

WATER QUALITY MANAGEMENT IN INDIA – CONCERNS AND STRATEGIES

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SYNOPSIS

India has to support 1/6th of the world's population, with only 1/25th of the world's water sources with meager 1/50th of global land area. Deteriorating quality of surface and ground water is affecting the net availability of water for consumptive uses. Water pollution is a major environmental concern in India. Deteriorating water quality has become a serious problem. Safe water supply and environmental sanitation are vital for protecting the environment, improving health and alleviating poverty. Water of poor quality leads to ill health, whereas water in insufficient quantity claims large chunks of time spent in augmenting the supply; otherwise, the significant time could be spent on more remunerative tasks. Availability of water is bound to improve sanitation, safe hygiene practices and better health standards to make India a safer place for all its citizens. The need of accelerated water storage development, water conservation through reuse, wastewater recycling, aquifer recharging and effective rainwater harvesting as well as role of community; especially women and professional societies are dealt in the Article; while focusing on the concerns and management of water quality related aspects in India.

INTRODUCTION

Stress on water resources is from multiple sources and the impacts can take diverse forms. The growth of urban megalopolises, increased industrial activity and dependence of the agricultural sector on chemicals and fertilizers has led to the over loading of the carrying capacity of our water bodies to assimilate and decompose wastes. Owing to the indiscriminate discharge of untreated sewage and industrial effluents into natural water bodies, the quality of surface water as well as ground water is deteriorating. To meet the increase in water requirements in the country in the next 25 years, it would be necessary to ensure substantial augmentation of water supplies; requiring the sufficient raising of water storage capacities, thus necessitating the completion of new large water storage projects. According to the World Bank estimates, annual costs of urban and rural health impacts due to water pollution varies between US\$ 83.44 billions and 30.76 billions out of the total annual costs of environmental degradation varying between US\$ 137.58 billions and 56.72 billions. Thus, water pollution accounts for about 60% of major annual environmental costs in India.

WASTEWATER GENERATION

Discharge of untreated domestic waste water is predominant source of pollution of aquatic resources in India. Urban centers contribute more than 25% of the sewage generation in the country. The smaller towns and rural areas do not contribute significant amounts of sewage due to low per capita water supply. The waste water generated in these areas normally percolates in the soil or evaporates. Owing to the indiscriminate discharge of untreated sewage and industrial effluents into natural water bodies, the quality of surface water as well as ground water is deteriorating. A result of this is that the principal drinking water supply sources of cities and towns are becoming polluted of which is increasing considerably the cost of water treatment.

Major water polluting industries are leather, sugar, distilleries, paper and pulp, chemicals, iron and steel, and metal plating. A large part of industrial water pollution is caused by small-scale units. The integration of proper water supply, recycling and reuse of water, roof water harvesting and adequate sanitation facilities in all cities and bigger towns is absolutely vital for revival and maintaining the integrity and purity of rivers eco-system. In the 8th five-year plan 24 highly polluted stretches in rivers of 16 states were identified and Ganga Action Plan Phase I & II were launched which were later on integrated into National River Conservation Plan. The focus of the River Action Plans has been on sewage with very little success with regard to other two forms of water pollution viz., industrial pollution and agricultural run off.

SURFACE WATER POLLUTION

About 75% of domestic water supplies from urban areas come back as return flow, deteriorated in quality due to organic, chemical and bacterial pollution. Even though, drains and rivers have been functioning as waste disposal channels from time immemorial; but the pollution load in earlier times was within the self-purification capacity of these streams. Due to the bulk of discharge of effluents with very heavy doses of impurities of the modern day world which are mostly untreated, the pollution load is now manifold and beyond the self-purification capacity of the rivers.

The water quality analysis during 1986 to 1997 shows that water quality has deteriorated over the years. The mean BOD values have gone up marginally in all the 28 major rivers between 1979 and 1991 with substantial increase in coliform bacteria in the river waters. Analysis of water quality data for 1997 reveals that Gujarat tops in chemical pollution, followed by Maharashtra, Andhra Pradesh, Tamilnadu, Uttar Pradesh and Punjab. The worst affected states in terms of presence of coliform bacteria in water, are Uttar Pradesh, Gujrat, Tamilnadu and Assam. In terms of BOD values Kerala is at the bottom and Maharashtra at the top (most polluted).

Given the scope for reducing industrial water requirements, the main challenge lies in devising instruments, which make it attractive for corporate sector to conserve and recycle water by adopting less water intensive processes and encourage material recovery. The direct regulation of the "Command and control Type" has not worked due to weaknesses in enforcement coupled with low level of penalty. Under regulation of this kind, perceived benefit from conservation must be more than the cost of compliance. The latter, in expected value terms, is the product of magnitude of penalty if non-compliance is detected and the probability of such an occurrence. Both are low.

GROUND WATER POLLUTION

Many users and communities are dependent on ground water, the flow and availability of which are inherently more stable than of surface water. Regulation and conservation of ground water present technical and administrative difficulties because precise delineation of aquifers is difficult and monitoring and control of extraction by large numbers of individually owned wells is not feasible. The capacity of the soil cover the retain impurities is not inexhaustible. Accordingly, depending upon the characteristics of the pollutants and application of water, the pollutants may migrate to the saturated zone along with recharge water, thereby affecting ground water quality.

HAZARDOUS WASTE

In arid and semiarid region where the rainfall being scanty, there is potential for usage of treated wastewater on land because on one hand there is economic gain from irrigation point of view and on the other it prevents the pollution due to discharge of undiluted wastewater in fresh water source. Notwithstanding the role of chemical products in improved health and

life expectancy, increased agricultural production, enhanced economic opportunities and the quality of life in general, the products and residues of the chemical industry pose unprecedented risks to human health and directly through contact or inhalation and indirectly through ingestion of contaminated water or food. Migration of chemicals through ground and surface increases contaminants in drinking water sources and in turn are potential risk to human health. Chemical contamination of vegetation and crops through contaminated irrigation water, application of sludges and deposition of air emissions results in tropic transfer of hazardous chemicals.

Hence the zones for siting of industries or disposal of hazardous waste are not readily available and as such while allowing hazardous industries in semi arid and arid areas and insisting on Zero effluent condition, industrial zoning be done in a manner that water intensive industries are not permitted. In arid and semi arid area emphasis should be to promote green category of industries failing which orange category of industries be permitted with provision of zero effluent condition. Setting of Red Category of industries be prohibited altogether. Hazardous waste treatment and disposal, therefore, need to be properly planned and sited to protect people and environment from any adverse impacts.

WASTE WATER TREATMENT

Care is necessary that treated wastewater does not contain toxic matter beyond a threshold. Otherwise, it may enter the food chain, both aquatic and terrestrial. Besides, wastewater can damage fertility of soil and quality of ground water if its constituents are not kept within the prescribed limit. For the most economic disposal of wastewater from various sources, recycling, re-use, renovation and regeneration (summed up by the term “4-R Concept”) must be practiced with utmost keenness. Recycling refers to repeating the same use; re-use is done by using effluent for other purposes; renovation refers to treatment to the (tertiary) level so that it is fit for use like fresh water, and regeneration refers to replenishment of a water source in a natural manner. Recycling and re-use has been demonstrated to be cost-effective in a large number of cases, with periods of return of investments ranging from a few months to less than five years.

RIVER ACTION PLANS

The first concerted action to tackle water pollution was the Ganga Action Plan (GAP-I). Launched in 1985 to cover interception, diversion and treatment of 873 mld (out of 1340mld) of sewage generated in 25 class I towns of UP, Bihar and West Bengal GAP-I (original cost Rs.250 Cr) had the following mix of schemes. This was a 100% Centrally Sponsored Scheme meaning that the entire funds were provided by central government but execution was done through the State Agencies and assets were to be owned and operated by the latter. In subsequent stages, Ph-II and other river action plans have been launched till these have now been merged under the National River Conservation Plan. Agricultural run off releases harmful pesticides, chemicals and fertilizers in the water bodies. The complexity of the problem has not even begun to be addressed. The problems of toxicity and bio-magnification take several years to appear in their recognizable manifestations is driven by immediate, short-term visible problems.

WATER CONSERVATION

Water Conservation has three broad connotations; maximum storage of rainwater, economical and optimal use including prevention of wastage/ leakage and multiple use – Reuse and Recycling. In hydrological sense, water conservation means, improving the dependability of the water by augmenting additional resources through storage of rain water in reservoirs, ponds lakes, shallow and deep ground water or in the soil moisture. It means

improving efficiency of available water including judicious use for different purposes, in water-supply sector, in irrigation sector or in industrial sector. It includes the conservation of water in both qualitative and quantitative assessment. It is roughly estimated that in urban water supply almost 30 to 40% of the water is wasted through the distribution system. In almost all the major urban centers of the country there is already acute problem of adequate water supply while the sources of augmentation are very few. Therefore, the need of preventing such wastages is all the more significant. In Industrial sector also, there is a scope of economy in use of water. Present conservation measures are not enough in the country. Sufficient scope exists for further savings in water through better strategies.

REUSE AND RECYCLING

In almost all major urban centres there is an acute problem of adequate water supply while the sources of augmentation are very few. In addition to the storm water harvesting, recycling is an important measure of conservation of the water resources. It is estimated that around 80% of water consumed by a household is let off to the drains of sewers as waste water. Management of the scarce resource would be incomplete without adequate measures in the reuse of this waste water after primary treatment for non potable purposes. There is substantial scope for segregated use of the water for appropriate use and recycling of the water for further use for gardening, industrial cooling, street cleaning, vehicular washing, fire fighting, irrigation, yard cleaning, fountains, recreational lakes etc. Though methods are available to improve the quality of recycled water to potable grade, the lack of social acceptance and prohibitive costs may prevent the adoption of these techniques.

PROTECTION OF NATURAL WATER RESOURCES

Land and soil degradation is a serious cause for concern, not simply for the loss of a natural asset and productive capacity that it represents, but also for the resulting impacts on water resources. Management practices to achieve sustainable land use are well established, although application to specific localities may require further investigation. The principal issues are political, social and economic in nature. Natural water resources are highly vulnerable to over exploitation and to contamination from human and industrial activities. It is very important to manage the precious water sources in a well-balanced manner, protect them from pollution and take decisive, rapid action to remedy the situation when contamination occurs. Groundwater is particularly vulnerable to point and non-point contamination. Remedial action are difficult, time coating and expensive. Either no or very little flow occurs in many streams during the lean season and disturbance in ecological balance of streams affect the self-purifications process of natural streams. Specific plan and research is necessary to save the critical ecosystem of river in low flow period, in the absence of storage projects in the head reaches. Deteriorating water quality has become a serious problem. Safe water supply and environmental sanitation are vital for protecting the environment, improving health and alleviating poverty. Based on water quality criteria, 13 heavily and 26 medium polluted rivers and 26 medium polluted rivers' stretches have been identified in the country. Water quality should be monitored regularly at every out-fall drain. State wise river basin conservation plan should be formulated for different basins. The pathogenic, toxic and biological and physico-chemical effects of various types of water pollution in different scenario and regions should be scientifically analysed, collated, understood and action plans be framed by involving CPCB, CWC, CGWA, SPCBs, Civic Agencies, IITs, Universities like Anna, Roorkee, Calcutta, Bikaner etc, IISc, Engineering Staff College of India.

LAKES MANAGEMENT

Lakes are the large fresh water storages and from the time immemorial serve the human beings in non-raining season for all its water demands. They constitute an important component of fresh water systems. But due to excessive withdrawal of water in command and disposal of high nutrient content and polluted water from the catchment, the very sustainability of lakes has become questionable. The National Lake Conservation Programme to arrest further degradation of lakes and to revive the water body to acceptable environmental standards so that water can be utilised for various purposes needs to be strengthened. Wetlands are natural filters but these are faced with the problems of dumping of municipal solid wastes, weed infestation, siltation, pollution and anthropogenic activities. Wetlands have to be regenerated by the reorientation of policy of “open access” to “common property resources”. Enlarged programs of Lake and Wetland conservation need to be initiated and streamlined.

BIO-CONSERVATION AND ECOLOGICAL RESTORATION OF RIVER SYSTEMS

The different groups of biota play a very important role in the ecology and metabolism of the river system. They help in self-purification of the rivers which, in turn, helps in pollution abatement and eco-restoration. Under the Ganga action Plan, special efforts have been made for in situ as well as ex situ conservation in the rehabilitation of certain endangered and indicator vertebrate fauna. This will not only help in restoration of flora and fauna of the river system, it will further contribute towards sustainable development of the aquatic wealth of rivers. Under the in situ bio-conservation programme, projects have been framed with a view to gathering information on the indicator fauna available in different river stretches and on the reasons for their depletion over the years. Factors like habitat degradation and soil erosion, water abstraction, logs of natural breeding grounds, effects of domestic, industrial and agriculture pollution etc have to be studied in a more systematic manner.

MEASURES FOR WATER QUALITY IMPROVEMENT

Strict environmental laws (command and control measures) or market – based instruments for controlling water pollution must be scrupulously applied and implemented to large and medium scale enterprises. CETPs can provide a viable solution to the problem of water pollution by small scale industries, which are not able to bear the cost of treatment of their effluents on an individual basis. We should strive hard for strengthening of monitoring capabilities of Central Water Commission and SPCBs; regular monitoring of discharges by firms and public access to information on discharge by polluters and ambient air & water quality. Disinfections of water supply be provided to control pathogen. Strict Quality control should be enforced for disposal of trade effluents into water sources.

NEED OF PROPER ZONING/ CLASSIFICATION OF WATER BODIES

Presently, designated best use of important water bodies in the country has been defined. If a water body is used for more than one use; the use demanding highest quality of water is termed as designated best use and accordingly the water body or its part is designated. In course of time, human activities have increased manifold, which has adversely affected the earlier designated bodies also. It is necessary that the present and future scenario for next 25 and 50 years should be properly analyzed for rational planning and implementing the pollution control efforts; with involvement of CWC, CGWA, CPCB, SPCBs, NHPC, and Metro Water Supply & Public Health Agencies, in collaboration with expert scientific agencies like NEERI, WRDTC, CWPRS, NIH.

IMPROVING COASTAL WATERS QUALITY:

India's coastal waters quality has also deteriorated primarily due to industrial activities in coastal areas and disposal of untreated domestic wastes. We should urgently analyze, collate and understand and augment the data for qualitative and quantitative aspects of pollution in our large coastal belt. Identification, classification and implementation of properly chalked action plan; in all the important coastal river stretches and their tributaries. It is essential to ensure focused coordination with large industries, cities' civic bodies, Beach erosion Control Board, CPCB, CWC, SPCBs and Scientific Institutions in Coastal areas like CWRDM Calicut, Anna University, IIT Chennai & Mumbai, CWPRS Pune etc, in this task of national importance.

MARKETING BOTTLED WATER

The fast catching up practice of selling mineral water bottles at rates even more than milk and more than 1000 times than the tap water in India is paradoxical. While half of our population is unable to afford even the absolute minimum needs to quench their thirst. Only water supply utilities should be allowed to bottle and market the bottled water to generate much-needed funds for modernization and proper maintenance of existing infrastructure so vital for social and economic sustenance of our cities and towns.

ROLE OF PROFESSIONAL SOCIETIES

Professional societies can very well serve as multi-disciplinary fora for national and regional debates, analysis and framing of action plans on water related matters especially the technical, scientific, ecological, social and economic aspects to utilize their infrastructure, professional expertise, library, publication and documentation services. These societies can be rich source in generating technically sound options with well-defined limitations & assumptions in Indian peculiar situations for taking informed decisions to be endorsed by various stakeholders. The presentation of facts, analysed inferences and voicing of unscientific perceptions have to be delinked. The professional societies can perform like watchdogs in this respect. The services of professional Societies like Institution of Engineers (India), Indian National Science Academy, Indian Water Resources Society, Indian Water Works Association, Water Management Forum etc may be channelized in debating, dissemination, documentation of reports and action plans in this venture of revival and rejuvenation of our rivers.

WORKING GROUP ON WATER RELATED ECOLOGICAL MATTERS

Considering the seriousness and deteriorating state of affairs concerning quality and quantity of available water particularly for urban use, alarming water pollution levels and challenges in managing water related ecological concerns, a Working Group on Water Related Ecological Matters for X Five Year Plan was formed by Planning Commission chaired by Union Secretary (Water Resources). Group consisted of the representatives of the Planning Commission, CII and the Ministries of Environment and Forests, Agriculture & Cooperation, Urban Development & Poverty Alleviation, Industrial Development, Rural Development, Ocean Development as well as Chairman, CWC; Chairman, CGWB; Chairman, CPCB; Member (River Management), CWC etc. The author was inducted as Member Secretary of this Working Group, which suggested the following measures:

- Strict measures so as to ensure proper treatment of waste water with a view to restoring the water quality of the river/ water bodies to meet the designated-best-uses.
- Strict enforcing of responsibility on users for waste treatment before discharging into water bodies, localized bodies should take responsibilities for maintaining CETP's and regular monitoring of water pollution status.

- Economic Instruments as incentives and subsidies to induce users accountability to curb increasing water demands and to encourage recycling and reuse of water
- Either the income or the cess collected on marketing of water bottles be exclusively reserved for modernization and proper maintenance of public water supply systems.
- Water Sensitive Urban Planning
- Wide spread use of water saving fixtures
- Strategy based on agro-climatic regional planning
- Integrated planning and management of river basins
- Declaration of water resources projects as green projects in respect of environmental clearance
- Equitable distribution of water
- Use of appropriate technology in water supply and sanitation sectors
- Balanced public awareness and curbing unnecessary activism and environmental pseudoism.
- Encouraging professional societies for scientific opinions, feedback and proper dissemination
- To take up research and development activities in the area of water quality management
- To draw scheme(s) for imposition of restriction in water abstraction and discharge of treated sewage/ trade effluent on land, rivers and other water bodies with a view to mitigating crisis of water quality;
- To maintain minimum discharge for sustenance of aquatic life forms in riverine system;
- Encourage rain-water harvesting, roof top harvesting for indigenous consumption
- Self assimilation capacities at the critical river stretches to minimize cost of effluent treatment;
- Ground water recharging with strict monitoring of the water quality
- Public awareness on water conservation and economical water usage.

CONCLUSION

The linkages of poverty reduction and sustainable development with different aspects of integrated water management are highlighted in Indian context; while suggesting strategies for integrated water management to avert the alarming crisis. It is high time that connections between lack of access to water, poverty entrapment, increased risk of diseases, reduced livelihood opportunity and blockades by self styled activists in accelerating water storage projects are rightly understood. Supreme Court Majority Judgment for Narmada Projects has underlined that against the utilizable storage 690 cu. km. of surface water resources out of 1869 cu. km.; so far storage capacity of all dams in India is only 174 cu. km., which is incidentally less than the capacity of Kariba Dam in Zambia/Zimbabwe with capacity of 180.6 cu. km. and only 12 cu. km. more than the Aswan High Dam of Egypt. The impact on environment should be seen in relation to the project as a whole. Non-development of water storage projects is not a viable or available option. Accelerated development of hydropower is highly desirable which would not only help in meeting our energy requirements but will also ensure food security due to increased irrigation from the regulated flows. Availability of water is bound to improve sanitation, safe hygiene practices and better health standards to

make India a safer place for all its citizens. The need of accelerated water storage development, water conservation through reuse, wastewater recycling, aquifer recharging and rainwater harvesting as well as role of community especially women and professional societies have been dealt; being the most vital factors for sustainable infrastructure development in India.

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