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SPECIAL ARTICLE

Public Water Supply : Issues & Challenges

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Water is essential for our life, livelihood, food security and sustainable development. It is a scarce natural resource but renewable through cyclic process of the climate. India having one-sixth of world population and 2.4% of world's land area is to satisfy with only 4% of world's renewable water resources[1]. The per capita availability of water is decreasing in the country and it has reduced to one-third today compared to water availability during independence. The demand of water is increasing at a faster rate due to growing population, growing agriculture, food production, rapid industrialization and economic development. Again climate change in recent time has resulted in alteration of rainfall pattern. It has been predicted that the climate change is likely to increase the variability of water resources affecting livelihood and human health. Spatial rainfall pattern of varying characteristic has resulted in uneven water resources and thereby developing water stress and water-scarce situation in many stretches of the country. The situation has aggravated due to natural and anthropogenic pollution of both groundwater and surface water sources.

The global water cycle is deeply embedded in the earth system and thus strongly related to water resources and human development. Global temperature rise vis-à-vis climate change will cause considerable fluctuation in the hydrological cycle. While the amount of water may remain the same the probability of extremes, such as, frequent flooding and droughts are likely to be more as well as severe than before. This situation may cause adverse impact on agricultural and industrial development. The climate change will result in decrease flow in rivers, deterioration of water quality through increased

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pollutant concentrations and load from surface run-off and overflows of water facilities due to increased temperature.

According to National Water Policy (2012)[2], planning, development and management of water resources need to be governed by common integrated perspective considering local, regional, state and national context, having an environmentally sound basis, keeping in view the human, social and economic needs as well as good governance through transparent informed decision making to achieve equity, social justice and sustainability. Unplanned and uncared abstraction of ground water in many regions has resulted in scarcity of fresh water with depletion of ground water table and deterioration in water quality.

Water is a public good and every person has the right to demand drinking water. To increase economic productivity and improve public health, there is an urgent need to enhance access to safe and adequate drinking water. Accordingly every water supply agency must ensure water security and safety for the consumers addressing the issue of potability, reliability, sustainability, convenience and equity.

The quality of ground water in certain regions has undergone a change to such an extent that the use of such water could be risky and hazardous. Increase in overall salinity of the groundwater and / or presence of high concentration of fluoride, arsenic, iron, nitrate, total hardness and few toxic metals have been noticed in large area of several states in India. Drinking of fluoride contaminated water may cause dental, skeletal and non-skeletal fluorosis. Excess fluoride in groundwater has been detected in more than 200 districts in 20 States of the country. Consumers may suffer from arsenicosis if they drink arsenic contaminated ground water for prolong period. Arsenic contamination in groundwater has been detected in West Bengal, Bihar, Uttar Pradesh, Jharkhand, Chattisgarh, Assam and Manipur. Coastal regions of the country are suffering from fresh water crisis due to saline water intrusion.

Quality of surface water sources are also getting deteriorated due to mixing of untreated or partially treated municipal sewage and industrial effluent. Surface and groundwater pollution from pesticides, insecticides, toxic chemicals and heavy metals are causing problem and concern in many places. Bacteriological contamination in many rivers, lakes and other water bodies has reached to alarming proportion. If this situation continues

and action to control pollution is not taken up immediately then it will be difficult to purify river water by the application of conventional water treatment process.

Public water supply qualitatively must conform to the specification laid down by Bureau of Indian Standard (10500: 2012)[3]. Thus any unwanted matters or impurities need to be removed from surface water and ground water by using appropriate water treatment process. Unit operations of water treatment process may be sedimentation, co-precipitation, filtration, adsorption, ion-exchange etc. Finer and dissolve impurities can be removed by the application of micro-filtration, ultra-filtration, nano-filtration and reverse osmosis. In order to keep water pathogen free disinfection is mandatory. Point-of-use water purifiers have been developed by various manufactures with technology options suitable for separation of target impurities. Such water purifiers mostly use U-V rays for disinfection. Package drinking water and mineral water manufactures prefer ozonization and U-V rays for disinfection.

In order to assure safe water supply to the consumers there must be water quality monitoring and surveillance program. Water quality can be assessed by testing in the laboratory or by using field test kits on regular basis. Surveillance of drinking water quality is an uninterrupted and vigilant public health assessment and watch dog of drinking water supplies. Water testing laboratory infrastructure along with field testing kit should be available for both urban and rural water supply systems. Under national program the issue of Water Quality Monitoring and Surveillance has been given due emphasis. In rural water supply system the monitoring and surveillance results from the habitations are also being put on the data-base of the Department and monitored to ensure drinking water scarcity at the household level.

In order to achieve water security at the individual household level, the water supply system should not depend on a single source. During natural calamity or pollution of different sources, the single drinking water source may either become non-potable or inaccessible resulting in acute shortage of drinking water availability to many, especially to the marginalized people and cattle. Water security involves conservation and storage of water by utilizing different sources for different use. It can be achieved by collecting and storing rainwater, treating surface water / ground water for drinking and cooking, untreated water but of acceptable quality for bating and washing and grey water / spent water for flushing of toilets. To ensure risk and vulnerability reduction on such occasions and to

ensure reliability and sustainability, a good framework should consider different drinking water sources accessible in different situation and different point of time.

Considering the actual problems of water scarcity that many parts of the country are facing and many parts are likely to face in near future, it would be prudent not to ignore the direct exploitation of nature's simplest and most fundamental source of renewable fresh water – Rain water. Harvesting of rain water is an assuring, ensuring and enduring way to make the nation capable to solve the water crisis. It is a technology that people can develop, use and manage; and therefore RWH must be popularized as people's program.

It is of great concern that low consciousness about scarcity of water and its life sustaining and economic value has resulted in mismanagement, wastage and inefficient use of water. The un-accounted for (UFW) water in many Indian cities and towns ranges between 40 – 50 percent in our country[4]. Similarly wastage of water in agriculture sector is extremely high. Thus wastage of water must be reduced by minimizing pipe leakages, judicious use of water in agriculture and industry. Recycling and reuse of water should be practiced in industries, multistoried buildings, institutional and commercial establishments. In water scarcity areas water-shed management system may be adopted for augmentation of ground water and surface water resources.

Water conservation is defined as the minimization of loss or waste, care and protection and appropriate use of water. Facilities are to be created for rain water collection and storage through de-centralized and centralized approaches. Artificial recharging can be made mandatory through introduction or modification of building rules and regulations. More emphasis needs to be given on conjunctive use of surface and groundwater resources if feasible, to meet the water demand. Public water supply system may be operated with minimum prescribed loss. Installation of water meters and introduction of water-tariff may minimize considerable quantum of water loss from cities and towns. Application of appropriate water saving technology and appropriate cropping system may minimize water requirement in agriculture. Principle of recycling and reuse of water may help in the process of water conservation to overcome the problem of water crisis.

Waste water treatment and management for abatement of pollution needs priority at the present juncture. Appropriate technology must be applied for treatment of municipal waste water. Emphasis must be given on tertiary treatment of waste water for reclamation of water. Water reclamation is a process by which waste water quality is upgraded by using

biological and chemical treatment processes so that water can be returned to the environment safely to augment the natural systems from which it came. Most of the uses of water reclamation are non-potable uses such as, washing cars, flushing toilets, cooling towers for power plants, concrete mixing, gardening and irrigation etc. In order to minimize fresh water demand, industries must be motivated for recycling treated effluent in the process and if feasible, to achieve “zero discharge” credit.

Water is a State subject and State Government / its agencies are responsible for managing safe drinking water. With 73rd Amendment of the Constitution, rural drinking water has been placed in the XIth schedule of the Constitution to be devolved to Panchayati Raj Institutions. The rural water supply program aims at empowered, well aware and skilled stakeholders capable of proper planning, implementation, operation, maintenance and management of water supply and water resources at all levels. A well planned information, education and communication (IEC) strategy is a necessity to play a critical role. IEC campaign has to inform, educate and persuade people to realize their roles and responsibilities, and benefits accruing from investing in right practices.IEC strategy needs to prepare the PRIs and rural community to take over the responsibility of managing and providing safe drinking water to all on a sustainable basis.

All water supply agencies must adopt holistic approach for facilitating water safety, security and sustainability. Following focused areas need to be addressed for ensuring water supply to rural and urban communities:

- Protection of drinking water sources; sustainability of water sources
- Planning and management of water services
- Use of safe and clean water
- Judicious use of water
- Avoiding wastage of water
- Rainwater harvesting, use and recharging
- Reuse and recycling of water; reclamation of water
- Water-borne diseases and illness time
- Water storage and handling
- Hygiene behavior and practice
- Water quality monitoring and surveillance
- Gender specific water issues
- Water pollution and control

- Water treatment; low-cost technology options
- Water safety and security
- Research and development study
- Community awareness and motivation / community involvement
- Implementation of 24x7 water supply where feasible
- Capacity building and institutional development
- PRI / community involvement in operation and maintenance of rural water supply system

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