Water summit*

The mountainous state of Uttarakhand is rich in natural resources like water, and is known for many glaciers and lakes. Many rivers also originate/run from this small state. Reduction in per capita availability of water owing to population growth, depleting groundwater table and deteriorating water-quality scenario in the developing world were discussed during the summit.

The programme was inaugurated by B. S. Bisht (Vice Chancellor, G.B. Pant University of Agriculture and Technology (GBPUAT), Pantnagar). He stressed the need for conserving water and suggested the adoption of water harvesting as a national mission. He has also highlighted the reduction in per capita availability of clean water owing to population growth. Bisht promoted the idea of an efficient management system for optimum utilization of water resources. More than 92 faculty, engineers, scientists, NGOs, researchers, companies, industries, planners, practitioners, social and economic scientists, and local and national media from Delhi participated in this conclave for the cause of water.

H. J. Shiva Prasad (GBPUAT) introduced the dignitaries and spoke about the objective of the Summit. Experts in the field participated and delivered a series of lectures on various topics.

P. P. Mujumdar (Indian Institute of Science (IISc), Bangalore) spoke on 'Climate change impacts on hydrology and water resources'. A class of methods for assessing hydrologic impacts of climate change, emphasizes the uncertainties involved in assessing such impacts at the regional, and river-basin scales. He described the recent work on addressing such uncertainties.

There is scientific evidence to show that global climate has changed, is changing and will continue to change. The recently released Assessment Report 4 of the Inter-Governmental Panel on Climate Change establishes that a rapid change in climate has occurred over the last few decades. Three distinct signals of climate change witnessed in the recent decades are: (a) rise in global average temperatures; (b) change in regional precipitation patterns and (c) rise in the sea levels. Hydrologic response at river-basin scales is suggested to be changing due to climate change. Water resources are inextricably linked with climate, and therefore the prospect of global climate change has serious implications for water resources and regional development. Increased evaporation (resulting from higher temperatures), combined with regional changes in precipitation characteristics (e.g. total amount, variability and frequency of extremes), has the potential to affect mean run-off, frequency and intensity of floods and droughts, soil moisture, and water supplies for irrigation and hydroelectric generation.

Deepak Kashyap (Indian Institute of Technology, Roorkee) spoke about 'Groundwater modelling and its role in planning' by performing numerical experiments on a groundwater flow model. The objective of such experimentation for practising engineers is usually to check the feasibility of any human intervention into the groundwater system, e.g. pumpage, recharge, etc. For groundwater academics, the objective could be to understand various processes involved in the groundwater system. A groundwater flow model is essentially a tool to project the state variables of the groundwater system for an assigned pattern of forcing function, and known initial and boundary conditions and parameters.

Floods and droughts constitute majority of the natural disasters. A substantial portion of the geographical area of India is affected either by floods or by droughts. Climate change causes also flood or drought problems in many new areas. In the light of these facts, an overview of the various traditional as well as modern practices adopted in India to manage both floods and droughts separately and also in an integrated manner through better management practices was put forward by V. R. Desai (IIT Kharagpur). Although floods and droughts are inevitable, it is possible to minimize their adverse impacts separately and in an integrated manner. The success achieved in such efforts largely depends upon the affected basin/population size, duration and return period of flood/drought, depth and area of the flood inundation, and promptness of response from the affected persons/policy makers. Long-term and integrated approach through water harvesting and watershed management can significantly reduce the flood/drought damages.

K. V. Jayakumar (Centre for Water Resources Development and Management, Kozhikode) spoke about urban water management. He mentioned that urbanization changes the hydrological cycle of a region because the catchment has been changed from a natural to a man-made one. In his talk, the various problems associated with urban stormwater management problems in countries like India, with specific reference to Kerala were presented, along with possible solutions to tackle the problem using cost-effective methods. As a prelude, some important statistics about the coverage of water supply and sanitation in less developed countries were presented to show the need for improved urban water management practices in less developed countries. The major problems faced by countries like India for the design of urban stormwater drainage network are: (i) no data available; (ii) data available, but not adequate, or (iii) adequate data available, but not reliable. Methods are now available for developing intensity–duration–frequency relationship under the above data-scarce conditions. The use of swales, detention basins and constructed wetlands was also highlighted.

K. D. Sharma (National Rainfed Area Development Authority, New Delhi) highlighted the importance of groundwater management for national food security. He highlighted that reduction in groundwater supply, saline water encroachment, drying up of springs and shallow aquifers, increased cost of pumping, replacement of centrifugal pumps with expensive submersible pumps, reduction in free flow, weakening drought protection

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and local land subsidence were threatening the sustainability of the aquifers.

V. N. Uma Mahesh (National Institute of Technology, Warangal) spoke about 'Soft computing applications in water resources'. The applications of these techniques in hydrology and water resources are in still early stages, but the results of various studies reported in the literature indicate that these techniques have a good potential for solving the problems in hydrology and water resources. These techniques can be viewed as alternative modelling tools to supplement the conventional mathematical models. In the recent years soft computing techniques are increasingly becoming more popular among hydrologists and water-resources researchers due to their ability to overcome some of the deficiencies of the traditional modelling techniques. The soft computing techniques which comprise artificial neural networks, fuzzy logic and genetic algorithm are basically data-driven techniques and can be considered as an extension of statistical techniques. Many other applications may be forthcoming as these techniques gain acceptance among hydrologists and water-resources engineers.

Water is an integral part of all facets of life. It is a key element in the socio-economic development of the country as a whole, and particularly of critical importance to the Himalayan region, as mentioned by G. S. S. Negi (G.B. Pant Institute of Himalayan Environment and Development, Almora), while speaking on 'Mountain springs: Sources of fresh water in peril?'. Although water sources are found in abundance in the Himalayas (also commonly referred to as the water tower of the earth), their uneven distribution both in space and time comes in the way of development needs of the region. Despite the fact that mountains provide life-giving water to millions of people living downstream through perennial river system, people face water shortage of varying magnitudes now almost year-round, except for the few months of the rainy season. Social conflicts on issues relating to access to water for drinking and other uses have increased. The problem arising out of increasing and competing demands for water is becoming more acute in terms of availability, quality, management, data acquisition, laws, institutions and investment.

A. P. Sharma (GBPUAT) spoke about harnessing water resources for fisheries production. Higher fish production is achieved by combining mainstay culture practices with strong traditional knowledge and by applying scientific strategies in management. With fish becoming a popular diet component, aquaculture should be promoted with a view to achieving nutritional security and generating further employment opportunities. Fish also contains significant amount of all essential amino acids, particularly lysine, in which cereals are relatively poor. Fish protein can be used, therefore, to complement the amino acid pattern and improve the overall protein quality of a mixed diet. Moreover, the sensory properties of an otherwise bland diet can be enhanced through fish products, thus facilitating and contributing to greater consumption. A fish supplement can significantly raise the biological value of a cereal-based diet. Also, fish meat is generally a good source of the B vitamins and, in the case of fatty species, of A and D vitamins. As for minerals, fish meat is a particularly valuable source of calcium and phosphorus as well as iron, copper and selenium. Saltwater fish have a high iodine content. In addition to essential amino acids and proteins, fish nutritional attributes relate to the quality of lipids, and vitamin and mineral content. Convincing evidence now exists for the significant role that fish and fish oils play in decreasing the risk of developing cardiovascular diseases and in improving foetal brain development.

T. C. Gupta (NHPC Limited, Banbasa) spoke about 'Challenges in development of hydropower in India'. He mentioned that the theme of the Summit was aptly timed, when there have been increasing concerns globally about the need for sustainable energy development/water management strategies to meet the growing demands through clean development mechanism in which hydro power is playing a vital role.

India is one of the fastest growing economies of the world, with GDP growth rate projected between 7% and 8% per annum. At present, India's installed capacity is about 145 GW against the demand of 200 GW. The energy shortage and peaking deficit for the year 2007–08 were 9.9% and 16.6% respectively. The Prime Minister, Manmohan Singh, has set a target to provide 'power to all by 2012'. In addition, the annual per capita consumption of electricity is also expected to increase from the existing 704 to 1000 kwh per annum by 2012. Presently, the installed capacity of hydropower is around 36 GW, which makes 25% of the total installed capacity against the desired mix of 40% from hydro and 60% from thermal and other sources. With fast-depleting reserves of fossil fuels, including coal and gas, and increasing awareness and concerns about global warming and climate change, there is an urgent need to re-align our policy planning and strategies to conserve our limited fossil-fuel reserves and bridge the demand–supply gap by generating more power from renewable sources of energy, especially hydropower. This will help address the global concerns for clean development mechanism together with providing energy security to the nation.

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