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Sustainable Use of Water in the Rural Heart of India

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Abstract

This paper deals with the monitoring and management of water as a resource. Today the world is heading towards a water crisis of unusual dimensions. Average water consumption in the world per person, per day is 50 liters in rural areas and 150 liters in the urban areas. First recognition of this crisis came at the "United Nations Conference on Environment and Development (UNCED)", in 1992.The first collective discussions were initiated by "World Water Commission", at Hague in the year 2000.UNCED estimates 80% of all diseases and more than 1/3 of the deaths in developing countries are associated with water. Today to manufacture one ton Nickel, 4000 m3 of water, to smelt one ton Steel,200 m3 of water and to make one ton of paper, 100 m3 of water is needed.

In the rural heart of India, to irrigate one hectare of agricultural land, 12,000-14,000 m3 of water is needed. Attention has been focused on the rural water supply problem by the "Technology Mission on drinking water" , launched in 1986,renamed as Rajiv Gandhi National drinking water mission in 1991.'Risk assessment', as a tool provides information about water management. Multiple recycling of water is also being carried on in India. Every drop of water in the Colorado River, is used 6 times before it reaches the sea. Israel recycles 80% of its waste water. 'Multistage harvesting' of rain water is done for direct use. Supplementing fresh water by desalination of sea water is done in costal areas. ILSI-(International life Science Institute) India takes initiatives to organize conferences on water quality management to sensitize concerned agencies to achieve the goals of vision 2025 of ILSI.

Introduction

Drinking Water Problem

The drinking water is becoming the main problem faced today. In Rajasthan the receding ground water level has compounded the problem with the rise in summer heat. Under the 'Rajiv Gandhi Traditional Water Resource Mission Scheme' traditional water resources-Wells, bawadis, boris have been deepended and repaired in the state to mitigate the water problem. The state government has launched an ambitious operation to hire wells and tube wells owned by individuals to deal with the drinking water problems in the state. State government sanctioned of Rs 100.84 crore for the rejuvenation of the conventional water sources within the state of which 35,845 baories and wells have been repaired and rejuvenated. UNDP, Jaipur (Rajasthan) has built up a fair amount of database related to the drought this year and also of the droughts of previous years.

UNDP is supporting a project for awareness sensitization of masses on ground water recharge and water harvesting in urban areas.

Its main objectives are-

- To generate mass awareness on multistage rain water harvesting system
- Preparation of material on water management and development
- Strengthening and intensifying water management among children.
- To create awareness on the role and responsibility of people in management of water.

Under the project:

- A booklet in the name 'Jal Jeevan and sangrakshan' has been prepared and published with the help of 'ground water Department'. It covers the water scarcity, how people are aware of the problem, technical details of ground water recharging/conservation and how everybody can contribute in water saving.
- 15 school workshops have been organized in Jaipur, Alwar and Bikaner (five each) including interactive sessions, short plays (Nukkad)

- natak) etc. Similarly other workshops with different target groups are under way.
- A short documentary on water harvesting, recharging ground water and conservation has been prepared in the name of 'Boond Boond'. The documentary concentrates on the need of water and demonstrates the techniques in brief.
- At state level a seminar on ground water management and rain water harvesting has been organized.
- UNDP has started Community based drought proofing plan (CBDPP) in aclusetr of Barmer and Udaipur districts of the state. Save Children Fund (SCF), UK is providing financial assistance in Barmer district to minimize the impact of drought.

Ground Water Problem

Table 1:Ground Water Pollution In India

Region	Type of pollution
Maharashtra ,Bihar, Rajasthan, U.P, Haryana	Inland salinity
Andhara Pradesh, Orissa, West Bengal, Gujrat	Coastal salinity
Kerela, Andhara Pradesh, Rajasthan, Punjab, Tamil Nadu, U.P	Floride
U.P, Assam, Orissa, Bihar, Rajasthan, Tripura, West Bengal	Iron
Orissa ,U.P	Manganese
Andhara Pradesh, New Delhi, Rajasthan, West Bengal	Nitrate
Karnataka, Madhya Pradesh, Rajasthan, West Bengal	Chloride
Andhara Pradesh, New Delhi, Rajasthan	Zinc
Punjab	Chromium

Unsewered domestic waste

Under certain hydrogeological conditions, unsewered domestic waste can cause severe ground awter contaminatin by pathological bacteria, nitrate and other pollutants.

Disposal of liquid urban and industrial waste

Methods of waste water disposal includes infiltration ponds, spreading or spraying onto the ground surface and discharge to steam or dry stream beds. In some areas abandoned wells are used for the disposal of liquid domestic, industrial and farming waste. Lack of monitoring , supervision and management adds to the problem.

Disposal of solid domestic waste and industrial waste

The most common method of disposal of solid municipal waste in India is by deposition in landfills . In order to minimize the impact of such fills on ground water quality and the environment in general it is necessary to properly design and develop these facilities to prevent pollution an put in strict management control to ensure they are operated correctly.

Cultivation with Agrochemicals

Agriculture land use and cultivation practices have been shown to exert major influences on groundwater quality. Under certain circumstances , serious groundwater pollution can be caused by agriculture activities the influence of that may be very important because of the large areas of aquifers affected.

Salinity from irrigation

Increasing salinity resulting from the effects of irrigated agriculture is one of the oldest and most common forms of groundwater pollution. It is caused by the dissolved salts in irrigated water deposits after evaporation of the water. The addition of further excess irrigation water leaches the soil and transfers the problem to the underlying groundwater.

Mining activities

The nature of this pollution depends upon the material being excavated and extracted. Both surface and underground mines usually extend below the water table and often dewatering is required to allow mining proceed which results in a pollution increase.

Excessive ground water exploitation

More water is being pumped out of a number of aquifers than is being replaced by the natural recharge. Ground water levels in some aquifers have declined by tens of meters because of over pumping, making it more difficult and expensive to abstract more water. Declining groundwater levels have reduced weather flow and have caused some to disappear completely.

Fresh water resources

Water as a resource is under relentless pressure. Due to economic development, rapid urbanization ,large scale industrialization and environmental concerns water stress has emerged as a real threat. The scarcity of water for human and ecosystem uses and the deteriorating water quality leads to 'water stress'.

Importance and need of fresh water

Despite the importance of fresh water resource, we are increasingly beginning to take this resource as being everlasting. In today's world much water is wasted, used inefficiently and polluted through its abusive use. The per capita availability of fresh water is fast declining all over the world. If present consumption pattern continued , two out of every three persons on the earth will live in water stressed conditions by year 2025.

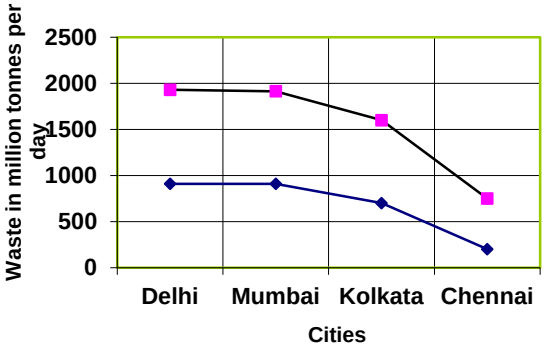
Table 2 : Present Water Statisitcs in India

Present status	Quantity
Per capita average annual fresh water availability	5177 cu meter(1951)
Per capita average annual fresh water availability	1869 cu meter(2001)
Estimated status	
Per capita average annual fresh water availability	1341 cu meter(2025)
Per capita average annual fresh water availability	1140 cu meter(2050)

Emerging Fresh Water Crisis in India

A major fresh water crisis is gradually unfolding in India. The crisis is lack of access to safe water supply to millions of people as a result of inadequate water management and environmental degradation. The crisis also endangers the economic and social prosperity of the country.

The fresh water crisis is already evident in many parts of India varying in scale and intensity at different times of the year. In 2005, UNICEF and the World Wide Fund for Nature commissioned case studies in five different ecological regions of the country with the objective of providing insights in the trends in water availability and use at the local level for all purposes to study the water balance situation.
The reports stated nearly one million children in India die of diarrhea diseases each year directly as a result of drinking unsafe water and living in unhygienic conditions. Some 45 million people are affected by water quality problems caused by pollution, by excess fluoride, arsenic ,iron or by salty water. Millions do not have adequate qualities of safe water particularly during the summer months. In rural areas girls still have to walk long distances and spend up to four hours a day to provide to household with water.



Projected Water Scarcity in 2025

First recognition of this crisis came at the United Nation conference on environment and development(UNCED) in 1992. The first collective discussion was initiated by 'World water commission' at Hague in the year 2000.UNCED estimated 80% of all diseases and more that 1/3 of the death in developing countries to be associated with water By 2025, 1.8 billion people will live in countries or regions with absolute water scarcity. Most countries in the middle east and north Africa can be classified as having absolute scarcity today. By 2025, these countries will be joined by Pakistan, South Africa and large parts of India and China. This means that they will not have sufficient water resource to maintain their current level of per capita food production from irrigated agriculture even at high levels of irrigation efficiency and also to meet reasonable water needs for domestic, industrial and environment purposes.

Water Conservation Techniques

Conservation of water in the agricultural sector is essential since water is necessary for the growth of plants and crops. A depleting water table and a rise in salinity due to overuse of chemical fertilizers and pesticides has made matters serious. Various methods of water harvesting and recharging have been and are being applied all over the world to tackle the problem. In areas where rainfall is low and water is scarce, the local people have used simple techniques that are suited to their region and reduce the demand for water. In India's arid and semi-arid areas, the 'tank' system is traditionally the backbone of agricultural production. Tanks are constructed either by bunding or by excavating the ground and collecting rainwater.

Rajasthan, located in the Great Indian Desert, receives hardly any rainfall, but people have adapted to the harsh conditions by collecting whatever rain falls. Large bunds to create reservoirs known as khadin, dams called johads, tanks, and other methods were applied to check water flow and accumulate run-off. At the end of the monsoon season, water from these structures was used to cultivate crops. Similar systems were developed in other parts of the country. These are known by various local names ¾ jal talais in Uttar Pradesh, the haveli system in Madhya Pradesh, ahar in Bihar, and so on.

Rainwater Harvesting

In urban areas, the construction of houses, footpaths and roads has left little exposed earth for water to soak in. In parts of the rural areas of India, floodwater quickly flows to the rivers, which then dry up soon after the rains stop. If this water can be held back, it can seep into the ground and recharge the groundwater supply.

This has become a very popular method of conserving water especially in the urban areas. Rainwater harvesting essentially means collecting rainwater on the roofs of building and storing it underground for later use. Not only does this recharging arrest groundwater depletion, it also raises the declining water table and can help augment water supply. Rainwater harvesting and artificial recharging are becoming very important issues. It is essential to stop the decline in groundwater levels, arrest sea-water ingress, i.e. prevent sea-water from moving landward, and conserve surface water run-off during the rainy season. Town planners and civic authority in many cities in India are introducing bylaws making rainwater harvesting compulsory in all new structures. No water or sewage connection would be given if a new building did not have provisions for rainwater harvesting. Such rules should also be implemented in all the other cities to ensure a rise in the groundwater level. Realizing the importance of recharging groundwater, the CGWB (Central Ground Water Board) is taking steps to encourage it through rainwater harvesting in the capital and elsewhere. A number of government buildings have been asked to go in for water harvesting in Delhi and other cities of India.

All you need for a water harvesting system is rain, and a place to collect it! Typically, rain is collected on rooftops and other surfaces, and the water is carried down to where it can be used immediately or stored. You can direct water run-off from this surface to plants, trees or lawns or even to the aquifer.

- Some of the benefits of rainwater harvesting are as follows. Increases water availability
- Checks the declining water table. Is environmentally friendly
- Improves the quality of groundwater through the dilution of fluoride, nitrate, and salinity .
- Prevents soil erosion and flooding especially in urban areas

Reducing water demand

Simple techniques can be used to reduce the demand for water. The underlying principle is that only part of the rainfall or irrigation water is taken up by plants, the rest percolates into the deep groundwater, or is lost by evaporation from the surface. Therefore, by improving the efficiency of water use, and by reducing its loss due to evaporation, we can reduce water demand. There are numerous methods to reduce such losses and to improve soil moisture. Some of them are listed below.

- Mulching, i.e., the application of organic or inorganic material such as plant debris, compost, etc., slows down the surface run-off, improves the soil moisture, reduces evaporation losses and improves soil fertility.
- Soil covered by crops, slows down run-off and minimizes evaporation losses. Hence, fields should not be left bare for long periods of time.
- Ploughing helps to move the soil around. As a consequence it retains more water thereby reducing evaporation.
- Shelter belts of trees and bushes along the edge of agricultural fields slow down the wind speed and reduce evaporation and erosion.
- Planting of trees, grass, and bushes breaks the force of rain and helps rainwater penetrate the soil.
- Fog and dew contain substantial amounts of water that can be used directly by adapted plant species. Artificial surfaces such as netting-surfaced traps or polyethylene sheets can be exposed to fog and dew. The resulting water can be used for crops.
- Contour farming is adopted in hilly areas and in lowland areas for paddy fields. Farmers recognize the efficiency of contour-based systems for conserving soil and water.
- Salt-resistant varieties of crops have also been developed recently. Because these grow in saline areas, overall agricultural productivity is increased without making additional demands on freshwater sources. Thus, this is a good water conservation strategy.
- Transfer of water from surplus areas to deficit areas by inter-linking water systems through canals, etc.
- Desalination technologies such as distillation, electro-dialysis and reverse osmosis are available.
- Use of efficient watering systems such as drip irrigation and sprinklers will reduce the water consumption by plants.

Table 3
Demand for Fresh Water Resource in India (In B.C.M)

Use	Year		
	2000	**2010**	**2025**
Domestic	30	56	73
Irrigation	501	688	910
Industry	20	12	23
Energy	20	5	15
Others	34	52	72
	605	**813**	**1093**

Conclusion

Water is one of the most essential natural resources for sustaining life and it is likely to become critically scarce in the coming decades, due to continuous increase in its demands, rapid increase in population and expanding economy of the country. Variations in climatic characteristics. Both in space and time are responsible for uneven distribution of precipitation in India. This uneven distribution of the precipitation results in highly uneven distribution of available water resources both in space and time, which leads to floods and drought affecting the vast areas of the country. Better and scientific structural and non-structural measures are required for mitigating the floods and droughts. Mathematical models are needed for forecasting the monsoon rainfall accurately, which may be utilized by the decision makers and farmers for adopting appropriate strategies for management of droughts and floods. There is a need for increasing the availability of water and reducing its demand. For increasing the availability of water resources, there is a need for better management of existing storages and creation of additional storages by constructing small, medium and large sized dams considering the economical, environmental and social aspects.

The availability of water resources may be further enhanced by rejuvenation of dying lakes, ponds and tanks and increasing the artificial means of groundwater recharge. In addition to these measures, inter-basin transfer of water provides one of the options for mitigating the problems of the surplus and deficit basins. Integrated and coordinated development of surface water and groundwater resources and their conjunctive use should be envisaged right from the project planning stage and should form an integral part of the project implementation. There is a need for proper management of groundwater resources, which presently require adequate inputs including manpower, financial inputs, technologies, etc. Some of the important measures which may be taken up for sustainable development of groundwater resources include improving public water supply, use of energy pricing and supply to manage agricultural groundwater draft, increasing rain-water harvesting and groundwater recharge, transfer of surface water in lieu of groundwater pumping, increasing the economic growth and reduction in dependence on agriculture and formalizing the water sector.

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