WATER SECUROTY AND ENVIRONMENTAL SUSTAINABILITY

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BACKGROUND

India supports more than 1/6th of the world's population on 1/50th of global land with just 1/25th of the world's water resources. 80% of all diseases and over 1/3rd of deaths are caused by consumption of contaminated water. As much as 1/10th of countrymen's productive time is sacrificed to water related diseases in addition to bulk amount of time of women spent on carrying water for domestic needs by long walk in hills and deserts. Unless facilities for the treatment of domestic sewage and industrial effluents are manifold increased, the increasing pollution load due to urbanization will further deteriorate the quality of water bodies. Safe water supply and environmental sanitation are vital for protecting the environment, improving health and alleviating poverty.

WATER CONSERVATION

Water conservation has three dimensions:

a) Water resources conservation – efficient management of rain water through storage, allocation and transfer for use.
b) Water use conservation – water supply and distribution with minimum losses and consumption through prevention of wastage.
c) Efficient use of water through adoption of water saving technologies and cropping patterns.

Public awareness should be generated through a massive campaign of communication through print & electronic media, with special emphasis on women's participation and by the utility management itself setting an example for conservation. All urban dwellers should be made aware of the source from which water is being brought to the city and from which additional water will have to be brought in the future. They should be aware of the costs involved, not only in financial terms, but also the cost that other communities have to incur in terms of opportunity lost by not using the water. The measures for water conservation should include metering of supplies as a matter of policy and increase in tariff rate on a sliding scale. Use of treated effluents, in place of filtered water for horticulture and large gardens, and fitting of waste-not taps on public stand-posts to avoid wastage of water should be encouraged.

RECYCLE AND REUSE OF WATER

In almost all major urban areas, there is an acute problem of adequate water supply while the sources of augmentation are very few. It is roughly estimated that in urban water supply, 30 to 40% of the municipal water is wasted through the distribution system. There is a lot of scope of economy in use of water in industrial sector. It is estimated by Bureau of Industrial Costs and Prices that 10 to 30% saving in water consumption in industries is possible by recycling, modifications in processing, evaporation control etc. Apart from ensuring leakage control, water conservation strategy in industries should include introduction of appropriate technology to ensure efficient use of cooling and process water and necessary pollution control mechanisms and maximum recycling and reuse. Raw wastewater has been in use for crops and fish production in several countries including India without the approval of the competent authorities.

Providing financial assistance and technical guidance in improving existing practices, not only to minimize health risks but also to increase productivity is preferable to outright prohibition. Upgrading of existing schemes should in general take precedence over the development of new projects. Treatment of wastewater in stabilization ponds is an effective and low-cost method of pathogen removal, and is, therefore, suitable for schemes for wastewater reuse, particularly for irrigation of crops. Similarly, duckweed ponds are quite effective in treating municipal wastewater and at the same time the harvested duckweed is a good fish and chicken feed. As such, there is a need to develop appropriate and cost effective technologies, for treatment and reuse of municipal wastewater, suitable to urban local bodies for their adoption. Possible health risks to agricultural workers should be assessed thoroughly and monitored regularly. Treated wastewater should conform to pollution control standards for adopting reuse practice.

There are various options for recycling and reuse of grey water (bathroom and kitchen wash) and black water (sewage). Grey water and black water from large residential complexes like cooperative housing societies, multi-storied buildings and effluents from large industries can be recycled and reused for various purposes other than drinking. The grey water may be put into various types of treatment such as grease trap, anaerobic filter etc. and the filtered water may be let into wet land, polishing ponds for reuse for gardening and horticulture etc. The black water may also be put into various types of treatment such as screen, grit removal primary, secondary and tertiary treatment etc. Treated waste water can be let into wet land for irrigation and ground water recharge.

The municipal wastewater and industrial effluent are being treated up-to tertiary level and used for various purposes other than drinking by various industries and cities. In Chennai the Chennai Metro Board is providing 30mld treated municipal wastewater to Ennore Thermal Power Plant for recycle and reuse for cooling & other purposes. Likewise in Mumbai, many of the industrial houses are using the recycled industrial effluent for purposes such as air-conditioning, cooling etc. In Pondicherry Ashram, wastewater from housing complexes and community's toilets are recycled and reused for horticulture purposes and irrigation. State Governments may create urban development fund for urban infrastructure development and the same can also be used for setting up of pilot projects for reuse, recycling and resource recovery of waste-water.

INCENTIVES AND LEGAL ASPECTS

Suitable fiscal concessions and subsidies may be considered by Central and State Governments to the industries, commercial establishments and any other agencies to adopt/practice waste reuse, recycling and resource recovery. Similarly, in case the urban local bodies on their own should take initiative and set up waste reuse, recycling and resource recovery schemes in their respective areas. Similar fiscal concessions and subsidies may also be made available to them. It should be made mandatory in phases that large industries and commercial establishments must meet a sizeable percentage of their non-potable water requirements from the reclaimed water. Similarly, for irrigating crops, horticulture, watering public lawns/gardens, flushing of sewers, fire-fighting etc. reclaimed water may be used and to this effect, there is a need for legislation or amendment in the municipal byelaws.

Economic instruments may provide incentives to economic actors inducting them to behave in an environmentally responsible manner. Their merits include: effectiveness, efficiency, flexibility and incentives for eco-innovation. Under the scope of the polluter pays principle we can consider of such subsidies such as originating from funds created on the basis of pollution related charges (e.g. acidification funds). Another important thing about pricing of water may be costing according to its end use. Farmers and low income industries should not be charged at the rate of charges fixed for high yielding industries.

PROTECTION OF NATURAL WATER RESOURCES

Responsibility should be fixed on various civic and industrial authorities to treat the wastewater before disposing it in conveyance drains or natural streams. 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 analyzed, collated, understood and suitable action plans should be framed.

QUESTIONABLE USE OF WATER AS A CARRIER OF WASTES

The traditional way of removing wastes from industries and homes has been to dilute them in water and then carry this wastewater over long distances to extract most of the waste in the sludge and leaving polluted water as effluent. Such traditional and highly unscientific method of using water carriers of wastes need to be closely examined. There are many better alternatives to treat the waste at its origin, without using so much water. Use of low flushing and dry toilets as well as use of ‘grey water’ drained from showers, kitchens and laundries to flush the toilets, should be targeted for adoption in at least in all new construction of commercial institutions and planned colonies in all class I and II cities.

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. Common effluent treatment plants (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 various organizations regular monitoring of discharges by firms and public access to information on discharge by polluters and ambient air & water quality.

MICRO WATERSHED DEVELOPMENT AND LARGE DAMS

The former captures rain in-situ and supplements/conserves soil moisture for a longer period, whereas the latter holds the run-off in storages of surface waters and make it available through canals for irrigation. The former has a crucial role in treatment of catchment area and non-command areas of irrigation schemes. It recharges ground water for use in local drinking water needs. Also, it provides soil moisture to replace may be one or two irrigation watering, in kharif season. Its main role therefore is important for the vast rain-fed areas of the country, which will not be irrigated through surface storages even in ultimate stage of development. The former successfully operates within a narrow band of meteorological phenomena of intensity, duration, antecedent rainfall, potential evaporation, infiltration capacity dictated by topography, geology, slope, vegetative cover etc. Its contribution in increase in productivity of cropped land is rather limited. Both therefore are considered as complementary and not adversarial. Sediment generation is reduced in the former case. Erosion and deposition in downstream will continues due to hydraulic phenomena. Large dams hold bed load of sediment in the designed pockets. Economic analysis on dams accounts for such siltation. Peak flood is reduced for local watersheds but does not have significant impact on generation of floods.

LIMITATIONS OF WATER HARVESTING STRUCTURES AND LARGE DAMS

Available data shows that when numerous small projects are constructed to substitute a single large storage project the cost per unit storage, relative submergence and relative evaporation losses are invariably many times more. Evaporation loss would obviously be more because of larger water spread. Claims that only small size (or some claim only large) of dams be adopted are wrong. Only small dams can not capture required quantity of water. In each basin, even if one wants, all dams can't be of only large or only small size. Each size has its advantages and deficiencies.

Another important point quite often missed is the need of large dams in Peninsular India even for minor irrigation purpose (covering lesser than 2000 ha.) due to the limited capacity of the valleys on account of the topography and configuration. On the other hand, large barrages of lesser than 15 m height are required for diversion of voluminous discharge for irrigation of large tracts of land in Indo-Gangetic plains as well as rivers' deltas. It needs to be appreciated that the dams upto a height of 100 m are needed even for the run -of- river projects having no live storage in Himalayan rivers. The steep gradients in the river beds and the large rolling boulders down the hills quickly fill up the storage capacity, quiet often even during the construction period. Apart from cost, the issues of mortality, reliability, dependability, submergence, displacement of inhabitants, loss of forest and cultivated land, adverse impacts, multiplier effects are to be considered while making the decision. A recent study of proposal to revive the old tanks of south India indicates that contrary to popular perception, it will be economically too expensive.

The proposition that a series of small dams can make up one large dam is an abstraction which is not always physically practicable and cost effective. It may often turn out that series of small dams submerge a far larger area and displace much greater number to store less water as a factor of valley geometry. Again one type of techno-economically viable development can not be replaced usually by another for example to replace a single large reservoir with a few small reservoirs will need a large number of alternative sites which is rarely available in practice necessitating again a curtailment in the envisaged development. In different studies, it has been proved that when more reservoirs are constructed to substitute a single large reservoir, the cost of storage creation and submergence are high. Also there cannot be a small reservoir on a large river and even if a less storage reservoir is constructed on a large river, it has to be provided with a large spilling arrangement to tackle the expected large size flood.

MEDIUM AND SMALL RIVER VALLEY PROJECTS

It is a established fact that shallow storage causes proportionately greater loss of land area due to submergence. Shallower storage also means greater surface area and hence evaporation as per studies conducted in many river valleys by reputed scientific agencies. Further it is difficult to find large number of alternative sites for medium projects even if such an alternative is preferred over deeper storage. Small and medium projects have to be constructed generally in the upper reaches of hills, causing substantial loss of valuable forests. Construction of large dams, on the other hand, in the foothills involves submergence of large areas of cultivated lands per unit of storage. Of-course shortcoming is compensated in same ways.

For this reason small and medium hydel projects are not only costlier than the large projects but they also submerge larger land areas for the equal amount of storage and in addition, they have increased evaporation losses. Steep gradients in the river beds, large rolling boulders and sedimentation problems further limit the efficacy of small and medium hydel projects. This became particularly evident in case of Ichhari and Maneri Bhali dams (60 metres and 39 metres height respectively), both being run of the river projects. These were filled up to crest by sedimentation during construction, itself as planned. It is thus evident that large water storage projects are surely better alternatives wherever the parameters such as the volume of water flow, geological and topographical considerations and regional requirements are satisfied.

Historical records establish that dynamic nature of environmental effects, which seem adverse to the environment at the time of construction, generally tend to stabilise and become less unfavourable. In fact extensive green cover develop in submergence and irrigation commands. Large number of migratory bird and wild life starts developing after construction of large dams (case studies for Aswan, Ramganga, Rihand, Matatila, Indira Gandhi Nehar, Beas Sutluj Link, Bhakra and Hirakud projects). Hence the major, medium and minor reservoirs are complementary to each other. This, too, depends upon the hydrological, geological, topographical and regional limitations. A large dam site is a natural resource depending on rocks formation, geometry of valley, foundations and hydrological features.

EFFECTIVENESS OF RAIN WATER HARVESTING

Roof Top Rain Water Harvesting (RTRWH) is an ancient technique of providing domestic water supply and still in use, especially in tropical islands and semi arid rural areas. Many Ministries/Departments of State Governments have encouraged RTRWH with large scale subsidies. During last 20 years, under the hype of 'traditional wisdom' rain water collected from the roofs of entire country (<1bcm) will not be enough even to meet the water requirement of Delhi. Contribution of RTRWH is very small and comes at a very high unit cost with a significant recurring component. The cost of storage is Rs. 2000/- per cubic meter or Rs. 6 Lacs for 300 cubic meter per family. A family requires 300 cu. M. of water per year of domestic use. In an area having rain fall 100 mm, the roof top size required for this quantity of water would be 3600 m^2. The roof top requirement for agriculture purpose would be eight times more than domestic use. RWHS like RTRWH is at all useful when it comes to power generation and long distance transportation of water. RTRWH can hardly solve even fraction of the water requirement needs of our entire country. Thus RTRWH can be a solution to the no water situation but definitely not as a substitute for large dams and transfer of water from sir-plus to deficit river basins.

SUPREME COURT JUDGEMENT

It is highly relevant to underline the following excerpts of Hon'ble Supreme Court in their judgement delivered on 18th October, 2000 for Narmada Project, in writ petition of Narmada Bachhao Andolan Vs. Government of India and Others (C.A. No. 6014/1994 W.P.(C) Nos. 345/94 with 104/1997, S.L.P. (C) No. 3608/1985 & T.C. (C) No. 35 of 19995).

Dams and Environment -Supreme Court in its judgement stated 'that in the present case, they were not concerned with the polluting industry, but a large dam. The dam is neither a nuclear establishment nor a polluting industry. The construction of a dam undoubtedly would result in the change of environment but it will not be correct to presume that the construction of a large dam like Sardar Sarovar will result in ecological disaster.'

'India has an experience over 40 years in the construction of dams. ***The experience does not show that the construction of a large dam is not cost effective or leads to ecological or environmental degradation. On the contrary, there has been ecological up-gradation with the construction of large dam***. What is the impact on environment with the construction of a dam is well known in India and therefore, the 'precautionary principle' and the 'polluter pays principle' will have no application in the present case. So far, a number of such river valley projects have been undertaken in all parts of India. ***The petitioner has not been able to point out a single instance where the construction of a dam has, on the whole, had an adverse environmental impact. On the contrary, the environment has improved***. That being so, there is no reason to suspect, with all the experience gained so far, that the position here will be any different and there will not be over all improvement and prosperity. It should not be forgotten that poverty is regarded as one of the causes of degradation of environment. With improved irrigation system, the people will prosper. The construction of Bhakra Dam is a shining example for all to see, how the backward area of erstwhile undivided Punjab has now become the granary of India with improved environment than what was before the completion of Bhakra Nangal Project. We are not convinced that the construction of dam will result in there being an adverse ecological impact. There is no reason to conclude that the Environmental Sub-group is not functioning effectively. The Group, which is headed by the Secretary, Ministry of Environment and Forests is a high powered body, which can not be belittled merely on the basis of conjectures or surmises.'

Hon'ble Court was satisfied that substantial compliance of stipulated environmental safeguards was undertaken in SSD Project. Surprisingly, the Supreme Court noted that the Narmada Bacchao Andolan (NBA) had not even allowed surveys for demarcation for R&R of the PAFs and that the NBA's efforts to stall SSDP through FMG had failed. It was ruled that NBA could not give a single example of the whole adverse environmental impacts of even a single dam in India.

CONCLUSION

With population growth, rise in urbanization and non-uniform water availability, the adoption of water conservation measures, augmentation of water supply through creation of storages and demand management has assumed significant importance. To improve the efficiencies in domestic sector various measures such as water audits, mass awareness programmes, water pricing, proper maintenance and improvement in supply, control on leakages, prevention of unaccounted use of water, etc. has to be adopted.

Social tensions, political instability and street fights are already on the horizon; due to stoppage and slowing down the construction of almost all major dams; ignoring the bulging demands of water and power for municipal uses in metro cities. A series of smaller dams, even if feasible, would entail higher costs, greater submergence, far more displacement, greater evaporation losses, increased maintenance cost and far less benefits. Small dams are prone to fall in critical years of drought because they depend on tiny catchments. Moreover, a large dam site is a natural resource depending on the rock formation, geometry of valley, foundation-conditions and hydrological features. Medium and small water projects as well as water harvesting schemes cannot substitute the need of large water storages but can at best complement the larger projects.

Non-development of water storage projects is not a viable or available option; due to the large temporal variations in river flows in Indian monsoonic climate. Supreme Court in their judgement in PIL by NBA expressed its deep concern that against the utilisable 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.

Most of the industrial production processes require large quantities of water. Adoption of most appropriate technology to ensure efficient use of cooling and process water apart from sound maintenance practices including leakage control is necessary for water conservation. Some of the action points towards water conservation for improving efficiency in industrial sector could be setting up of norms for water budgeting, modernization of industrial process to reduce water requirement, recycling water for cooling purposes, rational pricing of industrial water to compel adoption of water saving technologies, proper treatment of effluents and use of treated water by industrial units. There is need to maintain the water use to the prescribed norms and reduce evaporation losses which would result in efficient water use. Irrigation sector is the biggest consumer of water as more than 80% of available water in India are being presently utilized for irrigation. The average water use efficiency in irrigation projects is assessed to be only of the order of 30-35%. The productivity of farm land has to be increased for increased production of food to keep pace with the increasing population and water use efficiency in irrigation projects should be raised through various structural & non-structural practices and participatory irrigation management.