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WATER MANAGEMENT SECTOR IN INDIA

Mr. S.P. Verma
Retired Principal
Roorkee, District Haridwar, Uttarakhand, India

Abstract

Water can be defined as the most critical resource for India's society from many points of view: availability, supply, sanitation needs, pollution and discharge. It is the most basic and primary need, but it is still out of reach for a large section of the population, either in terms of supply or in terms of adequacy to health and sanitation needs. It is also a major area of environmental impact, due to the low diffusion of efficient practices of wastewater treatment. The Indian market for water and the development of utilities are still not very organized and need to undergo strong development, both in the public and the private sectors. At the same time, water is a subject widely studied since Independence due to its critical socio-economic relevance. In India there is a huge number of institutions, agencies, universities, NGOs and social initiatives dealing with water at different levels.

Introduction

The water sectors in India are characterized by several key issues:

- Access to adequacy of safe water
- Institutional challenges
- Service provisions
- Over-extraction of groundwater and quality problems
- Financial and management constraints
- Water conflicts

The per capita water availability at national level has been declining over the years. Water quality is also deteriorating due to pollution and seasonal shortages.

In rural areas water has to be fetched from distant sources and urban areas are chronically short of water. In metros like Delhi, Bangalore or Chennai people do not have direct control over water sources and are dependent from distant sources outside the control of the local municipal bodies (even beyond 200 km).

Supply of sweet water is undergoing severe stress. After the independence, in 1951, the per capita availability was 5,177 mc that were down to 1,820 mc in 2001 and are expected to reduce further to a minimum of 1,240 mc. Per capita consumption (89 liters) is still quite low compared to European standards, but it is expected to double by the mid of the century due the growth of the economy, urbanization, industrial development and a very water intensive agriculture. The corresponding growth of the population (expected to be 1.66 billion) might create an acute water shortage in the country. Irrigation is one of the major factors leading to over-exploitation of groundwater sources, which is causing depletion of water tables in many districts in the country (at least 60% of them according to the Central Ground Water Board) and inland salinity.

Industrial consumption can be estimated to be minimum 6% of the total, though there are no reliable and organized statistics. Especially for the non-government and non-corporate sector the share of water supply to the industry is much higher. The industrial consumption is expected to increase four times by the mid of the century, to reach a total share of 18%. Sectors that are very critical for the growth like energy and steel are highly water intensive. About 75% of the total planned power capacity is generated by thermal power plants that are highly water-consuming. India has become the fifth producer of steel in the world and if all projects that are in pipeline are implemented it will become the second largest producer by 2015. Water in industry is used in a very inefficient way. A comparison in the steel sector suggests that in India there is need to consume 10-80 mc of water to produce one MT of steel, whereas in US the consumption of water for the same 5-10 mc.

Approximately 80% of the water used in steel plants is discharged as effluent and not recycled. According to a study by the World Bank, the productivity of water usage in Indian industry (USD generated per mc of water used) is one of the lowest in the world

2.1 National Water Mission

The national water policy of the Ministry of Water Resources identifies the following priorities for each of these areas:

Water Supply

Promote Integrated Water Resource Management (IWRM) to

• coordinate all water issues by location (surface, ground), by users (rural, urban, peri-urban), or by use (domestic, irrigation, industrial and institutional)

• Promote seawater desalinization through big plants and tackle the problem of saline intrusions in the aquifers.

Water Conservation

• Promotion of technology and systems to scale and rehabilitate community based tanks (there are more than 580,000)

• Promotion of technology and systems for rain water harvesting

• Water technologies to reclaim water

• Alternative technology for irrigation

In order to promote a technological approach to water management, the Ministry of Water Resources is introducing a Decision Support System (DSS) to support planning and allow real time decision-making. The DSS aims to integrate surface water and groundwater management and monitoring of water quality, drought and integrated operation of reservoirs. The National Institute of Hydrology (NIH) is the nodal agency for the development of this program. The NIH is located in Rourkee, in North India and undertakes R&D activities in the field of dam break flood studies, conservation storage of reservoirs, regulations of spillway gates, flood control regulations and forecasting, snow and glacier studies, water quality, groundwater assessment, remote sensing and GIS application. The institute is also developing software for reservoirs analysis, frequency analysis and estimation of large catchments areas, flood and seepage from canals.

Other institutions involved are the Central Water and Power Research Station (CWPRS), the Central Pollution Control Board (CPCB), the Central Water Commission (CWC), the Indian Meteorological Department (IMD) and the Central Groundwater Board (CGWB). A total of nine States are participating to the program.

The National Water Policy identifies the following areas for research and technology development:

• Hydro-meteorology

• Snow and lake hydrology

• Surface and ground water hydrology
• River morphology and hydraulics
• Assessment of water resources
• Water harvesting and ground water recharge
• Water quality
• Water conservation
• Evaporation and seepage losses
• Recycling and re-use
• Better water management practices and improvements in operational technology
• Crops and cropping systems

Soils and material research

• New construction materials and technology (with particular reference to roller compacted concrete, fiber reinforced concrete, new methodologies in tunneling technologies, instrumentation, advanced numerical analysis in structures and back analysis)
• Seismology and seismic design of structures
• Safety and longevity of water-related structures
• Economical designs for water resource projects
• Risk analysis and disaster management
• Use of remote sensing techniques in development and management
• Use of static ground water resource as a crisis management measure
• Sedimentation of reservoirs
• Use of sea water resources
• Prevention of salinity ingress
• Prevention of water logging and soil salinity
• Reclamation of water logged and saline lands
• Environmental impact
• Regional equity

Government of India R & D Water Priority

Priority areas for research and development (R&D) initiatives in rural drinking water and sanitation sector during 11th Five Year Plan

Department of Drinking Water Supply, Ministry of Rural Development, Government of India has identified the following priority areas for sponsoring research and development projects in rural drinking water and sanitation sector and seeks R&D proposals from well established R&D institutions, Universities, etc.:

Priority area – I

Water resources exploration, assessment & exploitation related technology development

i.) Specialized geo-physical interventions for problem areas;

ii.) Remote sensing applications in specific areas (other than hydro-geo-morphological maps) including temporal changes in land use and interventions on creation of ground water sanctuaries;

iii.) Improvement of traditional springs/ tanks/ ponds/ surangams including monitoring;

iv.) Evaporation control in drinking water based surface water courses; and

v.) Dissemination of efficient technologies through universities and reputed organizations.

Priority area – II

Technology development for improvement in water extraction techniques

i.) Improvements in hand pump/ attachments like dual pumps energy saving pumps/ windmill/ solar pumps/ hydraulic rams;

ii.) Improving energy efficiency for reducing O&M costs for projects using conventional power;

iii.) Improvement in tube-well efficiency (strainer, gravel pack);

iv.) Improvement on rejuvenation techniques (caving of wells/ clogged strainers/ clogged infiltration gallery).

Priority area – III

Water scarcity reduction and related technology development

i.) Artificial recharge/ control of salinity ingress/ evaporation reduction techniques/ desalination;

ii.) Water saving irrigation/ industry/ reuse and recycling/ tap leakage detection and prevention improved storage and distribution inexpensive storage tanks (ferro-cement)/ distribution pipes (PVC, bamboo);

iii.) Improvements in distribution network of water supply projects for reducing water losses including unaccounted losses;

iv.) Recovery of pure water from waste-water/ sludge generated from clari-flocculators and improved methods of alum recovery;

v.) Special interventions for providing safe drinking water in drought prone and flood-hit areas;

vi.) Cost optimization and improvements on types of materials, structure, storage, etc. For rain-water harvesting structures.

Priority area – IV

Technology for water quality enhancement for rural areas

i.) Development of water quality kit;

ii.) Technologies for treatment of excess salinity/ sulphate/ nitrate/ arsenic/ fluoride/ iron, etc.;

iii.) Bacteria/ virus and related micro-biological/ genetic engineering impacts with respect to unsafe drinking water quality;

iv.) Development of water quality enhancement - tablets/ powders/ portable heaters/ traditional herbs and processes;

v.) Various methods of disinfection including newer technologies like ozonation, copper-silver ionization, etc.;

vi.) Environment friendly sludge disposal methodologies from treatment plants; and

vii.) Improving efficiency of RO plants and reduction of O&M cost through use of solar photo-voltaic (PV) cells.

Priority area – V

Watershed management to optimize drinking water supply

i.) Delineation and resource inventory of the micro or mini watersheds;

ii.) Maximization of water conservation and minimization of environmental degradation like erosion, sedimentation, etc..;

iii.) Conjunctive use of water resources – development of effective models; and

iv.) Pilot studies on convergence of various centrally sponsored schemes for achieving drinking water security.

Priority area – VI

Water-health interaction in the socio economic cultural set up

i.) Interface problems between engineers/ geologists/ medical scientists on water and sanitation issues;

ii.) Correlation between water constraints and quality of life, especially for communication and social mobilization strategies;

iii.) Nutritional intervention in Fluoride and Arsenic affected villages;

iv.) Methods of bringing about behavioral changes w.r.t. sanitation, safe water use, etc.;

v.) Improving water and sanitation governance;

vi.) R&D projects based on multi-centric studies;

vii.) Governance and conflict resolutions in water and sanitation sector; and

viii.) Change management of rural water supply sector Engineers/ Scientists.

Priority area – VII

Development of appropriate rural sanitation technology

i.) Design of improved leach pit;

ii.) Hygienic rural toilets;

iii.) Utilization of kitchen waste;

iv.) Protection of open wells/ ponds and improved methods of sanitary survey;

v.) Ecological sanitation and methods for enhancing fertilizer value of digested material;

vi.) Improved methods of solid and liquid waste management;

vii.) Solid waste management especially with regard to re-use/ recycle/ reduce use of plastics;

viii.) Women menstrual hygiene, baby friendly toilets, special toilets for disabled, infant sanitation, etc.

List of Fields for R&D Proposal on Sanitation

1. Design & implementation of environment friendly self-sustaining sanitation system - this may include design of improved leach pits, other technical options for IHHL, hygienic rural toilets, ecological sanitation etc.
2. Improved/economical toilet design for children, differently-abled persons, Emergency situations with suggested cost implications.
3. Improved/Economical Community/Institutional sanitation system including waste management.
4. Effectiveness of models of sanitation in various hydro-geological & geo-physical conditions.
5. Methods of bringing about behavioral changes for sanitation and its use.
6. Zero discharge/waste management system involving communities – this considers utilization of kitchen waste and methods of solid & liquid waste management.
7. Establishing linkages of sanitation with Water, Health, Agriculture and Power generation.

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