Groundwater Resource Scenario and Challenges in India – G.C. Pati, Chairman, CGWB & CGWA

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Water is vital for the growth of economy and is a critical component of ecology. India has 1122 billion cubic metre (bcm) water, annually available for utilization out of which groundwater is 432 bcm and surface water 690 bcm. Ubiquitous nature of occurrence, reliability, ease of access and operation, least gestation period, economy and independence of use has made groundwater the most preferred water resource. In India, groundwater accounts for over 62% of irrigation water requirements, about 85% of rural drinking water supply and about 50% of urban and industrial water requirements. Urban areas irrespective of their hydrogeological settings are highly dependent on groundwater resources.

India has varied hydrogeological settings. The behavior of groundwater in India is highly complicated due to occurrence of diversified geological formations with considerable lithological and chronological variations, complex tectonic framework, climatological dissimilarities and varying hydro-chemical conditions. Copious groundwater is available in alluvial aquifers in Indo-Gangetic and Brahmaputra basins. However, groundwater availability in hard rock terrain is a concern.

India is the highest groundwater extractor in the world with annual groundwater withdrawal of about 249 billion cubic meter (bcm) accounting for nearly a quarter of worlds groundwater withdrawal. About 88% of the extracted groundwater in India is being utilised for irrigation. The contribution of groundwater to India's GDP is about 9 percent. Groundwater acts like a cushion to cater to the rising water demands not being fulfilled by other committed water sources. Dependence on groundwater has increased tremendously leading to overexploitation and deterioration of its quality at many places. Out of the total 6881 groundwater assessment units, 1186 have become over-exploited, 313 critical and 972 semi-critical based on the stage of groundwater extraction. The adverse effect of over-extraction from the aquifers has not only manifested as drying of shallow wells due to continuous decline in water levels, but also given rise to increase in many types of contaminants of geogenic & anthropogenic origin in groundwater. Groundwater, in major parts of the country has one or more chemical constituents exceeding the respective permissible limit of their use. Particularly, occurrence of arsenic, fluoride, nitrate and iron in groundwater in a large part of our country is a great concern. Emerging pollutants from medical wastes, medicine residues in human excreta, pesticides, plastics etc are going to be some of the most formidable contamination challenges in groundwater sector in coming days. Global warming and climate change associated variations in rainfall patterns and sea-level rise may also pose serious threat in terms of increased evapo-transpiration, decreased groundwater recharge and increase in inland and coastal salinity in the aquifers.

Some other issues of groundwater sector in India are: (1) The regional mismatch between water availability and demand is high. There is skewed development and under-utilization of groundwater resources in eastern states. (2) Availability and sustainability of ground water in hard rock areas is a concern. (3) Less recharge potential and resource availability in arid areas. (4) Water logging and salinity problems (in some parts of) canal command areas. (5) Urban Ground Water Management. (6) Spring management in hilly terrain. (7) Effects of climate change which is likely to further aggravate the problem. (8) Groundwater use is dependent on demand not supply (resulting in indiscriminate extraction without due regard to the recharging capacities of aquifers and other environmental factors). (9) Ownership of groundwater.

India, being agro-climatologically a diverse country, has different challenging issues in groundwater sector in different areas. Given the variability and heterogeneity, it is not possible to device a one-size-fits-all kind of solution for the entire India. Unconfined and confined aquifers in hilly, alluvial, urban, coastal and hard rock terrains require area-specific management interventions for sustainability of groundwater resource. Besides effective implementation of ground-water regulation, both supply side and demand side management, is the key to combat the emerging problems of water scarcity.

Some of the supply side groundwater management measures are: (1) Scientific Development of groundwater resource. (2) Conjunctive use of surface water and groundwater resources in canal command areas. (3) Augmentation of groundwater resource by rainwater harvesting and artificial recharge. (4) Recycling and reuse of water. Use of treated water for re-use for appropriate purposes. (5) Urban water recycling and re-use. (6) Utilisation of advanced desalinization methods. (7) Management of water quality. Action to protect recharge sources from contamination.

Some of the demand side groundwater management measures are:

In domestic sector : (1) Introduction of domestic water saving devices. (2) Water meters on all consumers/groups of consumers. (3) Progressive water tariff structure. (4) Sewage and other domestic use to be piped out separately.

In agriculture sector. (1) Adopting appropriate and sustainable cropping pattern considering the agro-climatic condition. (2) Introduction of optimal micro-irrigation. Achievement of desired water use efficiency. (3) Reduction in water footprint of agricultural production.

There is a need to develop low cost, easy to understand technologies and tools, which can be adopted in practice by farmers to know about the status of water levels, crop-water budgeting, designs of water harvesting structures etc.

In industrial sector: (1) Introduction of progressive water tariff to ensure judicious utilization of water. (2) Regular water audit for optimal utilization of fresh water and reduction in water footprint of industrial production. (3) Telemetric water level monitoring and quality surveillance need to be adopted. (4) Development of optimal water recycling facilities. (5) Use of treated urban sewage water in feasible processes such as cooling etc.

Challenges are immense in water sector as water demands are raising in all sectors. Sustainable management of groundwater resources without leaving any negative impact is paramount. Innovations with successful integration of science and technology and community mass participation will enable us to overcome the challenges of water sector, ensure sustainability of groundwater resource and ensure desirable agrarian and industrial economic development.

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