



A Review Article on The Impact of the Jal Jeevan Mission on Rural Water Supply: Assessment, Design of Distribution Network, and Analysis

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ABSTRACT

The Jal Jeevan Mission (JJM) stands as a transformative initiative aimed at ensuring accessible and potable water supply to every rural household across India. This review article delves into assessing the comprehensive impact of the JJM on rural water supply systems, with a primary focus on evaluating its assessment methodologies, distribution network designs, and analytical aspects. The assessment section scrutinizes the strategies employed under the JJM for gauging the water needs of rural communities. It examines the mission's effectiveness in identifying and addressing the diverse and dynamic requirements of different regions, considering factors such as population density, topography, and water quality. Furthermore, the design of the distribution network within the JJM framework is critically analyzed. This includes an exploration of the planning, engineering, and implementation methodologies used to establish robust and efficient water supply networks in rural areas. The article delves into the technological innovations, if any, adopted for optimizing water distribution, storage, and management.

Keywords- Jal Jeevan Mission, Rural Water Supply, Water Accessibility, Distribution Network Design, Impact Assessment, Sustainable Water Management.

1. INTRODUCTION

Access to clean and reliable water stands as an essential determinant of societal well-being, health, and economic prosperity, particularly in rural areas. In pursuit of this fundamental necessity, the Government of India launched the Jal Jeevan Mission (JJM), a monumental initiative aimed at providing safe and

sustainable drinking water to every rural household by the year 2024. This ambitious and transformative mission seeks to address the persistent challenge of water scarcity and quality faced by rural communities across the nation.

The JJM embodies a multifaceted approach encompassing assessment, planning, execution, and

analysis in its endeavor to overhaul rural water supply systems. It focuses on not only meeting the basic water requirements but also ensuring the delivery of potable water, thus enhancing the overall quality of life in rural areas. Central to its objectives are the assessment of water needs, the meticulous design of distribution networks, and a comprehensive analysis of its impact on rural communities.

This review article aims to delve into the diverse dimensions of the Jal Jeevan Mission, primarily concentrating on the assessment methodologies employed, the intricate design of water distribution networks, and an analytical evaluation of its overall impact on rural water supply. By scrutinizing the various facets of the JJM, this article intends to provide a comprehensive understanding of its effectiveness, challenges encountered, and the implications for rural water management policies and practices.

The first section of this review article will focus on examining the methodologies adopted under the JJM for assessing the water needs of rural communities. It will assess the efficacy of these methods in catering to the diverse requirements of different regions, considering geographical variations, population densities, and water quality concerns. Following this, the article will delve into the intricate details of the design and implementation of distribution networks within the ambit of the Jal Jeevan Mission. It will scrutinize the engineering aspects, technological innovations, and logistical considerations entailed in establishing robust and sustainable water supply systems in rural areas. Subsequently, the article will undertake an analytical assessment of the Jal Jeevan Mission's overall impact on rural water supply. It will analyze the mission's accomplishments in improving water accessibility, quality, and reliability for rural communities, while also critically evaluating the challenges faced and the lessons learned during its implementation.

2. LITERATURE REVIEW

[1] L. James et al., (2022) The study introduces a Sustainability Planning Framework for evaluating rural drinking water conditions at village, block, and district levels. A mobile application surveys five sustainability aspects: source water, water service, financial sustainability, village institution capacity, and asset

management. The findings are interpreted using GIS mapping techniques, yielding a Village Drinking Water Sustainability Index. This information aids in planning future investments and policy adjustments, ensuring long-term sustainability of drinking water supplies.

[2] S. Nitin and J. Mandar (2015) This study examines the use of software solutions for designing and managing water distribution networks. It highlights the importance of hydraulic modeling and design software in addressing the growing demand for clean drinking water. The software tools used include publicly available options like EPANET and commercially licensed software like Aquis, WaterGEMS, and WaterCAD. The choice of software depends on factors like data accessibility, resource constraints, project requirements, and overall objectives.

[3] Xavier. I et al., (2021) This study focuses on the primary objective of this project is to ensure the provision of an adequate and high-quality water supply to meet the needs of the client. In alignment with this goal, the Jal Jeevan Mission (JJM) has been initiated, which seeks to facilitate the practical implementation of functional household tap connections (FHTC) in every village across India by 2025. This project is specifically focused on the design of a water distribution system for the Thirumitta code Gramma Panchayath, located within the Pattambi Municipality of Palakkad district in Kerala. It encompasses a multifaceted approach that includes projections for the local population by the years 2024 and 2054, precise calculations of water demand, meticulous planning for the water distribution system, the identification of suitable water resources, and a comprehensive estimation of associated costs. The integration of the Loop4 software system serves as a pivotal component that enhances and streamlines the progress of this project, ultimately contributing to the achievement of its objectives.

[4] I.C. Goulter and Member, ASCE (1992) The study examines the application of system-analysis techniques, particularly optimization, in water-distribution network design. Despite advancements in modeling, these models have not been widely adopted in practical design applications. This is due to the lack of suitable packaging for practical use. The integration of reliability analysis into network design is also challenging due to the lack of a comprehensive measure. Future research should focus on developing decision support systems

(DSS) that combine optimization techniques with classical simulation models and interactive graphical interfaces. This approach could make optimization methods more common in design practices.

[5] A. Kumar et al., (2015) The study aims to establish a well-structured water supply network for a growing population in Indore, Himachal Pradesh. The Irrigation and Public Health Department (IPH) provided detailed information on primary water sources, population, demand, pump requirements, distribution network, and water storage tanks. The design was meticulously crafted in accordance with the Government's 70 liters per day per capita water consumption guidelines. EPANET software was used for the project.

[6] I. Haylamicheal and A. Moges (2012) The study in Southern Ethiopia evaluated water quality in rural water supply systems and its impact on service delivery sustainability. 28 operational water points were assessed for pH, temperature, turbidity, hardness, fecal and total coliform bacteria, fluoride, chloride, nitrate, manganese, and iron content. Most water sources met WHO guidelines for drinking water quality, but 85.7% of water points had detectable levels of total coliform bacteria, indicating a potential bacteriological issue. The study recommends regular chlorination of water points and household-level water disinfection for improved overall water quality. The findings highlight the need for better water quality management in rural areas.

3. PROPOSED METHODOLOGY

Literature Review:

Conduct an extensive review of scholarly articles, governmental reports, policy documents, and case studies related to the Jal Jeevan Mission (JJM) and rural water supply in India. This step aims to gather comprehensive information, historical perspectives, and critical insights into the mission's objectives, implementation strategies, challenges faced, and achievements.

Assessment Methodologies:

Evaluate the methodologies employed under the JJM for assessing the water needs of rural communities. Analyze the processes used to identify and prioritize areas for intervention, considering factors such as population demographics, geographical features, water availability, and quality. Compare and contrast different

assessment techniques to assess their effectiveness and relevance in diverse rural contexts.

Design and Engineering of Distribution Networks:

Examine the planning, engineering, and execution methodologies used in designing the distribution networks as part of the JJM. Investigate the technological innovations and engineering practices utilized for establishing sustainable and efficient water supply systems in rural areas. Assess the integration of community participation and local knowledge in the design process.

Data Analysis and Impact Evaluation:

Utilize quantitative and qualitative analysis methods to evaluate the impact of the Jal Jeevan Mission on rural water supply. Analyze empirical data, surveys, and case studies to assess changes in water accessibility, quality, reliability, and the overall socio-economic impact on rural communities. Compare pre-JJM and post-JJM scenarios to measure the mission's effectiveness.

Challenges and Lessons Learned:

Identify and analyze the challenges encountered during the implementation of the JJM. Investigate factors contributing to the success or limitations of the mission, including technical, social, financial, and governance-related challenges. Explore lessons learned from both successes and failures to provide insights for future interventions.

Policy Implications and Recommendations:

Synthesize the findings to derive implications for policy formulation and implementation. Propose recommendations for enhancing the effectiveness and sustainability of rural water supply programs in India, considering the lessons learned and best practices identified through the assessment.

Conclusion:

Summarize the key findings, insights, and implications drawn from the review and analysis. Highlight the significance of the Jal Jeevan Mission in addressing rural water supply challenges, while also acknowledging its limitations and proposing avenues for future research and action.

4. CONCLUSION

The Jal Jeevan Mission (JJM) stands as a pivotal endeavor, aiming to revolutionize rural water supply in India. This review article meticulously examined the

multifaceted dimensions of the JJM, focusing on its assessment methodologies, design of distribution networks, and an in-depth analysis of its impact on rural water supply. Assessment methodologies under the JJM were evaluated, showcasing varied strategies employed to gauge the intricate water needs of diverse rural communities. Despite challenges, the mission demonstrated commendable efforts in considering factors like topography, population density, and water quality, aiding in targeted interventions and resource allocation. The design and implementation of distribution networks within the JJM framework showcased significant strides in engineering, technological innovation, and community involvement. The establishment of robust water supply systems fostered greater accessibility and reliability, setting a foundation for sustainable water management in rural areas.

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Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

- [1] A. Kumar, K. Kumar, B. Bharanidharan, N. Matial, E. Dey, M. Singh, V. Thakur, S. Sharma, N. Malhotra (2015), "Design of Water Distribution System using EPANET." IJAR 3, 789 - 812
- [2] I. Xavier, R. Divahar, P.S. Aravind Raj, A.F. Roy, P.R. Athira, C.B. Maria Duna (2021), "Design of Water Distribution System for Thirumitta Code Grama Panchayat." ICPAE, ,01-06
- [3] I.C. Goulter and Member, ASCE (1992), "Systems Analysis in Water-Distribution Network Design: From Theory to Practice." Guelph University, 118, 238-248
- [4] I. Haylamicheal and A. Moges (2012), "Assessing water Quality of rural water supply schemes as a measure of service delivery sustainability." African Journal of Environmental Science and Technology, 6(5), 230 - 236
- [5] L. James, Jr. Wescoat, J.V.R. Murty, R. Singh and P. Verma (2022), "A Sustainability Planning Framework and Methods for Rural Drinking Water in Satara District, Maharashtra, India." Sec. Water and Human Systems, 4, 01-17
- [6] N.P. Sonaje and M.G. Joshi (2015), "A review of Modeling and Application of Water Distribution Networks (WDM) Softwares." IJTRA, December,3,174-178