When 2007 is declared A Water Year for India:

Future Water Solutions for India

"Go back to the basics".

That is the message experts give to Indian cricket team when the team is not performing well.

Exactly the same advice is relevant for the huge challenge that India's water sector faces.

The Challenges

Consider the contours of the future water demands for a population that could be anywhere between 1.4 to 1.65 billion in 2050. With foodgrains demand going upto 450 Million tonnes per annum (remember that 84% of water use is in agriculture sector today). With per capita water demand going up everyday. With demand for industries and cities increasing almost on daily basis. With more rivers and groundwater aquifers getting polluted day after day. With Power Demands (and every major option of power generation requires water one way or the other) likely to be 3-4 times what it is today, even as half the households remain without electricity access. With looming climate change making the rainfall (the primary source of water), droughts and floods more and more destructive and yet more and more frequent and at unusual places and times. Add the real possibility of diversion and damming of our rivers in the upstream by China.

The challenge could not have been more daunting.

The Responses And now consider the responses the governments have come up with: More Big dams, More Big Hydropower projects, more long distance water transfer, interlinking of rivers and desalinization (how that can be an option at current energy costs is difficult to understand) on large scale.

The response could not have been more off the mark. For it shows that the governments have learnt nothing from the experience, ignore the realities about our resources, the nature of needs, available infrastructure and options available. In short, ignores the basics.

And ignorance seems to be the bliss for the decision makers. This seemed clear when Union Water Resources Minister Prof Saufuddin Soz, speaking at a public function in Delhi said on Dec 13 that his govt is going ahead with river linking plan, the Ken Betwa is a success story (in reality even the Detailed Project Report of that project is yet to be done and the differences between Uttar Pradesh and Madhya Pradesh seem insurmountable), that Polavaram is a good dam project and should go ahead (when the Central Water Commission is yet to give final clearance and when Orissa and Chhattisgarh are yet to agree to the project and strong movement is taking shape on ground). The minister was clearly parroting the line given to him by the bureaucrats in the Water Resources Ministry, but what he said had little foundation in facts or ground realities.

Remember that India has the largest irrigation infrastructure in the world, but as Union Finance Minister said in his last budget speech, performance of that infrastructure is possibility the poorest in the world. The World Bank's report card on India's water sector in June 2005 (interestingly titled: *India's Water Economy: Bracing for a Turbulent Future*) said, "the cost of replacement and maintenance of India's stock of water resource and irrigation infrastructure would be about $ 4 billion a year, which is about twice the annual capital budget in the Five Year Plan". Needless to

add, we do not allocate even a tiny fraction of that amount for maintenance of existing water infrastructure.

The implication is clear. As International Water Management Institute's paper in early 2006 showed, the proportion of canal irrigated areas is going down across the country. In a number of states (e.g. Tamil Nadu and Andhra Pradesh) even the actual area irrigated by canal has been going down for a decade. Our reservoirs are silting up: the latest data from Central Water Commission, analysed by us showed that capacity equal to at least two thirds of the additional storage capacity we are adding annually through new large dams at huge economic, social and environmental cost is silting up. And we are doing nothing to reduce the siltation.

The generation of electricity per MW installed capacity from large hydropower projects has reduced by over 20% in last twelve years as a result of aging machines, silting reservoirs and overdevelopment in some of the river basins.

The clearest sign of how wrong we are in the way we are dealing with water resources development and management is available from the fact that water related conflicts are growing at every level. What is the response of the government to this reality? At the public function on Dec 13, the Union Water Resources Minister said this is because Union Govt does not have much power over the states as Water is a state subject. He could not have been more off the mark. The trouble today is that Union and state govts are already too powerful and people have little role in planning, decision making, operation or maintenance of water resources development and management. There is no democracy in water resources development. And the solution lies in changing that situation in fundamental ways.

Options in Agriculture and Irrigation Understanding the ground realities of state of our water resources has to be the first step of an outline of future solutions, as Mahasweta Devi said in another context. An objective stock taking throws some interesting pointers for future action.

⇒ Average foodgrains yields from irrigated areas in India is around 2.5 tonnes per ha. This can be increased to 4 tonnes per ha without involving rocket science or toxic dreams.

⇒ Our water use efficiencies are at best around 25-35% in canal irrigated areas and a little higher groundwater irrigated areas. As Mid term review of tenth Five Year Plan showed, a 10% increase in irrigation efficiency can add 14 million ha of additional irrigated area. That's higher than the target of entire Bharat Nirman Yojana. And remember the cost of each additional ha of irrigated area this way will be much less in every sense of the term, than the cost from such benefit from new projects.

⇒ The gap between the irrigation potential created and actual irrigation is around 10 million ha. Bridging that gap would be more cost effective than hankering for more storage capacities.

⇒ Arresting the siltation of storages of all sizes and desilting them where feasible would be more cost effective with multiple spin offs, precious little is being done in that direction.

⇒ While over 90% of the additional irrigation in last decade came from groundwater and while about two-thirds of our irrigated foodgrains output comes from groundwater, we do not seem to have understood the dire implications of plunging aquifer levels and irreversible nature of pollution of the aquifers. One major consequence of depleting aquifer is the rising energy costs. This can be arrested and in fact reversed if we take up groundwater recharging on massive level (the plan for this has been submitted by the Central Ground Water Board to the Planning Commission for some years now, without any action towards implementation) and this will also prolong the lifeline that groundwater provides. Moreover we need to remember that groundwater availability, use and recharging options are much more widespread than any other option like the large dams.

India has the largest number of big dams under construction today, more than any other country. The most important justification provided for large dams in India is to store water available in monsoon to use it in non monsoon months. However, there are many options available for storing monsoon water. One of the most important one is storing water in the underground aquifers. Another option is to store it in small, decentralised projects, nearer to where the water demand is. Another important issue to keep in mind here is to assess the performance of large storages already created. Our analysis of data from the last twelve years shows that on an average, in each year, 36.25 Billion Cubic Meters (BCM) storage capacity out of the 133 BCM storage capacity through large dams monitored by the Central Water Commission remains empty. This means that in each year, capacity equal to 6.4 Sardar Sarovars is not used. We need to see how we can achieve better performance of existing capacity rather hanker for more capacities.

The concept of virtual water (water content of the products we consume, trade, export) is increasingly going to be important in future. Can we afford to export sugar and basmati rice, produced after consuming so much water, even as large parts of India continue to starve for water for basic needs? We need to understand the water content of the products we consume and export and ensure optimum benefits without taking away water for basic needs.

System of Rice Intensification Large scale adoption of new methods like the System of Rice Intensification (SRI) can get us huge benefits. One crop that is grown over the largest irrigated area in India is Paddy and it is very water intensive crop. Under SRI, tried in dozens of country over the last decade and also tried over thousands of hectares in states like Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Orissa and W Bengal in India, some basic modification in the cultivation method (e.g. increasing the spacing between plants, transplanting younger seedlings and transplanting just one plant per location in place of 2-3 plants per location and no flooding of the fields to name a few), it has been shown that rice yield can be increased to upto 8 Tonnes per ha and in the process water requirements (as also other inputs like seed) is reduced by over 50%. Even if this method, endorsed by the Union Agriculture Ministry and the Andhra Pradesh govt (though not pushed whole heartedly for some unknown reasons), is adopted over just half of the 24 m ha paddy irrigated areas and even if we achieve half of the possible gains, we can still add 6 m ha to irrigated areas with the water saved.

Hydropower Options While the biggest projected USP of large hydropower projects is supposed to be provision of peaking power, we neither monitor how much of the power generation from such projects is during peaking hours, nor do the consumers have to pay anything extra for consumption of power during peaking hours. If we can put peaking hours demand management system in place and also ensure optimum peaking power generation from existing hydropower projects, the need for such projects would go down significantly.

⇒ Similarly, regular independent assessment of performance of large hydro (and also large irrigation projects) would help us understand why the generation per MW installed capacity is going down and what we can do to arrest and reverse the same.

It would be interesting to note here that 90% of our existing dams do not have hydropower component, where we have the water storage and heads available for generation of hydropower without additional social and environmental costs. We need to assess at how many such existing dams we can add hydropower component. Similarly, hydropower can also be generated through small projects. According to a United States Dept of Energy study published in January 2006, US has potential of generating 300 000 MW through small hydropower projects of lower than 30 MW installed capacity. It was assessed that 100 000 MW of that is feasible even according to the feasibility norms of 2005. That capacity is three times larger than existing projects in US currently.

Considering the way energy costs have gone up over the last one year, that figure would go up substantially. We in India have not even comprehensively assessed the potential with similar study. We are fond of giving the example of China, but we can do better by learning appropriately from Chinese experience, as they already have more than 88 000 small hydro projects, and the number if fast going up.

A system of transparent and accountable project appraisals would also eliminate some of the unviable projects, saving the society in terms of economic, social and environmental costs.

Some other options that are relevant in power sector include demand side management (DSM - potential of 25 000 MW as per a Power Ministry study), off shore wind power, solar and biomass power, use of decentralised power generation systems, reducing transmission and distribution losses, time of day metering and increasing end use efficiencies. A study by Prayas energy group recently showed that if every electrified household in India replaces just one 60 W incandescent bulb with a Compact Fluorescent Lamp of sufficient wattage to give same light, the peak load demand of electricity can be reduced by 5 000 MW. That should open up many eyes and minds.

Mr MK Midha, Commissioner, Hisar Division, Haryana, recently said on energy conservation day in Dec '06, "The DSM has the potential to address the needs of filling the gap between demand and supply of electricity and providing uninterrupted electricity supply to consumers at reduced rates". This is like double benefits. DSM can not only bridge the outstanding demand, since it saves the electricity, it will make the cost per unit of power less as more power becomes available at same costs.

Water Supply Options In the years to come, the water requirements for urban and industrial use is going to increase in a big way due to increasing population, increasing per capita demands, increasing urbanization and industrialization. This will further add to the load of pollution to the rivers and aquifers, many of them are already unusable currently. Among the big unexplored options in this area include demand side management, pollution control, reuse of water after adequate treatment and local supply side solutions like the rainwater harvesting and decentralised water treatment. Evidence of this working is piling from all over the world.

Global Warming and Climate Change The best that science is able to tell us today about the impact of global warming on our climate is that the frequency of extreme weather incidents would increase. However, that is not great help as we won't know where and when exactly such instances will occur. Under the circumstances, we need to put in place better systems of monitoing and communications so that the impacts of such extreme weather incidents when they occur, is minimized. Adaptation is the key word that the global agencies use in this context. Unfortunately, today we do very little in that direction. As we saw in 2005 and 2006 monsoons, a lot of the damages during the floods could have been avoided had we put in better systems of forecasts and preparedness. The flood forecasting done by the Central Water Commission currently is highly inadequate, non transparent and unaccountable. We can do a lot more to use information technology and knowledge base to move towards a knowledge using society.

It is clear that we have a large number of technological, management and institutional options before us.

It is often said that we know what to do, the trouble is, we don't know how to do it. I guess we will learn the hard way.

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