Krishna	Karad	Vijaywada	2004-2005	0.14	1.16	0.84	1.88	0.002	0.005	50	0.061	0.05	0.06	0.47	0.77
5	Cauvery	Kudige	Musiri	2004-2005	0.56	0.79	1.58	3.55	0.01	0.019	0.271	0.041	0	0.257	0.03	0.975
6	Tapi	Dedtalai	Ghala	2001-2002	0.225	0.394	1.155	1.549	0.004	0.005	0.013	0.013	0.091	0.160	0.297	0.28
7	Narmada	Dindori	Chandwada	2003-2004	0.172	0.732	0.268	0.958	0.003	0.009	0.018	0.019	0.077	0.179	0.367	0.225
8	Pennar	Nellore	Nagalamadike	2001-2002	NA	NA	N.A.	N.A.	N.A.	NA	N.A.	NA	N.A.	N.A.	N.A.	N.A.
9	Sabarmati	Kheroj	Nabhoi	2001-2002	A.	NA	N.A.	N.A.	N.A.	NA	N.A.	NA	N.A.	N.A.	N.A.	N.A.
10	Mahi	Mataji	Khanpur	2001-2002	0.338	0.845	0.732	2.592	0.000	0.005	0.007	14	0.101	0.205	0.231	0.31

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TABLE 6.1.18 (a): WATER QUALITY IN MAJOR RIVER BASINS....contd

Sr. No	Name of Basin/River	Name of the Site		Year for which data given	Nitrate (NO ₃)				Dissolved Oxygen (DO)				Biochemical Oxygen Demand (BOD)			
		Tolerance Limits (Units)-			Max =50.00 (mg/l)				Max =6.00 (mg/l)				Max=3.00 (mg/l)			
					Minimum		Maximum		Minimum		Maximum		Minimum		Maximum	
		First Site	Last Site		First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site
1	2	3	4	5	42	43	44	45	46	47	48	49	50	51	52	53
1	Mahanadi	Baronda	Tikarpara	2003-2004	-	0.012	-	0.012	5.96	6.01	8.5	8.82	0.4	0.41	2.87	7
2	Brahmani	Jenapur	Tilga	2002-2003	0.017	0.013	0.171	0.074	5.58	5.4	8.54	8.39	0.37	0.41	1.02	1.1
3	Godavari	Ghargaon	Polavaram	2005-2006	0.23	0.21	1.09	0.82	3.5	5.6	8.2	8	0.4	0.4	2.3	2.4
4	Krishna	Karad	Vijaywada	2004-2005	0.009	0	0.203	0	4.2	3.9	8.1	8.1	0.3	0.1	3.1	4.4
5	Cauvery	Kudige	Musiri	2004-2005	0.006	0.041	0.013	0.343	5.4	5.6	7.1	7.7	0.4	0.1	1	3.7
6	Tapi	Dedtalai	Ghala	2001-2002	0.001	0.001	0.004	0.004	-	-	-	-	0.2	0.2	1.4	1.7
7	Narmada	Dindori	Chandwada	2003-2004	0.011	0.003	0.29	0.004	-	-	-	-	-	0.1	-	1.1
8	Pennar	Nellore	Nagalamadike	2001-2002	NA	NA	N.A.	NA	NA	NA	N.A.	NA	NA	NA	NA	NA
9	Sabarmati	Kheroj	Nabhoi	2001-2002	NA	NA	N.A.	NA	NA	NA	N.A.	NA	NA	NA	NA	NA
10	Mahi	Mataji	Khanpur	2001-2002	0	0.001	0.002	0.003	-	-	-	-	0.2	0.2	1	1.6

TABLE 6.1.18 (a): WATER QUALITY IN MAJOR RIVER BASINS....contd

Sr. No	Name of Basin/River	Name of the Site		Year for which data given	Cyanide (Cn)				Lead (Pb)				Maganese (Mn)			
		Tolerance Limits (Units)->			Max= 0.05 (mg/l)				Max =0.10 (mg/l)				Max=0.50 (mg/l)			
					Minimum		Maximum		Minimum		Maximum		Minimum		Maximum	
		First Site	Last Site		First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site
1	2	3	4	5	78	79	80	81	82	83	84	85	86	87	88	89
1	Mahanadi	Baronda	Tikarpara	2003-2004	-	-	-	-	-	-	-	-	-	-	-	-
2	Brahmani	Jenapur	Tilga	2002-2003	-	-	-	-	-	-	-	-	-	-	-	-
3	Godavari	Ghargaon	Polavaram	2005-2006	-	-	-	-	-	-	-	-	-	-	-	-
4	Krishna	Karad	Vijaywada	2004-2005	-	-	-	-	-	-	-	-	-	-	-	-
5	Cauvery	Kudige	Musiri	2004-2005	-	-	-	-	-	-	0.72	3.20	-	-	-	-
6	Tapi	Dedtalai	Ghala	2001-2002	-	-	-	-	-	-	-	-	-	-	-	-
7	Narmada	Dindori	Chandwada	2003-2004	-	-	-	-	-	-	-	-	-	-	-	-
8	Pennar	Nellore	Nagalamadike	2001-2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	Sabarmati	Kheroj	Nabhoi	2001-2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	Mahi	Mataji	Khanpur	2001-2002	-	-	-	-	-	-	-	-	-	-	-	-

Source : Central Water Commission

TABLE 6.1.18 (a): WATER QUALITY IN MAJOR RIVER BASINS....contd

Sr. No	Name of Basin/River	Name of the Site		Year for which data given	Mercury (Hg)				Zinc (Zn)				Total Harfness (CaCO ₃)			
		Tolerance Limits (Units)->			Max= 0.001 (mg/l)				Max =15.00 (mg/l)				Max=300 (mg/l)			
					Minimum		Maximum		Minimum		Maximum		Minimum		Maximum	
		First Site	Last Site		First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site
1	2	3	4	5	90	91	92	93	94	95	96	97	98	99	100	101
1	Mahanadi	Baronda	Tikarpara	2003-2004	-	-	-	-	-	-	-	-	-	48.04	-	222.18
2	Brahmani	Jenapur	Tilga	2002-2003	-	-	-	-	-	-	-	-	34.03	20.02	108.09	56.04
3	Godavari	Ghargaon	Polavaram	2005-2006	-	-	-	-	-	-	-	-	-	-	-	-
4	Krishna	Karad	Vijaywada	2004-2005	-	-	0.17	0.230	-	-	-	-	21	142	182	222
5	Cauvery	Kudige	Musiri	2004-2005	-	-	0.04	0.28	-	-	0.05	79.00	31	104	51	212
6	Tapi	Dedtalai	Ghala	2001-2002	-	-	-	-	-	-	-	-	81.69	91.74	116.10	123.95
7	Narmada	Dindori	Chandwada	2003-2004	-	-	-	-	-	-	-	-	68	96	150	108
8	Pennar	Nellore	Nagalamadike	2001-2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	Sabarmati	Kheroj	Nabhoi	2001-2002	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	Mahi	Mataji	Khanpur	2001-2002	-	-	-	-	-	-	-	-	81.940	99.95	112.060	138.72

Source : Central Water Commission

TABLE 6.1.18 (a): WATER QUALITY IN MAJOR RIVER BASINS....concl

Sr. No	Name of Basin/River	Name of the Site		Year for which data given	Sodium percentage				Sodium Adsorption Ratio (SAR)			
		Tolerance Limits (Units)-			Max= 60.00				Max =26.00			
		First Site	Last Site		Minimum		Maximum		Minimum		Maximum	
					First Site	Last Site	First Site	Last Site	First Site	Last Site	First Site	Last Site
1	2	3	4	5	102	103	104	105	106	107	108	109
1	Mahanadi	Baronda	Tikarpara	2003-2004	-	16.50	-	25.93	-	0.37	-	0.62
2	Brahmani	Jenapur	Tilga	2002-2003	22.76	19.46	52.88	37.70	2.73	0.38	1.90	0.65
3	Godavari	Ghargaon	Polavaram	2005-2006	28	18	36	36	0.8	0.4	1.7	0.8
4	Krishna	Karad	Vijaywada	2004-2005	7.91	27.70	33.33	55.26	0.17	1.09	1.10	3.18
5	Cauvery	Kudige	Musiri	2004-2005	43.41	31.65	62.26	50.44	0.95	0.98	2.99	2.92
6	Tapi	Dedtalai	Ghala	2001-2002	17.33	18.94	37.11	40.98	0.29	0.45	1.26	1.64
7	Narmada	Dindori	Chandwada	2003-2004	6.9	27.90	19.7	32.10	0.14	0.78	0.55	0.96
8	Pennar	Nellore	Nagalamadike	2001-2002	NA	NA	NA	NA	NA	NA	NA	NA
9	Sabarmati	Kheroj	Nabhoi	2001-2002	NA	NA	NA	NA	NA	NA	NA	NA
10	Mahi	Mataji	Khanpur	2001-2002	17.290	32.22	27.50	53.27	0.38	1.00	0.820	2.66

Source : Central Water Commission

Note: '-' indicates that analysis of particular parameter has not been carried out

NA : Not available

RD : River Dry

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TABLE 6.1.18 (b) : WATER DISCHARGE IN MAJOR RIVER BASINS

Sr. No	Name of Basin/River	Name of the Guage Station		No of C.W.C. Sites	Year for which data given	Maximum Discharge		Minimum Discharge		Basin limit	
		First Site	Last Site			(Cumecs)		(Cumecs)		(Cumecs)	
						First Site	Last Site	First Site	Last Site	Maximum	Minimum
1	2	3	4	5	6	7	8	9	10	11	12
1	Mahanadi	Baronda	Tikarpara	21	2002-03	406.70	12306	0.00	154.10	.00-12306	0.00-880.00
2	Brahmani	Jenapur	Tilga	5	2002-03	2005	662.3	48.82	0.00	.00-3288	0.00-631.8
3	Godavari	Ghargaon	Polavaram	56	2005-06	635.8	43703	0.00	13.232	.00-50001	0.00-3998
4	Krishna	Karad	Vijaywada	57	2002-03	1121.00	158.7	0.00	2.874	0.00-4632	0.00-223.1
5	Cauvery	Kudige	Musiri	31	2004-05	1388	632.3	1.06	0.00	0.00-1388	0.00221.7
6	Tapi	Dedtalai	Ghala	12	2003-04	1839	1286	0.00	16.63	0.00-7564	0.00-271.9
7	Narmada	Dindori	Chandwada	25	2002-03	866.3	2070	0.85	0.00	0.00-18401	0.00-653.60
8	Pennar	Nellore	Nagalamadike	8	2005-06	21.72	18.6	0.00	0.00	0.00-4140	0.00-300.4
9	Sabarmati	Kheroj	Nabhoi	6	2003-04	265.8	2220	0.00	0.00	0.00-2220	0.00-335.0
10	Mahi	Mataji	Khanpur	6	2003-04	4000	1677	0.00	1.8	0.00-4000	0.00-111.1

Source : Central Water Commission (updated during September,2007)

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TABLE 6.1.18 (c) : SEDIMENT LOAD IN MAJOR RIVER BASINS

Sr. No	Name of Basin/River	Name of the Guage Station		Year for which data given	Mansoon Flow		Non- Mansoon Flow		Annual Flow		Basin Range		
		First Site	Last Site		(Million Cubic metre)		(Million Cubic metre)		(Million Cubic metre)		(Million Cubic metre)		
					First Site	Last Site	First Site	Last Site	First Site	Last Site	Monsoon	Non-monsoon	Annual
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Mahanadi	Baronda	Tikarpara	2002-03	0.066	1.985	0.00	0.180	0.066	2.165	0.050-2.400	0.000-0.180	0.00-2.462
2	Brahmani	Jenapur	Tilga	2002-03	1.678	1.107	0.070	0.001	1.748	1.108	1.107-3.430	0.001-0.008	1.117-4.811
3	Godavari	Ghargaon	Polavaram	2005-06	1.963	69.708	0.000	0.218	1.963	69.926	0.015-69.708	0.00-0.218	0.015-69.926
4	Krishna	Karad	Vijaywada	2004-05	1.255	0.008	0.005	0.000	1.26	0.008	0.008-3.204	0.00-0.042	0.008-3.246
5	Cauvery	Kudige	Musiri	2003-04	0.039	0.017	0.003	0.025	0.042	0.042	0.000-0.067	0.00-0.024	0.000-0.091
6	Tapi	Dedtalai	Ghala	2001-02	2.419	4.796	0.360	0.127	2.779	4.923	0.003-7.769	0.00-0.800	0.003-8.569
7	Narmada	Dindori	Chandwada	2002-03	1.846	0.658	0.001	0.000	1.847	0.658	0.355-41.982	0.00-0.187	0.355-42.169
8	Pennar	Nellore	Nagalamadike	2003-04	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	Sabarmati	Kheroj	Nabhoi	2001-02	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	Mahi	Mataji	Khanpur	2001-02	0.053	0.052	0.000	0.266	0.053	0.318	0.005-0.053	0.00-0.266	0.018-3.358

Source : Central Water Commission (updated during September,2007)

Note : NA : Not available

TABLE 6.1.18 (d) : WATER DISCHARGE AT MONSOON & NON- MONSOON IN MAJOR RIVER BASINS

Sr. No	Name of Basin/River	Name of the Guage Station		No of C.W.C. Sites	Year for which data given	Monsoon		Non-Monsoon		Basin Limit	
		First Site	Last Site			First Site	Last Site	Monsoon	Non-monsoon		
										7	8
1	Mahanadi	Baronda	Tikarpara	21	2002-03	0.01	1.24	0.00	0.26	0.01-1.24	0.00-0.26
2	Brahmani	Jenapur	Tilga	5	2002-03	0.50	0.09	1.08	0.00	0.09-0.50	0.00-0.18
3	Godavari	Ghargaon	Polavaram	56	2004-05	52.08	1.36	52.10	1.17	1.36-141.56	0.00-52.10
4	Krishna	Karad	Vijaywada	57	2002-03	11.39	1.72	2.73	0.34	0.00-33.54	0.00-8.77
5	Cauvery	Kudige	Musiri	31	2004-05	11.17	16.36	0.73	10.09	0.00-24.20	0.00-11.16
6	Tapi	Dedtalai	Ghala	12	2003-04	12.34	19.80	0.12	3.05	0.86-38.07	0.00-3.05
7	Narmada	Dindori	Chandwada	25	2002-03	4.54	1.56	0.49	0.00	0.00-6.92	0.00-1.65
8	Pennar	Nellore	Nagalamadike	4	2004-05	0.12	0.00	0.00	0.00	0.00-0.12	0.00-0.00
9	Sabarmati	Kheroj	Nabhoi	6	2003-04	1.11	19.84	0.00	1.47	0.07-19.84	0.00-1.47
10	Mahi	Mataji	Khanpur	5	2003-04	8.48	15.11	0.03	4.26	0.13-15.11	0.01-4.26

Source : Central Water Commission (updated during September,2007)

Note : NA : Not available

Table 6.1.19 : RIVER-BASIN WISE DISTRIBUTION OF WATER QUALITY MONITORING STATIONS

Sl. No.	River (main stream) Lake etc.	Tributaries	Total Stations
1	2	3	4
1	Baitarni (5)	-----	5
2	Brahmani (11)	Karo (1), Koel (2), Sankh (1).	15
3	Brahmputra (6)	Burhidihing (1), Dhansiri (6), Disang (1), Jhanji (1), Subansiri (1), Bhogdoi (1), Bharalu (1) Borak (1), Deepar Bill (1), Digboi (1), Mora Bharali (1), Teesta (4), Dickhu (1), Maney(2), Ranchu (2)	31
4	Cauvery (20)	Arkavati (1), Amravati (1), Bhawani (5), Kabini (4), Laxmantirtha (1), Shimsa (2), Hemavati (1)	35
5	Ganga (28)	Barakar (1),, Betwa (3), Chambal (8), Damodar (5), Gandak (1), Saryu-Ghaghra (3), Gomti (5), Hindon (3). Kali (West) (2), Kali Nadi (2). Khan (1), Kshipra (3), Mandakini (Madhya Pradesh) (1), Parvati (2), Ramganga (1), Rapti (1), Rihand (2), Rupanarayan (1), Sai (1), Sone (5), Tons (Madhya Pradesh) (2), Yamuna (23), Sind (1), Johila (1), Sankh(1), Gohad (1), Kolar(1). Churni (2), Tons (Himachal Pradesh) (1)	118
6	Godavari (11)	Manjira(2), Maner(2), Nira(l),, Wainganga(3), Wardha(l)	20
7	Indus	Beas (19), Chenab (1), Jhelum (3), Larji (1), Parvati (1), Ravi (3), Sutlej (20), Tawi (1), Gawkadal (1), Chuntkol(1), Sirsa(2)	53
8	Krishna (17)	Bhadra (3), Bhima (9), Ghataprabha (2), Malprabha (3), Muneru (1), Musi (2), Nira (1), Paleru (1), Tunga (1), Tungabhadra (5), Panchganga (1)	46
9	Mahi (7)	Anas (1), Panam(1)	9
10	Mahanadi (16)	Ib (4), Hasdeo (2), Kathajodi (1), Kharoon (1), Kuakhai (2), Sheonath (2), Birupa (1)	29
11	Narmada (14)	Chhota Tawa (1)	15
12	Pennar (4)	----	4
13	Sabarmati (8)	Meswa (1), Shedhi (1), Khari (1).	11
14	Subarnerekha (6)	----	6
15	Tapi (10)	Girna (2).	12

Table 6.1.19 : RIVER-BASIN WISE DISTRIBUTION OF WATER QUALITY MONITORING STATIONS--Conclid.

Sl. No.	River (main stream) Lake etc.	Tributaries	Total Stations
1	2	3	4
16	Medium rivers	Ambika (1), Ulhas (2), Ulhas-Bhasta (1), Ulhas -Kalu (1) Imphal (4), Mandovi (2), Palar (1), Pamba (3), Pariyar (3), Rushikulya (2), Tambiraparani (7), Achankoil (2), Chalakudy (1), Damanganga (6), Ghaggar (16), Kallada (1), Kali Karnataka (1), Manimala (2), Mindhola (1), Nagavalli (3), Amlakhadi (1), Chaliyar (2), Iril (2), Kharkhala (1), Karmana (1), Kolak (2), Kundalika (1), Meenachil (1), Muvattupuza (1), Patalganga (2), Umtrew (1), Vamanpuram (1), Zuari (2), Gumti (2), Kalna (1), Valvant (1), Madai (1), Khandepar (1), Asanora (1), Bhadar (1), Neyyar (1), Ithikkara (1), Kadalundy (1), Kuttiyady (1), Mahe (1), Kuppum (1), Neelsvaram (1), Karingoda (1), Chandergiri (1), Chitrapuzha (1), Nambul (2), Ganol (1), Simsang (1), Myntdu (1), Arasalar (1), Kodra (1), Haora (1).	105
17	Lakes Tanks Ponds	Hussainsagar (1), Sarooranagar (1), Himayatsagar (1), Pulicate (1), Salaulim (1), Kankoria (1), Chandola (1), Ajwah (1), Sursagar (1), Brahamsarovar (1), Sukhna (1), Govindsagar (1), Pongdam (1), Renuka (1), Wuller (1), Dal (1), Ulsoor (1), Hebbala Valley (1), Oruvathikotta (1), Sasthamcotta (1), Ashthamudi (1), Paravur (1), Vembanad (1), Periar (1), Kodumgallor (1), Kayamkula (1), Punnamadakayal (1), Pookotekayal (1), Upper Lake (1), Lower Lake (1), Multai Lake (1), Loktak (4), Umiam (1), Ward (1), Thadlaskena (1), Osteri (1), Bahour (1), Harike (2), Pichola (1), Udaisagar (1), Ramgarhjaipur (1), Pushkar (1), Fatehsagar (1), Kalyana (1), Nakki (1), Udhagamadalam (1), Kodaikanal (1), Yercaud (1), Lakshminarayan Baridigh (1), Rudrasagar (1), Ramgarh-Uttar Pradesh (1), Naini (1), Rabindrasarovar (1) Dharamsagar (1), Bibinagar (1), Kistrapetrareddy (1), Gandigudem (1), Goysagar (1) Elangabeel System (1), Lakshadweep (1)	64
18	Creeks, Canals, Tanks, Ponds, Drains	Creeks (3M), Agartala Canal (1M), Gurgaon Canal (1M), Western Yamuna Canal (9M), Drains (12M)	26
19	Groundwater	----	180
Total			784

Source: Central Pollution Control Board.

G - GEMS (Global Environmental Monitoring System),

M - MINARS (Monitoring of Indian National Aquatic Resources)

YAP- Yamuna Action Plan

TABLE 6.1.20 : ANNUAL INTERNAL RENEWABLE WATER RESOURCES & WATER WITHDRAWALS IN SELECTED COUNTRIES OF WORLD

Sl. No.	Country	Annual Renewable Water Resources		Annual Withdrawals					
		Total (Cubic kilometres)	Per capita (Cubic Metres)	Year of Data	Total Cubic Kilometers	Sectoral Withdrawals Percent			Per Capita * Cubic Metres
						Domestic	Industry	Agriculture	
1	USA	3069.40	10837	1993	479.29	13	46	41	1689
2	India	1869.00	1820	2000	634.00	7	1	85	629
3	China	2829.57	2259	1993	525.48	5	17	78	360
4	Spain	111.50	2794	1993	35.90	10	22	68	837
5	Japan	430.00	3383	1993	88.83	19	18	63	718
6	Canada	2902.00	94353	1993	45.10	18	70	12	1415
7	Turkey	229.30	3439	1993	35.81	14	10	76	476
8	Brazil	8233.00	48314	1993	36.47	43	17	40	216
9	France	203.70	3439	1993	36.63	17	73	10	590
10	South Africa	50.00	1154	1993	13.75	17	10	73	288
11	Mexico	457.22	4624	1993	77.81	17	5	78	785
12	Italy	191.30	3325	1993	43.04	18	35	46	983
13	UK	147.00	2465	1993	11.72	20	77	3	201
14	Australia	492.00	25708	1985	14600.00	65	2	33	786
15	Norway	382.00	85478	1993	2.10	19	70	11	461
16	Germany	154.00	1878	1993	46.33	11	69	20	712
17	Albania	41.70	13306	1993	1.05	1	4	95	57
18	Romania	211.93	9445	1993	24.89	8	34	58	1155
19	Zimbabwe	20.00	1584	1993	2.50	7	3	90	98
20	Thailand	409.94	6527	1993	82.23	2	2	96	528
21	Sweden	174.00	19679	1993	2.93	36	55	9	333
22	Bulgaria	21.30	2680	1993	3010.00	4	81	15	1566
23	Switzerland	53.50	7462	1993	1.19	23	73	4	351
24	Austria	77.70	9616	1993	2.52	36	63	1	304
25	Czech-Republic	13.15	1280	1993	2.74	41	57	2	269

Source: Water profile of Selected countries compiled by ISO, CWC

Note : Sector Q1 percentages data year of Annual Withdrawal Data

* : Per Capita withdrawals are estimated for 2000

TABLE 6.2.1: MAIN ACTIVITIES ALONG THE INDIAN COASTAL ZONE

1	2
<p style="text-align: center;">Land Based :</p> <p>I. Coast dependent</p> <p>II. Coast preferring</p> <p>III. Coast independent</p> <p style="text-align: center;">Water based</p>	<p>Ports & Harbours Oil Terminals Paper & Pulp mills Metallurgical Plants Fish Processing Power Plants</p> <p>Urban, commercial & residential development Tourism & beach recreation Agriculture</p> <p>Defence</p> <p>Offshore oil and gas Offshore placer mining Navigation Naval defence Water sports Fishing</p>

Source : The State of Environment, 1995, Ministry of Environment & Forests

Coastal areas are of enormous socio-economic importance, because of both their traditional resources viz. fish, tourist potential, commercial and residential development as well as the new types of resources using new technologies such as ocean thermal energy, wave energy, offshore mineral deposits, mariculture etc. The high economic value of these areas and the relative fragility and vulnerability to natural hazards, sea level rise and anthropogenic activities make the preservation and the management of coastal zone resources and its environment of enormous importance.

TABLE 6.2.2 : POLLUTANTS AND THEIR IMPACTS ON THE MARINE ENVIRONMENT

Sl. No.	Sources	Impacts
1	2	3
1	Municipal and Domestic Waste	Reduce dissolved oxygen (DO); increase hydrogen sulphide levels; incidence of faecal coliform & faecal streptococci; high biological oxygen demand (BOD)
2	Industrial Waste	Affect DO, temperature, turbidity, pH, ammonia values; increases BOD, COD, suspended solids
3	Toxic Metals	Cause change in chemical and biochemical processes, increase in turbidity, lethal and sublethal effects on marine life
4	Oil Pollution	Causes smothering, clogging and toxicity
5	Fertilizers	Affect nutrient levels and may cause eutrophication
6	Dredging & Reclamation	Affect habitats of marine organisms; lethal and sublethal effects; affects flushing capacity of the waterbody
7	Siltation	Increases in nutrient levels and can cause excessive algal bloom; may also cause damage to coral reefs and coastal nurseries
8	Discharge of Coolant Waters	Raises the temperature of the water can cause the growth of the blue-green algae
9	Toxic Chemicals	Cause lethal and sublethal effects on marine organisms
10	Offshore Mining	Increases particulate loading which can lead to loss of light and reduced primary productivity ; smothering and clogging of benthic communities
11	Radionuclides	Bioaccumulation in fish and other benthic communities

Source : The State of Environment, 1995

TABLE 6.2.3 : "POTENTIAL HOTSPOTS" ALONG THE INDIAN COAST

Sl. No.	States	Coastal Cities/ Towns
1	2	3
1	Gujarat	Okha, Veraval
2	Maharashtra	Bassein, Bombay Harbour, Thane, Trombay, Versova, Ulhas creek, Mahim
3	Goa	Marmagoa
4	Karnataka	Karwar, Mangalore
5	Kerala	Kochin, Thiruvananthapuram
6	Tamil Nadu	Ennore, Madras Harbour, Cooum, Port Calimere, Koodankulam, Arumuganeri, Tuticorin
7	Andhra Pradesh	Vishakhapatnam
8	Orissa	Gopalpur, Paradip, Puri
9	West Bengal	Indo-Bangladesh border, Sandheads, Diamond Harbour

Source: State of the Environment, 1995

Pressures on the marine environment arise from both natural as well as anthropogenic activities. The latter occurs either due to overexploitation of coastal and marine resources or due to the use of the coastal and marine environment as sinks of pollutants and other wastes arising as by-products of development activities. There are various such sources of marine pollution, their impacts varying according to the nature of the coastal or marine environment impacted upon and on the nature of the pollutant itself.

Marine pollution occurs off most metropolitan cities and densely populated coastal towns in India, but there are 25 heavily polluted potential 'hot spots' along the Indian coast.

TABLE 6.2.4 : CRITERIA FOR CLASSIFICATION OF INLAND SURFACE WATER

Sl. No.	Parameter	Maximum / Minimum	Drinking Water without Conventional Treatment but after Disinfection	Outdoor Bathing Organized	Drinking Water with Conventional Treatment Followed by Disinfection	Propagation of Wildlife and Fishries	Irrigation, Industrial, Cooling etc.
1	2	3	4	5	6	7	8
1	Dissolved oxygen (mg/litre)	Minimum	6	5	4	4	-
2	Biological oxygen demand (mg/letre)	Minimum	2	3	3	-	-
3	Total coliform bacteria (most probable number per 100 millilitres)	Maximum	50	500	5000	-	-
4	Total dissolved solids (mg/litre)	Maximum	500	-	1500	-	2100
5	Chloride as chlorine (mg/litre)		250	-	600	-	500
6	Colour (hazen)	Maximum	10	300	300	-	-
7	Sodium absorption ratio	Maximum	-	-	-	-	26
8	Boron (mg/litre)	Maximum	-	-	-	-	2
9	Sulphates (mg/litre)	Maximum	400	-	400	-	1000
10	Nitrates (mg/litre)	Maximum	20	-	50	-	-
11	Free ammonia as nitrogen (mg/litre)	Maximum	-	-	-	12	-
12	Conductivity at 25°C(µs/cm)	Maximum	-	-	-	1	2.25
13	PH	-	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.0-8.0
14	Arsenic (mg/litre)	Maximum	0.05	0.2	0.2	-	-
15	Iron (mg/litre)	Maximum	0.3	-	50	-	-
16	Fluorides (mg/litre)	Mximum	1.5	1.5	1	-	-
17	Lead (mg/litre)	Maximum	0.1	-	0.1	-	-
18	copper (mg/litre)	Maximum	1.5	-	1.5	-	-
19	Zinc (mg/litre)	Maximum	15	-	15	-	-

Source : TERI Energy Data Directory and Yearbook, 2002-2003