ISSN(s) ONLINE : 2583 – 47891

VIVA IMR International Journal of Management
Vol. 02 (01), JUL 2023, pp.21-30

A Study on the Effectiveness of Domestic Water Conservation Systems in India

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Abstract

All living organisms require water for survival, including drinking, cooking, and washing. Rainwater harvesting is a straightforward method of preserving stormwater by collecting, storing, transporting, and treating it. Plants and animals also depend on water, which primarily comes from rainfall. Some regions in our country receive inadequate or no precipitation at all. Interestingly, 97.3% of the world's water is salty and found in oceans, unsuitable for human use. The remaining 2.7% exists as ice and fresh water in ice sheets. Agriculture accounts for about 70% of drinking water usage. Water conservation is crucial for environmental well-being, as clean water is becoming increasingly scarce globally. It is imperative to safeguard this valuable resource for various reasons. Implementing water-saving techniques in agriculture, like "drip irrigation," is more appropriate than trying to meet growing demands. This article emphasizes multiple in both urban and rural settings and provides helpful advice for young people and offers practical tips for young individuals.

The 2018 UN Water Development Report identifies a problematic issue - about 3.6 billion people worldwide. The United Nations (UN) has recognized water scarcity as a "silent crisis."

"SAVE WATER, SAVE LIFE" encapsulates the urgency of water conservation and the significance of preserving water for the sustenance of life.

KEYWORDS

Water conservation, Challenge

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Introduction:

The 2018 UN Water Development Report highlights a concerning issue - approximately 3.6 billion people around the world reside in regions facing water scarcity or rapid decline. This means that nearly 50% of the global population is at risk of encountering water scarcity problems. The lack of clean water is an ongoing concern, exacerbated by population growth, making it increasingly challenging to meet the demand. According to projections, the disparity will expand from 50% by 2030. In India, the situation is particularly dire, with the 2019 NITI Aayog report revealing that over 600 million people, over half of the country's population, are experiencing severe water shortages. Furthermore, three-quarters of rural Indian households lack piped water, exposing them to significant health risks. Alarmingly the World Bank data shows that 163 million people are unable to access safe drinking water.

Groundwater Extraction and Challenges: Inadequate infrastructure for water collection, storage and distribution exacerbates the situation in India. Groundwater, a crucial resource both in urban and rural locations, is depleting rapidly due to its excessive use. The World Bank reports that only 28% of wastewater produced in India is treated, leading to wastage and depletion of water resources. India relies heavily on water from aquifers, accounting for approximately one-third of global groundwater demand, with over 90% of it being used for agricultural irrigation. Groundwater serves as the primary drinking water source for about 85% of India's population, with approximately 80% of the country's 1.35 billion people depending on it for drinking and water needs. However, around 70% of this groundwater is polluted, and major rivers are facing degradation due to pollution, contributing to the country's worst water crisis in history. The Indian government has issued warnings of a looming water crisis in the future due to excessive water usage, posing risks to economic, social, and public health aspects.

Climate Change and Future Projections: Climate change is anticipated to worsen especially as floods and droughts become more frequent and severe in India. Overreliance on unpredictable monsoon patterns adds to the challenges. Disturbingly, it is projected that nearly 91 million Indians will lack the inability to acquire clean water by 2023 due to various factors, including over-construction, climate change impacts, and inadequate infrastructure.

The situation calls for urgent and comprehensive measures to address the Indian water crisis, with a focus on conservation, sustainable water

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management, and infrastructure development to secure a reliable water supply for the future.

Based on the UN 2023 Global Water Development Report 2023, which focuses on Water Cooperation and Collaboration, it was revealed that nearly 80% of Asia's population, including regions like Northeast China, India, and Pakistan, faces water scarcity. The report also indicates that the global population in water-scarce cities, which was 933 million in 2016, is anticipated to grow to between 170 and 240 million by 2050, as per a United Nations report. India, being a country with limited resources, is expected to experience a significant decrease in the capacity of its 3,700 Great Lakes by an average of 26% by 2050, based on a January 2023 report. The Central Water Resources Commission highlights that water shortages are becoming prevalent across the country as a result of drought and inadequate winter precipitation. Lakes in India, excluding the northern region, were filled to only 92% of their previous levels compared to the previous year, with 80% of the country's 91 reservoirs being below normal. In some areas, reservoirs have even been depleted, leading to potential water crises and heat waves. This critical situation has been exacerbated by poor regulation, excessive commercialization, widespread negligence, and government corruption, leaving generations yearning for more than meager amounts of contaminated water.

In light of these challenges, significant government intervention is essential to prevent a looming water crisis in the coming months and years. While initiatives such as the Jal Shakti Abhiyan project, aimed at improving precipitation in 2019, and the Atal Bhujal Yojana project, focused on better groundwater management, may offer some assistance, their success largely depends on political will and efficient implementation.

II. Research Objectives

The research aims to explore the following objectives:

Innovations and Novel Technological Solutions: Investigate and identify innovative approaches and new technological solutions in water conservation practices.

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Sustainable Water Conservation Practices: Examine and promote sustainable water conservation practices that can be adopted by both rural and urban communities.

Water Supply and Demand Management: Examine ways for effectively managing water supply and demand to guarantee efficient water resource utilisation.

Strategies for Sustainability in the Water Industry: Explore strategies and measures to promote sustainability in the water industry, taking into account the importance of water resources for present and future generations.

III. Aim of the study

Water conservation has become a crucial issue, and society must understand the significance of water resources. People often utilize natural resources for their benefit, leading to security concerns regarding water availability. Addressing this challenging problem is a collective responsibility, as our lives depend on it. This research aims to raise awareness among rural and urban residents in India about the importance of conserving water. Recognizing that the health of everyone relies on water, it is essential to comprehend ways to safeguard, preserve, and keep water resources clean and unpolluted for the future.

IV. Research Methodology

This article employs analytical, descriptive, and comparative methods to gather information from diverse sources, including books, magazines, newspapers, and online materials. The insights and opinions of various experts in the field are also incorporated to support the research.

V. Traditional Practices

People continue to employ ancient traditional methods of water collection, similar to those used by civilizations in the past. Archaeological evidence from the Indus Valley Civilization reveals specific systems for collecting and diverting water. For instance, the storm canal of the settlement of Dholavira showcases effective water channeling and storage during dry seasons. The study also references irrigation and water harvesting practices from historical records.

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Chanakya's Arthasastra provides valuable insights into traditional water harvesting methods and their applications. One such example can be observed in Sringaverapur, near Allahabad, where a water harvesting system utilizes the natural slope from the land store floodwater. In Bhopal, King Bhoj created India's largest artificial lake as a means of conserving water. Similarly, in Mandu, Madhya Pradesh, the Jahazmahal stands as a water-saving structure on top of a hill with a low water table. These examples offer valuable knowledge about traditional water conservation practices.

Rectangular stepped wells with cascades on three or all sides are typical features of reservoirs used to collect subsurface seepage water from streams or reservoirs. These wells provide a regular water supply for various purposes, including religious ceremonies, public use, and royal occasions. The Bari and Stepwell systems were once the portion of an old reservoir network. Rainwater was collected and transferred to tanks via canals on the city's outskirts cities to supply water, thereby contributing to groundwater recharge. The Tanka system primarily consists of underground impervious reservoirs covered with shallow water to collect rainwater, with each house in Bikaner having its tank to store water during dry periods. In colder regions like Ladakh, the Jing system involves digging a fraction from the land build reservoirs that collect and retain water from the melting glacier primarily for irrigation purposes.

The Eri system is an ancient water management technique In India , this method has been employed as a means of flood control and soil erosion prevention and to conserve runoff during heavy rains. Water from the basin is gathered in a central location cistern, and channels help rejuvenate water bodies. Aqueducts allow water to flow to various distribution points, preventing water accumulation and enabling its use for domestic, agricultural, and other purposes in the surrounding area.

India's water conservation efforts involves the optimal use of water resources through various technologies and strategies, aiming to balance water demand and supply. Different regions in India face water scarcity and have developed unique water conservation practices. Drylands in Rajasthan, for example, rely on rainwater collected in nearby tanks and reservoirs due to water scarcity caused by rocky soils and lower water tables. In the ancient walled city of Mandu in Madhya Pradesh, collection and storage of rainwater are crucial for survival, with deep wells and reservoirs serving as effective rainwater harvesting methods.

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Overall, these traditional water conservation practices hold significant value in preserving water resources and sustaining livelihoods in India.

"RAINWATER HARVESTING"

The Jal Shakti Ministry has undertaken important initiatives for managing groundwater resources. One such initiative is the "Jal Shakti Abhiyan: Catch the Rain" (JSA: CTR) campaign, with the theme "Catch the Rain-Where it Falls When it Falls," covering all blocks in districts across the country, including rural and urban areas, from 22nd March 2021 to 30th November 2021. This campaign The Honourable Prime Minister unveiled it on March 22, 2021.

CGWB created the 4 Master Plan for Artificial Recharge to Groundwater-2020 in conjunction with stakeholders to improve groundwater recharge., outlining various structures suited to different terrain conditions, including regions in Rajasthan, Haryana, and Delhi. The Master Plan-2020's objective is to build around 1.42 crore rainwater harvesting and artificial recharge systems across the nation, capturing an estimated 185 Billion Cubic Metres (BCM) of water.

Another crucial effort is the implementation of "The National Aquifer Mapping and Management Program" (NAQUIM) falls under the Ground Water Management and Regulation Scheme (GWM & R). Its goal is to map and characterise water-bearing formations (aquifers) and develop Aquifer Management Plans to facilitate sustainable groundwater resource management.

The outputs of NAQUIM are shared with States/Union Territories for appropriate interventions.

To encourage water conservation measures, The Ministry of Housing and The Ministry of Housing and Urban Affairs (MoHUA) has developed recommendations for states, including the Unified Building Bye Laws (UBBL) of Delhi 2016, Model Building Bye Laws (MBBL) of Delhi 2016, and Urban and Regional Development Plan Formulation and Implementation (URDPFI) recommendations 2014.The importance of rainwater gathering and water conservation practises is emphasised in these guidelines. According to the MBBL, a comprehensive rainwater harvesting concept is required for all structures with a plot size of 100 square metres or more to incorporate all

buildings with a plot size of 100 square metres or more. or more to incorporate all buildings with a plot size of 100 sq.m. or more must incorporate a comprehensive rainwater harvesting proposal. Currently, 33 The provisions of these by-laws have been adopted by states and union territories.

The second Jal Shakti Abhiyan (JSA), which began in 2019 and will run through 2021, aims to improve water availability, especially groundwater conditions, in states such as Rajasthan, Delhi, and Haryana. Significant progress has been made under the JSA: CTR programme, with 10.65 lakh water conservation/rainwater harvesting works and 1.79 lakh conventional water body rehabilitation works performed across the country as of February 7th, 2022.

The following are the number of completed rainwater harvesting-related works under the Jal Shakti Abhiyan: Catch the Rain (JSA: CTR) initiative in the states of Rajasthan, Delhi, and Haryana: Furthermore, the Ministry has begun artificial recharge groundwater augmentation activities in specific water-stressed blocks in Rajasthan and Haryana. Several states have also made noteworthy efforts in Water harvesting and conservation, such as Rajasthan's 'Mukhyamantri Jal Swavlamban Abhiyan,' Maharashtra's 'Jalyukt Shibar,' Gujarat's 'Sujalam Sufalam Abhiyan,' Telangana 'Mission Kakatiya,' Andhra Pradesh's 'Neeru Chettu,' Bihar's 'Jal Jeevan Hariyali,' Haryana's 'Jal Hi Jeevan,' and Tamil Nadu's 'Kudimaramath' scheme.

The Central Government extends support for water harvesting through various programs such as the The Mahatma Gandhi National Rural Employment Guarantee plan (MGNREGS), the Pradhan Mantri Krishi Sinchayee Yojana-Watershed Development Component (PMKSY-WDC), the Surface Minor Irrigation (SMI) plan, and the Repair, Renovation, and Restoration (RRR) of Water Bodies Schemes are all examples of government programmes. Annexure II contains information on the monies awarded to Rajasthan, Delhi, and Haryana under these projects over the last four years. Shri Bishweswar Tudu, Minister of State for Jal Shakti, supplied this information in writing response in Lok Sabha.

The World Bank has actively aided the Government of India in delivering clean drinking water to rural people during the last decade. More than 20 million people have benefited from various projects worth $1.2 billion. The World Bank-financed Uttarakhand Rural Water Supply and Sanitation Project, for example, improved long-term water supply and sanitation services for nearly 1.57 million people in the state from 2006 to 2015, taking into account

the region's susceptibility to natural disasters like flash floods, earthquakes, and landslides.

In Kerala, despite abundant rainfall, water sources are depleting due to rapid urbanization. The World Bank has provided assistance to the state government in reliable piped water supply to rural families at an affordable price, including low-income households, through initiatives like Jalanidhi I (2000-2008) and Jalanidhi II (2012-2017). These projects have empowered local communities to manage water supply schemes, ensuring a dependable water supply to village homes.

For urban areas experiencing rapid urbanization, a constant piped water supply has long been a desire. 14 Karnataka has proved the feasibility, cost, and long-term viability of a 24-hour water supply. 1 This strategy was pioneered in three water-stressed cities by the World Bank-supported Karnataka Water Supply Improvement Project, which has since been expanded to cover the whole population of those cities. Even as citizens pay for the water they consume, the scheme ensures that the cost for "lifeline consumption" stays affordable for low-income households. Household water connections are subsidised to assure their availability. improved services are accessible to low-income families. Similar improvements have been seen in Shimla, where a Increased water supply hours were achieved as a result of the Water Supply and Sewerage Service Delivery Reform Project.

The Punjab Municipal Services Improvement Project is assisting two large cities in shifting to surface water sources in order to manage diminishing groundwater levels. These advancements are likely to benefit millions of people by 2026, with a projected 5 million population by 2055. Chennai, which is facing a severe water shortage in 2019, has made tremendous strides by deploying large-scale waste water recycling to suit its businesses' non-drinking water needs. Chennai is the first city in India to accomplish this, reducing its reliance on fresh water.

Since 2011, the World Bank has been financing initiatives to revitalise the renowned Ganga River. Various projects have contributed to the establishment of critical institutions and infrastructure to control the river's cleanliness, such as sewage treatment facilities and drainage systems in various towns to properly treat sewage before it joins the Ganga. In terms of agriculture, The World Bank has been instrumental in developing irrigation practises. Irrigation infrastructure investments have benefited small and marginal farmers, as evidenced by projects in West Bengal, allowing for two harvests per year and

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reducing the need for migration in pursuit of work. Furthermore, the West Bengal Major Irrigation and Flood Management Project has enhanced agricultural productivity and rural incomes by improving irrigation services and flood protection.

Implementing water-saving techniques in farming:

Water conservation is crucial for plant growth and crop production. Various methods of water collection and replenishment are employed across the country. The Central Groundwater Commission, in collaboration with Union territories and states has developed a comprehensive 2020 Artificial Groundwater Recharge Master Plan, proposing diverse structures suitable for different geographical conditions. Farmers are also using salt-tolerant crop varieties, optimizing water usage in saltwater irrigation. Additionally, employing organic or inorganic materials such as mulched crop residues and compost helps reduce surface runoff, enhance soil moisture, minimize evaporation loss, and improve soil fertility. Some plant species adapted to fog and dew contain significant amounts of water, which can be used directly. Artificial surfaces like mesh traps or polyethylene sheets can be utilized to collect fog and dew water for crop irrigation.

Conservation practices:

Contour farming is widely practiced in hilly and lowland regions, particularly in paddy fields, as it is effective in conserving soil and water. Simple water-saving devices like the Tippy Tap provide a slow jet of water for thorough hand cleaning, using much less water compared to conventional tap water hand washing. Encouraging drought-tolerant plantations with lower water

Farmers can contribute significantly to water conservation by implementing drip irrigation systems in their fields, which deliver water directly to plant roots, reducing water loss through evaporation.

VI Suggestions

Improve Water Management: Recognize and protect the close link between forests and water, as well as the traditional relationship between agriculture and water, to ensure sustained productivity. National water management policies should consider the impact of trade in water-intensive goods on water availability and ecosystem integrity. In conclusion, addressing water challenges

demands proactive responses and responsible water usage from individuals, communities, businesses, and institutions. Conservation of water The conservation of water resources is critical for future generations' well-being. Access to trustworthy data is critical for sound water resource management, particularly as populations and demands on water resources expand. It is critical to use a variety of ways to align 6 water supply and demand. 3 complete understanding and measurement of the hydrological cycle and human influences are vital for sustainable water resource development and protection. It is important to revive and build upon traditional and sustainable water management systems, and water reuse principles should be incorporated into water management strategies and programmes, along with incentivizing conservation efforts.

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