International Journal of Social Science Research (IJSSR)
Volume- 3, Issue- 6 | November - December 2026 ISSN: 3048-9490

Addressing Water Scarcity with Jal Jeevan Mission Approach: The policy to fulfill SDG 6

Dr. Barnali Deka
Associate Professor, Department of Political Science,
Mangaldai College (Autonomous), Mangaldai, Assam, India

Abstract:

Considering the crucial issues of declining water availability and groundwater depletion in India, the Indian Government launched the Jal Jeevan Mission Scheme in 2019 to ensure safe and clean drinking water providing household tap water connections to every household. Access to quality drinking water is regarded as a 'basic human need for health and well-being' and is globally committed under the United Nations as one of the Sustainable Development Goals (Goal 6). To achieve this goal, India's Jal Jeevan Mission scheme adopts a decentralized and community-based approach and is giving importance to its operational management and effective service delivery. This community-led approach involves the gram panchayats and village water sanitation committees, which monitor and identify water-affected and source of contaminated water to decrease the risk of water borne diseases. Tap water connections in households, schools, and Anganwadi Centers benefit women and children in particular, ensuring equity, social justice, and a sustainable future. In this paper, a policy-oriented analytical approach has been adopted to examine how Jal Jeevan Mission addresses water scarcity in India aligning with Sustainable Development Goal 6. This paper highlights the policy framework of the Jal Jeevan Mission scheme, its institutional governance, identifies the challenges, and presents policy recommendations to ensure water security and sustainability in India.

Key words: Jal Jeevan Mission, water scarcity, Sustainable Development Goal 6, India.

Introduction:

Water crisis in India has been a significant concern and researchers on this problem have identified multifaceted factors leading to this scarcity. India has 18 percent of the world's population but only 4 percent of the world's fresh water (World Bank Group, 2023; SIWI, 2018)[39/40]. This indicates the level of water scarcity in India having the highest population of the world with almost 1.43 crores. The report 'Composite Water Management Index' by NITI Ayog in 2018 is the evidence of water scarcity, stating that about 600 million of India's population is facing extreme water crisis. (NITI Ayog, 2019)[1]. Water scarcity in India is mostly compounded by over growth of population, climate change, urbanization and industrialization. There are both natural and manmade causes that have resulted in depletion of groundwater, rise

*Corresponding Author Email: dekabarnali067@gmail.com
Published: 24 November 2026
DOI: https://doi.org/10.70558/IJSSR.2026.v3.i6.301449
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in surface water pollution posing the threat to increase the risk of water crisis often termed as 'hydro-metrological disaster' (Gupta, et al 2022)[2]. Different factors ranging from climate change induced deficit monsoon rainfall, seasonal environmental hazards, unplanned urbanization and also some socio-economic factors associated with equity and accessibility have further aggravated the situation. According to the estimates 'per capita water availability in India has declined by almost 20 percent in the last two decades and is likely to decline by another 20 percent by 2050'. India uses the groundwater to a large extent. The groundwater distribution record shows that 80 percent of the water supply in rural and urban areas utilize groundwater. Ground water depletion is another area of major concern in India. Punjab, Haryana, Rajasthan and Delhi are the states that have overexploited their groundwater with more than 100 percent extraction (TERI, 2022; Gupta et al., 2022)[3]. Not only depletion of water resources but also issues of water contamination resulting in occurrence of water borne diseases are affecting millions of people in India. Here comes the question of providing access to clean and safe drinking water to the people indifferent parts of India or transcending the socio-economic barriers especially in rural arears. Thus, in response to this growing water crisis, The Jal Jeevan Mission initiative was started by the Indian Government in 2019 with the goal of ensuring that every household has access to tap water by 2024. (GOI, Ministry of Jal Shakti, 2019)[4]. This paper aims to conduct a study on the interconnection between India's ongoing water crisis and the implementation of the Jal Jeevan Mission Scheme. This paper also attempts to align the Sustainable Development Goal 6 related to clean water and sanitation with the Jal Jeevan Mission scheme to address the water security challenges including the issues of sustainability.

Objectives of the Study: Following are the objectives of this study-

1. To analyze the current water crisis in India by reviewing existing literature on water resource
2. To explore the link between Jal Jeevan Mission and Sustainable Development Goals
3. To evaluate the progress, challenges and policy implications of Jal Jeevan Mission towards a sustainable water management
4. To identify the policy gaps and provide recommendations in Jal Jeevan Mission Scheme for its long-term sustainability.

Methodology:

This research examines the institutional governance of Jal Jeevan Mission (JJM) Scheme. The analysis is primarily based on secondary data collected from United Nations reports, Water Resource Institute (WRI) statistics, reports published by Ministry of Jal Shakti, Government of India, and Government of India's policy document relating to the Jal Jeevan Mission. To enhance the validity and reliability of the study a systematic literature review incorporating different articles, reports, research papers, news and global statistical records through content analysis is followed that are linked with the water scarcity and goal of ensuring clean and safe drinking water in India.

Review of Literature:

Global water challenges and a call for sustainable solution:

The 17 Sustainable Development Goals (SDGs) set by the United Nations in 2015 are essential for peoples' well-being and a sustainable future. These are the universal, integrated and inclusive goals aim to ensure better standard of livelihood for all people in the earth. Out of these 17 Goals, Goal 6 i.e. to 'ensure clean water and sanitation for all by 2030' is pivotal as access to 'safe water sanitation and hygiene is the most basic human need for health and well-being' (un.org)[5]. As a basic human right water is essential not only to health, but also to poverty reduction, economic development and environmental sustainability. Nonetheless, the rapid expansion of population, urban developments, environmental pollution, climate change contribute to an increasing water scarcity in numerous regions globally. The United Nations reports that in 2022, 2.2 billion people continued to be deprived of securely managed drinking water, with 703 million lacking even basic water services (un.org)[6]. There is growing concern over water stress across the globe particularly in India, Africa and Middle East that are facing water scarcity (WRI, 2023)[7]. Studies show that Asia, particularly India, Pakistan and North East China accounts for about 80 percent of the population under water stress. (Vanham et al., 2021; UNESCO, 2023)[8]. In this context SDG 6 is intrinsic to a quality life as it encompasses a range of possibilities to have right to clean and safe drinking water and proper sanitation to enhancing the quality of water, its efficient use, integrated water management and to protect the water-based ecosystem (un.org). Policy innovation, region specific initiatives and international support and cooperation are highly encouraged by SDG 6 as these are essential to ensure water security for sustainable future. Global statistical data reveals the water crisis faced by the humanity as 50 percent of the earth's population deal with the water shortfall at least one month in a year (UNEP, 2024)[9]. The situation becomes more challenging when the Food and Agricultural Organization (FAO) mentions about sever water scarcity (UNEP, 2024)[10]. The rising water uses in middle- and lower-income countries, especially in emerging economies has further worsened this crisis (Ritchie and Roser, 2017; UNESCO, 2023)[11].

The sources of water scarcity vary region to region. Climate change, fresh water pollution, rapid industrialization in lower- and middle-income countries, population growth, improper water management practices etc. are intensifying the water stress in many regions. Water crisis and climate change are interconnected and causing serious challenges to sustainable livelihood of the people. Water resources are severely affected by climate change in terms of quality and availability. Rise in temperature, rainfall, drought or other adverse weather conditions affects the water cycle causing disturbances in its natural phenomenon. One of the most crucial effects of this is depletion of groundwater availability. Studies show that severe weather conditions bought by change in climate leads to change in precipitation pattern that have directly linked with groundwater resources (Martin Kerry et al., 2023; Bolan et al., 2024)[12/13]. This changes in the precipitation pattern are linked with extreme water events like drought, flood, storm etc. (Mahato et al., 2022)[18]. Thus, research studies have linked this shifting in precipitation pattern and global temperature with the causes of groundwater depletion (Stocker et al., 2013; Candon et al., 2020; Carr et al., 2024)[19/20]. Besides these factors the rise of sea levels due to climate change could severely impact the groundwater quality especially in the coastal areas (IPCC,

un.org). The salty sea water that penetrates into the freshwater can affect the potential drinking water quality that are supplied. It also causes widespread flood in the vulnerable coastal areas (Sangsefidi et al., 2023, Bolan et al., 2024)[21/13]. These further associates many health-related illness and even death occurrences among the people due to waterborne diseases like malaria, dengue etc. (Parker et al., 2022; Bolan et al., 2024)[22/13]. Contaminated water has direct and indirect impact on human health. Developing countries face a high rate of waterborne diseases, most notably diarrhea (Park, 2009)[23]. Based on 2019 data from the World Resources Institute, India is among the global nations facing extreme water stress of more than 80 percent (wri.org., 2023)[7]. The World Resources Institute identifies the Middle East and North Africa (83 percent population) and South Asia (74 percent) as the regions facing the most water stress (wri.org, 2023)[7]. By 2050 population in these regions are projected to use 80 percent or more of their available water. (wri.org, 2023)[24].

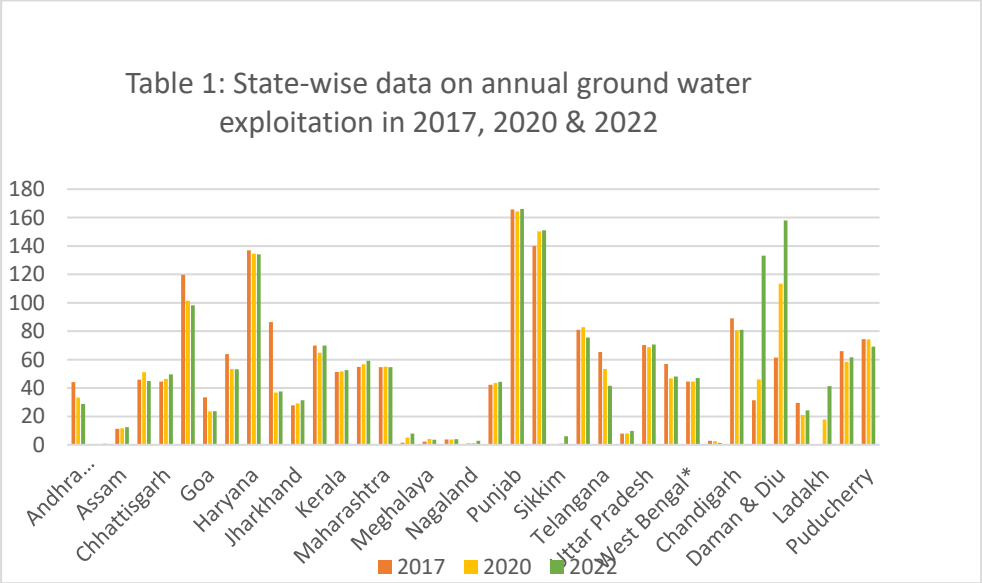
The water crisis is also intensified by water pollution mostly caused by human activities like industrialization and urbanization. The availability of clean water is disrupted by the contaminants from sewages, industrial and trade wastes, agricultural pollutants comprised of pesticides and fertilizers and presence of harmful substances in water supply pipes etc. Presence of harmful substances as pollutants reduce the quality of freshwater to be used by the people. Many research studies link the cause of exposure of clean water scarcity with harmful pollutants in water (Jones et al., 2024; Wang, 2024)[25/26] stating that water pollution 'aggravates water scarcity in more than 2000 sub basins worldwide' with high concentration of nitrogen pollution level. Nitrogen pollution in rivers is the key factor for global clean water crisis. The industrial pollution plays the key role in the water scarcity as it releases various toxic chemicals, organic and inorganic harmful and poisonous substances (Choudhury et al., 2019; Lin et al., 2022) [27/28]. Studies on impact on pollution on human health reveals that industrial pollution is responsible for occurrence of many waterborne diseases like diarrhea, typhoid, cholera, anaemia, malaria, skin diseases, risk of cancer etc. (Choudhury et al., 2019; Meetei, 2024)[27/29].

The Indian Context:

Shifting climate patterns have a deep impact on India's water resources putting challenges to its geographically diverse regions encompassing the northern Himalayas, coastal areas spreading from east to west, dry deserts, and areas of heavy rainfall. Therefore, the water resources of India go through different climatic conditions like melting the glaciers, rise in the sea levels, heavy monsoon rainfall induced flood and cyclones and also drought disasters in different regions. The changes in precipitation pattern induced by climate change are resulted in occurrence of the phenomena such as devastating flood and droughts (Mohommed, 2023; Sachan, D. et al., 2023; Lakhwan, N. et al., 2024) [30/31/32]. High temperature, erratic rainfall pattern has severe impact on the ecosystem of river Ganga causing flood, droughts even disturbing river flow pattern indicating the variations in the quality of water (Jain & Sing, 2020)[33]. Changes in glacier can significantly affect the water availability in major Himalayan river system-such as Indus, Brahmaputra, and Ganges, resulting in severe consequences for Indian agriculture (Goyal & Rao, 2018) [34].

Besides, contamination of surface and groundwater resources are also identified as the challenge posed by shift in climate. Climate change influences the presence of contaminants in

the water sources (Abdelhak et al., 2023)[35]. Pollution induced by agricultural practices are also causing severe damage to the water ecosystem. Pesticides used in cultivation, soil sediments, nitrates, phosphorus, salts and pathogens are the main pollutants that contaminate water making it harmful for human use (Paris, 2011; Lin et al., 2022)[36/37]. In many developing countries like China and India, wide use of untreated or partially treated waste water brings health and environmental risk (Lin et al., 2022)[37] as the water quality is not up to the mark of human use. Studies also project that due to rapid urbanization and improper management of waste water will make sewage the primary driver of nitrogen pollution in rivers and India is going to face this challenge in the upcoming decades (Chacko, 2024) [38]. Already India's rivers are highly polluted and declared unsafe to use due to sewages, along with these human activities from dumping wastes, bathing, washing clothes are worsening the scenario contributing to the occurrence of epidemic of health disasters (World Bank, 2013; SIWI, 2018)[39/40]. Studies found that discharge of untreated water effluents in Yamuna River by industrial units, improper wastewater handling, waste caused by leakage pipelines and some inequitable distributions are the primary cause of Delhi's water crisis. (Gupta et al, 2022) [2].



Source: PIB, Ministry of Jal Shakti, 2022

Groundwater depletion is a major area of concern as it plays important role in our life from agricultural production, domestic needs, drinking water to facilitating the industrial development. In India, 60 percent of agricultural irrigation and 85 percent of drinking water rely on groundwater (World Bank Group, 2012) [41]. Evidences show that elevated groundwater levels of arsenic, affecting 52 districts across 21 states, and fluoride, covering 370 districts across 23 states of India are found beyond the permissible limit in groundwater bringing health risk to the people residing in the affected areas (Ministry of Jal Shakti, GOI, 2022)[42]. Another research study examining the Indian states found increased groundwater concentration having partial effects in Uttar Pradesh, Punjab, Haryana, Chhattisgarh, Jharkhand, Rajasthan, Andhra Pradesh Telangana, and Tamil Nadu, and the study suggested that contaminated areas need to be demarcated where groundwater were used for drinking purpose (Shrivastava et al., 2021) [43]. According to studies, uranium contaminated groundwater if consumed can have serious health

effects on human bodies (Zamora et al., 1998; Smith, 2004; Guo et al., 2016; Srivastava et al., 2021)[43]. Besides, uranium studies in Kolkata region reveal the contamination of groundwater used for drinking with heavy metals and its concentration exceeding the permissible limit as per drinking water standard (Dutta et al., 2021) [44]. So, ensuring safe and clean and quality drinking water to the people as human right is of utmost importance to be looked after by the concerned authority.

In India millions of people along with industrial and economic development process is going to be affected due to the freshwater demand which will double the availability supply by 2030. NITI Ayog Public Policy Centre in its 2023 report forecasts a "step fall of around 40 percent in freshwater availability by 2030" (NDTV India News, 2024)[45]. The studies undertaken on water crisis by National Institute on Disaster Management states that rapid urbanization, population growth, pollution, overextraction of ground water are acting as the factors of growing water crisis in metropolitan cities like Delhi, Bangaluru, Chennai, Hyderabad etc. and these cities are 'on the verge of exhausting their ground water resources (Gupta et al., 2022)[2]. Evidences from Delhi reveal the struggle of public for the collection of everyday needed water specially by women during covid-19 violating the social distancing norms and also water cutdown in hospitals even threatening the health and security of the people (Gupta et al, 2022)[2]. Lack of freshwater caused by disturbances in water cycle and insufficient rains in monsoon increase the water scarcity and also are affecting the people leading to serious health problems. Depletion of water in the Latur city of Maharashtra forces the people to use borewells exposing themselves to dangerous chemicals and risking contamination (Katoch, 2021)[46]. Bangaluru had experienced extreme high temperature in 'February and March' and the heat led to the severe water crisis, falling the city to face 'Day Zero' scenario (Mehta & Saroha, 2024) [47].

The water woes in the rural India have become a struggle for survival. Depleting groundwater, erratic rainfall, drought, pollution all are contributing in the water scarcity making the life in many villages miserable. Access to safe and clean drinking water is still an issue of major concern in rural India. Apart from this, climate change caused water crisis have negative impact on the agricultural sector that has devastated the agricultural economy and livelihood making the farmers suffer from crop failures and food insecurity etc. In dry season the water shortage is more aggravated in many rural areas. People from rural areas mostly fulfill their water demands from public sources like rivers, streams, cannels and lakes etc. But these has emerged out 'labour-intensive and time-consuming process of fetching water' and also problems arise due to 'poor quality of water, seasonal scarcity, lack of maintenance of water sources' including equity issues where certain social groups are deprived of some specified water sources (Sing, 2019) [48]. All these interconnected events are threating the sustainable livelihood having a severe impact on water resources and violating the human right to safe and clean drinking water and sanitation. This highlights the utmost need of sustainable water management in order to address the challenge of water crisis in India.

The water policy of a particular country directly governs the long-term sustainability of its water resources. Effective water management policy can reduce the water stress in India as it falls under the category of highly water scarce zone of the world. From the findings of different studies as discussed in this paper it is evident that India's water scarcity can be connected to

variations in precipitation pattern caused by climate change, growing urbanization, pollution resulting in depletion of ground water pollution in surface water and even occurrence in water crisis and conflict in many parts of the region. The sustainable solution to this water crisis highlights the need for effective water policy. This scarcity is not caused only by a physical shortage of water; it also results from poor water quality, inefficient water use, and weak institutional management of demand for water. (Larson et al., 2009; Sing & Goyal, 2025)[49/50].

Jal Jeevan Mission: An Overview

One of the most important policies launched by Government of India to address the issue of water scarcity is Jal Jeevan Mission scheme in 15th August, 2019. The objectives of the mission are set in alignment with the holistic aim that "every rural household has drinking water supply in adequate quantity of prescribed quality on regular and long-term basis at affordable service delivery charges leading to improvement in living standard of rural communities" (Ministry of Jal Shakti, GOI)[51]. This long-term visionary statement is very significant in this crucial juncture that India's demand for water is expected to be double the availability supply by 2030 expecting its severe impact on the population, agricultural and industrial production (NITI Aayog, 2019)[52]. During the initial period the target to provide functional tap water connection to every rural household was set to be achieved by the year 2024. However, in a recent announcement of the Union Finance Minister Nirmala Sitaraman, the Jal Jeevan Mission scheme is extended till 2028 with increased budget to achieve the target. The supply of adequate quantity and prescribed quality of water to the targeted household require a strategic planning and well-equipped technological intervention in the management and implementation of water supply policies. Besides, there is a need to identify the water source and its channelization, through functional tap connection, the best method to deliver the service where not only planning and management and infrastructural set up is essential but the support and the cooperation from the local communities, local administrative bodies and all other stakeholders are also crucial to fulfill the goal. Therefore, the broad mission of the scheme aims to assist, empower and facilitate a robust service delivery mechanism to be operationalized by the States/UTs along with their local counterparts.

Integrating Jal Jeevan Mission (JJM) with Sustainable Development Goal (SDG):

The Sustainable Development Goal 6 aims to 'ensuring availability and sustainable management of water and sanitation for all'. The aim of providing functional household tap connections (FHTC)to all rural household by 2024 (extended till 2028) (GOI, Ministry of Jal Shakti, 2022)[51] are completely aligned with the SDG 6 which emphasis on equitable access to 'clean water and sanitation for all (un.org). The policy framework of JJM is designed to fulfill the SDG 6 prioritizing its components like clean drinking water, sanitation, hygiene, improve water quality, increase efficiency, water conservation, ensure community support to mitigate the crisis of water scarcity in India. Implementation of JJM scheme is changing the lives of millions of people by providing tap water connection to every household, schools, Anganwadi centers etc. emphasizing on health concerns, education outcome, awareness and empowerment of the rural communities. To address the water crisis JJM adopts decentralized and community-based approach both in operation and management of the delivery of water service. Moreover, a climate resilient water conservation strategy considering extreme weather events like flood

and droughts has been initiated to address the challenge of climate change. The extreme weather disasters have been tried to mitigate and prevent improving the water storage capacity and identifying the sustainable water resources, a conservation strategy is being adopted with support of local authority, community and NGOs. Accordingly monitoring and evaluation is conducted to ensure accessibility of 'adequate quantity of prescribed quality on regular basis ' (Operational Guidelines, JJM, GOI) [53].

Identifying the water effected and contaminated areas JJM focuses on monitoring and testing the water quality to minimize the risk of delivering unsafe water at the source. In this process water quality surveillance is undertaken with the local communities. Government of India's report on JJM states that 2,100 water quality testing laboratories have been set up till 2025 and 25 lakh women have been trained to test drinking water. This will indeed prevent the possibility of delivering contaminated water to the household thereby ensuring the water safety at the source (GOI, Ministry of Jal Shakti, 2025)[54].

The Policy Framework of Jal Jeevan Mission:

The policy framework of JJM provides a detailed account of the strategy and implementation mechanism for achieving the holistic goal. Sustainable water resource management, strong institutional set up and community participation are the key elements in the implementation strategy of JJM. The broad objectives of Jal Jeevan Mission as stated in the policy (GOI, 2019)[51] includes the following targets-

- To provide Functional Household Tap Connections (FHTCs) to every rural household
- To prioritize FHTCs in quality affected areas, villages, in drought prone and desert areas, Sansad Adarsh Gram Yojana (SAGY) villages etc.
- To provide functional tap connections to schools, Anganwadi Centers, GP buildings, health centers and community buildings.
- To monitor functionality of tap connections.
- To promote and ensure voluntary ownership among local community by way of contribution in cash, kind and/or labour and voluntary labour (shramdaan).
- To assist in ensuring sustainability of water supply system, i.e. water source, water supply infrastructure and funds for regular Operation and Maintenance (O&M).
- To empower and develop human resource in the sector such that the demands of construction, plumbing, electrical, water quality management, water treatment, catchment protection, O&M etc. are taken care of in short and long term.
- To bring awareness on various aspects and significance of safe drinking water and involvement of stakeholders in manner that make water everybody's business.

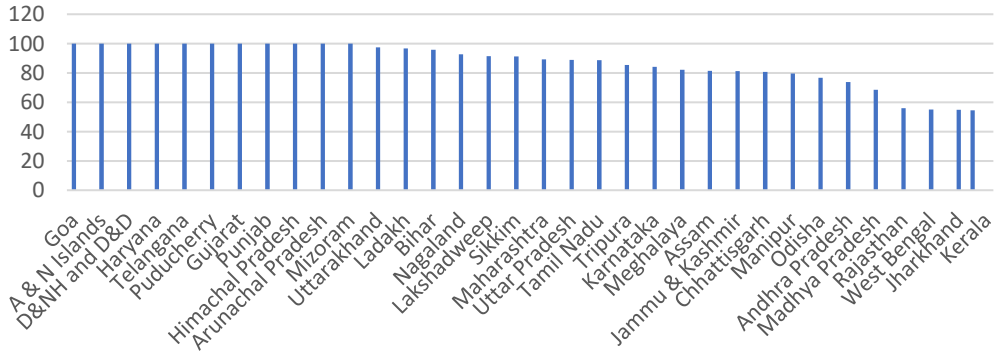
The implementation strategy of JJM adopts a decentralized mechanism with a structural approach to ensure universal tap connection to every household. This has focus on multiple level action plan- village action plan, district and state action plan, Annual Action Plan with

specific implementation target. Along with this a community led partnership approach is adopted to involve the gram panchayats and village water sanitation committees, self-help groups, NGOs, youth groups and women in the process of planning and implementation of sustainable water supply system. This sustainable operation and maintenance of water supply is been considered as 'utility based' approach to address water insecurity. Also, a technical support system is built to generate awareness, train the locals involved in water distribution management and service delivery system. A technology driven monitoring and surveillance system has been developed to ensure safe and clean drinking water along with its conservation. Thus, government of India's policy JJM is adopting a participatory holistic approach involving all stakeholders in a decentralized integrated water resource management system.

Jal Jeevan Mission in progress:

The relentless efforts of the authority in charge of implementation of the JJM scheme has made it possible to provide tap water connection to 15.55 crore households as on March 26, 2025. Till 2024-25 tap water coverage increased from 8 percent to 78.35 percent in 112 aspirational districts in India.[54]. According to JJM dashboard data on March 25, 2025 Andaman and Nicobar Islands, Puducherry, Gujarat, Punjab, Himachal Pradesh, Arunachal Pradesh and Mizoram has achieved the target of 100 percent functional household tap connection, whereas Rajasthan, West Bengal, Jharkhand and Kerela are the states where the functional household tap connection delivery service is slower than other states having only 54 percent to 55 percent[51].

Table 2: Statewise household tap water connection as on March 26, 2025



Source: GOI, Ministry of Jal Shakti, 2025

Access to clean and safe drinking water is the foundation of sound public health. Contaminated water sources are responsible for occurrence of water borne diseases like diarrhea, cholera, typhoid etc. Unsafe drinking water containing pollutants like arsenic, fluoride, uranium and other heavy metals are responsible for health-related issues and even occurrence of death, especially among children. According to World Health Organization (WHO, 2023) globally at least 1.7 million people uses unsafe drinking water with microbial contamination and over 1 million death per annum are due to diarrhea, out of which children under 5 years are mostly vulnerable among them [55]. Here, effective water management policy with adequate infrastructure, technological intervention and community participation can bring significant improvement in providing safe drinking water to the people. WHO states that in 2022, 73

percent of the global population used a safely managed drinking water service- that is, one located on premises, available when needed and free from contamination' (WHO, 2023)[55]. Studies conducted by Kremer et al., (2023) estimates that the successful implementation of JJM will prevent around 1,36,000 under 5 deaths per year (JJM dashboard impact studies)[56]. JJM is committed to provide 'higher level of drinking water service defined by the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP)'[57]. Studies related to safely managed drinking water services also projected that effective implementation of JJM to provide universal access to safe drinking water will reduce almost 45.4 percent of the diarrheal death case that were reported prior to its implementation (JJM Dashboard)[58].

Issues of women and water are interconnected. Water scarcity has a direct impact in the livelihood of women. From drinking to washing, bathing, doing the household activities water is essential and women have to shoulder the responsibility of collecting the water required for family in most regions of India. In the water stressed regions women have to face the hardship to fetching the water from long distance which becomes very much detrimental to their health, including physical extortion and deprive of getting educational and economic opportunities due to waste of several times in this process[54]. In many parts of India lives of women and children become miserable due to their daily struggle for collecting water and also due their non-awareness about water supply management system the service delivery system remains poor. But the implementation of JJM, people's active participation, training and empowerment of rural women have contributed to the successful implementation of household piped water connection in many villages of Arunachal Pradesh, Andhra Pradesh, Assam, Bihar, Jammu & Kashmir, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and many other parts of India from drought prone to flood prone areas, from hills to coastal terrains. With more than 50 percent women led Local Water Committees/ Pani Samitis in involving its operation and maintenance in India, receiving training on water quality testing, their enthusiastic participation in decision making have brought a paradigm shift in empowering the rural women [54]. Now women and girls have more time to conduct economic activities, get education and community involvement thereby overcoming the social and gender barriers that put obstacles in their empowerment. Women feel liberated from the burden of fetching water from long distance water sources.

The JJM has also played a transformative role in improving public health in rural areas. Supply of clean piped water twice a day has reduced the possibility of diarrheal death as stated by the people of Khunti district of Jharkhand[54] and Deoria district of Uttar Pradesh. The possibility of contaminated water supply is reduced as total 2,180 laboratories for water testing are set up for public to test water quality as recorded by official sources of Government of India [54]. Moreover, more than 24.80 lakh women are provided training to use Field Test Kits (FTKs) to check the water quality at source/home and in 2024-25, over 1.42 crore tests were conducted in the labs or using the FTKs.

In the education sector of rural India JJM has successfully removed the biggest hurdle in children's education by providing tap water connection to schools, Anganwadi centers bringing a great relief specially those girls suffered due to dirty and unhygienic toilets. The Government

of India's official record states that 9.32 lakh schools, 9.69 lakh Anganwadi centers and 3.93 lakh public institutions are benefited by this scheme till 2024-25. Thus, JJM's holistic effort to promote access, equity and social justice can be regarded as positive step and an optimistic policy in sustainable water management practices. The launch of JJM scheme has significantly transformed the water stressed scenario accessibility, equity and inclusiveness including health benefits, socio-economic development and sustainable livelihood. Access to clean water has contributed to reduce the water borne disease and child mortality (GOI, Ministry of Jal Shakti)[56/58]. Helping the women and girls to empower themselves, educated and engaged in economic activities and saving their time to contribute to the nation building process are the positive impacts of JJM that cannot be overlooked. Another important aspect that can be related with the JJM implementation is the potential in employment generation in the process of operation and maintenance of the scheme. Studies conducted by IIM Bangalore and ILO on 'Assessment and Employment Potential of JJM' reveal that JJM has potential to generate 59.9 lakh persons per- years of and 2.22 crore persons- years of indirect employment (Naik, G. et al., 2023)[59]. So, JJM has been succeeded to dismantle the socio-economic barriers to a great extent that were responsible for getting deprived of water accessibility by the disadvantageous section of the society. The involvement of the community in water resource management and conservation is highly appreciable ensuring the environmental sustainability. This holistic and decentralized policy would be beneficial for sustainable future if implemented with transparency and accountability. Community ownership of the policy and its operation and maintenance therefore are the boon for public creating a ray of hope in the field of good governance.

Challenges:

However, the ambitious goal of ensuring safe and clean drinking water to every household through tap connections with adequate quantity and prescribed quality is not easily achievable. Despite its significant progress JJM has facing several challenges in its implementation which are creating obstacles in its prolonged sustainability. A much deeper examination is needed to delve into the rooted challenges and to address them efficiently. The ground water contamination is a major challenge which is widespread in many regions. The sustainable service delivery system is hampered due to the lack of groundwater data and information to identify the pollutants like arsenic, fluoride, microbiological pollution and salinity (Cobbing, et al., 2021)[60].

In the proper implementation of JJM scheme accurate data on ground water availability, water quality, infrastructure and household connections coverage are crucial. It helps in identifying and prioritizing the areas that need intervention. However, reports indicates a deficit in reliable data and systematic monitoring in this area. Variations both at national and state in the available data from the sources like NFHS, NSS etc. indicates that comparison and interpretation of data regarding the accessibility of FHTC is not possible (Thomas & Ray, 2025)[61].

In most of the urban areas the gap between the demand for supply of water and over population results in inadequate and insufficient water supply. This necessitates the distribution of water by some private tankers at the cost of payment. In this case the objective of JJM to 'improve the quality of water and source sustainability will be challenging due to outpacing the demand

for water supply and conservation efforts' (Ray, 2025)[61]. Case studies in Delhi water crisis in 2021 reveal that inadequacy in the distribution of water can be emerged as a failure of water supply management system (GOI, NIDM, 2022)[62]. Interference of some 'tank mafias' and private tankers in this process worsened the situation of Delhi water crisis. Community awareness and involvement must therefore be widely encouraged to reduce the intensity of such problems. Moreover, people have to pay more charges than the usual cost to these private parties in the high-water demand areas. Hence 'unwillingness to charge or to be charged' can be a cause for irregular service delivery (Wascoat et al., 2021) [63].

Financial constrains due to shortfall of budget may create impediment in the implementation of the scheme. At the launched period the aim of JJM was to be achieved by December, 2024 but it is now extended for four years to be completed by December, 2028 which requires an estimated investment of nearly 3 lakh crores. But deciding a possible cut of 46% in the centers funding assistance, The Expenditure Finance Committee has recommended to release only '1.51 lakh crores creating a financial gap of over 1.25 crore' (outlookbussiness.com) [64]. This will create constrains for at least 17 states and Union Territories in the implementation of the project. Still 30.9 million households across these 17 states and UTs are lacking the piped infrastructure (Haq, 2025) [65]. The main challenges include mainly 'delayed project work, unreliable ground water sources, water contamination and difficult terrain'.

Incidence of technical constrains in the distribution system are also reported specially in the diverse and 'undulating terrains'. In some villages of Uttar Pradesh cases of leaks or cracks were reported and some problems occurred due to narrow and inadequate pipe connection. Moreover, complains of theft of taps and infrastructural damage created disturbances in the regular distribution system (The Hindu, 2023)[66].

Recommendation and Conclusion:

The Jal Jeevan Mission is a landmark initiative undertaken by the Ministry of Jal Shakti, Government of India, in the context of the water crisis facing by the people as it aims to ensure tap water connection to every household in India to be achieved (as extended) by 2028. The long-term success of JJM depends on 'sustainable water resource management, quality assurance mechanism, and effective governance' (World Bank, 2022)[67]. JJM aims to promote social equity and environmental sustainability in terms of expanding social benefits by emphasizing on long term water resource management. Hence, it focuses on community involvement and their monitoring in the operation and maintenance of the scheme. However, in the implementation of the scheme only number of households getting the tap water connection need not be the ultimate target, rather issues of preserving water resources by introducing new technologies and innovation should be prioritized so that people can be benefitted in the long run. There is a need to involve different agencies in collection of JJM data, integrate and analyze the data more accurately so that the functioning of the policy can be monitored more effectively. Here research and independent field surveys are recommended to provide critical input to assess the whole policy (Thomas & Ray, 2025) [61]. There is also a need of flexible policy to comply with problems arising out of diverse situations specially in India's geographical heterogenic set up. For example, problems faced by people of hilly regions while using ground water are areas of more concern. The bottom-up decentralized policy

approach demands a mechanism that can make up the issues in the planning process itself and interventionist steps in the operation and maintenance. Some communities facing problems of social barriers such as limited participation of women in decision making and water governance, have seen some progress under JJM with the formation of Village Water and Sanitation Committees and some awareness campaigns, however, economic barriers -such as inability of poor households to bear the maintenance cost in case of any connection or technical issues are still need to be focused.

To benefit the targeted people a clearly defined administrative mechanism to operate in cooperation with central, state and local authority is helpful as it ensures effective service delivery system. Efficient governance, accountability and coordination of different stakeholders along with community participation, avoiding the risk of overlapping in service delivery can fulfill the holistic aim to save the people from water insecurity. To reduce the risk of water contamination policies regarding industrial waste management and pollution control policies must be strictly implemented. Technological innovations and research in the field of water resource management is helpful to identify the implementation gap of the policy including the slow service delivery in specific regions. Along with that, collaborative efforts of different agencies and authorities like water and sanitation department, pollution control board, irrigation department, public health, inter-state council to deal with river water management and water conservation bodies is vital for successful implementation of the policy. Efficient implementation of this water management policy and its decentralized operation and management system not only ensure socio-economic equity and justice but also protect the right to have clean and hygienic water for all in aligned with the fundamental right to health associated with our right to life.

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