BLUE REVOLUTION

Charting South Asia's Water Future

Recommendations Report

OBSERVER RESEARCH FOUNDATION
AND
PHD CHAMBER OF COMMERCE AND INDUSTRY

September, 2011

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DISCLAIMER

The Contents published in this report are only informative in nature and are based on the proceedings of the conference on ***'Blue Revolution: Charting South Asia's Water Future'***, Apr 11, 2011. Observer Research Foundation and PHD Chamber of Commerce and Industry may not be legally held responsible for any omissions or inaccurate information / mistakes here.

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SHRI SALMAN KHURSHID, Hon'ble Minister of Water Resources

Water is a scarce natural resource with multifaceted uses cutting across class, economic and political boundaries. Evaluating and recognizing the importance of water in different spheres of life is where the trouble begins. What is part of our lives has also become part of our lifestyle and our lifestyle is what is creating the trouble for us and indeed for our environment, ecology and our surroundings.

We are in the beginning of a major crisis for ourselves and for succeeding generations, something that we have taken for granted. Water as it is understood is inexhaustible, something that cleans and cleanses itself, something that can be there and has always been there for the millennia. Only recently, we have started to understand that it might disappear and that we are increasing the demand for water and need at a much greater speed than availability of water in times to come.

The problem is not of availability but of storage

All sources of water have been discovered, researched and largely accessed. The problem in our country is that there is availability of water at a particular time of the year but due to limited storage capacity we are not able to capture, save and secure that water for use for the rest of the year. Fortunately, our neighbouring countries have the potential storage capacity to solve our 'storage' crisis to a certain extent. Government of India has placed it under high priority but the socio-political discourses have had a pervasive influence on the success and failure of such cooperation and negotiations.

It has been identified that the difficulties in dealing with the water issues are not those of engineering or finance but about our attitudes. Therefore, the first and foremost step in discussing any water issue is to address the basic questions attached to the water debate:

How do we see water?
How do we see ourselves in relationship with water?
How do we see the future?

It is imperative to ask these questions to achieve solutions to the water challenges that we are facing today.

An attitudinal change is required in addressing the water management issue

Historically evident behaviour suggests that reforms in India occur as a result of crisis management. For instance, the first tranche of economic reforms was possible because we were under a crisis and as the dark and threatening clouds of crisis parted we went back to argue about ideological issues, pros-cons,etc. As a result, the second and third phases of the economic reform that should have followed got stalled, certainly slowed down and we are still in the process of trying to work out our national attitudes about 'what is acceptable?' and 'what is ideal'. The attitudinal change that we require at the moment should incorporate rational evaluation of the relationship between the Centre and States, the conventional views of the federal structure or quasi-federal structure of our country, the relationship between the centre and States on management of water.

Rivers run through many politically contested areas, therefore, there is a need to look at the potentially available resource within the existing constitutional arrangements. Parliament holds power to a certain extent to manage the inter-river basin sources but there is a need for a constitutional change to have an integrated river basin management. It is also essential that this conceptual arrangement within the river basins is agreed upon by the entire country, for an effective and efficient sharing of the water resource.

A micro view of the macro picture: Aquifers

Aquifers, in the course of its neglect has unfortunately only been felt or known by experts who study water hydrology and who study aquifers. Knowledge about aquifers is lacking in our current system and even in planning. Proposed mapping of aquifers has been suggested a number of times but hardly any progress have been made in collecting reliable and authentic data. It is impossible to plan and manage an unknown resource. However, undiscovered and untouched resources also provide a way of saving water for the future.

How we have treated water bodies in this country?

There has been traditional water bodies that existed which have now been encroached upon either for agricultural purposes, residential habitations, perhaps somewhere even

for industrial use. The Supreme Court has very categorically said that there will be no land use permitting people to change water bodies for any other purpose. The innumerable cases of lake-land transfer have given rise to conflict situations in many parts of the country. We will need negotiations, compensation, use of existing legislation and government cooperation between the State and the Centre to resolve the issue of land transfers.

The approach that is required to deal with this issue should be sensitive towards treating river as a livelihood, heritage and traditions. For instance, about 39 baulis and old tanks have been restored after considerable participation from the Government, corporate sector and the local community. Apart from adding to the aesthetics of our lives, traditional water bodies have positive implications in balancing the eco-system of the area in numerous ways. Given the benefits, there is an urgent need to replicate this model in other parts of the country and revive the micro-water bodies of historic and cultural importance.

Groundwater: Whose water is it anyways?

While dealing with the groundwater, issues of 'water ownership' becomes critical. For instance, Punjab has been exploiting the water table of the region to meet their irrigational needs to an extent that the groundwater has depleted to an alarming level. Lack of monitoring, assessments and other externalities like Government policies for promoting tube-wells and subsidized electricity have resulted not only in the degradation of the quality of groundwater in the region but also adversely impacted the ecology.

Groundwater fails to find its place in the decision-making processes for trans-boundary – international or inter-state water issues. The most logical reason points to the fact that it is not a readily visible source and it is difficult to assess its level of degradation both in terms of quality and quantity. Despite the presence of groundwater legislations in the country, groundwater lacks attention. It all comes down to the same fundamental question: Does the water belong to the owner of the land? Can Groundwater be used at owners' discretion? Water ownership needs to be clearly defined and more so, needs to be reflected in the attitude of the people.

A probable way of solving the water issue is by pricing water appropriately. True value of water will automatically rationalize the usage and promote efficiency. However, water pricing has been one of the most politically contested areas in the water development field.

Misconceptions and myths around water have been straddling with water management. Predominant national instincts and conventional wisdom need to be looked into. For instance, the lining of canals has been invariably thought to save water but it also deprives water to seep into the ground and thereby, disrupting groundwater recharge. Engineering, environmental sciences and sociology needs to be integrated for better water management.

Water management should be a central issue of governance

Water policies, regulations and management have one basic common factor for an effective implementation: 'Governance'. Advantageously, the Water Mission under the Climate Change Action Plan underlines all the water issues and challenges. However, improvement of governing standards in our country by inducing transparency in decision making, rationality, accountability and autonomy of institutions is essentially required.

In conclusion, it is obligatory now to revise the water policy based on the dialogue that water is a major factor and has the potential to become a growth inhibitor if not managed carefully. Furthermore, water management needs to involve greater participation from local communities than being treated as an issue of engineers, experts or of concerned enlightened people. An attitudinal change to treat water as a precious resource is the first step that needs to be taken.

I hope that there will be one day an election in this country where our positions on water management will decide who gets into government and who stays out of government. I hope this happens in the near future without one of us having to sit on a hunger strike. All talk about Third World War being fought over water etc., is perhaps a little bit of an exaggeration but certainly we will be gasping for life if we don't manage our water well.

MESSAGE

MR. SALIL BHANDARI, President, PHD Chamber of Commerce and Industry

Water is central to economic growth and poverty reduction in South Asia. Provision of clean drinking water is crucial for maintaining basic health and curtailing disease. In South Asia, 85% of people have access to water supply and 36% have access to sanitation services. Most of the rural or semi-urban areas don't have access to clean drinking water. The South Asian countries are home to about 1/4th of the world's population but only contain about 4.5% of the world's annual renewable water resources. Except for Bhutan and Nepal the per capita water availability in the region is less than the world average with water use in this region being limited mainly to the agricultural sector. Almost 90% of the withdrawn water is consumed by the agriculture sector. A much larger proportion than the average global agricultural water use which is 70% in contrast the region generally exhibits very limited water use in the industrial and domestic sectors.

For India, the largest among south Asian nations, the water resource base is estimated at 2518 billion cubic metres including surface and ground water is substantial but highly variable in different geographies and spread over different times of the year. 50% of the annual rainfall happens in just one month and 90% of river flows occur in 4 months of the year. As a result only 29% of the available fresh water resources are accessible and reliable. The water storage capacity per person in India is 10 times less as compared to China and 30 times less as compared to the United States.

Crop irrigation currently accounts for nearly 80% of overall water consumption in India and this share is projected to remain the same even by 2030. Most of India's river basins would face severe deficit by 2030 unless concerted effort is taken to transform its most populous basins, the Ganges, the Krishna and the Indian portion of the Indus.

Strategies for water resource security will entail a combination of three core methods of matching water supply and demand. Expanding supply of water in water deficit zones, increasing productivity of existing water use in agriculture and reducing demand by shifting the economy towards less water intensive activities. The emphasis will be on solutions, necessary policy interventions and approaches to their implementation rather than on highlighting the water challenge. A sharp and focused policy document will be distilled from the proceedings at the conference and circulated among the top decision makers of the country and of this region.

I am pleased to know that a sharp and focused policy document is being distilled from the proceedings at the conference on Blue Revolution: Charting South Asia's Water Future jointly organized by PHD Chamber and ORF Foundation on 11th of April, 2011 at PHD House New Delhi, and is being circulated among the top decision makers of the country and of this region.

KEY RECOMMENDATIONS

1. AGRICULTURE

1.1. Water saving technologies such as Zero Tillage, laser land levelling and direct seeding of rice should be promoted to increase the cost efficiency. There are several underlying benefits that can be reaped from these agricultural techniques such as additional income generation, electricity usage efficiency, gender employment and water quality improvement. By facilitating public-private initiatives in new such technologies and knowledge transfer, agricultural practices can be made more environmentally and socially sustainable.

1.2. Creation of a massive micro-harvesting structure network with large number of check dams and village pond and promotion of drip irrigation will strengthen the agricultural production.

1.3. Integration of land and water resource is an essential step to address the major intersecting problems such as environmental degradation, population growth and food issues. Since, bulk regions of India are in the areas with river basins shared by more than one state, it is only logical to devise an integrated management of rivers and aquifers. Through strategic institutional framework and restructuring the current water resource departments, irrigation efficiency and an inclusive growth can be achieved.

1.4. Crop diversification should be intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk. For this a shift must be facilitated from traditionally grown less remunerative crops to more remunerative crops. An accelerated pace of diversification is required to create positive import of higher income, higher employment and conservation and efficient use of natural resources.

1.5. On farm water management: Efficient water conveyance systems at the farm level are methods like tanker trucks, rural aqueducts, and pipelines. In some cases, this involves the transfer of water from one portion of a river basin to another, or between river basins. Also, precision land levelling may improve conveyance, application and distribution efficiency.

1.6. Optimal irrigation scheduling: Such an irrigation schedule would ensure that the crop will grow at its potential rate provided all other agricultural inputs are supplied at optimal levels. When the available water is not adequate to meet the crop-water demands for the season, water deficits during some periods in the season cannot be avoided. Because crop-water response to water deficits at different periods is not uniform, it becomes critical for irrigation managers to decide how best to distribute the deficits among the intra-seasonal periods for a crop.

1.7. Others Measures: Timely transplanting of rice to increase Water Use Efficiency; Moisture conservation; Recharging of groundwater aquifer; Renovation of village ponds; Reuse of waste water; Surface drainage system; Sub-surface drainage system; Multiple well point system; Cyclic/Conjunctive use of canal water and tube-well water; Bio-drainage; Lining of canals; Fish farming should be promoted.

2. URBAN WATER USE EFFICIENCY

2.1 Water resource allocation: Domestic water allocation should be based on population density including the livestock. In urban areas, allocation of water for industrial and domestic and in rural areas, rain-fed, groundwater recharge and cultivated area should be separated.

2.2 Water footprints: It is the total volume of freshwater used to produce the goods and services consumed by the individual. The importance of water footprint calculation can be linked to better understanding of the water pollution, consumption and water scarcity issues. The method laid out in the Water Footprint Assessment fills an emerging and urgent need for a means of understanding water consumption in operations and in the supply chain, assessing its sustainability, and devising effective response strategies.

2.3 Hydropower generation should be from the main stream for the base load and not from diversions. Less water should be allocated to large users to encourage re-cycling and re-using of treated water and water recycling.

2.4 Common equity issues that plague the sector in most developing countries also hold true for India. Comprehensive study on equity issues relating to water supply, sanitation, and health should be conducted.

3. WATER QUALITY

3.1 Water Pollution Control: The use of chemical fertilizers and pesticides should be minimized by replacing it with bio-fertilizers. Regulations should be made stricter for drainage of untreated water in the rivers. There should be more focus on checking water contamination for arsenic and fluoride content regularly across regions and mechanisms should be put in place for treatments.

3.2 Restoring qualities to flow: Handling and harnessing variability and stochastic flow regimes, consequently, have become critical in shaping sustainable approaches towards river management. Equally as well, flows must be grasped as organic entities: rivers stitch together innumerable ecological processes to produce an intricate and interconnected fluvial system. A fresh paradigm is required for managing and interacting with such hydraulic endowments.

3.3 Ecosystem services significantly contribute to human well-being and sustainable water management and, therefore, it is important that damaged water-based ecosystems should be restored and further damages are prevented. Ensuring the sustainability of freshwater ecosystems and their services underpins efforts to achieve food and energy security, climate change adaptation and mitigation and flood protection.

3.4 Handling of industrial accidents and extraordinary water pollution requires increased environmental awareness and security, improved permit procedures and early warning systems, emergency plans and strengthened bi-lateral and international water governance, respectively.

4. WATER MANAGEMENT AND GOVERNANCE

4.1 Alternative measures should be investigated to utilize unconventional water sources–such as brackish or other marginal quality waters, stormwater runoff, or water produced through artificial aquifer recharge – for widespread beneficial use.

4.2 The State should improve and encourage land management practices to help protect both water quality and quantity. This should include the implementation and development of planning tools that ensure responsible growth, development and sustainable use of resources, such as low-impact development, including green roofs, rainwater capture systems and rain gardens.

4.3 Public Participation: Community based organizations (CBOs) should be set up to involve the local consumers for a more participatory democratic approach for water usage. The paradigm shift from government control to community-centered control and management will efficiently regulate coordination among the different water departments and will allow the short and long term benefits to reach the bottom level. Awareness of correlation between water and health by community mobilization will aid in regulating water quality and improve water-use efficiency.

4.4 Local consumers are treated as tenants of state with the current nature of water policies. Water should be treated as a common property – 'Joint Ownership'. It should use mechanisms that will allow collective spreading of risks to overcome their individual vulnerability to shocks and stresses.

4.5 A comprehensive land-use zoning should be developed along the River Indus and its tributaries to stop encroachment into the river area for settlements, hotels construction, tourist's facilities and agriculture.

4.6 **Disaster Management Plan** (DMP) with clearly defined roles and responsibilities should be formulated at Provincial, District as well as tehsil levels. DMP must cover all the three phases of disaster i.e pre flood, during flood and post floods

4.7 **Flood management strategies** should be shifted from a reactive approach towards management of risks and more emphasis must be placed on non-structural measures, such as effective real-time hydrological forecasting systems, flood zoning and insurance. These strategies should also pay more attention to ecosystem based solutions.

4.8 Flood protection infrastructure should be strengthened and upgraded which must include but not limit to

4.8.1 Forestation in catchment areas to reduce flood intensity & soil erosion

4.8.2 In-time repair of protection bunds

4.8.3 Construction of new dams

4.9 A shift in policy and financial resource management for incorporating participation of workers, employees, unions, users and public and shifting resources towards the public Sector would eliminate the financial and social risks. Both private and public entities will have to work together to make delivery of water more cost-effective and environmentally sound.

4.10 Better means of knowledge transfer between science and policy to improve evidence based decision-making and launch more relevant water-related research are required. Traditional dissemination activities (symposiums, conferences, media products) are important, but are not sufficient for fruitful two-way dialogues.

5. WATER PRICING

5.1 It is widely recognized that water has a number of economic features that create potential market failure. These may include non-rivalry, non-excludability, externalities, merit good features, and significant transactions costs. Careful assessment is required to mitigate the variability in water prices.

5.2 Market based instruments has the potential to address the funding constraints in water distribution and usage.

5.3 For reasons of cost and political acceptability, the introduction of a new pricing system should be gradual. Moreover social-order considerations must be taken into account in water pricing, but must not take precedence where sustainable water resource management is under threat. Social back-up policies should be preferred. Systematic ex ante and ex post assessment of the effects on demand of any such pricing policies is needed.

5.4 Sectoral pricing policy needs to be reviewed in accordance to the nature of the private-public partnership or public-public partnership.

5.5 The economic value of ecosystem services should be integrated into all sectoral policies and instruments (economic, trade, transport, agriculture and energy), as well as into public procurement and private sector decision-making.

5.6 The use of incentives–such as tax credits, cost-share programs, and utilization of the increasing block rate water pricing mechanism – as well as improved irrigation and farming techniques, control of invasive species and the use of marginal quality waters (including treated gray and waste water) should be promoted for water conservation.

5.7 Comprehensive studies, organized data sources and even literature surveys on the economic value of the water and sanitation sector in India should be conducted.

6. SECURING WATER IN SCHEDULED AREAS

6.1 Special efforts should be made to investigate and formulate projects either in, or for the benefit of, areas inhabited by tribal or other specially disadvantaged groups such as socially weak, scheduled castes and scheduled tribes.

6.2 In other areas also, project planning should pay special attention to the needs of scheduled castes and scheduled tribes and other weaker sections of the society. The economic evaluation of projects benefiting such disadvantaged sections should also take these factors into account.

6.3 There should be an integrated and multi-disciplinary approach to the planning, formulation, clearance and implementation of projects, including catchment area treatment and management, environmental and ecological aspects, the rehabilitation of affected people and command area development.

6.4 Water Sector Schemes and Programs should converge with PESA where community has the direct role in planning and management of community resources. This approach also is in harmony with the participatory approach in the NAPCC and National Water Mission.

7. CLIMATE CHANGE

7.1 Although the effects of climate change are unknown at the moment, but a comprehensive Environmental Impact Assessment and Social Environmental Assessment would enable disaster risk reduction. In each agro-climatic zone, agro-meteorological fields should be established with the soil health card program to regulate the quality of land and water in an integrated manner. Climate change adaptation measures should include reversal of groundwater depletion as well. Research on critical climate analysis and studies should be promoted.

7.2 Instead of an overt emphases on technical and technology based approaches that run with the narrow expertise of engineers and state negotiators, the new compact for river management/sustainability in the region incorporating different social constituencies and their experiences with the river systems in India should be given more attention.

7.3 Greenhouse gas emissions should be associated with water systems by reducing the energy cost of providing, treating, delivering, using, and cleaning water.

7.4 Creation of sharable information among river basins, Tran-boundary regions and states is essential for sustainable use of water resources. This would go a long way for selecting meaningful adaptation options to climate change impacts.

8. INTER-STATE WATER MANAGEMENT

8.1 The impacts of inter-state river water conflicts can be reduced by a more efficient design of mechanisms for negotiations: some of the possibilities include a national water commission independent of daily political pressures, a federated structure incorporating river basin authorities and water user associations, and fixed time periods for negotiation and adjudication.

8.2 River Board Organizations (RBOs): Under the provisions of the River Boards Act of 1956, RBOs should be set up to facilitate negotiation and arbitration surrounding interstate transboundary rivers. These are empowered for regulating and developing interstate rivers and their basins. The board should have members with expertise in fields such as irrigation, water and soil conservation, and finance.

8.3 There is an urgent need to deploy mediation as a tool for conflict resolution and participatory management. Mediation is a process that employs a neutral person or persons to facilitate a process of negotiations between the disputing parties so as to arrive at a mutually acceptable solution.

8.4 Alternative approaches to scenario building in water: There is a need to hypothetically freeze the total available water or freeze the quantum at current levels of total consumption for a given region or unit of analysis and build scenarios of alternative usages patterns. Such an exercise will help in

unraveling the assumptions that is made while making projections and will also assist in radically interrogating theories of risk society by positing scenarios as 'designs'.

9. INTERNATIONAL TRANS-BOUNDARY WATER MANAGEMENT

9.1 Total basin management in respect of a transboundary river is now recognized to be the best approach for the best possible development of water resources for equitable benefit of all each gaining more than is possible under narrow national approaches. This approach will allow local, national, and regional issues to be addressed within an overall framework The benefits derivable from cooperative total basin management of trans-boundary rivers include those:

9.1.1 from the river (e.g., increased food and energy production),

9.1.2 because of the river (e.g., reduced geo-political tensions, enhanced flood management),

9.1.3 beyond the river (e.g., catalyzing wider cooperation and economic integration), and

9.1.4 to the river (e.g., improved water quality, conserved biodiversity)

9.2 Action to embark upon a path of flourishing cooperation in water sector and beyond, and to work together to find most appropriate basin-wide management to seek, e.g., improved management of floods and optimal solutions to water scarcity and water quality problems as well as to find the best regional approaches to augmentation of water flows in the dry season, improved irrigation opportunities for the riparians, and hydroelectricity generation and sharing. But, appropriate actions must follow and it is the governments who must act at track-2 should provide support by clarifying issues and defining actions to properly manage the forward move.

9.3 For continuing good and friendly relationship among co-riparians: In the case of any planned intervention in a common river by a particular co-riparian, the key to preventing confusions from arising and avoiding

adverse impacts on the relationships between co-riparians is transparency and adherence to the principles of equity, fairness and no harm to any co-riparian (as enshrined in the 1996 Ganges Treaty between Bangladesh and India).

9.4 Misplaced lower riparian emphasize on obtaining more water from upstream. Stronger demand-side water policies and strong and stable infrastructure management will encourage better management and result in stabilizing effects on regional water tensions and enable regional water security.

9.5 Water politics among South Asian Nations that are co-riparian in key river basins, urgently need an ecological dimension and must acknowledge the varied fluvial linkages, from the delta-upwards. This will involve, significantly enough, harnessing the full gamut of what have been termed as confidence building measures (CBMs), such as evolving soft borders, thickening track two diplomacy and actively enabling scholarly exchange. It might no longer be possible to sustain the mere division of the Indus Rivers; rather we must actively seek new political and cultural possibilities for the beneficial sharing of waters.

MR. SURESH PRABHU, Former Union Minister and Chairman of Task Force for Inter-linking of Rivers

South Asia's future is directly linked to that of water because bulk of the population sustain on agriculture for their livelihood. Since, agriculture is highly dependent on irrigation in South Asia; water management has become one of the most critical factors for growth, development and sustainability in the future strategies of the region.

South Asia, like many parts of the world, has trans-boundary Rivers. Therefore, South Asian water issues are inevitably trans-boundary water challenges and conflicts. Most of the concerns related to water management and governance are common in South Asian countries. It is important to have a perspective of the entire region in terms of common grounds of cooperation and management of the water resource.

Is agriculture the root cause of water shortage problems in South Asia?

The regular themes in the South Asian water debates can be categorized into four main sectors. First, agriculture consumes more than 80% of the water in all these countries. In India it is 83%, in Bangladesh it is more, in Pakistan it is almost the same. However, in Nepal and Bhutan, agriculture water consumption is low given their small population. But in most of the countries the predominant use of water is for agriculture. Pre-dominant use of water in the agricultural sector is one of the root causes of the water problems of South Asia.

It is paradoxical to say that because water consumption by agriculture and water shortage is intricately linked in a vicious circle. So, unless better management and efficient use of water for agriculture is not undertaken, the South Asian water problem will not be solved.

Over-dependence of crops from one state or few states for securing the food supply of the country inevitably leads to over-exploitation of the resources, water being the most critical one. For instance, India depends on Punjab for its major share of food production and as a result, the surface and groundwater sources have been exhausted. Another predominant issue is the cropping pattern. It would be prudent to see this as an issue of agriculture

management. How to bring in the most efficient use of water for agriculture should be one of the first priorities if we are thinking of charting out a Blue Revolution for South Asia.

The second important factor is the efficiency of water use. Much of the agricultural infrastructure is operating at sub-optimal efficiency level. This is despite the fact that huge investments have been made into agriculture infrastructure particularly irrigation. If we are not going to reap the full benefit of it, then we are really losing out on the investments made as well as the possibility of making best use of the scarce resources available in this part of the world. So, therefore, agriculture has to be one of the major priorities.

How do we make power generation less water intensive?

The second area where water is intensively used is the power generation sector. It is not just used for hydroelectricity generation, as power plants whether they are thermal or nuclear need water for processes like cooling. So, how do we make power generation less water intensive is another challenge that South Asia is facing. Some of the new emerging technologies which again have a huge potential are in the renewable energy sector. Careful assessment is still required to use these in the most effective and efficient manner. For instance, it may be counter-productive if water is used again in the same manner for solar thermal power plants.

The third issue which is not really about quantity is water quality. In the context, human development indices in South Asia are extremely low. The water quality will determine the quality of life of people. In India, and the situation is not so different in other countries, probably 2/3rd of the diseases are on account of water quality. Fatal deaths that take place on account of water quality are related to 1/3rd of these diseases. So, Blue Revolution, through efficient water management will improve the quality of life, the health standards, and income of people.

A top priority: Improving water use efficiency in urban areas

Despite the fact that urbanization is increasing so rapidly the amount of water use in urban area is disproportionately low. Urban areas consume more water indirectly called the

virtual water consumption. In contrast to popular belief, water consumption in urban areas is not as high as it is in the general perception. However, improving efficiency in urban water has to be one of the top priorities.

One of the most contested areas in water debate is the pricing of water. What is the cost of urban water? How is cost of water determined? Is it the cost of infrastructure? The optimum infrastructure availability and usage is questionable. Is there enough scope for reducing the cost of infrastructure? Secondly, are we calculating the cost of raw water that comes in? Are we paying somebody for that water or is it available for free? So, therefore whatever methodology is adopted, first of all there is a need to come up with a normative approach of costing of urban waters itself. Also, are we really in a position to look at these issues in a manner that will be transparent and acceptable to decide how to actually calculate the cost of urban water itself? Therefore it is required that it should be supplemented with local initiatives.

There are some dimensions added by climate change to which the water issue is aggravated and also causing a sense of urgency. Climate change is like a great leveler. All the countries in the region are affected by it. It is a common threat and should be used as a means to deal with some of the trans-boundary issues.

Can the ground water depletion be reversed?

There are some successful case studies on it. Gujarat has been able to recharge the ground water in a significant manner. In one district of Gujarat the ground water depletion is still higher but in some parts they have been able to recharge it. It is not only time to recharge the ground water but also recharge the aquifers. India, Pakistan, Bangladesh, Nepal and Bhutan should try to work on ground water as much as surface water.

India's water availability has dropped to $1/4^{th}$ in the last 60 years largely because of mismanagement predominant population explosion. If it continues to multiply like this and water refuses to play ball with it, then we will hit the water stress situation before the end of this decade. So, therefore, population control has to be one of the most important parts of water management strategy for South Asia.

MESSAGE

MR. VIKRAM SOOD, Vice-President, Observer Research Foundation

The global hydrological cycle annually makes available several times more fresh water than is needed to sustain the current world population of about seven billion people. However, much of it is not accessible for human use because this water is not distributed evenly in time or space. Half of the estimated annual surface water available from rain, rivers and lakes run rapidly off the land in floods. An additional one-fifth of annual runoff is geographically too remote to be an economically viable source of supply for agriculture, cities, or industries for the foreseeable future. This leaves less than 30 percent of annual runoff as accessible for controlled human use, a figure that increases only as newly constructed dams capture and store additional flood water.

Humans already appropriate half of this accessible runoff, either directly in the form of withdrawals for agriculture, cities, and industries, or indirectly in the form of pollution dilution and other in stream uses. Even with optimistic assumptions about dam construction to increase supplies coupled with modest assumptions about the growth in human demands, human appropriation of accessible runoff could climb to 70 percent in the next two decades. Such a degree of human dominance of fresh water would have severe ecological consequences.

There is also widespread physical evidence that human activities have already reached or exceeded renewable water limits in many regions. The clearest indicator of unsustainable use is chronic over-pumping of groundwater, a practice now widespread in many important food-producing regions and large urban areas especially in developing countries where water rights are vague and unqualified.

Groundwater withdrawals exceed recharge levels in much of China's north plain, an important grain production area. The U.S. Great Plains and California's Central Valley, parts of the Middle East and North Africa, the valley of Mexico and parts of Southeast Asia have experienced the same level of degradation. Six of India's most important agricultural states are overexploiting ground-water to meet current irrigation demands. Their collective water deficit exceeds the average annual flow of the Nile River.

Another sign of excessive water use is that many major rivers now run dry during all or part of the dry season, when irrigation water is most needed. A case in point is the Indo-

Gangetic river system, home to over 750 million people. It is one of the world's most populous river basins in the World and is representative of complex interactions between man and nature, poverty and prosperity, problems and possibilities. Rapid expansion in agricultural water use is a common theme across these interactions and access to water is central to livelihoods of the poor who dominate these river basins.

With many aquifers and river systems being over-tapped to meet current water demands, stresses on freshwater systems is expected to worsen markedly as population and consumption levels increase. Two of water's most fundamental functions-its role as a prerequisite for life, on the one hand, and its use as a commodity or economic resource on the other will increasingly be in conflict. The outcome of this conflict will determine not only the World's food security and ecological sustainability but also the political stability in international river basins.

LIST OF DISTINGUISHED SPEAKERS

Mr. Salman Khurshid, Hon'ble Minister of Water Resources, Govt. of India

Mr. Suresh Prabhu, Former Union Minister & Chairman of Task Force for Interlinking of Rivers

Mr. Salil Bhandari, President, PHDCCI, New Delhi

Mr. Vikram Sood, Vice President, Observer Research Foundation

Mr. A. K. Bajaj, Chairman, Central Water Commission

Mr. Ahmad Rafay Alam (Represented by Mr. Maaz Hassaan Gardezi, Senior Researcher, LUMS), Senior Researcher, Lahore University of Management Sciences, Pakistan

Prof. Bhanoji Rao, Lee Kuan Yew School of Public Policy, National University of Singapore.

Dr. Q. K. Ahmad, Founder Chairman, Bangladesh Unnayan Parishad (BUP), Bangladesh

Dr. Rohan D'Souza, Asst Professor, Jawaharlal Nehru University, New Delhi

Mr. A. G. Noorani, Senior Advocate, Author & Columnist

Dr. A. K. Gosain, Head, Deptt. of Civil Engineering, IIT, Delhi

Mr. Muhammad Azeem Ali Shah, Senior Researcher, Lahore University of Management Sciences, Pakistan

Prof. A. K. Jain, Head, Department of Soil & Water Engineering, Punjab Agricultural University

Prof. Prem S. Vashishtha, Prof. & In charge (R&D), Sharda University, UP

Prof. Inderjeet Singh Sidhu, Professor, Punjab University

Mr. S. R. Ramanujam, Director, Samatva Infrastructure Advisors, Mumbai

Mr. Mohd. Shawahiq Siddiqui, Advocate, Supreme Court of India, Managing Partner, Indian Environment Law Offices, New Delhi

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