QUALITY OF LIFE AND OUR NATIONAL WATER WEALTH

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1. Introduction

The last century of the bygone millennium, especially its later half, has seen unbelievable scientific and technological developments in improving the quality of life of mankind. The innovations in the field of electronic media in particular have done wonders to make our life run faster than ever before. The world has become too small with the growth of the information technology. What was difficult to achieve even a decade ago has now become easily accessible. With the blessings of the modern technology informatics the living has become not-so-hard as it was before. Consumerism induced by the mass media has changed the style of living at all walks of life. People are looking for the state-of-the-art equipment and accessories, which are available in urban centres, to have comfort in day-to day life. As a consequence, there is a tremendous stress in urban infrastructure services, be it housing, water supply, waste management, transportation, power generation, telecommunication or any other system. The more the stress, the more is the failure rate in the provision of these services, The ill effects of such fall-outs then boomerang on the management of the services adversely affecting the various components of environment out of the 'uncared for' residues which reach the natural water bodies through direct and indirect routes polluting them.

2. Water Resources of India

The annual rainfall over India, based on the daily data from more than 3,000 rainfall recording stations for a period of 50 years (1901-1950), is computed as 105 centimetres. It is the largest anywhere in the world for a country of a comparable size. From precipitation alone, India receives 4,000 km^3, including snowfall. Of this, 75 percent

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occurs only during three monsoon months. A good part of it is lost through the process of evaporation and plant transpiration, leaving only half of it on the land for use. After allowing for evapo-transpiration losses, the country's surface flow is estimated as 1,880 km^3. Due to topographical, hydrological and other constraints, it is assessed that only about 700 km^3 of surface water can be put to beneficial use by conventional methods of development. The annual replenishable groundwater resource is assessed to be about 600 km^3, of which the annual usable resource is estimated at 420 km^3. The distribution of water resources in various compartments is shown in Table 1.

Table 1 Estimated distribution of fresh water resources of India

Compartment	Quantity (km^3)
Total precipitation	4,000
• Immediate evaporation	700
• Percolation in soil	2,150
- Soil moisture	1,650
- Groundwater	500
Surface water	1,150

Our country is rich in water wealth in terms of rivers. There are fourteen major river basins in the country, which occupy 83 percent of total drainage basins, contribute 85 percent of the total surface flow and house eighty percent of the country's population. They are Brahmaputra, Ganga, Indus, Godavari, Krishna, Mahanadi, Narmada, Cauvery, Brahmani, Tapi, Mahi, Subarnarekha, Pennar and Sabarmati rivers. Besides, there are 44 medium rivers and 55 minor rivers. There are also several non-basin coastal rivers, the lengths of which are small, besides a few rivers, which originate and get lost in the deserts after traversing some distance. These rivers have been grouped into three

categories based on drainage basin area as shown in Table 2. However, most of these rivers are seasonal and do not carry any water during almost nine non-monsoon months.

Slide 1 **Table 2 River basins of India**

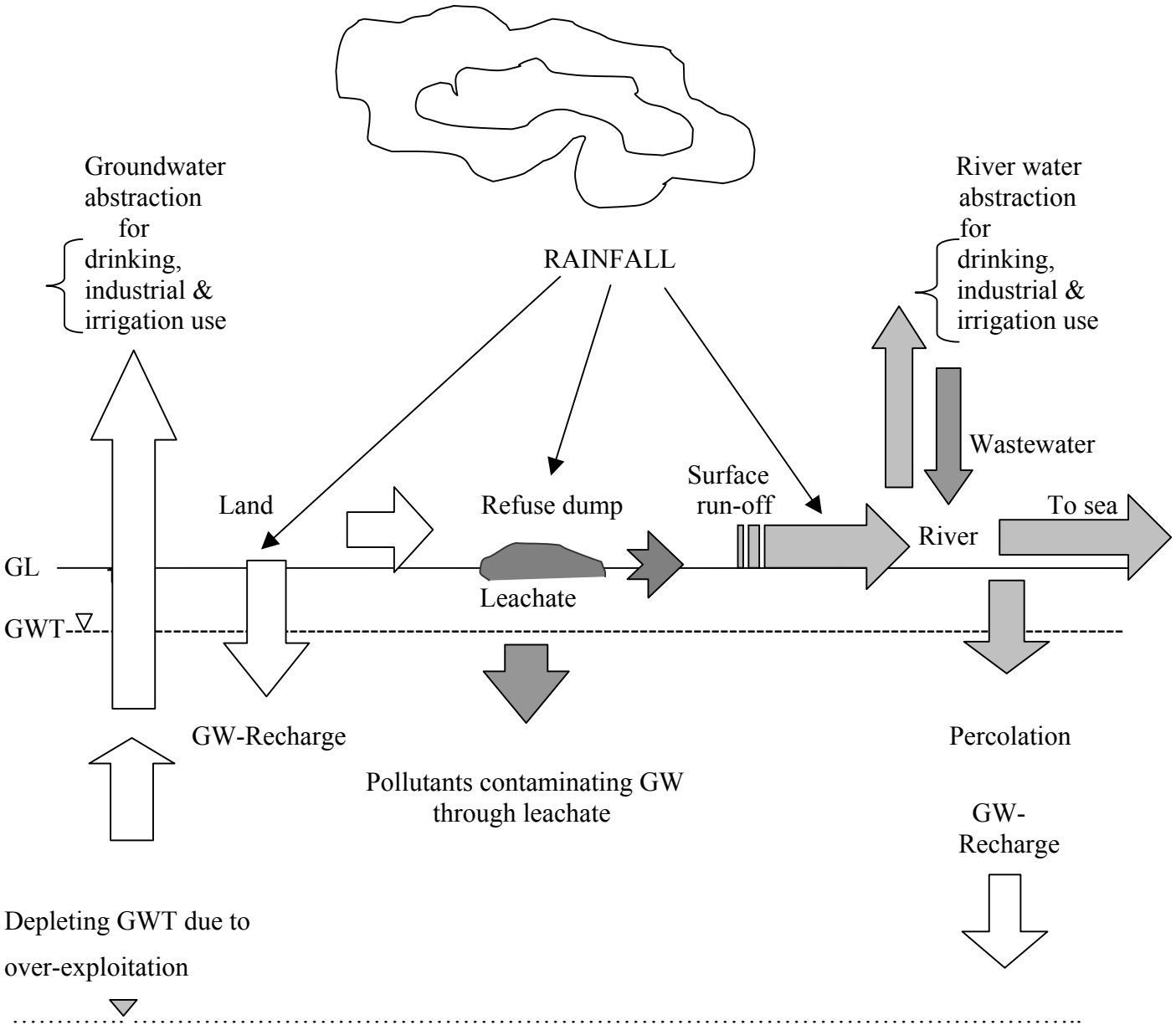
Category	Basin Area (km^2)	Number of Basins	Percentage of Total Drainage Area	Percentage of Flow Contribution	Percentage of Population living in the Basin
Major	More than 20,000	14	83	85	80
Medium	Between 2,000 and 20,000	44	8	7	20
Minor	Less than 2,000	55	9	8	

On the contrary, precipitation during monsoon months are too heavy to be stored because of lack of storage facilities. As a result, we bank too much upon groundwater reserves to tide over dry season for all developmental activities besides agriculture. Because of over-exploitation of groundwater, there is a negative water balance between groundwater withdrawal and recharging of aquifer and the water table is depleting every year due to over exploitation in most part of the country as depicted schematically in Fig. 1.

To make the situation worse, the wastewaters generated out of domestic and industrial usages are being discharged into natural water bodies with partial/no treatment causing concern for availability of potable water. Polluted river water not only contaminates groundwater by leaching, it also contaminates soil if used for irrigation. Thus the country is faced with the twin problems arising out of the quest for a better quality of life and the backlashes of development by not caring for its residues before indiscriminate disposal.

3. Growth of Urbanisation and its Impact

The economic growth in the country being city-centric, the country is faced with the



Abbreviation : GL - Ground level
GW - Groundwater
GWT - Groundwater Table

FIG. 1 SCHEMATIC DIAGRAM SHOWING CONTAMINATION OF WATER RESOURCES

problem of unbridled growth of population in urban centres, specially in the metro cities for employment opportunities and better living conditions. The urban scenario in terms of population, water requirement and wastewater generation & treatment, which can be indirectly correlated with the sanitation status of the inhabitants and also the health of the natural water bodies, is presented in Table 3. The contents of the Table provide several interesting revelations as discussed in the following paragraphs.

4.1 Population increase

The decadal growth of population in Class I cities during 1978-79 and1989-90 was 49.3 percent whereas the five yearly increase during 1989-90 and 1994-95 had reached 41 percent and overall growth in 15 years is 111 percent. The trend shows more exodus from other categories of cities and towns to floc around Class I cities began in early nineties and the decadal growth in the penultimate ten years of the past millennium would far exceed the growth rate in the eighties.

4.2 Water supply source

Dependence on surface water (river) source increased from 61 percent in 1978-79 to 73.3 percent in 1989-90, while it declined in the subsequent five years to 39.6 percent. This may be attributed to increased requirement / demand beyond the discharge carrying capacity of rivers, uncertainty of water availability in rivers due to fluctuating monsoon period or degradation of the quality of river water rendering cost of treatment to drinking water standards unaffordable to municipal bodies. However, it is interesting to note that dependence on conjunctive use of surface water and groundwater has increased from 3.5 to 52.7 percent for more steady water supply without over-stressing either source. It is definitely a more considerate approach.

4.3 Water consumption

Water consumption per capita per day was almost steady at around 145 litres, about 10 litres more than the national standard of 135 litres, during 1978-79 to 1989-90. Thereafter

there is a sudden increase to 182 litres indicating probably change in life style requiring more water to cater for the daily needs.

Table 3 Water supply and sanitation status of Class I cities in India

S. No.	Parameters	Status		
		1978-79	**1989-90**	**1994-95**
1	No. of Class I cities	142	212	299
2	Estimated population	6,02,57,025	10,23,48,951	12,81,13,865
3	Distribution of Class I cities according to catchment area: *a.* Major river basins *b.* Non-basin, coastal *c.* Non-basin, non-coastal	 112 17 13	 170 23 19	 233 29 37
4	Population distribution of Class I cities according to catchment area: *a.* Major river basins *b.* Non-basin, coastal *c.* Non-basin, non-coastal	 42725526 (71%) 12808602 (21.3) 4660299 (7.7)	 74482328 (80.19%) 20613176 (10.85%) 7853447 (8.96%)	 97403783 (76%) 23275720 (!8%) 7434362 (6%)
5	Water supply, mld *a.* Ground *b.* Surface *c.* Combined ground and surface source	8638.48 784.28 (9%) 5261.71 (61%) 2582.49 (30%)	15191.88 3527.77 (23.2%) 11132.75 (73.3%) 531.36 (3.5%)	20545.24 1542.22 (7.5%) 8135.88 (39.6%) 10867.14 (52.9%)
6	Per capita water supply, lpcd	143	147	182
7	Wastewater generated, mld	7006.74	12145.49	15772.50
8	Wastewater collected, mld	4306.67 (59%)	2633.02 (22%)	11693.10 (74%)
9	Wastewater treated, mld	2755.94 (39%)	2485.42 (20.5%)	3740.20 (24%)
10	Wastewater untreated &disposed, mld	4250.80 (61%)	9660.07 (79.5%)	12032.30 (76%)

Source : Central Pollution Control Board

4.4 Wastewater collection

There was slump in collection of municipal wastewaster from 59 percent in 1978-79 to 22 percent which may be due to inability of the local bodies to address to the need of unpredictable population growth, development of slum areas and / or the financial crunch of these agencies. However, in the subsequent five years there is marked improvement to 74 percent indicating increasing awareness to sanitation and public pressures on municipal organisations for better upkeep of the society and increased fund allocation.

4.5 Wastewater treatment and disposal

In spite of the United Nations' declaration of 1981-91 as the 'Water & Sanitation Decade', wastewater treatment appears to get a lesser priority. The percentage slipped from 39 in 1978-79 to 20.5 in 1989-90 and remained almost steady at 24. Thus the figures tell a dismal story that almost 80 percent of wastewater generated in the Class I cities is discharged into water bodies without any treatment.

4.6 Quality of our water resources

4.6.1 If one could listen to the moaning of our natural water bodies, emotional it could appear though, one would realise that they are by far neglected by our modern society. During non-monsoon months the rivers mostly are dry serving as conveyance system for untreated domestic and industrial wastewater devoid of capacity to dilute or assimilate the pollution load imposed upon for the benefit of mankind. River is no more the lifeline of Indian civilisation except to stink. The Brahmanda Purana written in the 8/11th century AD prohibited through the following couplet thirteen actions on the river front for the protection of river water quality of the Ganga:

xaxk iq.;tyka izkI; =;ksn'k footZ;sr~ A 'kkSpekpeua lsda
fuekZY;aPkeu?k"kZ.ke~A

xk=laokgua ØhM+ka izfrxzgeFkks jfre~A vU;rhFkZjfrapSo% vU;rhFkZ iz'kalue~A

oL=R;kxeFkk?kkra laUrkjap fo'ks"kr% AA

"Thirteen actions must be prohibited on arrival at the sacred waters of the Ganga, namely: (1) defecation, (2) ablution, (3) discharge of water, (4) throwing of used floral offerings, (5) rubbing of filth, (6) body shampooing, (7) frolicking, (8) acceptance of donations, (9) obscenity, (10) offering of inappropriate praises or even hymns in an incorrect way, (11) discarding of garments, (12) beating, and (13) swimming across, in particular." -- Brahmandapurana

However, the message did not perpetuate through generations resulting in mass abuse of water bodies.

4.6.2 The Central Pollution Control Board through their modest network of about 500 water quality monitoring stations on main rivers and major tributaries have identified 39 polluted river stretches requiring action programmes for upgradation of water quality. The picture will be far more alarming if one considers the minor surface water drainage channels which have virtually turned into open sewers as recipient of untreated domestic and industrial wastes.

4.6.3 Groundwater is also not spared from the onslaught. More and more reports of groundwater pollution are pouring in, which are the results of indiscriminate disposal of municipal solid waste and industrial hazardous wastes on land without any treatment to cause leaching of contaminants to groundwater reserves. Reports of pumping industrial wastewater into ground to get rid of the waste are also coming to light. Pollution of groundwater, which is difficult to treat, is becoming a non-news item as it is prevalent in several industrial estates in the country,

5. Quality of Life

Defining quality of life is the business of the Social Scientists as it involves several socio-economic aspects of life. However, in broader terms, the apparent indices in commoners' language to describe the quality of living look for (1) availability of good infrastructure facilities in terms of housing, transportation, communication, electric power, water supply, sanitation, educational institution for children, commercial centres, place for

recreation and worship, health care etc., (2) employment opportunity, (3) capacity to procure daily needs without hardship, (4) healthy family relationship and (5) level of satisfaction. Urban centres do provide the afore-said opportunities to certain limit of satisfaction for which there is rapid migration of populace from non-urban areas. However, the development of the urban centres to the required expectation of the society is subject to availability of financial resources and prioritisation of needs in case of stringency. In a society having multi-faceted problems with resource crunch to pay attention to all the needs with equal interest, it is difficult to allocate higher priorities to avoidables (!), like waste treatment, river health care. In the 20-Point programme of the National Government, the standing of 'Environment' thus could figure at the seventeenth spot to provide room for other over-riding priorities.

6. Concluding Remarks

6.1 As a developed nation among the developing ones, India could make long strides in technological and scientific advancements to improve the quality of life and living, but the national water resources are dwindling for lack of resources and will to store surface water during monsoon months to tide over the long dry spell of almost nine months including the summer, and their quality deteriorating due to 'uncared for' abuses which may assume to be a potential threat to the society in the long run.

6.2 There is a need for reviewing of the National Water Policy for development/ harnessing of surface water resources to meet the increasing water demand and control of over-exploitation of groundwater and concomitant drastic lowering of groundwater table due to negative water balance in terms of withdrawal and recharging on annual basis. The Policy *inter alia* needs to integrate:

- River flow regulation for minimum discharge to be maintained;
- Imposition of discipline in water abstraction from and discharge of treated sewage/ trade effluent into river to effect water conservation;
- Waste load allocation to utilise self-assimilation capacity of the rivers instead of aiming at treatment of waste to pristine quality;

- Maximisation of recycling/reuse of treated sewage/trade effluent for irrigation in the growth of agriculture;

- Proper collection, conveyance, treatment and disposal of municipal sewage and solid wastes to nature in a sanitary manner so as not to defile the quality of the water resources;

- Water harvesting; and

- Pricing of potable water supplied and also for treatment of wastewater, for development of the facilities and sustainability of the services.

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