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ENVIS Newsletter State Environment Related Issues

DEPARTMENT OF FORESTS, ECOLOGY & ENVIRONMENT, GOVERNMENT OF KARNATAKA

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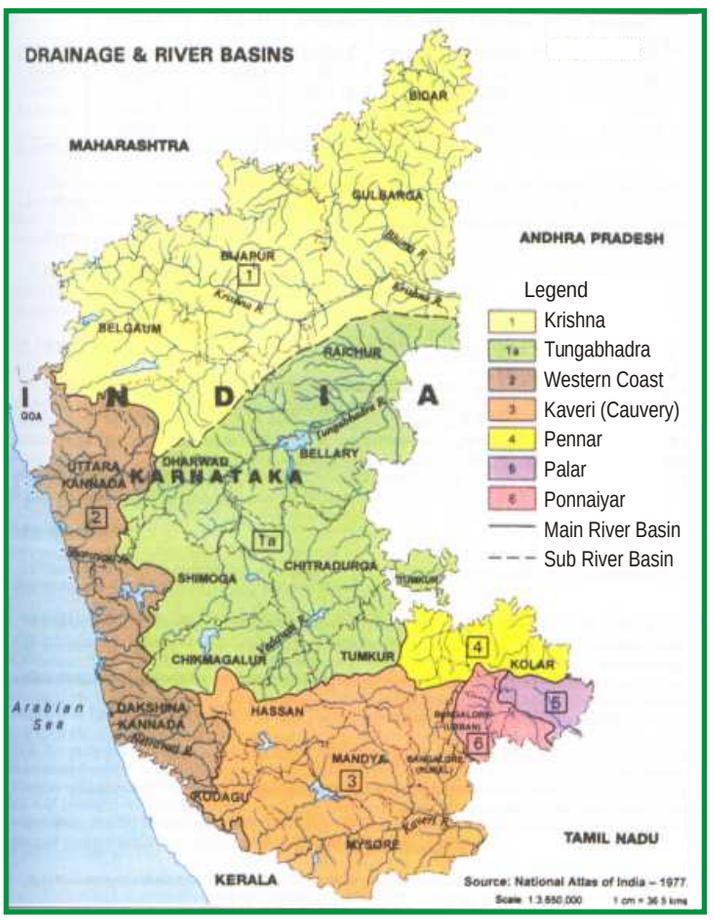
Water is an elixir for the mankind and its quality determines health of communities. As all the water that is available on the earth is not suitable for consumption, understanding its quality becomes the prime concern. As groundwater is found to be most appropriate source and at the same time has a geographical context, study of its quality, quantity and variation of both over large region is very important.

The National Water Policy (2002) states "Water is a prime natural resource, a basic human need and a precious national asset". As such, the policy emphasizes that planning, development and management of water resources should be governed by national perspectives. The Karnataka State Water Policy, 2002, highlights the limited availability of water resources, which are stressed and depleting due to increasing sectoral demands in the State.

The environmental problems linked to water resources are centred around both **quantity and quality** issues. The main issues of concern are conservation of existing water resources and prevention from further depletion and degradation. Associated issues are rejuvenation of degraded traditional surface water bodies, enhancing the availability through various water harvesting measures, and recharge of ground water resources, all of which are relevant in both rural and urban areas.



River Basins of Karnataka

Seven river systems (basins) comprising of east flowing and west flowing rivers drain the State (grouped under five river basins of Karnataka). Krishna, Cauvery, Godavari, North Pennar, South Pennar and Palar are the east flowing rivers. All these east flowing rivers are inter state rivers. West flowing rivers include a number of small and major (such as Kali, Netravati, Aghanasini, Sharavati) rivers.

In this Issue...

STATE OF THE ENVIRONMENT REPORT AND ACTION PLAN

The Department of Forests, Ecology & Environment, Government of Karnataka has started preparation of State of the Environment Report and Action Plan with assistance from the World Bank. The main objectives of the report are as follows:

- 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.

The following sectors are being studied for the state of environment report.

	Organisations	Environmental sectors
1	The Energy & Resources Institute	Air Quality and Indoor Air Pollution
		Industrial Pollution
		Mining & Quarrying
2	Centre for Earth Science Studies(CESS)	Coastal Zone Management
3	Indian Institute of Management(IIM-B)	Transport and Environment
		Urban Planning and Environment
4	Centre for Multidisciplinary Development Research (CMDR)	Water Resources
		Rural and Urban Water Supply and Sanitation
		Economic instruments
5	Centre for Ecological Studies, IISc	Bio Diversity
6	Dr. Kodira A.Kushalappa, IFS (Retd)	Land and Forest Degradation
7	Karnataka Cleaner Production Centre	Solid, Hazardous and Biomedical Wastes Management.
8	Dr. H. Paramesh	Environment and Health
9	Prof. D.K. Subramanian	Energy

Stakeholders' workshops have been conducted in Mangalore and Bellary which was attended by officers from concerned Government departments, academicians, NGOs and elected representatives.

The report is now in the final draft stage and is expected to be published during the month of June

GROUND WATER

The water occurring below the saturated zone in the subsurface (beneath the ground) is generally defined as groundwater. Groundwater occurs in permeable geologic formations known as 'Aquifers', i.e., formations having open spaces either cracks, fractures or intergranular spaces, which permit appreciable amount of water to move through them under ordinary field conditions.

Groundwater development status is normally determined by the extent of Dynamic Resources. Dynamic Resource is a variable and replenishable part of groundwater resource added yearly to groundwater system, which can be obtained without disturbing the sub surface storage of groundwater. It is the upper limit of safe yield / exploitation. Groundwater exploitation in excess to dynamic resource will induce irreversible damages to groundwater system unless attempts are made to augment recharge / replenishment to compensate the excess draft. The dynamic resource is estimated taking in to consideration of

1 Recharge through rainfall,
2 Leakage / seepage through surface water bodies and
3 Percolation of the irrigation water.

The Department of Mines & Geology, Government of Karnataka has classified the state into Safe, Semi-Critical, Critical and Overdeveloped blocks based on the groundwater resource and its status of development (normal annual recharge and the withdrawal for irrigation). Out of the categorised 380 watersheds, 324 are in safe block while 56 are classified as overdeveloped. Considerable portion of the state has already crossed the safe limit of groundwater exploitation.

CLASSIFICATION OF GROUNDWATER BLOCKS

Safe Block: Available groundwater is less than 70% and also between 70% to 90% where there is no long term significant decline of groundwater trend in both pre monsoon and post monsoon periods.

Semi-Critical: Available groundwater is between 70% to 90% and where either post monsoon or pre monsoon significant decline in long term groundwater trend is observed.

Critical: The percentage of utilisation of available groundwater resource is between 90% and 100% and either premonsoon or post monsoon groundwater trend shows significant decline.

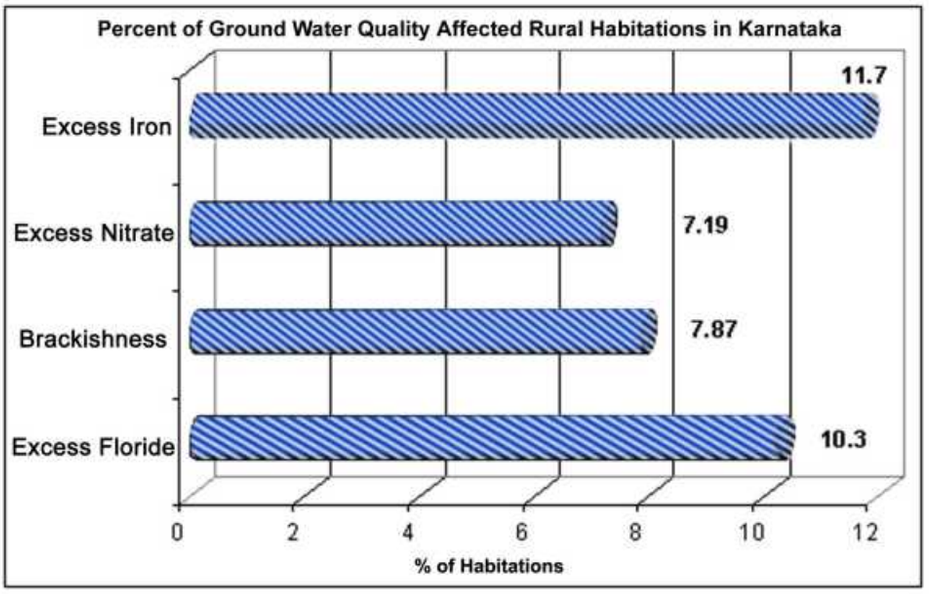
Overdeveloped: The percentage of utilisation of available groundwater resource is more than 100% and both pre monsoon and post monsoon groundwater trend shows significant decline.

Status of Water Quality by Habitations in Karnataka State – 2002

Sl. No.	District	No. of habitations affected by								Total No. of habitations affected	% of Affected habitations	Total No. of Habitations
		Excess fluoride	Percent	Brackish ness	Percent	Excess Nitrate	Percent	Excess Iron	Percent			
1	BAGALKOTE	135	21.29	158	24.92	33	5.21	88	13.88	414	65.3	624
2	BANGALORE (U)	262	20.39	224	17.43	0	0	318	24.75	804	62.57	1285
3	BANGALORE (R)	406	11.96	148	4.36	411	12.1	189	5.57	1154	34	3394
4	BELGAUM	134	8.9	159	10.56	1	0.07	419	27.82	713	47.34	1506
5	BELLARY	489	41.87	91	7.79	38	3.25	26	2.23	644	55.14	1168
6	BIDAR	37	4.56	56	6.9	123	15.2	1	0.12	217	26.72	812
7	BIJAPUR	200	21.55	241	25.97	19	2.05	113	12.18	573	61.75	928
8	C.R.NAGAR	34	4.1	27	3.25	425	51.2	173	20.84	659	79.4	830
9	CHIKKMAGALORE	51	1.52	77	2.29	136	4.04	524	15.57	788	23.41	3366
10	CHITRADURGA	519	37.91	345	25.2	126	9.2	87	6.36	1077	78.67	1369
11	D.KANNADA	2	0.06	4	0.13	0	0	294	9.37	300	9.56	3137
12	DAVANGERE	358	33.03	156	14.39	288	26.57	1	0.09	803	74.08	1084
13	DHARWAD	49	9.92	115	23.28	1	0.2	74	14.98	239	48.38	494
14	GADAG	127	36.29	42	12	0	0	0	0	169	48.29	350
15	GULBARGA	443	19.29	59	2.57	3	0.13	148	6.45	653	28.44	2296
16	HASSAN	159	4.08	181	4.64	39	1	323	8.28	702	18	3900
17	HAVERI	77	12.22	113	17.94	130	20.63	198	31.43	518	82.22	630
18	KODAGU	3	0.52	0	0	6	1.05	306	53.4	315	54.97	573
19	KOLAR	509	13.6	319	8.52	1005	26.86	109	2.91	1942	51.9	3742
20	KOPPAL	477	67.28	50	7.05	0	0	4	0.56	531	74.89	709
21	MANDYA	158	8.44	518	27.66	51	2.72	684	36.52	1411	75.33	1873
22	MYSORE	105	5.43	434	22.44	121	6.26	288	14.89	948	49.02	1934
23	RAICHUR	322	26.42	195	16	129	10.58	51	4.18	697	57.18	1219
24	SHIMOGA	89	2.01	87	1.97	2	0.05	362	8.18	540	12.21	4424
25	TUMKUR	658	12	585	10.67	976	17.8	1490	27.17	3709	67.63	5484
26	UDUPI	11	0.2	2	0.04	1	0.02	218	3.87	232	4.11	5640
27	UTTAR KANNADA	24	0.62	74	1.9	13	0.33	145	3.72	256	6.56	3901
	TOTAL	**5838**	**10.3**	**4460**	**7.87**	**4077**	**7.19**	**6633**	**11.7**	**21008**	**37.06**	**56682**

Note: Percent is to Total Number of Habitations
Source: Rural Development and Engineering Department

In Karnataka, ground water in more than 37 per cent of rural habitations and surface water in some rivers are contaminated at the points of effluent discharge and also around urban areas. Habitations in Bagalkot, Bangalore Urban, Bijapur, Chamarajnagar, Chitradurga, Haveri, Mandya, Tumkur, Bellary, Davanagere, Kodagu, Kolar, Raichur and Koppal districts have serious ground water quality problems, ranging from 50 to 79 percent. More specifically, excess Fluoride in ground water is a major problem in 14 districts, ranging from 10 to 67 per cent of the total habitations of each district. Similarly, excess Brackishness in 13 districts (in the range of 10 to 27 % of the habitations), excess Nitrate in 8 districts (10 to 51% of habitations) and excess Iron in 12 districts (10 to 63 % of habitations) is adversely affecting drinking water quality.



Depleting ground water resources

Ground water survey reports of 1999 reveal that there is depletion of ground water resources in 56 watersheds in the State, which are spread over 35 taluks in 10 districts, covering 5692 villages.

Based on the study of historical data, ground water levels are reported to be declining in all parts of the State, except in some command areas. In view of the expected rise in demand for surface water for drinking purposes in urban areas and continuing dependence on ground water for rural drinking water supply, the shortage of ground water resources are likely to be felt increasingly during the coming years particularly in some critical areas of the State. With decline in surface water availability for agriculture due to rising domestic demand, ground water extraction for irrigation may increase in near future. In the absence of any regulatory mechanism, there would be greater pressure on existing ground aquifer. Of the total 1895 wells under observation by the Dept of Mines & Geology, water level showed an increase in 418 (22%) wells while, decline was observed in 1109(56%) wells(Mines & Geology,2002). Uneven and scanty rainfall and the geo-structure have restricted the availability of underground water resources in the State.

Water tanks/lakes are the oldest of the natural rain water harvesting structures.Tanks have lost water holding capacity to an extent of 30 per cent due to siltation. Tanks help in maintaining soil moisture and facilitate recharge of ground water.

LAKES OF BANGALORE

As approaches to environmental conservation and to economic development have evolved in recent decades, the wisdom and value of aiming for development that is sustainable ecologically, socially, and economically has been embraced around the world. The sensitivity of lakes and surrounding lands to unsustainable uses has led lake communities to adopt sustainable approaches to development that can illustrate how sustainable development can be carried out in practice.

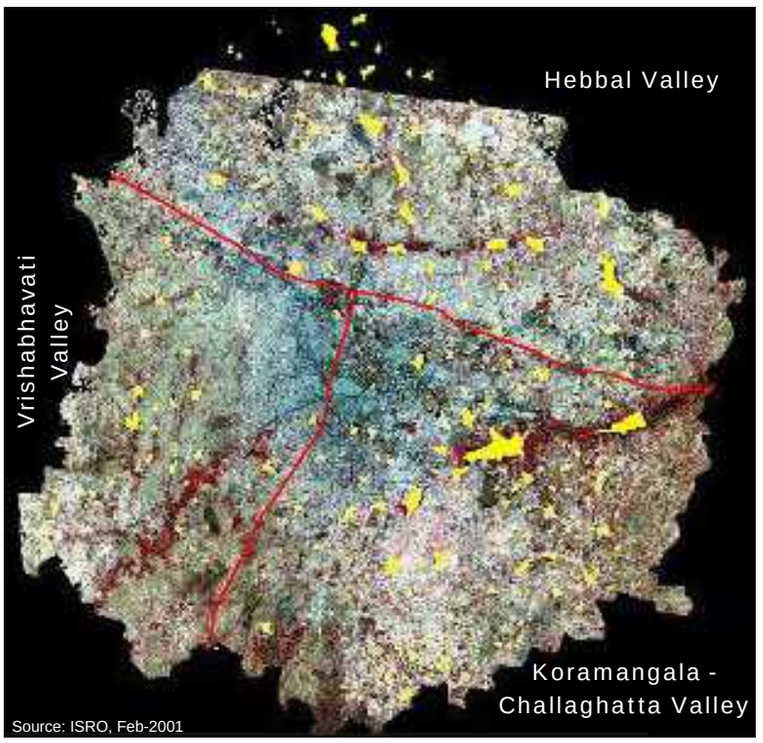
The city of Bangalore does not have any perennial river. It is dependent on the River of Cauvery, about 140 km away for water. The naturally undulating terrain of Bangalore city, with its hills and valleys, lends itself perfectly to the development of lakes that can capture and store rainwater.

The lakes in Bangalore form a chain of hydrological connection through them. The flow of water runs from North to South-east as well as South-west along the natural gradient of the land. During monsoons, the surplus water from the upstream lake flows down into the next lake in the chain and from there further down. The lakes thus form a chain of reservoirs in each of the three valley systems. Each valley at the ridge top gives birth to small streams. These cascades down to form major stream systems in three valleys.

1. Hebbal Valley
2. Koramangala Challaghatta Valley
3. Vrishabhavati Valley

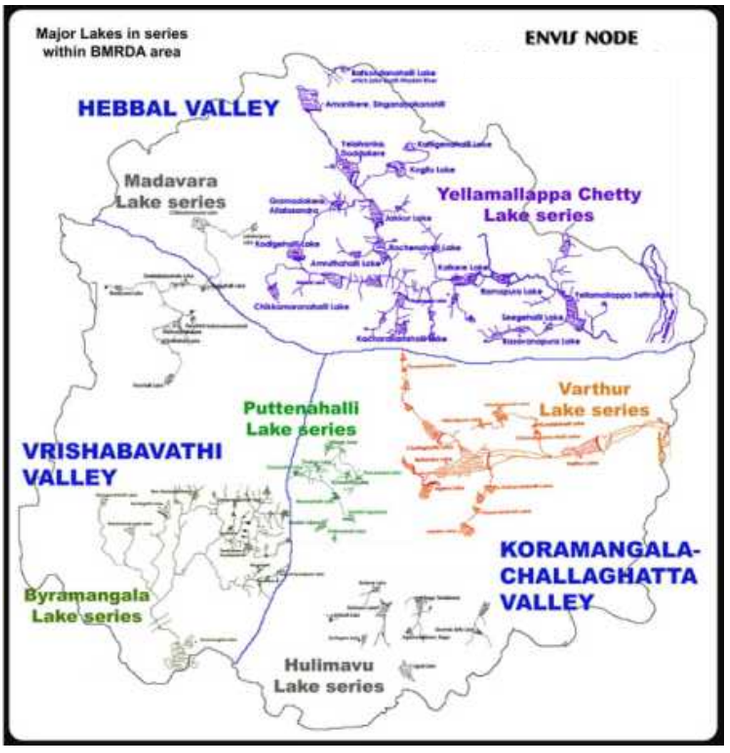
These three vallies are the repository of all the lakes in Bangalore and these lakes themselves are interlinked to each other through a series of chains of lakes giving a cascading effect to the whole system.

The area of Bangalore is part of semi-arid tropics, the founders of the city wisely used streams between ridges and valleys And created man-made lakes by damming the streams at appropriate places.



Aerial view of restored Hebbal Lake

The restored Vidyaranyapura Lake



LAKE Series OF BANGALORE

In the three valleys mentioned above, the lakes are identified in six cascades namely

1. Madavara and Yellamallappa Chetty lake series in Hebbal Valley
2. Puttenahalli and Byramangala Lake series in the Vrishabavathi valley
3. Varthur & Hulimavu lake series in the Koramangala Challaghatta Valley

In the wake of high growth of the city many lakes and tanks were denuded and converted into buildings and housing layouts. The marginal lands adjoining natural valleys, which were open spaces decades ago where the trunk sewers were laid were encroached by buildings and sewage and sullage are let out into the storm water drains constructed in these valleys. Number of slums constructed on either side of valleys discharge wastewaters into the open drains. The damaged trunk sewers and direct discharge of sewage and sullage from the slums and buildings abutting the storm water drains in all the four valleys namely Hebbal Valley, Vrishabhavathi Valley, Koramangala valley and Challaghatta valley had resulted in discharge of sewage into the lakes in the downstream side.

TACKLING THE PROBLEM

The Government took initiative to tackle the problem and set up an expert committee headed by N. Lakshmana Rau in 1985 to suggest ways to preserve and restore the pristine glory of the near extinct lakes of Bangalore. The committee recommended many steps and also suggested that the Forest Department, BDA, City Corporation, and BWSSB be given an active role in restoring the lakes.

Modern ideas of rainwater harvesting in buildings and parks, applied to residential extensions, may also help a great deal in improving the fresh water inflow into the dried up tanks and natural reservoirs.

The Government of Karnataka has set up **'Lake Development Authority'** for the integrated development of lakes. This authority is the first of its kind in the country. The Lake Development Authority will be responsible for:

- Restoring lakes and facilitating restoration of depleting ground water table
- EIA Studies
- Take remedial measures to restore & revitalize dying lakes & co-ordinate efforts of various organizations
- Conserve lakes, facilitate restoration of depleting ground water table, improve local environs
- Protection, Conservation, Reclamation, Restoration, Regeneration & Integrated Development of Lakes
- Environmental planning & GIS mapping of lakes and surrounding areas
- Monitoring & management of water quality and lake ecology
- Utilising the lakes for the purpose of education and tourism

Supporting Programmes

The Government of Karnataka with support from the Royal Norwegian Government has taken innovative efforts in lakes restoration. Three lakes of Bangalore Hebbal lake, Madivala and Doddabommasandra lakes are taken up for restoration under Indo Norwegian Environment Programme of which the restoration of Hebbal and Madivala is complete.

Further Department has obtained approvals of Ministry of Environment and Forest, Government of India, to take up the conservation of Vengaiahanakere, Mogekere, Jaraganahalli, Nagavara and Bellandur Lakes in Bangalore , Kotekere tank in Belgaum under National Lake Conservation Plan at a total cost of Rs. 2350.57 lakhs.

Environmental Action Plan for Bangalore City

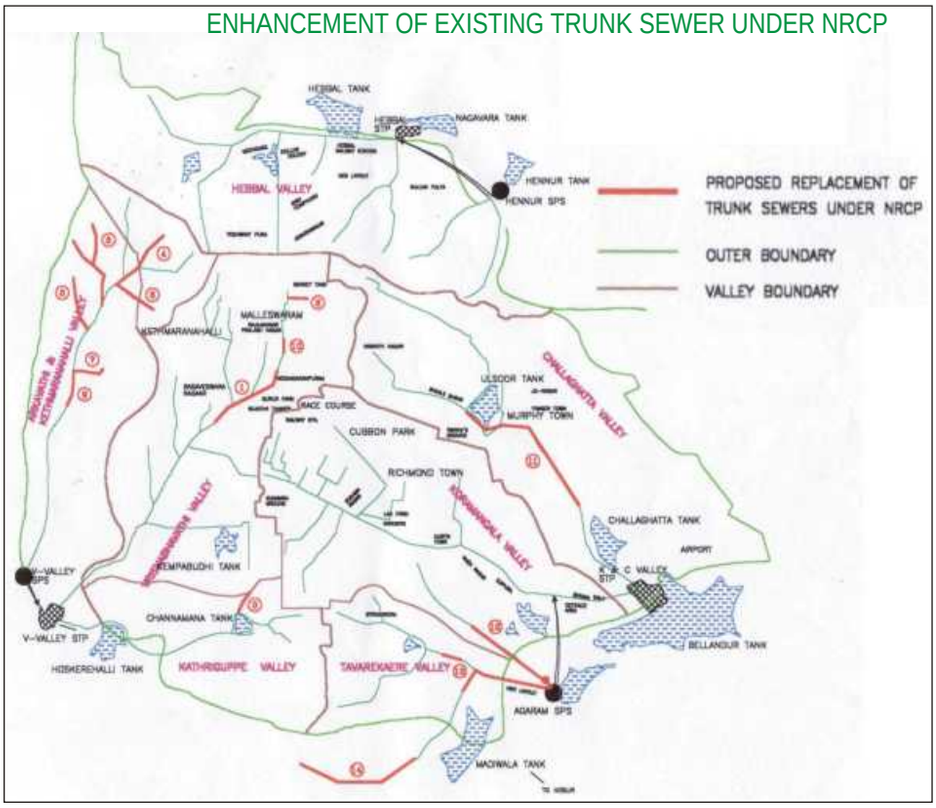
"Environmental Action Plan", a scheme for rehabilitation of existing sewerage system of Bangalore by BWSSB, estimated at Rs. 46.27 Crores has been approved and funded by NRCD under National River Conservation Programme(NRCP). The scheme consists of 14 major works identified for rehabilitation of existing sewers in the three major valleys viz., Koramangala, Challaghatta and Vrishabhavathi valley. The works costing Rs. 34.58 Crores related to Koramangala and Challaghatta valleys and the works costing Rs. 22.02 Crores related to Vrishabhavathi Valley have been already awarded. The works have been started and is scheduled to be completed by August 2004.

The ultimate objective of the scheme is collecting and conveying all the untreated sewage to the respective treatment plants for treatment to the required standards and discahrge to natural bodies thereby preventing the pollution of rivers and lakes.

Improved sewerage system results in a more pleasant surroundings through a reduction in odour and improvement in aesthetics of the city. One of the major benefit will be the reduction in risks associated with exposure to untreated sewage.

The indirect benefits of the project include the improvement in river water quality, lake water quality, ground water quality and increased self-purification capacity of water bodies. The water quality in rivers and lakes Inturn improves the aquatic life, native flora fauna, which inturn help to maintain the cycle. This will also

minimize the mosquito nuisance and the risk of communicable disease spread through animals coming in contact with the untreated sewage.



Pollution of lakes by discharge of sewage leading to contamination of ground water.

When sewage is discharged into a lake having clear water, the water becomes turbid, sunlight is shut out of the depths and there will be a decline in the dissolved oxygen present in the water due to the putrisible organic matter present in the sewage. In a highly polluted lake, the dissolved oxygen may become at times, totally extinct, resulting in fish kills. Depending on the availability of dissolved oxygen, only certain species of algae and fish having high tolerance may survive in the polluted waters. Continuous discharge of sewage into a lake, brings into the lake lot of organic solids mixed with sediments, part of which will settle down in the bottom of the lake.

Anaerobic decomposition sets in giving rise to release of malodorous gases. In a lake free from pollution, the dissolved oxygen may be as high as the saturation limit at the ambient water temperature. When oxygen is reduced to less than ½ ppm (parts per million) at the lake bottom, several chemical reactions occur within the sediments, resulting in the release from the organic sediments will also contribute to the algal and aquatodour problems and induce pipe line incrustation and biomass growth, for those who draw water at lower elevations from the lake water recharging into the ground water. The ammonia present in the ionized form in the polluted lake waters may get partially oxidized into nitrites and nitrates adding to the nitrate content in the ground water. Nitrates in excess of 45 mg per litre when ingested by infants are found to cause blue baby syndrome (Methamoglobinamia).

Thus, the polluted lakes contribute to changes in physical, chemical and bacterial quality of the ground water. The associated health risks are many - water borne diseases, breeding of mosquitoes leading to Malaria fever, Dengue fever, and etc.