



ANNEXURES



ANNEXURES

RURAL AND URBAN WATER SUPPLY AND SANITATION

Status of Rural Water Supply in Karnataka State – 2003

Distribution of Slums Across Districts and Class I Cities in Karnataka during 2002

WATER RESOURCES

Groundwater levels from May 2002 to May 2003

AIR QUALITY

Air quality in various cities of Karnataka for 2002-2003

Air Pollution Control Status as per 2002-2003

INDUSTRIAL POLLUTION

Charter on corporate responsibility for environmental protection (CREP)

Cleaner Production measures in selected '17 categories of highly polluting industries'

River Water Quality adjacent to highly polluting industries / industrial areas for April 2001 - March 2003

MINING AND QUARRYING

District wise production of Major Minerals (96-97 to 2000-01)

WASTE MANAGEMENT

Municipal Solid Waste generation per day in 6 City Corporations of Karnataka for 2002

Budget allocation for MSW management for the year 2002-2003

Work force available for MSW management in major city corporations of Karnataka

Existing Solid waste transportation capacity of various city corporations

BIODIVERSITY

Threatened bird species of the state

Hotspots of hope

Hotspots of despair

ENERGY

Table 1: Power stations under KPCL as on 31-3-2003

Table 2: Power stations under VVNL as on 31-3-2003

Table 3: Independent power producers as on 31-3-2003

Table 4: Details of non conventional units (Cogeneration and Biomass) installed in Karnataka

Table 5: Power Generation from Wind Energy in Karnataka

Table 6: Generation of electricity under different categories by different agencies (2002-03)

Table 7: Categorywise installations and energy consumption in the State-2003-04

Table 8: Growth rate of various categories of consumers of electricity

Table 9: Electricity consumers distribution pattern-2001

Table 10: Details of captive generators as on 31/03/2003

Table 11: Biogas plants implemented in districts

Table 12: Improved stoves implemented in districts

Some important legislations on environment

Important notifications having implications for the environment

Terms of Reference for the preparation of the State of the Environment Report 2002-2003

Annexures

RURAL AND URBAN WATER SUPPLY AND SANITATION

Status of Rural Water Supply in Karnataka State – 2003

District	No. of Habitations with LPCD								Total
	0-10	01-Oct	20-30	30-40	40-55	< 55 LPCD		55 LPCD and above	
						No.	% to Total		
Bagalkot	17	35	69	87	125	333	46.77	379	712
Bangalore (U)	0	330	120	101	150	701	64.79	381	1082
Bangalore (R)	54	9	128	134	631	956	30.09	2221	3177
Belgaum	5	100	376	242	272	995	64.44	549	1544
Bellary	3	58	134	112	283	590	57.28	440	1030
Bidar	19	14	80	56	42	211	23.29	695	906
Bijapur	0	125	156	78	165	524	52.04	483	1007
Chamarajanagar	0	84	120	140	165	509	75.18	168	677
Chikkamagalur	234	22	194	121	134	705	19.79	2857	3562
Chitradurga	0	70	191	111	132	504	33.14	1017	1521
Dakshina Kannada	0	696	318	221	235	1470	47.88	1600	3070
Davangere	0	24	101	121	145	391	31.94	833	1224
Dharwad	15	46	70	65	49	245	54.69	203	448
Gadag	27	10	23	30	38	128	34.04	248	376
Gulbarga	0	220	355	259	374	1208	62.59	722	1930
Hassan	0	92	597	702	532	1923	44.53	2395	4318
Haveri	0	8	70	85	176	339	48.85	355	694
Kodagu	142	98	80	72	60	452	82.94	93	545
Kolar	35	59	218	176	217	705	18.29	3149	3854
Koppal	0	14	46	72	133	265	33.42	528	793
Mandya	0	27	195	160	204	586	29.43	1405	1991
Mysore	3	0	97	137	303	540	26.77	1477	2017
Raichur	48	154	113	83	131	529	37.7	874	1403
Shimoga	4	301	297	288	178	1068	23.39	3498	4566
Tumkur	30	614	467	408	399	1918	37.33	3220	5138
Udupi	57	364	285	350	346	1402	41.38	1986	3388
Uttara Kannada	18	192	154	340	594	1298	22.74	4411	5709
Total	711	3766	5054	4751	6213	20495		36187	56682
% to total habitations	1.25	6.64	8.92	8.38	10.96	36.16		63.84	100

Source: Rural Development and Panchayat Raj Department

Distribution of Slums Across Districts and Class I Cities in Karnataka during 2002*

Name of the District	Total No. of Slums in the District	No. of Slums in Selected Class I Cities	
		Name of Class I City	Number of Slums
Bangalore (U)	366	Bangalore City	366
Bangalore (R)	71		
Tumkur	113	Tumkur	26
Kolar	70	Kolar	3
Mysore	108	Mysore	52
Dakshina Kannada	17	Mangalore	13
Udupi	27		
Mandya	62	Mandya	24
Chamarajanagar	54		
Chikkamagalur	60	Chikkamagalur	13
Hassan	116	Hassan	24
Davanagere	82	Davanagere	38
Chitradurga	41	Chitradurga	22
Shimoga	153	Shimoga	48
		Bhadravathi	40
Kodagu	4		
Dharwad	80	Hubli-Dharwad	61
Haveri	63		
Gadag	48	Gadag	13
Uttara Kannada	68		
Belgaum	110	Belgaum	18
Bijapur	78	Bijapur	50
Bellary	136	Bellary	38
Bagalkot	113	Bagalkot	11
Gulbarga	179	Gulbarga	60
Koppal	54		
Bidar	85	Bidar	23
Raichur	70		
Karnataka	2428		

Note: * Information on Raichur District pertains for the year 2001
Source: Karnataka Slum Clearance Board

WATER RESOURCES

Groundwater levels from May 2002 to May 2003

District	No of stations analysed	Fall in groundwater level						Total stations recording fall in ground water	Col 9 as % of col 2
		0-2 (m)	col 3 as % of col 2	2-4 (m)	col 5 as % of col 2	> 4 m	Col 7 as % of col 2		
1	2	3	4	5	6	7	8	9	10
Bagalkot	13	6	46	5	39	-	-	11	85
Bangalore (Rural & Urban)	25	10	40	11	44	-	-	21	84
Belgaum	38	20	53	6	16	5	13	31	82
Bellary	12	5	42	4	33	2	17	11	92
Bidar	12	5	42	1	8	-	-	6	50
Bijapur	20	11	55	1	5	1	5	13	65
Chamrajnagar	8	3	38	-	-	-	-	3	38
Chikkamagalur	25	18	72	1	4	1	4	20	80
Chitradurga	14	7	50	5	36	2	14	14	100
Dakshina Kannada	26	23	89	1	4	-	-	24	92
Davangere	9	3	33	2	22	1	11	6	75
Dharwad	5	2	40	2	40	-	-	4	80
Gadag	11	3	27	5	46	1	9	9	82
Gulbarga	53	8	15	7	13	6	11	21	40
Hassan	27	18	67	6	22	1	4	25	92
Haveri	2	1	50	1	50	-	-	2	100
Kodagu	18	11	61	1	6	-	-	12	67
Kolar	17	4	24	11	65	2	12	17	100
Koppal	10	4	40	5	50	-	-	9	90
Mandya	21	8	38	3	14	2	10	13	62
Mysore	13	6	46	1	8	-	-	7	54
Raichur	22	12	55	6	27	1	5	19	86
Shimoga	26	16	62	2	8	3	12	21	81
Tumkur	20	3	15	9	45	7	35	19	95
Udupi	23	15	65	4	17	-	-	19	83
Uttara Kannada	30	17	57	6	20	-	-	23	77
Total	500	239	47.8	106	21.2	35	7	380	76

Source: Department of Mines and Geology

Air quality in various cities of Karnataka for 2002-2003

City	Location of AAQM station	Classification of area	Total No. of samples Collected	Air Quality (average Values of the air pollutants monitored) in µg/m ³			
				SPM µg/m ³	RSPM µg/m ³	SO ₂ µg/m ³	NOx µg/m ³
Standards for Residential, Rural, and Other areas				140.0	60.0	60.0	60.0
Chitradurga	Chitradurga	Commercial	78	140.2	---	6.0	4.0
Gulbarga	GDA building	Commercial	250	156.0	122.7	4.2	6.0
Gulbarga	Super Market, Janatha Bazar	Commercial	250	541.7	111.7	6.3	4.1
Hassan	Narasimha Raja Circle	Commercial	45	432.0	---	13.0	19.0
Hubli	K.C. Circle	Commercial	529	490.6	---	7.9	12.5
Bangalore	Anand Rao Circle	Commercial	365	160.0	68.0	11.0	31.0
Davanagere	PWD office Davangere	Commercial	56	280.0	---	14.9	4.8
Gadag	Above CMC	Commercial	62	276.1	96.7	4.2	7.0
Karwar	Above Savitha Hotel	Commercial	19	293.1	32.2	0.6	12.0
Raichur	Office Building	Commercial	7	127.4	---	---	---
Davanagere	RO, KSPCB	Residential	37	82.1	---	2.2	2.1
Bellary	Vaddu village	Residential	12	130.4	---	18.6	1.1
Bellary	Top of regional office	Residential	59	250.4	---	1.9	0.8
Chickmagalur	Shariff colony	Residential	6	539.0	---	6.3	46.0
Hassan	Kuvempunagar	Residential	45	35.0	---	3.9	7.7
Standards for Industrial areas				360.0	120.0	80.0	80.0
Belgaum	KSCP Building Autonagar	Industrial	60	18.8	27.1	---	---
Bidar	Regional office building	Industrial	50	116.2	---	---	---
Bangalore	Amco Batteries	Industrial	365	119.0	55.0	12.0	26.0
Bangalore	Graphite India	Industrial	365	111.0	52.0	16.0	16.0
Belgaum	SSI Assocaition Udhyambhag	Industrial	60	27.1	85.4	---	---
Davanagere	M/s.HPF Ltd	Industrial	57	131.0	---	5.3	3.2
Dharwad	Hindustan Lever Ltd	Industrial	86	108.6	73.3	2.2	7.9
Dharwad	Office building, Lakamanhalli	Industrial	123	153.6	---	3.3	4.0
Hassan	B.Katihally Indl.Area	Industrial	45	96.0	---	6.0	9.3
Hassan	KIADB Indl.Area	Industrial	45	128.0	---	7.4	5.5
Hassan	HSSK Ltd.	Industrial	45	477.0	---	12.0	19.0
Mangalore	Regional office building, Baikampadi	Industrial	45	111.6	---	---	---
Standards for Sensitive areas				70.0	50.0	15.0	15.0
Hubli	KIMS	Sensitive	92	54.0	173.0	3.6	7.2

Red indicates values above the stipulated standards

Source: Annual Report 2002-2003, Karnataka State Pollution Control Board

Air Pollution Control Status as per 2002-2003

Category of Industry	Total No of Industries	APC system under operation	APC system under construction	APC system under planning	Defaulters	Industries Closed	Industries yet to be commissioned
Large	889	747	6	12	15	109	149
Medium	1340	1048	12	28	10	242	109
Small	9876	7208	76	123	756	1713	964
Total	12105	9003	94	163	781	2064	1222

Source: Annual Report 2002-2003, Karnataka State Pollution Control Board

Charter on corporate responsibility for environmental protection (CREP)

1. CEMENT INDUSTRY

1. Cement Plants, which are not complying with notified standards, shall do the following to meet the standards by augmentation of existing air pollution control devices by July 2003 and by replacement of existing air pollution control devices by July 2004. Non complying units shall give bank guarantee to respective SPCBs.
2. Cement Plants located in critically polluted or urban areas (including 5 km distance outside urban boundary) will meet 100 mg/Nm³ limit of particulate matter by December 2004 and continue working to reduce the emission of particulate matter to 50 mg/ Nm³. The new cement kilns to be accorded NOC/Environmental Clearance w.e.f. 01.04.2003 will meet the limit of 50 mg/ Nm³ for particulate matter emissions.
3. CPCB will evolve load based standards by December 2003. and along with NCBM will evolve SO₂ and NO_x emission standards by June 2004.
4. Cement industries will carry out feasibility study and submit target dates to CPCB for co-generation of power by July 2003.

2. DISTILLERIES

1. For existing molasses based distilleries, utilization of spentwash to achieve zero discharge in inland surface watercourses will include:
 - a. Compost making with press mud/agricultural residue / Municipal Waste;
 - b. Concentration and drying / Incineration;
 - c. Treatment of spentwash through biomethanation followed by two stage secondary treatment and dilution of the treated effluent with process water for irrigation as per norms prescribed by CPCB / MoEF;
 - d. Treatment of spentwash through bio-methanation following by secondary treatment (BOD < 2500 mg / l) for controlled discharge into sea through a proper submerged marine outfall at a point permitted by SPCB / CPCB in consultation with National Institute of Oceanography (NIO), so that Dissolved Oxygen in the mixing zone does not deplete, less than 4.0 mg/l;
2. For new standalone distilleries & expansion of existing molasses based distilleries without achieving zero discharge in surface water / ground water will not be considered by MoEF / SPCB.

3. DYES & DYE INTERMEDIATES

1. Industry Associations will conduct feasibility study for adoption of cleaner technologies for H-Acid manufacture (catalytic hydrogenation and others) within one year.
2. Dye intermediate industries will install salt recovery systems in case of sodium sulphate and reuse recovered salt in the process by December 2003.
3. An action plan for installation/up-gradation of incineration systems as per CPCB guidelines to handle concentrated wastewater and reuse of treated weak wastewater will be submitted within six months.
4. Wherever possible, waste generated from one industry will be utilized by others (e.g. use of effluent generated from Vinyl Sulphone plant in H-Acid plant).
5. Industries will regularly monitor ground water quality. This will be initiated immediately.
6. H-Acid industries will examine the feasibility to increase product yield from 1.09 to 1.86 for reducing iron sludge, within six months.
7. In case of dyestuff, wherever possible (to be decided by the Task Force within six months), industries will use spray drying instead of salting to minimize load on Effluent Treatment Plants.
8. Industries will minimize loss of volatile organics with solvent recovery of at least 90%
9. Scrubbing systems for SO_x and NO_x emissions will be upgraded by July 2003
10. Proper on-site storage facilities and final disposal of solid waste on secured landfill will be ensured immediately.

4. FERTILIZER INDUSTRY

1. Efforts will be made for conservation of water, particularly with a target to have consumption less than 8, 12 and 15 m³/tonne of urea produced for plant based on gas, naphtha and fuel oil, respectively. In case of plants using Naptha and Gas both as feedstocks, water consumption target of less than 10 m³/tonne will be achieved. An action plan for this will be submitted by June 2003 and targets will be achieved by March 2004.
2. Phase out use of arsenic for CO₂ absorption in ammonia plants and chromate-based chemicals for cooling systems by December 2003.
3. Ground water monitoring around the storage facilities and beyond the factory premises will be carried out at regular intervals particularly for pH, fluoride. CPCB will finalize the guidelines for groundwater monitoring by December 2003.
4. No effluent arising from process plants and associated facilities will be discharged to the storm water drain. The industries, where waste water/effluent flows through the storm water drains even during the dry season will install continuous systems for monitoring the storm water quality for pH, ammonia and fluoride. If required, storm water will be routed through effluent

treatment plant before discharging. An action plan will be submitted by June 2003 and necessary action will be taken by June 2004.

5. Proper and complete nitrification and de-nitrification will be ensured, wherever such process is used for effluent treatment, by September 2003.
6. All the upcoming urea plants will have urea prilling towers based on natural draft so as to minimize urea dust emissions while the existing urea plants having forced draft prilling towers, will install appropriate systems for achieving existing norms of urea dust emissions. In this regard, industries will submit action plan by June 2003 and completion of necessary actions by June 2004.
7. The sulphuric acid plants having SCSA system will switch over to DCDA system by March 2004 to meet the emission standard for SO₂ as 2 kg/tonne of H₂SO₄ produced. Plants having DCDA system will improve the conversion and absorption efficiencies of the system as well as scrubbers to achieve SO₂ emissions of 2 kg/tonne of H₂SO₄ produced in case of plants having capacity above 300 tpd and 2.5 kg/tonne in case of plants having capacity upto 300 tpd.
8. An action plan for providing proper dust control systems at rock phosphate grinding unit in phosphoric acid plants/single super phosphate plants, so as to achieve particulate emission levels of 150 mg/Nm³ will be submitted by September 2003 and complied with by March 2004.
9. Regular monitoring of ambient air quality with regard to SO₂, NO_x, PM, SO₃, fluoride and acid mist will be carried out.
10. Gypsum will be effectively managed by providing proper lining, dykes with approach roads and monitoring of groundwater quality around storage facilities. Accumulated gypsum will be properly capped.
11. Explore recovery/buy-back of spent catalyst by September 2003. Industries will also explore recovery of chromium from the sludge.
12. Carbon slurry, sulphur muck and chalk will be properly managed and disposed of in properly designed landfill either within premises or in common facility. Action plan on this will be submitted by June 2003 and implemented by March 2004.

5. INTEGRATED IRON & STEEL INDUSTRIES

1. To meet the parameters of leaking doors, leaking lids, leaking off take in coke oven plants, of the notified standards under EPA within three years (by December 2005). To rebuild at least 40% of the coke oven batteries in next 10 years (by December 2012).
2. Direct inject of reducing agents in blast furnace by June 2013.
3. Utilization of Steel Melting Shop (SMS) / Blast Furnace (BF) Slag to the extent of 70% by 2004, 80% by 2006 and 100% by 2007.
4. Charge of tar sludge / ETP sludge to Coke Oven by June 2003.
5. Inventorization of the Hazardous Waste (tar sludge, acid sludge, waste lubricating oil and type fuel falls in the category of Hazardous Waste) as per Hazardous Waste (M&H) Rules, 1989 as amended in 2000 and implementation of the Rules by December 2003.
6. To reduce specific water consumption to 5 m³/t for long products and 8 m³/t for flat products by December 2005.
7. Installation of Continuous stack monitoring system & its calibration in major stacks and setting up of the online ambient air quality monitoring stations by June 2005.
8. Up-gradation in the monitoring and analysis facilities for air and water pollutants. Also to impart elaborate training to the manpower so that realistic data is obtained in the environmental monitoring laboratories.
9. The industry will initiate the steps to adopt the following clean technologies/measures to improve the performance of industry towards production, energy and environment.
 - Energy recovery of top blast furnace gas.
 - Use of Tar-free runner linings.
 - De-dusting of cast house at tap holes, runners, skimmers ladle and charging points.
 - Suppression of fugitive emissions by using nitrogen gas or other inert gas.
 - Slag and fly ash transportation back to the abandoned mines, through empty railway wagons returning back to the mines.
 - Processing of the waste containing flux & ferrous wastes through waste recycling plant.
 - Promotion of Energy Optimisation Technology including energy audit
 - To set targets for resource conservation such as raw material, energy and water consumption to match international standards.
10. Inventorisation of sponge iron plants to be completed by SPCBs/CPCB by June 2003 and units will be asked to install proper air pollution control equipment by December 2003 to control primary and secondary emissions.

6. Oil Refineries

1. All the refineries located in the critically polluted areas, identified by CPCB, will submit an action plan within six months for phase wise reduction of SO₂ emission from the present level. Future refineries will have Sulphur Recovery Unit with minimum 99% efficiency.
2. With regard to NO_x emission, the new refineries/process units will install low NO_x burners. For retrofitting of low NO_x burners in existing units, the expert committee will suggest the strategies and action plan within six months including NO_x standard.

3. Refineries will install continuous emission monitoring systems for SO_x and NO_x in major stacks with proper calibration facilities and action plan will be submitted within six months.
4. Refineries will monitor total HC and Benzene in the premises (particularly at loading/un-loading operations and ETP). The status and action plan will be submitted within six months.
5. Refineries will prepare action plan for conservation of water resources and maximizing reuse/ recycling of treated effluent within six months. The treated effluent discharge quantity (excluding once through cooling water) will be limited to 0.4 m³/per tonne (for 90% of time) except for the monsoon season.
6. Oil spill response facilities at coastal refineries will be in position within two years.
7. Refineries will explore new technologies for reduction in the generation of oily sludge. Strategy and action plan for liquidation of existing sludge will be submitted within six months.
8. The petroleum coke having high sulphur content will only be sold to/ reused by organized industries (having consent from SPCBs), which have systems to control SO₂ emissions. This will be ensured by June 2003.

10.0 Pesticides industry

1. Waste streams should be segregated into high COD waste, toxic waste, low COD waste, inorganic waste etc. for the purpose of providing appropriate treatment by June 2003
2. Streams should be detoxified and treated in ETP or thermally destroyed in incinerator, as per CPCB guidelines. The waste streams should be treated suitably before taking to evaporation ponds by June 2004
3. Solvent recovery should be improved to achieve atleast 90% recovery wherever possible by Dec. 2003
4. By December 2004, the incinerator for rest of the solvents which cannot be recovered shall be in place incinerated.
5. As by-products are not being recovered fully, industry will make effort to recover by-product as far as possible by March 2004.
6. For air pollution control from processes, scrubber efficiency will be improved and maintained as per the best practicable technology for control of HCl, Cl₂, Methyl Chloride, Phosphorus Pentoxide, Ammonia, H₂S and volatile organic carbons (VOCs) by December 2003.
7. An incinerator will be installed, where necessary by December 2004.
8. For control of fugitive emissions (particularly for hazardous air pollutants), the industries will adopt standard engineering practices. System of leak detection and repair (LDAR) programme especially for solvents, should be developed by industries by March 2004.
9. Incinerators will be upgraded to meet CPCB norms for hazardous waste incinerators for Halogenated compound and POPs. The implementation target will be decided on the basis of action plan submitted by individual industries by June 2003.
10. The present bio-assay test will be replaced by Toxicity Factor test method developed by CPCB. Toxicity factor of four (TF-4) will be achieved by December 2003 and industries will improve their system to achieve TF-2 by July, 2006.

11.0 Petrochemicals

1. For the storm water generated from process area and tank farm area during initial hours of rain, an arrangement will be made for collection and oil separation including further treatment as required. Such arrangement will include provision for buffer tank (holding tank) and monitoring of effluent quality.
2. In order to control high COD and persistent organic pollutants including toxic constituents, the industry will select appropriate unit operations for pre-treatment of effluent within inside battery limit before sending to the biological treatment systems for better functioning of ETPs. Action plan for the same will be submitted within 6 months and implemented within one year (March, 2004).
3. The industry will adopt periodically leak detection and repair (LDAR) programme to check fugitive emissions within six months. Fugitive emissions of carcinogenic compounds (e.g. Benzene) will be controlled by closed vapor collection and recovery system. The frequency of the programme will be proportionate to the risk potential of carrying fluid. Based on leak detection as per LDAR programme, action will be taken to eliminate fugitive emissions. This will be a continuous activity. Measures will be taken to monitor health of the workers.
4. The industry will submit an action plan within 6 months to ensure that no halogenated organics is sent to the flares in order to avoid formation of persistent organic pollutants. All HAPs and halogenated organics will be routed to the incineration system having end-on pollution control facility.
5. For incinerable waste, properly designed incinerator will be installed within the premises or as a common facility. Industry will check the design and will adopt sound engineering practices for proper operation of incinerators. Continuous monitoring will be done for operational parameters and specific parameters in tail gas to ensure the efficient functioning. The non-incinerable hazardous waste should be disposed of in a secure-landfill.
6. Industry will go for self-assessment and regulation by conducting environmental auditing regularly, besides having regular monitoring of pollutants in air emission, liquid effluent and receiving environment.

12.0 PHARMACEUTICALS

1. Waste streams should be segregated into high COD waste, toxic waste, low COD waste, inorganic waste etc. for the purpose of providing appropriate treatment by December 2003.
2. High COD streams should be detoxified and treated in ETP or thermally destroyed in incinerator by March 2004.

3. Proper facilities should be provided for handling and storage of hazardous waste. For final disposal of hazardous waste, recycling and reuse should be given priority, either within the premises or outside with proper manifest system. In case of incinerable waste, properly designed incinerator should be installed within the premises or outside as a common facility. The non-incinerable hazardous waste should be disposed of in properly designed secure-landfill either within the industry's premises or in a common facility by March 2004.
4. For new industries which are not connected with CETP & TSDF and which cannot afford to install treatment facilities may not be considered for granting consent to establishment.
5. Consent for establishment and consent for operation under the Water Act will be based on pollution load and concentration of pollutants. Each industry will submit pollution load, concentration of final discharge along with water balance to SPCB/CPCB for formulation of strategy.
6. Industry will take up on priority, the control of hazardous air pollutants (such as benzene, carbon tetrachloride, 1-4 dioxane, methanol, toluene, methyl chloride etc.) and odorous compounds (mercaptan & hydrogen sulphide) by Dec. 2004.
7. Industries on their own will carry out monitoring of environmental parameters, audit it at regular interval and submit the same to SPCB.

13.0 PULP & PAPER INDUSTRY

Large Pulp and Paper

1. Discharge of AO_x kg/tonne of paper to be reduced to 1.5 kg/tonne of paper within 2 years and to 1.0 kg / tonne of paper in 5 years
2. Installation of lime kiln within 4 years
3. Wastewater discharge to be less than 140 m³/tonne of paper within 2 years, less than 120 m³ / tonne in 4years for units installed before 1992 and less than 100 m³ / tonne of paper per units installed after 1992
4. Installation of odour control system within 4 years.

Small Pulp and Paper

1. Recovery of chemicals by installation of Chemical recovery plant or utilization of black liquor with no discharge from pulp mill within 3 years

Shift to waste paper

2. Upgradation of ETPs so as to meet discharge standards within 1 year
3. Waste water discharge/ tonne of paper shall be less than 150 m³/tonne of paper within 3 years

14.0 SUGAR INDUSTRY

1. Operation of ETP shall be started atleast one month before starting of cane crushing to achieve desired MLSS so as to meet the prescribed standards from day one of the operation of mill.
2. Reduce wastewater generation to 100 litres per tonne of cane crushed by April 2004.
3. To achieve zero discharge in inland surface water bodies by December 2004.
4. To provide 15 days storage capacity for treated effluent to take care of no demand for irrigation by April 2004.
5. To install ESP/bag filter/high efficiency scrubber to comply with standards for particulate matter emission to <150 mg/Nm³ by April 2004.

15.0 TANNERY

1. All the chrome-tanning units in the country will have the Chrome Recovery Plant either on individual basis or on collective by December 2005.
2. Recovered Chromium is to be utilized in tanning process by December 2004.
3. All the tanneries will install water meters and flow meters to measure actual consumption and wastewater discharge by December 2003.
4. Water consumption rates will be brought down to 28 m³/tonne of hides by taking water conservation measures by December 2003.
5. All CETPs and ETPs will take the following measures:
 - Deployment of qualified and well trained staff for O & M of the ETPs/CETPs by December 2003.
 - Installation of automatic monitoring instruments by CETPs/large tanneries by December 2003.
 - Separate Energy meters for ETPs / CETPs by December 2003.
 - Replacement of open anaerobic lagoons with cleaner technology options will be implemented by December 2005.
 - Implementation of guidelines developed by CPCB for Health & safety of workers employed in the industry / ETP/ CETP by December 2003.
 - All large tannery units (processing more than 5 tonnes/day of hides/skins) will undertake Environmental Auditing on annual basis by June 2004.
 - Modification / up-gradation of the CETPs/ETPs wherever necessary will be taken up by tannery units and CETP management by December 2005.
6. For TDS Management following methods will be adopted:

- Manual / mechanical desalting by December 2003.
 - Use of cleaner technology for less use of salt by December 2005.
 - High Rate Transpiration system for effluent treatment will be adopted wherever feasible by December 2004.
 - Treated wastewater will be mixed with the sewage wherever feasible and further treated and the treated combined effluent will be used on land for irrigation by December 2005.
7. For solid waste management, the following methods will be adopted:
 - Utilization of process sludge for by-product recovery by December 2004.
 - Resource Recovery from process sludge and ETP sludge in the form of Biogas by December 2004.
 - Safe disposal of hazardous sludge and non-hazardous solid wastes by December 2005.
 8. Use of Boron bearing compounds will be dispensed with by December 2003.
 9. Ground water quality monitoring to be strengthened wherever the treated effluents are applied on land for irrigation by December 2004.

16.0 THERMAL POWER PLANTS

1. For existing thermal power plants, a feasibility study shall be carried out by Central Electricity Authority (CEA) to examine possibility to reduce the particulate matter emissions to 100 mg/Nm³. The studies shall also suggest the road map to meet 100 mg/Nm³ wherever found feasible. CEA shall submit the report by March 2004.
2. New / expansion power projects to be accorded environmental clearance on or after 1.4.2003 shall meet the limit of 100 mg/Nm³ for particulate matter.
3. Development of SO₂ & NO_x emission standards for coal based plants by Dec. 2003. – New / expansion power projects shall meet the limit of SO₂ & NO_x w.e.f 1.1.2005 – Existing power plants shall meet the limit of SO₂ & NO_x w.e.f. 1.1.2006
4. Install/activate opacity meters/continuous monitoring systems in all the units by December 31, 2004 with proper calibration system.
5. Development of guidelines / standards for mercury and other toxic heavy metals emissions by December 2003.
6. Review of stack height requirement and guidelines for power plants based on micro meteorological data by June 2003.
7. Power plants will indicate their requirement of abandoned coal mines for ash disposal & Coal India / MOC shall provide the list of abandoned mines by June 2003 to CEA
8. Power plants will provide dry ash to the users outside the premises or uninterrupted access to the users within six months.
9. Power Plants should provide dry flyash free of cost to the users.
10. State P.W.Ds / construction & development agencies shall adhere to the specifications / Schedules of CPWD for ash / ash based products utilisation.
11. New plants to be accorded environmental clearance on or after 1.04.2003 shall adopt dry flyash extraction or dry disposal system or Medium (35-40%) ash concentration slurry disposal system or Lean phase with hundred percent ash water re-circulation system depending upon site specific environmental situation. Existing plants shall adopt the appropriate systems by December 2004.
12. Flyash Mission shall prepare guidelines/manuals for flyash utilization by March 2004.

Cleaner Production measures in selected '17 categories of highly polluting industries'

Existing Technologies/Practices	Cleaner Production Measures
1. Bulk Drug Industry	
Collection of all the streams and providing Biological treatment (mostly activated sludge process and lagoons)	Segregation of effluent streams and characterisation for separate treatments as necessary. Solvent recovery systems Salt recovery from high TDS (inorganic) containing streams through forced evaporation system or TDS removal through Reverse Osmosis process
Scrubbers for point source emissions.	Collection of fugitive emissions from the processing sections and loading/unloading sections through hoods and ducts and providing control equipment such as absorption/adsorption systems.
Cyclone to control emission.	Multi-cyclones or bag filters for control of emissions from boilers.
2. Oil Refineries	
To minimise emissions of SO _x , Sulphur Recovery Units (SRU) based on Claus/Modified Claus process, are installed. Besides this, scrubbers are	Super Claus process with greater sulphur removal efficiencies and SCOT process for off-gas treatment. Catalytic cracking units should be provided with particulate removal devices.
To minimise fugitive emissions of HC, floating and fixed roof tanks are provided for storage of lighter products and crude oil respectively.	Steam injection in flaring stacks to reduce particulate emission, vapour recovery system to be installed to control losses of volatile organic compounds (VOC"s) from storage tanks and loading areas and it should achieve 90-100% recovery.
3. Dyes and dye intermediates industry	
Gypsum, iron sludge and sludge from ETP are generated as solid waste.	The gypsum and iron sludge can be used in the cement and pigment industries. Cleaner process technologies e.g catalytic hydrogenation, use of spent acid after nitration for acidification of fusion mass, which can eliminate generation of iron and gypsum sludge.
4. Tannery Industry	
Effluents containing chromium recovery is treated and discharged	Large and medium units should provide individual chrome recovery system. The small-scale units need to adopt the chrome recovery system in a group of 4 to 5 units. This results in substantial saving besides reducing the concentration of chrome in the trade effluent.
Drum soaking instead of pits soaking which reduces the water consumption besides bringing down the soaking time from 12 hours to 3 hours.	Possibilities of collection of dirt soak liquor and adding polyelectrolyte to flocculate and settle the suspended solids. This soak liquor after treatment and filtration can be reused
5. Textiles	
Starch is most commonly used as sizing material for cotton textiles. This starch can't be recovered and also contributes high BOD.	The starch can be substituted with othersizing materials such as carboxymethyl cellulose (CWC), polyvinyl acetate (PVA) which are comparatively more expensive but are renewable
Mercerising waste contains about 4% caustic. Few textile industries have provision for its recovery.	Spent caustic from mercerising as well as other units can be recovered and reused either by membrane separation technology or by most commonly used evaporation method.
Various types of dyes are used to impart the desired quality in the fabrics, which generates coloured effluent.	Instead of discharging the exhausted dye bath, it can be reconstituted by adding appropriate amount of make-up dyes and auxiliary chemicals. The reconstituted dyebath can be reused for dyeing successive batches.
The wastewater is treated by physico-chemical and/or biological treatment process. Some industries uses filtration along with physico-chemical treatment to reuse the specific effluent streams.	The effluent can be further treated by activated carbon adsorption process or other advanced treatment process so that the treated effluent can be recycled/reused.

Cleaner Production measures in selected '17 categories of highly polluting industries' contd...

Existing Technologies/Practices	Cleaner Production Measures
6. Pulp & Paper Industry	
Use of elemental chlorine in bleaching of pulp which is resulting in generation of toxic effluent containing chloro compounds of lignin. It results in generation of AOX, which is highly toxic and carcinogenic.	Use of chlorine dioxide and use of oxygen at alkali extraction stage should be preferred. It reduces generation of AOX by about 70%. The use of oxygen/ozone as bleaching agents makes the effluent recyclable from this section with no colour.
Use of kraft pulping process for delignification of wood/bamboo raw material in large-scale mills.	Use of modern pulping process like RDH pulping. Oxygen delignification should be practised. These processes produce pulp of low kappa number and high brightness, which require low bleach chemicals. Low steam requirement with high pulping yield are the attempted benefits.
Land disposal of lime sludge by the mills having chemical recovery plant.	Most of the large-scale mills dispose lime sludge on land. Limekiln should be used for recalcination of lime sludge, so that it can be reused in the process.
Discharge of black liquor by the small-scale agrobased pulp & paper mills.	Chemical Recovery Plant (CRP) is required to be installed by such mills. The black liquor can be taken to CRP for recovery of pulping chemicals. Some agrobased pulp & paper mills have installed CRP and running it successfully. The installation of CRP by all units is necessary to control pollution and colour.
Removal of colour through lignin precipitation by adding polyelectrolyte.	For the industry where chemical recovery is not economically feasible and problem of colour persists, the removal of lignin through precipitation and its conversion into useful and marketable product e.g. binders should be practised.

River Water Quality adjacent to highly polluting industries / industrial areas for April 2001 - March 2003

River and location where the samples are collected	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	
Bhadra River (Shimoga dist.)																									
Upstream of MPM and VISL, Bhadravati	A	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
Downstream of MPM, Bhadravati	A	B	C	C	C	A	C	B	C	B	B	B	C	D	D	D	C	D	C	C	C	C	C	C	C
Tungabhadra River (Davanagere dist.)																									
Upstream of Harihar Polyfibres	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	C	C	C	C	C	C	C	C	C
Downstream of Harihar Polyfibres	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	B	C	C	C	C	C	C	C
Kali River (Uttara Kannada dist.)																									
Upstream of West coast paper mills	C	C	C	C	C	C	C	C	C	A	-	-	C	-	-	B	-	-	-	B	-	-	-	-	
Downstream of West Coast Paper Mills	A	A	A	B	C	C	C	B	C	A	-	-	-	-	-	B	-	-	-	D	-	B	-	-	
Kabini River (Mysore dist.)																									
Intake of KIADB, Nanjangud	B	C	C	C	C	B	A	B	C	-	-	B	B	C	C	-	C	-	-	-	B	-	-	B	
Bathing ghat, Nanjanagud	C	C	C	C	C	C	B	C	C	B	C	D	B	B	B	C	C	C	C	C	C	C	C	C	

River Water Classification:

Class "A": Drinking water source without conventional treatment but after disinfection

Class "B": Out door bathing (organized)

Class "C": Drinking water source after conventional treatment

Class "D": Propagation of wild life, fisheries

Class "E": Irrigation, Industrial, cooling and controlled waste disposal

Source: KSPCB Annual reports (2001-02, 2002-03)

MINING AND QUARRYING

District wise production of Major Minerals (96-97 to 2000-01)

District	Production (Tonnes, * kgs)					Five year Ave.(%)
	1996 - 97	1997 - 98	1998 - 99	1999 - 00	2000 - 01	
Bangalore (North)	7,747	6,573	6,558	11,650	11,756	0.03
Bangalore (South)	0	0	0	0	0	0
Kolar	NF	3,933	0	0	3,413	0
Belgaum	153,742	118,188	169,342	159,940	230,211	0.55
Dharwar	219,179	191,976	168,150	126,045	150,065	0.56
Bellary	7,405,690	10,022,025	12,384,186	14,990,048	17,038,681	40.75
Raichur*	1,511	1,566	2,369	1,637	1,967	0.01
Chitradurga	7,730,922	1,363,907	1,306,176	1,291,312	106,863	7.78
Bijapur	894,762	798,444	4,563,128	802,342	564,236	5.02
Gulbarga	10,474,208	8,518,243	6,749,749	2,986,890	6,790,325	23.41
Bidar	0	0	0	0	0	0
Dakshina Kannada	150,962	168,136	151,357	120,350	100,887	0.46
Chickmagalur	5,645,370	6,211,564	4,970,698	5,493,850	4,910,733	17.95
Mysore	181,521	219,074	258,760	258,149	435,984	0.89
Hassan	36,489	50,964	24,088	21,185	36,121	0.11
Mandya	850	978	2,040	2,594	430	0
Shimoga	88,564	58,959	54,273	68,537	40,817	0.21
Tumkur	614,232	788,947	663,085	499,331	374,441	1.94
Uttara Kannada	138,587	94,932	80,105	87,570	113,537	0.34

Source: Administrative reports (from 97-98 to 2000-01) of the Department of Mines and Geology (DMG) -Govt. of Karnataka

WASTE MANAGEMENT

Municipal Solid Waste generation per day in 6 City Corporations of Karnataka for 2002

City Corporations	Population (2002)	Waste generated (tons / day)	Waste Collected (tons /day)	Per capita waste* generated (grams/day)
Bangalore	5,882,162	2,500	1,400	425
Mangalore	551,701	250	200	453
Hubli / Dharwad	801,442	250	200	311
Mysore	794,677	230	183	289
Belgaum	516,155	120	100	232
Gulbarga	452,944	120	100	264
Total	8,999,081	3,470	2,183	386

* Per Capita Waste generated = Waste generated /Population

Source: Respective City Corporations

Budget allocation for MSW management for the year 2002-2003

City Corporation	Population (2003-03)	Waste generated (Tons p.a.)	Budget allocated (Crores p.a.)	Budget spent Per capita (Rs.p.a.)
Bangalore	5,882,162	912,500	60.00	102.00
Belgaum	516,155	43,800	4.95	97.00
Gulbarga	452,944	43,800	4.70	110.00
Hubli-Dharwad	801,442	91,250	10.00	124.00
Mangalore	551,701	91,250	4.90	89.00
Mysore	794,677	83,950	7.20	91.00
Total	8,999,081	1,266,550	91.75	613.00

Source: KUIDFC, 2002-03

Work force available for MSW management in major city corporations of Karnataka

City Corporation	Health Officer		Health inspector		Pourakarmikas	
	Sanctioned	Working	Sanctioned	Working	Sanctioned	Working
Bangalore	9	9	317	317	8196	10713 (5804)
Belgaum	1	1	15	14	661	507
Gulbarga	1	1	17	11	422	266
Hubli-Dharwad	2	2	47	47	816	702
Mangalore	5	3	18	14	650	750 (350)
Mysore	2	2	30	25	1181	892
Total	20	18	444	428	11926	13830

Note: Fig in bracket indicates number of private workers engaged

Data under Health officer Grade includes Deputy Health officer and Chief Health officer also

Source: Personal Communication with Respective City Corporations, 2002-03

Existing Solid waste transportation capacity of various city corporations

City Corporation	Truck (6 tons/trip)	Tipper (5 tons/trip)	Dumper placer (3 tons /trip)	Tractor (2 tons/ trip)	Compactor (4 tons/ trip)	Maximum transportation possible in tons (Avg 2 Trips/day)
Bangalore	307 [includes tipper]		19	2	9	3878
Belgaum	15	Nil	Nil	1	Nil	184
Gulbarga	Nil	3	Nil	14	Nil	86
Hubli-Dharwad	18	Nil	Nil	7	Nil	244
Mangalore	22	2	3	Nil	Nil	302
Mysore	16	8	2	18	Nil	356
Total	378	13	24	42	9	5050

Source: Respective City Corporations, 2002-03

Threatened bird species of the state

Category	Common Name	Scientific Name	Habitat
Critical			
	White-Backed Vulture	<i>Gyps bengalensis</i>	Dry plains
	Long-billed Vulture	<i>Gyps indicus</i>	Dry plains
Endangered			
	Great Indian Bustard	<i>Ardeotis nigriceps</i>	Grasslands
	Lesser Florican	<i>Sypheotides indica</i>	Grasslands
Vulnerable			
	Spot-billed Pelican	<i>Pelecanus philippensis</i>	Wetlands
	Lesser Adjutant	<i>Leptoptilos javanicus</i>	Wetlands
	Pallas's Fish-Eagle	<i>Haliaeetus leucoryphus</i>	Wetlands
	Lesser Kestrel	<i>Falco naumanni</i>	Grasslands
	Sociable Lapwing	<i>Vanellus gregarious</i>	Wetlands
	Nilgiri Wood Pigeon	<i>Columba elphinstonii</i>	Evergreen Forests
	Yellow-throated Bulbul	<i>Pycnonotus xantholaemus</i>	Dry deciduous Forests
	White-bellied shortwing	<i>Brachypteryx major</i>	Shola
	Broad-tailed Grass bird	<i>Schoenicola platyura</i>	High altitude Grasslands
	Pied or White-naped Tit	<i>Parus nuchalis</i>	Dry deciduous Forests
	Green Munia	<i>Amandava formosa</i>	Wetlands
Criteria nearly met			
	Darter	<i>Anhinga melanogaster</i>	Wetlands
	Painted Stork	<i>Mycteria leucocephala</i>	Wetlands
	Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	Wetlands
	Oriental White Ibis	<i>Threskiornis melanocephalus</i>	Wetlands
	Ferruginous Pochard	<i>Aythya nyroca</i>	Wetlands
	Greater Grey-headed Fish Eagle	<i>Ichthyophaga ichthyaetus</i>	Wetlands
	Red-headed Vulture	<i>Sacrogyps calvus</i>	Dry deciduous Forests
	Pallid Harrier	<i>Circus macrourus</i>	Grasslands
	Asian Dowitcher	<i>Limnodromus semipalmatus</i>	Wetlands
	Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>	Evergreen Forests
	Great Pied Hornbill	<i>Buceros bicornis</i>	Evergreen Forests
	Grey-breasted Laughing thrush	<i>Garrulax jerdoni</i>	Shola
Locally Threatened			
	White Stork	<i>Ciconia ciconia</i>	Wetlands
	Large Cormorant	<i>Phalacrocorax carbo</i>	Wetlands
	White Necked Stork	<i>Ciconia episcopus</i>	Wetlands
	Spoon Bill	<i>Platalea leucorodia</i>	Wetlands
	Lesser Whistling Teal	<i>Dendrocygna javanica</i>	Wetlands
	Bar Headed Geese	<i>Anser anser</i>	Wetlands
	Black Bellied Tern	<i>Sterna acuticauda</i>	Wetlands
	Small Indian Practincole	<i>Glareola lactea</i>	Wetlands
	Black Ibis	<i>Pseudibis papillosa</i>	Wetlands
	Glossy Ibis	<i>Plegadis falcinellus</i>	Wetlands
	Great Stone Plover	<i>Esacus magnirostris</i>	Wetlands
	White Bellied Sea Eagle	<i>Haliaeetus leucogaster</i>	Wetlands
	Lesser Adjutant Stork	<i>Leptoptilos javanicus</i>	Wetlands
	Avocet	<i>Recurvirostra avosetta</i>	Wetlands
	Lesser Frigate Bird	<i>Fregata minor</i>	Wetlands
	White Ibis	<i>Threskiornis aethiopicus</i>	Wetlands
	Flamingo	<i>Phoeniconaias minor</i>	Wetlands
	Demoiselle Crane	<i>Anthropoides virgo</i>	Wetlands
	Alexandrine Parakeet	<i>Psittacula eupatria</i>	Dry deciduous Forests
	Great Black Woodpecker	<i>Dryocopus</i>	Evergreen Forests
	Ceylon Frogmouth	<i>Batrachostomus moniliger</i>	Evergreen Forests

Hotspots of hope

District	Taluk	Habitat	Ecosystem	Plants	Animals
Bagalkot					
	Bagalkot	Reservoir / Lakes	Reservoir/Lakes		<i>Water Fowl</i>
Bangalore-Rural					
		Reservoir / Lakes	Reservoir / Lakes		<i>Water Fowl</i>
	Kanakapura	Streams/Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>
	Kanakapura		Agricultural land	<i>Ragi (Elusine Coracana) varieties (Mallige, Majjige, Gidda, Jenumuthige, Ambukavi, Pichakaddi, Rathnachudi) Paddy (Oryza Sativa) (Raskadam gandhasale, Salem sanna Raskadam, Godhavari Isuku Vadlu, Annekombina batha, Salem sanna Basumathi)</i>	
Belgaum					
	Saudathi	Reservoir / Lakes	Reservoir / Lakes		<i>Water Fowl</i>
	Khanapur, Jogonalpet	Relic Evergreen Forests	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta</i>	
Bellary					
	Harapanahalli	Dry Deciduous/Scrub Forest	Scrub/Thorny forests	<i>Holoptelia integrifolia, Dichrostachys sp., Acacia leucophloea, Dyospyros melanoxylon</i>	<i>Sloth Bear</i>
Bijapur					
	Lingsugur	Streams/Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>
Chamarajanagar					
	Kollegal	Grasslands	Grasslands	<i>Grasses, ground orchids and other herbs</i>	
	Kollegal	Streams/Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>
Chikamagalur					
	Tarikere	Evergreen Forests	Evergreen Forests	<i>Rhynchosyilis, Catlea, Luisia</i>	
		Forests	Dry deciduous forests	<i>Anogeisus latifolia, Terminalia sp., Tectona grandis, Dyospyros melanoxylon</i>	<i>Tiger, Leopard, Sambar, Dhole</i>
		Montane Grasslands	Grasslands	<i>Grasses, ground orchids and other herbs</i>	
		<i>Poeciloneuron indicum</i> Forests	Evergreen Forests	<i>Poeciloneuron indicum</i>	<i>Lion-tailed Macaque</i>
	Sringeri	Streams/Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>

Hotspots of hope contd..

District	Taluk	Habitat	Ecosystem	Plants	Animals
Dakshina Kannada					
	Mangalore	Mangrove	Mangrove		
		Montane Grasslands	Grasslands	<i>Grasses, ground orchids and other herbs</i>	
		<i>Poeciloneuron indicum</i> Forests	Evergreen Forests	<i>Poeciloneuron indicum</i>	Lion-tailed Macaque
	Belthangadi, Sringeri, Karkala, Sulia,	Streams/Rivers	River	Members of <i>Podostemaceae</i>	Freshwater Fishes
Davangere					
	Channagiri	Reservoir / Lakes	Reservoir / Lakes		Water Fowl
Dharwad					
		Reservoir / Lakes	Reservoir / Lakes		Water Fowl
Hassan					
	Arkalgud	Streams/Rivers	River	Members of <i>Podostemaceae</i>	Freshwater Fishes
Haveri					
	Savanoor	Human Habitation	Human Habitation	<i>Baobab</i>	
Kodagu					
		Evergreen Forests	Evergreen Forests	<i>Dendrobium, Rhynchosytilis, Catlea, Luisia</i>	Nilgiri Langur
		Evergreen Forests	Sacred Groves		
	Somvarpet	Evergreen Forests	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Mesua ferrea</i>	Lion-tailed Macaque
	Bagamandala, Somwarpet	Evergreen Forests,	Evergreen Forests	<i>Dipterocarpus indicus, Chrysophyllum sp., Myristica malabarica, Mesea ferrea</i>	Nilgiri Langur, Lion-tailed Macaque
		Montane Grasslands	Grasslands	<i>Grasses, ground orchids and other herbs</i>	Greybreasted Laughing Thrush, Whitebellied Shortwing
	Kushalnagar	Streams/Rivers	River	Members of <i>Podostemaceae</i>	Freshwater Fishes
Kolar					
		Reservoir / Lakes	Reservoir / Lakes		Water Fowl
Mandya					
		Reservoir / Lakes	Reservoir / Lakes		Water Fowl
		Scrub Forest	Scrub Forest		Wolf and Fox
	Srirangapatna	Streams/Rivers	River	Members of <i>Podostemaceae</i>	Freshwater Fishes
Mysore					
	Gundlupet, Virajpet	Forests	Moist and Dry deciduous forests	<i>Anogeisus latifolia, Santalum album, Terminalia sp., Acacia leucophloea, Tectona grandis</i>	Elephant, Tiger, Leopard, Sambar, Dhole

Hotspots of hope contd..

District	Taluk	Habitat	Ecosystem	Plants	Animals
Mysore					
		Reservoir / Lakes	Reservoir / Lakes		<i>Water Fowl</i>
	H.D.Kote, K.R.Nagar	Streams/Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>
Shimoga					
	Sorab, Tirthahalli	Reservoir / Lakes	Reservoir / Lakes		<i>Water Fowl</i>
		Streams/Rivers			<i>Fishes, estuarine invertebrates</i>
	Thirthahalli	Streams/Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>
		All	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta</i>	<i>Amphibians</i>
Tumkur					
	Sira	Human Habitation	Human Habitation		<i>Painted Stork</i>
	Sira, Koratagere, Kunigal, Tumkur	Reservoir / Lakes	Reservoir / Lakes		<i>Water Fowl</i>
	Madhugiri	Rocky Mountain	Highest Monolith Rock in Asia		
Udupi					
		All	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta</i>	<i>Amphibians</i>
	Kundapura	Evergreen Forests	Evergreen Forests	<i>Saraca asoka, Rattan</i>	<i>Lion-tailed Macaque</i>
	Udupi	Evergreen Forests	Sacred Groves		
	Udupi	Island	Island		
		Montane Grasslands	Grasslands	<i>Grasses, ground orchids and other herbs</i>	
		<i>Poeciloneuron indicum</i> Forests	Evergreen Forests	<i>Poeciloneuron indicum</i>	<i>Lion-tailed Macaque</i>
	Karkala	Streams/Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>
Uttara Kannada					
	Sirsi, Siddapur, Kumta	All	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta</i>	<i>Amphibians</i>
	Honavar	<i>Dipterocarpus indicus</i> Forests	Evergreen Forests	<i>Dipterocarpus indicus</i>	<i>Lion-tailed Macaque</i>
	Karwar, Honnavar, Kumta	Estuary	Estuary		<i>Fishes, estuarine invertebrates</i>
	Honnavar	Evergreen Forests	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Mesua ferrea</i>	<i>Lion-tailed Macaque</i>
	Sorab	Evergreen Forests	Sacred Groves		
	Honavar	Mangrove	Mangrove	<i>Mangrove vegetation</i>	
	Haliyal	Moist Deciduous Forest	Moist Deciduous Forest		

Hotspots of hope contd..

District	Taluk	Habitat	Ecosystem	Plants	Animals
Uttara Kannada					
	Siddapur, Honnavar, Sirsi	Myristica Swamps	Evergreen Forests	<i>Myristica fatua, Gymnacranthera canarica, Semecarpus travancorica</i>	<i>Phylloneura westermanii</i> (Monotypic damselfly)
	Siddapur	Relic Evergreen Forests	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta</i>	
	Siddapur, Sirsi, Yellapur	Relic Evergreen Forests	Evergreen Forests	<i>Dipterocarpus indicus, Myristica malabarica, Garcinia gummi-gutta</i>	
	Siddapur, Kumta, Honnavar, Joida	Riparian Forests	Evergreen Forests	<i>Riparian flora</i>	
	Bhatkal, Kumta, Ankola	Rocky and sandy beach	Beach	<i>Marine algae, Spinefex, Ipomoea biloba, Canavalia, Hydrophylax maritima</i>	<i>Marine invertebrates</i>
	Kumta	Rocky Mountain	Rocks		
	Karwar	Sandy beach	Beach		<i>Olive Ridley Turtle</i>
	Kumta	Umbrella Palm Forests	Evergreen Forests	<i>Corypha umbraculifera</i>	

Hotspots of despair

District	Taluk	Habitat	Ecosystem	Plants	Animals	Causal factor
All districts						
		Agro ecosystems	Agro ecosystem	<i>Crop Diversity</i>		
Bangalore-Rural						
		Reservoir /Lakes	Reservoir/ Lakes		<i>Water Fowl</i>	Urbanization
	Bidadi	Reservoir /Lakes	Reservoir/ Lakes		<i>Freshwater Fishes</i>	Flow of untreated sewages, dumping of wastes, washing of vehicles
	Bangalore South	Streams /Rivers	River		<i>Freshwater Fishes</i>	Flow of untreated sewages, dumping of wastes, washing of vehicles
	Devanahalli	Tamrind	Sacred Groves			No Protection
Bangalore-Urban						
	Bangalore South	Lake	Lakes		<i>Freshwater Fishes</i>	Flow of untreated sewages, dumping of wastes, washing of vehicles
	Bangalore North	Lake	Lakes		<i>Freshwater Fishes</i>	Flow of untreated sewages, dumping of wastes, washing of vehicles

Hotspots of despair contd..

District	Taluk	Habitat	Ecosystem	Plants	Animals	Causal factor
Belgaum						
		Cave	Dry deciduous forests		<i>Wroughton's Free Tailed Bat (Otomops wroughtoni)</i>	Hydro electric project
Dakshina Kannada						
	Belthangadi	Estuary	Estuary		<i>Fishes, estuarine invertebrates</i>	Siltation
	Mangalore	Estuary	Estuary		<i>Fishes, estuarine invertebrates</i>	Siltation
	Belthangadi	Semi evergreen Forests	Fruit Bats conserved Sacred Grove		<i>Bats</i>	Deforestation
	Mangalore	Mangrove	Mangrove	<i>Candelia, Avecennia, Rhizophora</i>		Threat of clearing of mangroves
	Mangalore	Streams /Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>	River Diversion Scheme
	Mangalore	Streams /Rivers	River		<i>Freshwater Fishes</i>	Saline intrusion
	Mangalore	Sea side	Sea side		<i>Water Fowl</i>	Barge mounted projects
	Mangalore	Sandy beach	Sea side		<i>Marine invertebrates</i>	Occupational pressure, Water pollution, Costal erosion
Davanagere						
	Harihar	Streams /Rivers	River		<i>Freshwater Fishes</i>	Flow of untreated sewages, dumping of wastes, washing of vehicles
	Harihar	Streams /Rivers	River		<i>Freshwater Fishes</i>	Pollution in river
Dharwad						
	Naregal	Reservoir/ Lakes	Reservoir/ Lakes		<i>Water Fowl</i>	
Mandya						
	Maddur	Human Habitation	Human Habitation		<i>Grey Pelican, Painted Stork</i>	Ecotourism and Habitat Loss
Shimoga						
	Bhadravathi	Streams /Rivers	River		<i>Freshwater Fishes</i>	Flow of untreated sewages, dumping of wastes, washing of vehicles, Pollution in river
	Sagar	Streams/ Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>	Monoculture, Encroachment
	Sorab	Evergreen Forests	Sacred Groves			Decline of Sacred Kans
		Streams /Rivers			<i>Fishes, estuarine invertebrates</i>	

Hotspots of despair contd..

District	Taluk	Habitat	Ecosystem	Plants	Animals	Causal factor
Tumkur						
	Tumkur	Scrub-Deciduous Forest	Dry deciduous forests	<i>Anogeisus latifolia</i> , <i>Terminalia sp.</i> , <i>Acacia leucophloea</i> , <i>Dyospyros melanoxyton</i>	<i>Yellow Throated Bulbul</i>	Roads
	Sira	Scrub Forest	Scrub Forest		<i>Black Buck</i>	Habitat loss
Udupi						
	Udupi	Laterite hill tops	Human Habitation	<i>Paracaultlea bhatii</i>		Urbanization
	Kundapur	Mangrove	Mangrove	<i>Candelia</i> , <i>Avecennia</i> , <i>Rhizophora</i>		Threat of clearing of mangroves
	Kundapur	Streams /Rivers	River		<i>Freshwater Fishes</i>	Siltation
	Udupi, Kundapur	Sandy beach	Sea side		<i>Marine invertebrates</i>	Occupational pressure
	Udupi	Sandy beach	Sea side		<i>Marine invertebrates</i>	Costal erosion
Uttara Kannada						
	Bhatkal	Rocky and sandy beach	Beach	<i>Marine algae</i> , <i>Spinefex</i> , <i>Ipomoea biloba</i> , <i>Canavalia</i> , <i>Hydrophylax maritima</i>	<i>Marine invertebrates</i>	Urban Effluents, Garbage dumping, CRZ Violation, Unplanned tourism
	Kumta	Sandy beach	Beach	<i>Marine algae</i> , <i>Spinefex</i> , <i>Ipomoea biloba</i> , <i>Canavalia</i> , <i>Hydrophylax maritima</i>	<i>Marine invertebrates</i>	Destruction of Mangroves
	Kumta	Estuary	Estuary		<i>Fishes, estuarine invertebrates</i>	Shell Miming, Aquaculture, Destruction of Magnroves
	Siddapur	Estuary	Estuary		<i>Fishes, estuarine invertebrates</i>	Shell Miming, Aquaculture, Destruction of Magnroves
	Karwar	Estuary	Estuary		<i>Fishes, estuarine invertebrates</i>	Sand Mining, Industrial pollution
		Island	Island		<i>Sea birds</i>	Naval base activities
	Kumta	Mangrove	Mangrove	<i>Mangrove vegetation</i>		Clearing of mangroves
	Kumta	Streams /Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>	Forest Encroachment, Monoculture
	Kumta	Streams /Rivers	River		<i>Freshwater Fishes</i>	Saline intrusion, Siltation
	Honavar	Streams /Rivers	River	<i>Members of Podostemaceae</i>	<i>Freshwater Fishes</i>	Monoculture, Encroachment

Source: Dr Madhav Gadgil and team

Table 1: Power stations under KPCL as on 31-3-2003

Power station	No of units X capacity	Installed capacity in MW
Raichur Thermal Power Station	7 X 210	1,470.00
Sharavathi Generating Station	10 X 103.5	1,035.00
Gerusoppa Dam Powerhouse	4 X 60	240.00
Linganamakki Dam Powerhouse	2 X 27.50	55.00
Bhadra Right Bank Canal Powerhouse	1 X 7.2+ 1 X 6	13.20
Bhadra left Bank Canal Powerhouse	2 X 12 + 1 X 2	26.00
Nagjhari Powerhouse	3 X 135 + 3 X 150	855.00
Supa Dam Powerhouse	2 X 50	100.00
Kadra Dam Powerhouse	3 X 50	150.00
Kodasalli Dam Powerhouse	3 X 40	120.00
Ghatprabha Dam Powerhouse	2 X 16	32.00
Varahi Underground Powerhouse	2 X 115	230.00
Mani Dam Powerhouse	2 x 4.50	9.00
Mallapur Mini Hydel Scheme	2 x 4.50	9.00
Sirwar Mini Hydel Scheme	1 x 1	1.00
Kalmala Mini Hydel Scheme	1 x 0.40	0.40
Ganekal Mini Hydel Scheme	1 x 0.35	0.35
Kappatagudda Wind Farm	9 x 0.225 + 11 x 0.230	4.55
KPCL total installed capacity		4,350.50

Source: KPCL, 2004

Table 2: Power stations under VVNL as on 31-3-2003

Power station	No of units X capacity	Installed capacity in MW
Sir K Sheshadri Iyer Hydro Electric Station (Shivanasamudram)	4 X 6 + 6 X 6 X 3	42.00
Shimsha Hydro Electric Station	2 X 8.6	17.20
Mahatma Gandhi Hydro Electric Station	4 X 18 + 2 X 12	120.00
Muirabad Powerhouse	3 X 9	27.00
Tungabhadra Dam Powerhouse	20 % share	14.40
Yelahanka DG Station	6 X 21.32	127.92
VVNL Total installed capacity		348.52

Source: KPCL, 2004

Table 3: Independent Power Producers as on 31-3-2003

Name	Capacity (MW)
Ugar Sugar Works (Cogen)	44.00
I.T.P.L (Diesel)	9.00
Shamanur Sugar (Cogen)	22.00
Shree Renuka Sugar (Cogen)	9.60
E.D.C.L. (Minihydel)	9.00
M.P.C.L (Minihydel)	11.60
B.P.C.L. (Minihydel)	2.00
SMIORE (Minihydel)	16.00
Tungabhadra Steels (Minihydel)	2.40
Jindal Tractbel Power (Thermal)	260.00
Bannari Amman Sugar (Cogen)	16.00
ICL Sugars (Cogen)	12.00
PrabhuLingeswara Sugar (Cogen)	17.50
Tata Electric (D.G)	81.30
Rayalaseema Alkalies (D.G)	27.10
Taneer Bhavi Power Co.	220.00
South India Paper Mills	7.80
Amoga Power plant	1.50
Malavally Power Plant	4.50
Dandeli Ferro Alloys	1.50
Bhouraka Power Plant	3.50
Nijuveedu (wind)	6.00
Atria (Shiva)	6.00
Atria (Shimsha)	12.00
Jamkhandi Sugars	1.05
BESE	7.59
Cepco wind	0.60
Enercon Wind	8.40
Raithara Sakkare Karkhane	3.00
Vijayalakshmi	1.75
Godavari Sugars	24.00
Moodabagil	0.33
Gem Sugars	22.50

Source : KPCL annual reports

Table 4: Details of non conventional units (Cogeneration and Biomass) installed in Karnataka

Year	Installed capacity in MWs (cumulative)
1998-99	18
1999-00	80
2000-01	111
2001-02	166
2002-03	188

Source: KREDL

Table 5: Power Generation from Wind Energy in Karnataka

Financial Year	Installed capacity in MWs (cumulative)	Generation (Million Units)
1994-95	0.55	
1995-96	1.90	1.35
1996-97	5.84	7.41
1997-98	17.88	11.27
1998-99	19.13	26.62
1999-2000	37.22	39.45
2000-2001	40.97	72.08
2001-2002	69.77	93.07
2002-2003	96.70	135.30

Source: KREDL

Table 6: Generation of electricity under different categories by different agencies (2002-03)

Utility	Generation (in Million units)
Karnataka Power Corporation(KPC)	
a) Hydel	6,639
b) Wind	11
c) Thermal	9,391
Total KPC	16,041
Central Grid Share	9,098
Vishveshvaraiya Vidyut Nigam Ltd	935
Tungabhadra dam share	15
Independent Power Producers	
Co-generation	342
Mini hydel	237
Wind	111
Major	2,500
Total by all IPPs	3,189
Total in Million units	29,279

Source: KPCL

Table 7: Categorywise installations and energy consumption in the State-2003-04

Energy consumption in million units

Company	BESCOM		GESCOM		HESCOM		MESCOM	
	No of installations	Energy consumption	No of installations	Energy consumption	No of installations	Energy consumption	No of installations	Energy consumption
Bhagya Jyothi\Kutir Jyothi	911,258	110.43	423,439	91.51	481,085	103.91	251,912	51.41
Non commercial light and fans and AEH	3,424,299	2,137.63	990,873	400.75	1,625,086	696.76	2,192,640	934.14
Irrigation pump sets	495,661	3,904.02	201,106	2,125.18	395,563	2,251.21	326,245	1,504.66
Water supply-Urban and Rural	24,628	194.16	9,358	67.26	19,476	210.70	18,883	148.12
Public lighting-Urban and Rural	18,467	242.56	6,030	85.84	1,438	1.70	16,238	131.92
Other LT	580,342	514.05	162,785	222.00	235,791	385.66	294,037	495.15
LT Total	5,054,728	8,253.00	1,793,791	2,292.71	2,758,439	3,649.94	3,099,955	3,265.40
HT	3,355	2,539.00	572	472.28	715	525.89	1,213	1,216.70
Total	5,058,083	10,792.00	1,794,363	2,764.99	2,759,154	4,175.89	3,101,168	4,482.10

Table 8: Growth rate of various categories of consumers of electricity

Category	No. of connections	% growth	Conn. Load (kW)	% Growth	Energy consumption	% Growth in energy
Domestic						
1970	679,245	-	206,131	-	150	-
1990	3,296,253	485	818,030	397	712	475
2000	6,560,119	965	1,547,975	752	1,848	1232
10 Years growth (1990-2000)	-	99	-	89.23	-	159.5
AEH						
1970	30,167	-	77,426	-	48	-
1990	661,919	2194	1,705,930	2203	976	2033
2000	1,304,323	4321	3,488,414	4284	1,787	3723
10 year growth (1990-2000)	-	97.05	-	104.5	-	83.09
IP Sets						
1970	110,246	-	368,608	-	149	-
1990	673,907	611	2,357,928	640	3,537	2374
2000	1,181,963	1072	4,038,057	1184	6,589	4422
10 year growth (1990-2000)	-	75.39	-	71.25	-	86.30%
LT Power						
1970	35,525	-	214,598	-	206	-
1990	210,021	591	1,205,132	562	773	375
2000	278,733	900	2,137,775	952	1,278	620
10 year growth (1990-2000)	-	32.72	-	77.39	-	65.33
HT Power						
1970	403	-	677,787	-	1,519	-
1990	2,005	498	1,202,487	177	4,652	306
2000	3,416	848	1,378,606	198	3,383	223
10 year growth (1990-2000)	-	70.37	-	14.65	-	27.28%
All categories						
1970	1,004,443	-	1,604,937	-	2,663	-
1990	5,355,067	533	7,614,443	474	11,089	416
2000	10,202,019	1017	13,506,544	829	16,149	606
10 year growth (1990-2000)	-	90.51	-	77.38	-	45.63

Source: KPTCL

Table 9: Electricity consumers distribution pattern-2001

District	Population (2001 census)	Domestic lighting	Bhagya jyothi\ Kutir Jyothi	AEH	Total consumers	Ratio of total consumers to population
Bagalkot	1,652,232	115,236	52,263	7,959	175,458	0.10
Bangalore Rural	1,877,416	309,181	104,841	58,122	472,144	0.25
Bangalore Urban	6,523,110	721,475	26,335	693,573	1,441,383	0.22
Belgaum	4,207,264	370,627	139,798	51,319	561,744	0.13
Bellary	2,025,242	143,673	75,233	21,620	240,526	0.11
Bidar	1,501,374	97,145	54,762	10,910	162,817	0.1
Bijapur	1,808,863	92,365	72,919	11,460	176,744	0.09
Chamarajnagar	964,275	103,856	43,354	6,266	153,476	0.15
Chikkamagalur	1,139,104	144,364	38,078	15,202	197,644	0.17
Chitradurga	1,510,227	139,470	76,500	11,968	227,938	0.15
Dakshina Kannada	1,896,403	175,310	19,039	66,385	260,734	0.13
Davangere	1,789,693	208,075	73,737	31,877	313,689	0.17
Dharwad	1,603,794	147,459	43,452	47,174	238,085	0.14
Gadag	971,955	105,840	49,649	5,808	161,297	0.16
Gulbarga	3,124,858	175,021	119,334	32,412	326,767	0.1
Hassan	1,721,319	205,037	79,653	22,378	307,068	0.17
Haveri	1,437,860	120,365	67,663	7,449	195,477	0.13
Kodagu	545,322	55,805	7,013	16,637	79,455	0.14
Kolar	2,523,406	293,463	120,891	29,636	443,990	0.17
Koppal	1,193,496	83,656	55,225	4,923	143,804	0.12
Mandya	1,761,718	205,806	84,511	18,470	308,787	0.17
Mysore	2,624,911	262,064	80,868	76,411	419,343	0.15
Raichur	1,648,212	94,563	68,726	9,291	172,580	0.1
Shimoga	1,639,595	174,164	64,874	30,830	269,868	0.164
Tumkur	2,579,516	318,420	108,728	36,953	464,101	0.17
Udupi	1,109,494	133,409	17,803	36,696	187,908	0.16
Uttara Kannada	1,353,299	146,608	79,196	14,716	240,520	0.17
Total	52,733,958	5,142,457	1,824,445	1,376,445	8,343,347	0.15

Source: KPTCL

Table 10: Details of captive generators as on 31/03/2003

District	Installed Capacity (MVA)	Generation (MUs)	% installed capacity
Bagalkot	-	-	-
Bangalore North	421.86	65.92	9.52
Bangalore South	1,072.24	82.36	24.19
Belgaum	1,034.90	401.67	23.34
Bellary	47.90	9.90	1.08
Bidar	28.05	4.84	0.63
Bijapur	26.16	31.18	0.59
Chamarajnagar	22.62	0.49	0.51
Chikkamagalur	15.94	1.88	0.36
Chitradurga	60.37	18.01	1.36
Dakshina Kannada	236.25	412.15	5.33
Davangere	67.60	84.39	1.52
Dharwad	70.21	25.16	1.58
Gadag	-	-	-
Gulbarga	410.94	615.39	9.27
Hassan	38.21	27.09	0.86
Haveri	-	-	-
Kodagu	50.29	263.97	1.13
Kolar	49.34	12.04	1.11
Koppal	-	-	-
Mandya	94.14	58.65	2.12
Mysore	234.88	245.76	5.30
Raichur	133.12	46.51	3.00
Shimoga	79.04	189.54	1.78
Tumkur	74.76	38.70	1.69
Udupi	44.99	1.75	1.01
Uttara Kannada	119.31	267.83	2.69
Total	4,433.12	2,905.17	

Source: Electrical Inspectorate

Table 11: Biogas plants implemented in districts

District	1999-2000		2000-2001		2001-2002		2002-2003	
	Numbers		Numbers		Numbers		Numbers	
	Target	Realization	Target	Realization	Target	Realization	Target	Realization
Bagalkot	400	307	375	89	350	345	250	190
Bangalore Rural	150	278	375	609	1,000	1,089	950	748
Bangalore Urban	150	92	125	271	500	344	300	300
Belgaum	2,500	3,596	4,375	6,598	4,500	7,643	3,500	2,860
Bellary	500	356	500	280	800	316	400	310
Bidar	350	51	250	19	1,000	111	250	228
Bijapur	700	39	375	137	750	115	100	115
Chamarajnagar	250	107	375	240	300	370	350	274
Chikkamagalur	1,000	439	1,250	1,200	1,200	1,079	500	391
Chitradurga	1,200	500	625	380	700	565	300	240
Dakshina Kannada	200	506	625	357	500	332	200	155
Davangere	1,500	925	1,250	877	1,200	521	400	410
Dharwad	200	153	250	464	600	264	300	259
Gadag	200	99	125	114	250	100	100	6
Gulbarga	150	31	125	180	250	281	200	197
Hassan	1,000	4,800	5,620	3,940	5,000	5,136	3,000	2,330
Haveri	200	346	375	1,075	1,500	1,577	2,000	1,534
Kodagu	50	38	65	429	600	685	300	263
Kolar	400	303	500	289	600	388	400	356
Koppal	200	56	125	36	250	79	100	54
Mandya	300	769	1,000	893	1,000	1,152	800	613
Mysore	1,300	850	1,875	1,208	2,500	921	900	695
Raichur	150	4	125	128	400	211	200	173
Shimoga	2,000	1,705	2,500	1,903	1,500	1,844	2,150	1,803
Tumkur	200	194	250	629	1,500	1,491	1,500	2,217
Udupi	250	92	125	80	250	87	100	94
Uttara Kannada	500	1,046	1,440	867	1,000	663	450	354
Total	16,000	17,682	25,000	25,025	30,000	27,719	20,000	17,169

Source : Annual reports of RDPR Department, Government of Karnataka

Table 12: Improved stoves implemented in districts

District	1999-2000		2000-2001		2001-2002		2002-2003	
	Numbers		Numbers		Numbers		Numbers	
	Target	Realization	Target	Realization	Target	Realization	Target	Realization
Bagalkot	1,750	-	300	300	1,000	350	134	-
Bangalore Rural	5,000	5,000	5,000	5,410	6,000	3,854	-	-
Bangalore Urban	5,000	5,000	2,500	2,687	3,000	3,206	1,835	754
Belgaum	-	3,869	1,000	1,120	1,500	3,805	-	-
Bellary	4,500	3,075	3,000	3,504	4,500	3,821	625	425
Bidar	-	1,890	1,000	1,240	1,500	953	349	-
Bijapur	4,500	1,538	300	-	1,000	4,170	262	174
Chamarajnagar	3,600	309	800	860	1,000	2,285	221	-
Chikkamagalur	4,000	161	700	778	1,000	2,366	-	-
Chitradurga	3,600	3,600	3,500	3,750	4,000	963	-	410
Dakshina Kannada	8,000	4,650	1,000	1,200	1,000	200	-	-
Davangere	-	2,225	3,500	3,725	4,000	2,500	-	-
Dharwad	4,000	627	500	679	1,000	1,200	48	48
Gadag	4,000	4,300	300	-	1,000	330	-	150
Gulbarga	-	-	100	110	1,000	2,056	-	-
Hassan	2,000	2,000	1,500	2,000	2,000	1,490	300	-
Haveri	3,000	3,000	1,000	1,293	2,000	3,543	300	-
Kodagu	2,000	-	900	900	1,000	681	188	188
Kolar	-	1,852	2,500	3,484	3,000	3,277	672	672
Koppal	-	2,500	1,000	500	1,000	500	-	-
Mandya	3,800	1,600	400	425	2,000	870	175	175
Mysore	-	2,500	4,000	4,260	5,000	6,393	580	580
Raichur	-	1,600	3,500	3,819	1,000	1,618	590	-
Shimoga	4,500	-	4,000	4,500	4,500	2,600	1,042	2,600
Tumkur	1,750	2,140	2,400	2,426	2,500	4,746	1,360	1,360
Udupi	-	800	2,400	2,400	2,500	-	250	250
Uttara Kannada	-	471	900	900	1,000	234	100	100
Total	65,000	54,707	48,000	52,750	60,000	58,011	9,031	7,886

Source : RDPR Department, 2004

Some important legislations on environment

Laws pertaining to air quality		
Indian Explosive Act	1884	Air pollution
The Bengal Smoke Nuisance Act	1905	To prevent or reduce atmospheric pollution in and around Calcutta
The Bombay Smoke Nuisance Act	1912	To check smoke nuisance in Mumbai area.
The Petroleum Act	1934	Energy/air pollution
Motor Vehicle Act, with Regulations and Standards	1939	Section relating to emission standards
Inflamable substances Act	1942	Air pollution
The Gujarat Smoke Nuisance Act	1963	Air Pollution (smoke control)
The Air (Prevention and Control of Pollution) Act	1981	Amended in 1987
Indian Penal Code (IPC) Section 278		Polluting atmosphere
The Air (Prevention and Control of Pollution) Rules	1982	Framed under Section 53 of Air Act 1981
The Air (Prevention and Control of Pollution) Rules	1983	
Laws pertaining to water		
Indian Penal Code (IPC) Section 277		Fouling water, spring, reservoir
Northern India Canal and Drainage Act	1873	Water pollution (non industrial)
Obstruction in Fairways Act	1881	Water pollution (non-industrial)
Indian Ports Act	1908	Water pollution (non-industrial)
The Shore Nuisance (Bombay-Kalova) Act	1893	To check coastal and marine water pollution
Maharashtra Prevention of Water Pollution Act	1969	Water Pollution
The Water (Prevention and Control of Pollution) Act	1974	Amended in 1978 and 1988
The Water (Prevention and Control of Pollution) Rules	1975	Amended in 1976,1981 and 1989
The Water (Prevention and Control of Pollution) Rules (Procedure for Transaction of Business) Rules	1975	
The Water (Prevention and Control of Pollution)Cess Act	1977	Amended in 1991 and 1992
The Water (Prevention and Control of Pollution)Cess Rules	1978	Amended in 1991 and 1992
Orissa River Pollution Prevention Act	1953	Water Pollution
Laws relating to noise pollution		
The Madras Town Nuisance Act	1869	
Town Nuisance Act	1889	
The Factories Act	1948	
Bihar Control of Uses and Play of Loudspeakers Act	1955	

Laws relating to wildlife, forest conservation, fisheries, and pest control.

The Cattle Trespass Act	1871	For preservation of forest and Fisheries
Andhra pradesh wild Elephant Preservation Act	1873	Wildlife management and protection
Indian Fisheries Act	1897	For preservation of forest and Fisheries
Indian Forest Act	1927	For preservation of forest and Fisheries
The Uttar Pradesh Wild Birds and Animals Protection Act	1912	Wildlife management and protection
The Punjab Fisheries Act	1914	Applicable in Delhi, Punjab and Haryana
The Destructive Insects and Pests Act	1914	To prevent pollution through the use of pesticides
The Mysore Destructive Insects and Pests Act	1917	Pest control (agriculture)
The Andhra Pradesh (Andhra Area) Agricultural Pests	1919	Pest control (agriculture)
The Madras Agricultural Pests and Diseases Act	1919	Pest control (agriculture)
The Elephant Preservation Act (West Bengal)	1932	Wildlife management and protection
Uttar Pradesh Fisheries Act	1948	Fisheries management, protection and conservation
The East Punjab Agricultural Pests, Diseases and Noxious Weeds Act	1949	Pest Control (agriculture) (Delhi, Punjab and Hararyana)
Assam Agricultural Pest and Diseses Act	1950	Pest Control (agriculture)
Assam Agricultural Pest and Diseses Act	1950	Pest Control (agriculture)
Bihar Prevention and Control of Agricultural Pests, Diseases and Noxious Weed Act	1950	Pest control
Rajasthan Wild Animals and Birds Protection Act	1951	Wildlife Protection
The Bombay Wild Animals and Birds Protection Act	1951	Wildlife Protection
Rajasthan Wild Animals and Birds Protection Act	1951	Wildlife Protection
The Rajasthan Fisheries Act	1953	Fisheries management, protection and conservation
The Assam Agricultural Pest and Disease Act	1954	Pest Control
The Assam Rhinoceros Preservation Act	1954	Wildlife Protection
The Uttar Pradesh Agricultural Diseases Pests Act	1954	Pest Control
The Uttar Pradesh Fisheries (Development and Control) Rules	1954	Fisheries management, protection and conservation
The Kerala Agricultural Pests and Disease Act	1958	Pest Control (Agricultural)
West Bengal Agricultural Lands and Fisheries (Agricultural Resettlement) Act	1958	Pest Control (Agricultural)
Madras Parks, Play Fields and Open Spaces (Preservation and Regulation) Act	1959	Forests and Parks
The West Bengal Wild life Preservation Act	1959	Wildlife Protection
The Fisheries Act(of Jammu and Kashmir)	1960	Fisheries management, protection and
The MysoreWild Animals and Birds Act	1963	Wildlife Protection
The Punjab Land Improvement Schemes Act	1963	Rural land-use and planning
Goa, Daman and Diu Wild Animals and Wild Birds Protection Act (and Rules)	1965	Wildlife Protection
Agricultural Pests and Diseases Act (Mysore)	1968	Pest Control (Agricultural)
Kerala Parks, Play Fields and Open Spaces (Preservation and Regulation) Act	1969	Forests and Parks
The Wildlife (Protection) Act	1972	Amended in 1991
The Forest (Conservation) Act	1980	Amended in 1988
The Forest (Conservation) Rules	1981	Amended upto 1992
The Wildlife (protection) Act	1972	Wildlife Management and Protection

Laws relating to hazardous chemicals

The Destructive Insects and Pests Act	1914	To prevent pesticides pollution
The Hazardous Waste (Management and Handling) Rules	1989	Framed under Section 6,8 and 25 of the Environment (Protection) Act 1986
The Manufacture, Storage and Import of Hazardous Chemical Rules	1989	Framed under Section 6,8 and 25 of the Environment (Protection) Act 1986
Public Liability Insurance Act	1991	Amended in 1992
Public Liability Insurance Rules	1991	
Indian Penal Code	1860	Section 284,285,286: Negligent conduct with respect to poisonous substances Negligent conduct with respect to poisonous substance, combustible matter, explosive substance

Laws relating to urban and rural land use

The Punjab Land Preservation Act	1900	Rural land-use, planning and protection
Calcutta Improvement Act	1911	Urban land-use and planning
West Bengal Land Development and Planning Act	1948	Urban land-use and planning
The Assam Embankment and Drainage Act	1953	Rural land-use and planning
Jammu and Kashmir Natural Calamities Destroyed Areas Improvement Act	1954	Rural land-use and planning
The Madras Slum Improvement (Acquisition of Land) Act	1954	Human Settlement
The Assam Acquisition of Land for Flood Control and Prevention of Erosion Act	1955	Land Utilisation and improvement
The Andhra Pradesh (Andhra Area) Slum Improvement (Acquisition of Land) Act	1956	Human Settlement
The Slum Areas (Improvement and Clearance) Act	1956	Human Settlement
The Calcutta Slum (Clearance and Rehabilitation of Slum Dwellers) Act	1958	Human Settlement
The Mysore Slum Areas Improvement and Clearance Act	1958	Human Settlement
West Bengal Agricultural Lands and Fisheries (Agricultural Resettlement) Act	1958	Land-use and planning
Madras Land Improvement Scheme Act(b)	1959	Urban land-use and planning
The Assam Slum Area (Improvement and Clearance)	1959	Human Settlement
The Madras Land Improvement Schemes (Contour Bunding and Contour Trenching) Act	1960	Rural land-use and planning
The Punjab Slum Area (Improvement and Clearance) Act	1961	Human Settlement
The Uttar Pradesh Slum Areas (Improvement and Clearance) Act	1962	Human Settlement
The Punjab Land Improvement Schemes Act	1963	Rural land-use and planning
Maharashtra Felling of Trees Regulation Act	1964	Rural land-use and planning
The Delhi Restriction of Uses of Land Act	1964	Land Utilisation and improvement
Maharashtra Regional and Town Planning Act	1966	Land -use and Planning
Orissa Agriculture Land Utilisation Act	1969	Rural land-use and planning
The Maharashtra Slum Area (Improvement, Clearance and Redevelopment) Act	1971	Human Settlement

Important notifications having implications for the environment

The Water (Prevention and Control of Pollution) Act 1974, amended 1988

The Water (Prevention and Control of Pollution) Cess Act, 1977, amended 2003.

Notification on rate of Cess under the Water (Prevention and Control of Pollution) Cess (Amendment) Act, 1977(36 of 1977)

The Air (Prevention and Control of Pollution) Act 1981, amended 1987

Public Liability insurance Act 1991, amended 1992

The Environment (Protection) Act, 1986, amended 1991

Notifications

Coastal Regulation Zone notification 1991 amended 1994, 1997, 1998, 2000, 2001, 2002, 2003 declaring coastal stretches as Coastal Regulation Zones and regulating activities in the CRZ.

Eco-marks Scheme

Notification on the Scheme on Labeling of Environment Friendly Products (ECOMARK), 1991.

Notification no S.O.60(E), dated 27/01/1994 and subsequent amendments restricting modernization and expansion of any activity/new project without environmental clearance by Central/State government.

Notification on prohibition on the handling of Azodyes, 1997 issued on 27/03/1997

Notification on dumping and disposal of fly ash discharged from coal or lignite based thermal power plants on land issued on 14/09/1999

Rules

The Hazardous Wastes (Management and Handling) Rules, 1989, amended 2000, 2003.

The Manufacture, Storage and import of Hazardous Chemical Rules, 1989, amended 2000.

The Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.

The Bio-Medical Waste (Management and Handling) Rules, 1998, amended 2003.

The Recycled Plastics Manufacture and Usage Rules, 1999, amended 2003.

The Municipal Solid Wastes (Management and Handling) Rules, 2000

The Batteries (Management and Handling) Rules, 2001

Noise Pollution (Regulation and Control) Rules, 2000, amended 2002

The Ozone Depleting Substances (Regulation and Control) Rules, 2000

The order on regulating the supply and distribution of 2-T Oil, 1998

Terms of Reference for the preparation of the State of the Environment Report 2002-2003

A. OBJECTIVES

The overall objectives of the Karnataka State of Environment Report and Action Plan (SOE) are to:

- Identify and prioritize environmental issues and better understand the potential constraints imposed by the environment for realization of development goals.
- Recommend cost-effective policies, investments, and institutional improvements to avert future environmental damages to health, livelihoods and ecosystems in Karnataka.
- Strengthen the capacity of local institutions to set environmental priorities, foresee future changes, and develop and implement necessary policy and mitigation measures.

B. KEY TASKS

The program of work to be carried out by each consultant team shall comprise the following aspects:

- a) Review of the current and projected environmental situation
- b) Analysis of pressures and underlying causes
- c) Institutional assessment and
- d) Policy and institutional recommendations.

(a) Review of Current and Projected Environmental Situation

- The State should be divided into relevant geographical areas (units) for analysis, based upon dominant environmental characteristics (e.g. urban and industrial complexes and transportation corridors, key watershed or forested areas, fragile coastal zones, etc). The number and configuration of areas should take into account both accuracy and feasibility of disaggregated estimates. Areas should not necessarily be of similar size but rather define effective geographical boundaries for assessing and tracking environmental problems. (For example, large cities such as Bangalore could be defined as separate areas for the analysis while in rural Karnataka units will cover much greater geographical areas.) Full use should be made of available GIS data.
- Take stock of available data and information (based on secondary sources) on the current environmental situation in Karnataka. This would include data on emissions of pollutants and degradation of natural resources, showing both trends over the last five years, and projections over the next five years. Selectivity will be required, but information on all the major environmental issues facing the state will be required, including (but not necessarily limited to): water quantity and quality; urban air pollution and vehicular congestion; indoor air pollution; hazardous and solid waste; land and forestry degradation; and threats to biodiversity.
- Estimate, where possible using rapid and robust methods, damages to human health, ecosystems and global commons caused by environmental degradation and pollution using accepted evaluation techniques. Emphasis should be placed on the incidence of environmental damage, in particular those relating to lower income areas and with special regard to public health.
- Determine the main environmental priorities, based on the incidence of economic, social, health and ecological damage, and/or other available scoring and ranking techniques.

(b) Analysis of Pressures and Underlying Causes

- Review available information and studies that address not only the immediate, but also the underlying causes of environmental degradation in the State. These would also include actual and potential environmental impacts of macro-economic and sectoral policies, business regulations, etc.
- Provide an inventory of major environmental activities/projects being carried out by Government, private and donor agencies. Summarize State plans for action that may go beyond activities already in place. Assess the adequacy of such plans to address the key issues and sources of pressure identified above.

(c) Institutional Assessment

- Summarize existing responsibilities of public (State, municipal and local levels) and private institutions and NGOs involved

in the management of environmental issues in Karnataka. Review aspects of the social setting likely to impact upon environmental management and objectives (education, decentralization, empowerment, public information disclosure, regulatory transparency, etc).

- Summarize the current policy and institutional framework and procedures used for environmental management. This should include, as appropriate, the division of responsibility between various government agencies and non-government institutions, regulatory policies, environmental standards and charges, monitoring and compliance; environmental impact assessment; legal liability; community participation; and business deregulation and privatization.
- Evaluate the effectiveness of governmental institutions in terms of their major environmental functions such as (a) monitoring and enforcement of compliance, (b) licensing and permitting functions, (c) evaluating and improving existing regulatory programs, and (d) developing new programs/regulatory responses, etc.
- Assess the effectiveness and suitability of the division of responsibility between various government agencies and non-government institutions for environmental matters.
- Identify major institutional, administrative and political challenges facing GoK in carrying out its environmental mandate.

(d) Policy and Institutional Recommendations

A time-bound action plan, comprising institutional and policy measures and investments, should be presented, with emphasis upon the next five years, Indicative actions over the succeeding five to ten years should also be presented. Such an action plan should include the following:

- For the priority issues, assess the cost of achieving specified environmental objectives wherever possible, and outline priority actions based on comparison of the benefits and costs or cost-effectiveness of alternative measures. The determination of priorities should also reflect changes in international commitments and market pressures (such as green consumerism). Particularly in view of the difficulty of assigning monetary values to environmental goods, transparent procedures and methods for establishing priorities through stakeholder consultation and obtaining consensus should also be followed.
- Propose policy and institutional measures to enable a flexible and efficient GoK response to current and future environmental concerns. Examples of possible areas of recommendations:
 - environmental responsibilities of environmental agencies /other government agencies whose actions may have significant environmental effects
 - environmental institutions and laws
 - environmental regulations, economic instruments
 - financing/investment requirements, including the role of public versus private financing
 - creation of an environmental fund
 - recommended reforms in macroeconomic, regional and sectoral policies
 - decentralization, empowerment, and participation
 - training and awareness
 - improved data and monitoring systems, including GIS-based
- Identify information and data gaps that should be filled in order to provide an adequate baseline for future monitoring and/or analysis of environmental trends. Indicate targets against which progress in key areas of environmental management can be monitored, and propose institutional measures to ensure that key data and information are systematically collected and utilized for policy and management purposes.

C. OUTPUTS, SCHEDULE AND APPROACH

The work under this report should be completed within six months from the date of letter from the Department of Ecology and Environment. After approval by the State Level Coordination Committee (SLCC), all consultants were addressed by a letter dated 9-10-2002 to commence the work pending Government of India approval and signing of formal contracts.

Inception and Scoping Workshop (November 12, 2002)

Interim Report (December 15, 2002)

Draft Final Report (February 15, 2003)

Final Report (March 31, 2003)

All reports should be submitted with three hard copies and an electronic copy to the GoK, and one hard copy and an electronic copy to the World Bank.

Throughout the study, public consultations and other participatory approaches will be required to build public awareness and support. This will include organization of a series of workshops to report on progress, discuss findings, and obtain feedback from a range of participants including various government departments/agencies and other stakeholder groups, including farmers' and industrial associations, NGOs, and community-based organizations. A suggested schedule is as follows:

- Scoping workshop to discuss objectives, approach, methodologies, and outputs. (early November 2002)
- One or more workshops on environmental trends and key issues. (November-December 2002)
- One or more priority-setting workshops to determine environmental priorities for Karnataka. (January -March 2003)
- Series of workshops to discuss the recommendations on policies and institutional aspects, and next steps for implementing the recommendations. (April-May 2003)

D. REPORTING

The Final Report on each of the above issues should be 20-30 pages in length, supplemented as necessary by annexes containing statistical and other material.

The team members will report to the Secretary Environment, who will in effect be the team leader.

BIBLIOGRAPHY

COASTAL ZONE

- Beach morphological changes between Talapadi and Surathkal, Dakshina Kannada. Arabian Sea Seminar, Mangalore, Jayappa, K.S. and Subrahmanya, K.R., 1989.
- Coastal Zone Environment Management- An appraisal, Murthy, T.R.S., 1997.
- Erosion and Deposition Pattern of Beaches in the Northern Karnataka Coast. In recent Geo scientific studies in the Arabian Sea of India. Chavadi, V.C., Hegde, V.S., Nalwadi, A.R., and Jalilal, A.A, 1989.
- Geomorphology of Indian coast, Workshop on strategies for sustainable development in the coastal area, Ministry of Environment and Forest, New Delhi Baba, M. and Thomas, K.V, 1999.
- Impact of bottom trawling on exploited resources, In. Marine Biodiversity Conservation and Management, Central Marine Fisheries Research Institute, Cochin. Menon, N.G.,1996.

WATER RESOURCES

- Behavior of Depth to Water Level between 1978-97 in Karnataka State. Rajamarthanda, 1998.
- Impact of Water Pollution on Food Security and Environment-Bearing the Brunt, Wasteland News, Diwakar, H. and N.Nagaraj, 2002.
- Rejuvenating Tanks, ISEC and Book for Change, Bangalore, Raju, K.V., G.K. Karanth, MJ Bhende, D.Rajashekar and K.G. Gayatrivedi, 2003.
- Principles of Water Management for Irrigation in Karnataka, Water and Land Management Institute, Dharwad 1998
- National Commission for Integrated Water Resources Development Plan, Government of India, 1999
- State Water Policy, Government of Karnataka, 2002

RURAL AND URBAN WATER SUPPLY AND SANITATION

- Functions, Assets and Processes of Local Organizations in Watershed Sector [On-going World Bank Project] ISEC, Bangalore Rajashekar, D, 2002.
- Local Organizations in Water Supply and Sanitation – A Review of Functions, Assets and Processes. an unpublished paper, Rajasekhar D, Vijaya Bhaskar, M and Veerashekarappa, Inst. for Social and Economic Change, Bangalore, 2002.
- Final Report of High Power Committee for Redressal of Regional Imbalances, Government of Karnataka, 2002.

AIR QUALITY AND INDOOR AIR POLLUTION

- TERI Energy Data Directory and Yearbook, The Energy Research Institute, 2001-02
- Report of the Expert Committee on Auto Fuel Policy, Government of India, 2002

TRANSPORT

- Cost Effective Road Safety Counter-Measures for Metropolitan Cities of India, in Indian Highways, Mittal, Nishi and S.M. Sarin, 2001.
- Handbook on EMP implementation, Karnataka State Highways Improvement Project
- Karnataka at a Glance 1990-91, Directorate of Economics and Statistics, Government of Karnataka.
- Status of noise level in Bangalore City, Ravi Kumar, R., Shadakshraswamy, N., Somasekhar, R. K., Journal of Environmental Pollution, 2001.

MINING AND QUARRYING

- Mining and Forest cover change detection in parts of Bellary district using Multitemporal Satellite Data and GIS, Report,

Karnataka State Remote Sensing Application Center, Department of Information Technology & Bio Technology, Government of Karnataka, 2003.

Impact of Iron ore mining on the flora and fauna of Kudremukh National Park and environs – A Rapid Assessment, Report, Centre for Ecological Sciences, Indian Institute of Science, 2000.

CEIA of Sandur Manganese and Iron ore mines, National Environmental Engineering Research Institute, Nagpur.

EIA studies concerning opencast mining in Lokapur-Kaladgi-Bagalkot limestone deposits in order to help suitable environmental management for the future, Institute for Catchment Studies and Environment Management, Bangalore, 2002

EIA of areas under intensive quarrying in Balkundi block, Bijapur-Raichur districts, Karnataka, Technical report, Indian Resources Information & Management Technologies Pvt. Ltd., Bangalore, 1997

Impacts of granite quarrying on ecology and environment of Kodihalli state forest and surrounding areas, Kanakapura taluk, Karnataka. Department of Environmental Sciences, Bangalore University, Bangalore, 1998.

CEIA of Kudremukh Iron ore mines, Technical report, National Environmental Engineering Research Institute, Nagpur, 2000

Rapid Environmental Impact Assessment for Mining Operations in Bellary, Hospet Region Karnataka, Technical report National Environmental Engineering Research Institute, Nagpur, 2002

WASTE MANAGEMENT

An Empirical study on implementation of existing environmental laws in industrial hazardous wastes management in Karnataka-Bangalore as a case Study. STEM, Bangalore, 1999.

Emerging experiences in medical waste management in India, Srishti, 2000.

Urban Solid Waste Management: Progress and Prospectus for Social, Technical and Policy Improvement, Patel, Almitra H.

Study on plastic industries in Karnataka, Karnataka Cleaner Production Centre, 2001

LAND DEGRADATION

Perspective Land Use Plan for Karnataka-2025, Karnataka State Land Use Board, Government of Karnataka.

Soils of Karnataka for optimizing Land Use, National Bureau of Soil Survey and Land Urban Planning, 2000

Sustainable Land Use Practices under NSC for formulation of National Action Plan, Ministry of Environment and Forests, Government of India, 1999

FOREST

State of Forest Report, Forest Survey of India, Government of India, 1995, 1999, 2001

Report of Inventory of forestry resources of Dakshina Kannada district of Karnataka, Forest Survey of India, South zone, Bangalore, 1988.

ICFRE records, Mathur and Soni, 1986

URBAN PLANNING

Climate Change and City Initiatives. A case study of climate friendly and energy efficiency initiatives of Bangalore.”

Seminar on Climate Change and Cities: Challenges and Opportunities in Urban Planning, Municipal Investment, Energy Efficiency and Public Health. Bhaskara Rao, B., 2000.

Task Force Report on the Bangalore Green Belt, Government of Karnataka, 1999

HEALTH

Asthma in adolescents in Bangalore, Paramesh. H , Somasekhar, *International Conference on Health and Environment*, 2000.

A study report, Dr.S.R Chandrasekhar Institute of Speech and Hearing, Bangalore, 1999

Atopy in infancy and early childhood: Natural history and role of skin testing, Zeiger R.S., J.Allergy clinical Immunology, 1985.

Recent trends in aerobiology, allergy and immunology, Oxford and IBH Publishers, Agashe S., 1994.

Rural study on indoor pollution and asthma in ill ventilated huts, Paramesh H. and Cherian E., *Ind. Jour. Of Pediatrics.*, 2002.

Task Force on Health, Government of Karnataka, 2001

ANNUAL REPORTS

Bangalore Water Supply and Sewerage Board,2002, 2003

Karnataka State Pollution Control Board 2001,2002, 2003

Karnataka Power Corporation Limited, 2003

Water Resources Department, 2003

ADMINISTRATIVE REPORTS

Department of Mines and Geology, Government of Karnataka, 2002-03

DEPARTMENT MEDIUM TERM FISCAL PLAN: 2003-04 TO 2006-07 OF FOLLOWING STATE GOVERNMENT DEPARTMENTS

Agriculture and horticulture

Animal husbandry and fisheries

Forest, Ecology and Environment

Rural Development and Panchayat Raj

Energy

Urban Development

Economic survey of Karnataka, 2002-03, Bureau of Economics and Statistics, Department of Planning, Government of Karnataka