MEETING REPORT

Strategies for augmenting and conserving water – options for India*

A panel discussion was organized on the water-related options for India. In his inaugural address, T. Ramasami (Department of Science and Technology (DST), New Delhi) highlighted the challenges in designing complete solutions to water-related problems in the country. Based on his personal experience in the implementation of a technology mission on Winning, Augmentation and Renovation of Water (WAR for Water), Ramasami opined that there are many technologies available for addressing both quality and quantity-related issues. However technologies only provide inputs to designer solutions, which are important in real field applications to solve location-specific problems. What is needed is an integration of agencies and solution providers who can make the system work, along with the other attributes of success such as local market conditions, cultural practices, social structures and profitability.

Ramasami pointed out that 26 water challenges have been identified by DST in more than 89 locations. DST is finding it difficult to identify technology integrating platforms in terms of R&D institutions, private or non-governmental organizations who could develop and implement solution designs for water problems. There is a need to create more effective linkages. Water quality issues need to be understood along with issues of water quantity and specific applications. He sought the support of solution designers for water-related problems.

K. Lal (Indian National Science Academy (INSA), New Delhi), in his presidential address, discussed the deliberations (on water) at the meeting of the G8 plus academies in Paris during 24 and 25 March 2011, for recommending major initiatives in social development. Here the main focus was on water quality, which has worsened due to sanitary issues on the one hand and unacceptable levels of toxic elements such as arsenic, fluoride and microbiological species on the other. The academies are highly concerned about water problems in the world as it is projected that by 2050, about 3 billion persons worldwide would not have adequate supply of water. The development of a suitable knowledge base for water science and cost-effective technologies was stressed.

The panel discussion was organized under three sessions: (i) augmentation of water, (ii) conservation of water and (iii) enhancing water quality. In the first session, V. K. Gaur (Centre for Mathematical Modelling and Computer Simulation, Bangalore) spoke on the working of the hydrological cycle in general and its operation in India. He emphasized the need for knowledge of the watershed and groundwater basin in both hard rock and alluvial areas, and soil water. In India, groundwater is highly exploited. The amount of water available for development is not well constrained due to lack of awareness about evapotranspiration (ET) in the country. Our water policies should be driven by realistic knowledge of water science. S. K. Jain (Indian Institute of Technology (IIT) Roorkee) discussed the current understanding of water balance in India, both basin-wise and country-wise. In the water balance studies of many river basins such as the Indus, Ganga and Brahmaputra, the large flows entering through border areas are not accounted for. Thus the derived values of ET are rather low. Jain stressed the need for water balance studies in these basins.

T. B. Singh presented traditional solutions for water security, with a case history of catchment revival in the Arvari river basin using water-harvesting systems in ancient India, employing locally available technology and resources. The community had constructed johads and dams over small tributaries in uphill locations. Their initial success led to the building of more such structures. Thus the Bhagani river basin was revived, leading to sustainable and reliable water availability. All this happened in 12 years for Bhagani, a river that had disappeared in the 1940s. According to Singh, the focus should be on organizing the entire river basin community for water demand management. P. K. Mehrotra (Ministry of Water Resources, New Delhi) presented urban water-harvesting systems for mitigating water supply problems in Delhi. These systems should be designed on the basis of rainfall patterns, hydrogeological characteristics and infiltration rates in the area. Site-specific structures should be built based on the division of urban systems into small catchments. Artificial recharge needs site-specific knowledge, said S. K. Gupta (Physical Research Laboratory, Ahmedabad) who discussed measures for augmenting resources. He described an innovative soil-aquifer treatment technology for municipal water restoration, aquifer storage and recovery systems. He also advocated inter-basin water transfer for augmenting water supply.

The second session started with an emphasis on the traditional wisdom of water conservation over engineering-driven solutions, by R. R. Iyer. He discussed his paper on 'National Water Policy: an alternative draft for consideration'. There are issues regarding available and usable water resources, and also spatial and temporal availability of water. A substantial reduction in water demand for agriculture, which is the largest user of water, can be achieved through improvement in water-use efficiency, avoidance of wasteful-use, minimization of losses, production of 'more crop per drop', and changes in cropping pattern. He stressed on ecological and holistic solutions over engineering or economic solutions.

K. A. S. Mani (World Bank) noted that communities need to be empowered by providing information about groundwater. He presented an approach (started in 2002) in which 650 villages in Andhra Pradesh participated. Over 4000 volunteers made measurements of rainfall, groundwater table, water quality and crop planning. Such an approach increased curiosity and innovation in communities towards satisfactorily addressing their water problems. This is an example of science-based approaches to solve local problems. P. C. Tyagi said that a major problem is that any new demand

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for water is sought to be met from freshwater. He suggested that water should be stored in aquifers, used water should be recycled for agriculture and for flushing toilets, and losses such as those during water transmission should be checked. The main hurdle is that people want water to be supplied free and that there is no coordination between central agencies. A. Mittal (IIT Delhi, New Delhi) suggested looking for new sources of water, and use of wastewater as an additional water resource for purposes where freshwater is not an absolute necessity.

In the third session, A. Varma (Indian Agricultural Research Institute, New Delhi) presented the ways in which water quantity and quality issues had been handled in agriculture and the lessons to be drawn from those experiences. R. Kumar (National Environmental Engineering Research Institute (NEERI), Zonal Lab, Mumbai) spoke on connecting water and wastewater for augmenting water resources. He showed that the domestic wastewater (sewage) generated in the country is 30,000 MLD, out of which only 9800 MLD is treated. With proper treatment, this can be a supplementary resource for different uses of freshwater. Kumar described a wastewater treatment technology developed at NEERI, called Phytorid, which is suited to our climate and is also cost-effective.

A water safety plan for Nagpur – assessment of risks in catchments, source treatment, storage, distribution to households and monitoring of water quality at all levels – was presented by P. Labhasetwar (NEERI, Nagpur). He illustrated the status of water quality and risks at all levels in the city, and stressed on proper monitoring, education and partnership with all stakeholders. P. K. Seth (Biotechnology Park, Lucknow) reviewed technologies for water quality enhancement. His recommendations included: formulating proper standards and certification for point of use technologies, monitoring small quantities of residues of pharmaceutical and personal-use products, and making treatment technologies effective. Issues related to organic pollutants in aquatic environments were discussed by S. Mukherjee (IIT Bombay, Mumbai). She pointed out that their presence in water can affect the nervous, endocrine and immune systems. V. Rajamani (Jawaharlal Nehru University, New Delhi) argued for an understanding of life processes over the history of the earth, and their role in shaping its evolution and natural resources. He proposed rigorous research and education in interacting physical, chemical and biological aspects of the hydrological cycle, and using this knowledge for development of water resources.

The concluding session encompassed the following recommendations that emerged from the various presentations and discussions:

(1) Emphasis on research and education in water science and technology.

(2) Quantification of working of the hydrological cycle at hierarchical space–time scales.

(3) Estimation of ET for river basins.

(4) Combination of traditional methodologies, modern technologies and community participation. Integration of technologies used in different socio-cultural settings.

(5) Groundwater recharge in urban systems using site-specific knowledge.

(6) Emphasis on ensuring and enhancing water safety – from watersheds to households – by proper monitoring and risk assessment.

(7) Extensive use of nature-based technologies such as Phytorid for wastewater treatment, augmenting water supply, relieving freshwater supply for drinking and other uses.

(8) Recycling of wastewater to augment availability and technologies for conserving use of water at the level of agriculture, industry and household.

(9) Water cannot be treated as a free resource; it should be priced. Studies and integration of the economics of water supply and its use.

(10) Addressing the new and emerging molecules that could become causes for concern in future.

According to R. Rajaraman (INSA), these recommendations can be further developed into separate approach papers by INSA, forming the basis for initiating/strengthening research/short-term courses on these issues. The recommendations will be sent to various government agencies like DST and other stakeholders for further action as well as to consider supporting R&D proposals based on these suggestions.

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