

WORLD WATER DAY CELEBRATION BY PAKISTAN ENGINEERING CONGRESS ON 22 MARCH 2015

KEY RECOMMENDATIONS

I. INTRODUCTION

Pakistan Engineering Congress celebrated World Water Day on the theme of 'Water and Sustainable Development' on 22nd March 2015. Engr. Syed Abdul Qadir Shah, Chairman Pakistan Engineering Council was the Chief Guest. Engr. Iftikhar Ahmad, President Pakistan Engineering Congress presented Welcome Address.

II. PROCEEDINGS

Nineteen (19) papers had been contributed by Water and Irrigation Experts as listed in Annex-01. Topical coverage of these papers was as below: -

i. Overview	3
ii. Surface Water	4
iii. Ground Water	4
iv. Water Management	4
v. Water Conservation	4
Total	<u>19</u>

Above papers were presented by the concerned authors as well as discussed. These papers will be printed in book form for dissemination among members of Pakistan Engineering Congress.

The event was very well attended and given wide coverage by electronic and print media.

III. KEY RECOMMENDATIONS

Key topical recommendations emerging from the event were as per following.

A. Overview

1. a. About 97.5% of all water on earth is brackish leaving only 2.5% as fresh water. Out of this, a tiny 1% is accessible for human use. Considering geographic accessibility and regulation through dams the projected available runoff (AR) till 2025 is 13700 km³. Corresponding projected diversions are about 9830 km³ representing about 70% of AR.
- b. Clearly, humanity is approaching the limit of fresh water supply while presently: only about half of diverted water is being consumed; and a large proportion of world's population is experiencing water stress, which may become acute by 2015. Therefore, sustainable development of water resources is not only the dire need but becoming essential for existence of mankind.
- c. Sustainable water resource development should aim at: -
 - Conservation of quantity and quality.
 - Improving human productive power without damaging the society or environment.

- Progressive socio-economic betterment without going beyond Earth's twin capacities of natural resources generation and waste absorption.
- d. Focus of evaluation strategy for sustainable development should be that: -
- Current piecemeal and consumption oriented approaches to water policy may be substituted by systematic approach considering ecological integrity / service which natural sources can provide.
 - Besides increasing public awareness about the global challenges related to water, we must also change the way water issue is being perceived from being a driver of conflict to a catalyst for collaboration.
 - Recognizing our limited ability to see needs of the future, any attempt to define sustainability should remain as open and as flexible through the use of adaptive management.
2. a. While global approach to sustainable water development is somewhat generic, the national context requires focus on sustainability of already developed surface and ground water resources consistent with food, fiber and energy requirements of rapidly growing population.
- b. Indus Basin Irrigation System (IBIS), the mainstay of national economy, is currently facing a shortage of about 11% in post-Tarbela uses developed after completion of Indus Basin Project. This is basically due to: -
- Rapid siltation in live storage capacity of the storages at Tarbela, Mangla and Chashma (already reduced by about 1/3rd from original 15.5 MAF).
 - Non-construction of any new major storage after commissioning of Tarbela in 1977, while about 29 MAF surplus water is escaping to sea.
- c. Pakistan is facing an acute energy crisis for the past few years with perpetual load-shedding in the range of 2000-4000 MW. This has been basically caused by heavy reliance on thermal generation costing upto 8 times WAPDA's Hydropower System. To overcome this crisis at affordable tariffs, it is imperative to harness vast hydropower potential through multi-purpose mega storages instead of the present focus on run-of-river development.
- d. Stunted growth of agriculture in the face of rapidly growing demand for food and fiber warrants not only sustenance of post-Tarbela canal diversions into IBIS, but further development. In this regard:
- It is estimated that by 2025 additional storage of about 18 MAF will be needed.
 - The main focus should be for priority development of 5 multi-purpose already identified storages and principally approved by GoP in 2005.
 - Considering engineering preparedness, core construction may be immediately started on Diamer Basha Dam Project with live storage of 6.4 MAF and cheap annual energy generation of about 21500 GWh through

its: at site installed capacity of 4500 MW; and cascading effect on the existing downstream facilities of Tarbela, Ghazi-Barotha and Chashma.

3. a. Besides surface water, a very large scale extraction and use of groundwater for irrigated agriculture has already taken place. Consequently, about 45 MAF of fresh groundwater is being pumped at the farm gate thus providing over half of crop water requirements. Though sustainable groundwater yield is estimated about 55 MAF, the remaining potential is located in areas where the quality is poor.
- b. Unregulated and uncontrolled use of groundwater has diminished the related accessibility. A trend of continuous decline of fresh groundwater has been observed in many areas of the Indus Plains which illustrates serious imbalance between abstraction and recharge. Depletion of groundwater is more pronounced in non-command areas of Punjab where agriculture is heavily dependent on this source.
- c. This situation needs priority redressal through measures highlighted in the following Sub section C 'Groundwater'.

B. Surface Water

1. Water scarcity is becoming critical with passage of time. Therefore, transfer of water from high summer flows to lean winter flows is essential. This can be achieved through priority implementation of large storage dams on Indus and tributaries.
2. a. Climate change has increased the level of uncertainty in the water availability. Therefore, its optimal use is crucial to our survival.
- b. It is extremely important to invest more in hydrological investigations for developing a better understanding of snow and ice regime changes of Upper Indus Basin under the projected scenario of climate change.
- c. By adopting proper practices, including use of technology and infrastructure developments supported by intensive hydrological investigations of our rivers, we could make efficient use of water. This will enable meeting the requirements of food, fiber and energy of our rapidly growing population.
3. Kalabagh Dam Project (KDP) stands ready since 1988. Delay in its implementation due to politicization has hit the national economy hard, particularly agriculture and power sectors. As mentioned above, due to rapid loss in capacity of three on-line storages, we are: unable to sustain the level of canal diversions attained in post-Tarbela period; and facing a perpetual load-shedding ranging between 3000-4000 MW. To cope with this situation, a viable option could be priority implementation of KDP with live storage of 6.1 MAF and installed capacity of 3600 MW.
4. Besides rapid siltation of the three on-line reservoirs, their operations remain sub-optimal. In this regard, computer based mathematical simulation models are now available to derive firm yields thus providing a useful tool for optimizing reservoir operation. It is, therefore, recommended that serious consideration be given by the operators (WAPDA) and monitors (IRSA) for subjecting the on-line reservoirs to application of modern computer based mathematical simulation techniques.

C. Ground Water

1. As mentioned above, about 45 MAF of fresh groundwater is being pumped annually to provide about 50% crop needs. However, sustainability of this extraction has come under serious doubt due to combination of the following factors: -
 - a. Excessive mining of fresh aquifers due to imbalance between recharge and abstraction resulting in progressively increasing pumping costs.
 - b. Deterioration in quality due to salt water intrusion from the adjacent saline water zones.
 - c. Salinization of irrigated lands due to application of marginal quality groundwater specially in tail-ends of canal distribution system.
2. To address the critical issue of groundwater pumpage sustainability, effective management of this precious resource is essential through: -
 - a. Putting in place monitoring measures with priority for the aquifers under severe stress to provide basis for policy reforms for their effective regulation.
 - b. Effective conjunctive use of surface and groundwater.
 - c. Educating the farmers for adopting appropriate technical / scientific tools to protect key aquifers with regard to quality and quantity.
 - d. Introducing a range of corrective measures before problem becomes insolvable or not worth solving.
3. Particular attention is drawn to the aquifer underlying Lahore, sustainability of which is now seriously threatened due to: increasing gap between recharge and abstraction; and deterioration in quality due to recharge from untreated sewerage effluent and intrusion from the adjacent salty aquifer. The following corrective measures are recommended: -
 - a. Establishment of a central groundwater organization with responsibility of: comprehensive awareness raising campaign about impending water shortage; efficient and sustainable use of this precious resource; and future planning and development of water supply and sewerage.
 - b. Taking masses on board to achieve successive reduction of abstraction-recharge gap for ensuring long-term sustainability.
 - c. Each and every user of existing groundwater above 0.2 cusec should be registered and each new user should get a permit before installing equipment including payment of groundwater development surcharge.
 - d. Waste water disposed by all entrepreneurs should be monitored to ensure its proper treatment at source or payment of penal charges for untreated load.
 - e. At least two small weirs be constructed on Ravi at appropriate locations in vicinity of Lahore for enhanced good quality water recharge to groundwater.

4. To sustain various fresh water aquifers without mining, artificial / induced recharge proposals be developed. In this regard, a case study was conducted for Punjab rivers to create small storages through inflatable dams. This study revealed that: -
 - a. Ground water recharge can be successfully achieved at 27 river locations in Punjab through inflatable dams having flexibility in operation with available flow during lean and flood period.
 - b. Effort should be extended further by conducting feasibility studies considering detailed aspects including economic benefits.

D. Water Management

1. Integrated Water Resources Management (IWRM) is fundamental to dealing with both existing and emerging challenges regarding sustainability by taking into account the issues like: effect of climate change on river hydrology; surface and groundwater use; water quality; pollution; urbanization and industrialization; provision of safe drinking water and sanitation; and licensing access to water.
2. Implementation of Integrated Water Resources Management (IWRM) in a system involving 105 MAF of annual canal head diversions and 45 MAF groundwater abstractions is a challenging task. This should be tackled through: -
 - a. Institutional and policy reforms
 - b. Managing climate change impacts
 - c. Addressing water quality issues
 - d. Providing safe drinking water and sanitation through effective implementation of: National Drinking Water Policy (2009); and National Sanitation Policy (2006).

E. Water Conservation

1. Under rapidly growing global population, the water scarcity is assuming alarming proportions. Currently, our annual water availability is under 1000 m³/capita. According to international standard this falls under the category of 'Scarcity'. It is projected that by 2025, the water availability will be around 500 m³/capita and bring the country in the category of 'Extreme Scarcity'. Under this scenario, water conservation will assume very important role in conjunction with other sustainability measures under IWRM.
2. With regard to conservation, the Government is already pursuing 'On-Farm Water Management Programme' in the water-course commands of IBIS. In addition, the following potential conservation areas require focused attention: -
 - a. Creation of awareness among end water users through 'Farmers Organizations' for adopting efficient crop irrigation techniques.
 - b. Switching over from the prevalent high delta to low delta crops including rationalization of existing very high water allocations in certain irrigated areas.
 - c. Promoting high efficiency systems such as sprinkler and drip.

- d. Introducing sustainable efficient irrigation methods for the major Rice and Wheat crops.
- e. Lining of irrigation conveyance system, particularly in saline groundwater areas.