



Research Paper

Ground Water: Its Contamination, Pollution And Its Prevention In India

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ABSTRACT: Groundwater comprises 97 percent of the world's readily accessible freshwater. More than three quarters of India's rural population depends on groundwater for drinking. As the more easily accessed surface water resources are already being used, pressure on groundwater is growing. Groundwater has been considered historically as reliable and safe source of water, protected from surface contamination by geological filters that remove pollutants from the water which percolates through the soil. Still ground water is not absolutely free from all these pollutants. The ground water is used for many purposes so it can be polluted. It contains the soluble detergents, fertilizers, harmful chemical, which includes degradable as well as non-degradable waste, hospital waste, drainage, municipal waste. The waste may contain the organic nitrogen compounds which cause reversible and irreversible changes in the body. This waste also changes the physical parameters like colour, smell, taste etc. of this water. It creates some health problem and diseases to the human beings. Surface water contamination receives a lot of attention because of the visible pollution of this water. In India, 19 states have reported fluoride contamination of water and at least 10 states is contaminated with arsenic. Groundwater is under increasing threat from over-development, over-extraction and pollution, due to increasing pollution, due to increasing population pressure, increasing living standards, industrialization and a lack of proper management to match the demands and use patterns with the natural resource base.

KEYWORDS : Groundwater, Contamination, Pollution

Received 06 Jun, 2018; Accepted 21 Jun 2018 © The Author (S) 2018. Published With Open Access At Www.Questjournals.Org

I. INTRODUCTION

Groundwater is the water that seeps through rocks and soil and is stored below the ground. The rocks in which ground water is stored are called aquifers. Aquifers are typically made up of gravel, sand, sand stone or limestone. Water moves through these rocks because they have large connected spaces that make them permeable. The area where water fills the aquifer is called the saturated zone. The depth from the surface at which ground water is found is called the water table. The water table can be as shallow as a foot below the ground or it can be a few hundred meters deep. Heavy rains can cause the water table to rise and conversely, continuous extraction of groundwater can cause the level to fall.

Hard rock aquifers of peninsular India are aquifers which represent around 65% of India's overall aquifers surface area. Most of them are found in central peninsular India. These aquifers have poor permeability (the ability of a rock to transmit water) which limits their recharge through rainfall. This implies that water in these aquifers is non-replenishable and will eventually dry out due to continuous usages.

Alluvial aquifers of the Gangetic and Indus plains in Northern India have significant storage spaces and hence are a valuable source of fresh water supply. Due to excessive groundwater extraction and low recharge rates, these aquifers are at the risk of irreversible overexploitation.

Groundwater plays a decentralized source of drinking water for millions rural and urban families in India accounting for nearly 80 percent of the rural domestic water needs in the country. A variety of land and water based human activities are causing pollution of this precious resource. The country's aquifers are not only under tremendous stress, the quality of water they provide is also deteriorating.

Groundwater contamination is the presence of certain pollutants in groundwater that are in excess of the limits prescribed for drinking water. The commonly observed contaminants include arsenic, fluoride, nitrate

and iron, which are geogenic in nature. Other contamination include bacteria, phosphates, and heavy metals which are a result of human activities including domestic sewage, agricultural practices and industrial effluents. The source of contamination include pollution by landfills, septic tanks, leaky underground gas tanks and from overuse of fertilizers and pesticides. The groundwater is more than half the country's districts is contaminated with poisonous substances. In Haryana, the groundwater of Gurgaon, Faridabad, Rohtak, Panipat and Panchkula is contaminated. The Central Ground Water Board (CGWB) has revealed a shocking assessment according to which 276 districts have high levels of fluoride in their groundwater. At least 387 districts in 21 states of the 676 districts in the country have nitrate above permissible levels. Eighty seven areas have a high amount of arsenic which is a slow poison and UP is the worst polluted. Consumption of arsenic contaminated drinking water can lead to cancer. It can also cause arsenicosis, a condition that is as sinister as it sounds, manifesting as skin lesions, pigmentation changes and an abnormal thickening of the skin.

Groundwater pollution in the country and the permissible level of fluorides prescribed by Bureau of Indian Standards is 1.5 milligram per litre (*mg/l*) occurs in 15 Indian states affecting a total of 69 districts. Excessive fluoride may cause fluorosis that can cause discolouration of teeth or can lead to skeletal deformities. It can also cause damage to neurological, muscular and gastrointestinal systems.

High levels of salinity are reported from all states except West Bengal and also the NCT of Delhi and affects 73 districts and three blocks of Delhi.

Iron content above permissible level of 0.3 ppm is found in 23 districts from 4 states, namely Bihar, Rajasthan, Tripura and West Bengal and Coastal Orissa and parts of Agartala Valley in Tripura. Iron is the biggest groundwater chemical contaminant in India, the number of habitations or household clusters affected by this problem have decreased.

Falling groundwater levels are going to make things worse, according to experts. It can lead to an increase in the concentration of arsenic in water as the volume of the groundwater in the aquifers falls the same amount of contaminant will exist in higher concentration. The prospect of an arsenic contamination crisis has particularly caught the attention of leaders and experts. There is an urgent need to start a nationwide movement to make people aware of the arsenic problem. Out of the 10 states that have arsenic contamination, 7-West Bengal, Jharkhand, Bihar, Uttar Pradesh, Assam, Manipur and Chhattisgarh have reported contamination level that is above the permissible limit of 10 micrograms per litre ($\mu\text{g}/\text{l}$). High levels of arsenic above the permissible levels of 50 parts per billion (*ppb*) are found in the alluvial plains of Ganges covering six districts of West Bengal.

Presence of heavy metals in groundwater is found in 40 districts from 13 states. According to experts if heavy metals enter the groundwater, they cannot be removed. At best they can be diluted, but they remain stuck to the aquifers forever. The groundwater have been poisoned with impermissible levels of hazardous heavy metals, lead, cadmium and chromium.

Non-point pollution caused by fertilizers and pesticides used in agriculture, often dispersed over large areas, is a great threat to fresh groundwater ecosystem.

Nitrate concentration is above the permissible level of 45 ppm in 11 states in India. Covering 95 districts and two blocks of Delhi. Pollution of groundwater due to industrial effluents and municipal waste in water bodies is another major concern in many cities and industrial cluster in India. Poor environmental management system in industries lead to toxic and organic waste discharges of water. This has resulted in pollution of surface and groundwater sources from which water is drawn for irrigation and domestic use.

Contaminated water caused 10 million cases of diarrhea, 740,000 cases of typhoid and 150,000 viral-hepatitis cases between 2007 and 2011 as said by the groundwater board.

The Comptroller and Auditor General (CAG) of India in its Performance Audit of water pollution in India, 2011-12 observed that despite increasing pollution of groundwater sources and presence of contaminants like arsenic, nitrate, fluoride, salinity etc. no programme at the central or state level is being implemented for control of pollution and restoration of groundwater. The Central Pollution Control Board and the CGWB do not carry out real time monitoring of water pollution in rivers, lakes and groundwater sources. The CAG(Comptroller and Auditor General) has made the following recommendations with regard to the prevention and control of pollution of groundwater :

1. The Ministry of Environment, Forest and Climate change needs to establish enforceable water quality standards for lakes, rivers and groundwater to help protect ecosystem and human health.
2. Penalties need to be levied for violations of water quality standards and
3. States need to take measures for source control of pollutants through sewage and agriculture runoff entering water bodies in projects for conservation and restoration of lakes.

In response to the "Committee on Estimates" which reviewed the occurrence of high arsenic content in groundwater, the Ministry of Water Resources constituted an "Inter-Ministerial Group" for arsenic mitigation. The group recommended the formation of a "National Arsenic Taks Force" to coordinate arsenic

related matters between the central ministries and state governments and other institutions. In addition, it has worked out a project funding for five states, namely Assam, Bihar, Jharkhand, Punjab and West Bengal.

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Kunjilata Lal. "Ground Water: Its Contamination, Pollution And Its Prevention In India" Quest Journals Journal of Research in Agriculture and Animal Science, vol. 06, no.5, 2018, pp. 10–12.