Water Governance and Policy Frameworks in India Challenges and Solutions for SDG 6 through the Empowerment of Rural Women

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***Abstract*—Water governance and policy frameworks are an important aspect in India's initiatives toward achieving Sustainable Development Goal 6 (SDG 6), which ensures availability and sustainable management of clean water for all. Despite many sweeping policy reforms and initiatives such as the National Water Policy (NWP) and the Jal Jeevan Mission, water scarcity, pollution, inequitable water distribution, and climate change continue to elude solutions. Through a systematic review of existing literature and policy frameworks, this paper attempts to examine the current scenario of water governance in India with special reference to the voices and empowerment of rural women in the resolution of these issues. It analyses the viability of existing policies at the national and state levels and brings into perspective concerns like poor inter-sectoral coordination, lack of funding, fragmented institutions, and depletion of groundwater. Innovative participatory approaches such as community solutions, the use of digital technologies, and integrated water resources management (IWRM) are being explored to improve water governance. The study emphasizes the need for a strong legal-policy framework that would encourage and facilitate cooperative endeavors between government and the private sector, and more importantly engage local communities across the board. Specifically, the findings highlight that empowering rural woman as primary decision-makers is essential for effective, equitable local water management. Ultimately, to achieve SDG 6 in India, a more holistic and inclusive governance paradigm is needed that brings water sustainability and equity into consideration alongside environment and social concerns.**

***Index Terms*—Empowerment of Rural Women, Integrated Water Resource Management, Policy Frameworks, SDG-6, Water Governance, Water Sustainability**

I. INTRODUCTION

Sustainable Development Goal 6 of the United Nations, embedded within the 2030 Agenda for Sustainable Development, is focused on "ensuring availability and sustainable management of water and sanitation for all." This ambitious goal, adopted in 2015, addresses the contemporary water-related challenges that countries are facing worldwide in their quest to ensure equitable access to water, improve water quality, reduce water scarcity, and promote integrated water resource management. Thus, achieving SDG 6 is essential not only for human health and well-being but also for environmental sustainability and economic development. Water is an essential element for sustaining life in all forms and is also an important resource for economic development, agriculture, sanitation, and industrial processes.

For India, achieving SDG 6 poses unique questions concerning the intricate geography, growing population, and varying climatic conditions throughout the country. Given the diverse water-related problems existing within India such as water scarcity, declining water quality, and regional inequalities when it comes to water availability, along with the climate change considerations, the goal of providing equitable access to water and sanitation to all and managing resource uses become very difficult to achieve. Addressing these challenges requires a multi-sectoral approach that includes all stakeholders, particularly marginalized groups such as rural women, who remain crucial in water collection and management.

The era of water stress in India, which is home to an estimated 1.42 billion people, is unprecedented. The country's per capita water availability has been on a

constant decline over these many years even when the country is endowed with large rivers and lakes. Many regions suffer from severe water scarcity. Since a multitude of problems create water-stressed regions, one can conclude that the situation is very grim in villages. Lack of good governance and infrastructure and socioeconomic challenges compound the water-related issues they face. The rural women, who mostly do the water collection in various parts of the country, are primarily and disproportionately affected by these issues. The empowerment of rural women with a role in water governance and policy frameworks is critical for addressing India's water crisis as well as for realizing SDG 6.

The subsequent sections will elaborate on the incidence of key water-related challenges in India, the role of women in managing water resources, and how the empowerment of rural women can form part of the solution for India's water woes. A discourse on these issues would demonstrate the interlinkage of water governance, gender equality, and sustainable development in suggesting solutions that are both sustainable for water security and equitable for social justice.

Water Challenges in India

India suffers from a highly complex set of water challenges that obstruct progress towards SDG 6. Water resources in the country are unevenly distributed, and demand continues to increase with growing population, burgeoning agriculture, and ebbing urbanization. This entire situation is made worse by climate change and numerous other environmental scourges, along with the institutional problem of increasing difficulty for water management.

- Water Scarcity: This is one of the most pressing challenges that India faces. The country is water-stressed, even though it has vast freshwater resources; per capita water availability is going down due to explosive population growth and increased consumption. This deficiency is compounded by myriad demands for water from agriculture, industry, and urban settlements. Agriculture uses most of India's water and still heavily depends upon irrigation systems that deplete groundwater sources, especially in states like Punjab, Haryana, and Uttar Pradesh. Excessive groundwater extraction in this region has lowered the water table to the level of making access of clean water very difficult.

- Water quality: One of the more critical challenges is the pollution of water sources, rendering the drinking water unsafe and unfit for consumption. Pollution of surface and underground water shares many parameters with untreated domestic sewage, agricultural runoff, industrial effluents, and poor wastes disposal. Such water pollution is the main cause of water quality deterioration, especially with respect to rivers, lakes, and groundwater. Ganga River, one of the most important water bodies in India, has been the subject of several cleaning efforts through programs like Namami Gange. Despite these efforts, the river is still polluted, demonstrating the difficulty of combating pollution on an extensive level. Contamination of water sources is a serious issue that impairs public health and brings major obstacles to making safe drinking water available to all.

- Climate change: Climate change has emerged as a major factor affecting water supply in India. Change in precipitation patterns is irregularly supplemented by the occurrence of droughts with increased frequency and severity, thereby disrupting traditional water cycles and rendering prediction and management of water resources difficult. The melting of glaciers in the Himalayas, which feed many of India’s major river systems, is alarming. As climate change becomes more conspicuous, indeed, the glaring effects are seen in Rajasthan and Gujarat, where water scarcity has already become a serious concern, worsening from there on.

- Regional Disparities: Water available in India is rather unevenly distributed in various parts of the country, wherein a few regions suffer from continuous water scarcity, while others enjoy plenty of water. In west arid and semi-arid regions like Rajasthan, Gujarat, and Tamil Nadu, extreme rainfall scarcity has resulted in severe water stress. While states such as West Bengal and Uttar Pradesh have a much higher availability of water, poor management, absence of infrastructure, and inefficient distribution systems become

obstructions, not allowing these areas to fully utilize their water resources. Enhancing regional disparity concerning water availability and accessibility complicates efforts directed toward ensuring equitable distribution and management of water throughout the country.

- Institutional Challenges: Governance pertaining to water resources in India has been hindered by a fragmented institutional framework. Water management is carried out under the auspices of several government agencies and ministries with little coordination between them. The non-existence of a unified and integrated approach for water management has led to inefficiencies, duplicated efforts, and a lack of accountability. Equally, the lack of clearly defined institutional structures for IWRM has prevented lasting interventions toward water scarcity and quality problems. Solving these challenges is crucial for improving water governance and, hence, for achieving SDG 6.

- Population growth and Urbanization: The rapidly increasing population of India with ever-expanding urbanization has put tremendous pressure on its water resources. Water demand in cities has surged as more and more people are attracted toward urban centers searching for opportunities. Many of these urban areas are facing severe water shortages due partly to the steadily increasing population, which is outpacing the development of water sector infrastructure, leading to issues of inequitable distribution of water and poor quality of water. Poor wastewater treatment practices and increasing untreated sewage are further aggravating the situation of water pollution. Thus, rapid urbanization in India with the combination of old infrastructure and inefficient distribution systems worsens the chances for sustainable water management.

Water Governance and Rural Women

Water has a huge importance in the life of women in the rural areas of India, particularly when access is remote. Water collection has traditionally been the responsibility of women in many rural contexts, sometimes necessitating a journey spanning long distances for a household's water needs. This task takes away a considerable amount of time and energy from those women and poses several health threats for them linked to waterborne diseases. There is a huge gap: while women are central to household water management, they are often excluded from the governance structures that shape water policy and management agendas.

There is much to say about the empowerment of rural women as one remedy to address the problem of water in India toward achieving SDG 6. Women hold the knowledge and experience of local-level water resource management. They are those who bear witness to the effects of the manifestations of water scarcity and pollution. They know what their households need and what their communities require. Hence, involving women in water governance will give India more inclusive and effective water management, addressing the requirements and viewpoints of marginalized groups.

Women's empowerment in water management would also improve water conservation, enhance community awareness, and lead to sustainable water use approaches. Women's involvement in decision-making processes also challenges gender inequalities regarding access to resources, ensuring women and girls have equal opportunities from safe and clean water.

There needs to be a multi-dimensional approach to the diverse aspects of water scarcity, quality, and governance alongside gender considerations in the realization of SDG 6 for India. Actively involving rural women would serve towards this end. Meanwhile, this strengthens the women-given concern for water governance toward sustainable and equitable solutions for India's water crisis, benefiting the management of water resources and the access to it in rural areas. Challenges and opportunities in empowering rural women in water governance are discussed in this paper in relation to social aspects and inclusive and integrated policy frameworks on the technically oriented side of water management. Therefore, this will be a check to see if India is trying seriously toward achieving SDG 6 and ensuring a sustainable water future for all.

II. RELEVANCE OF THIS RESEARCH

The fulfillment of Sustainable Development Goal (SDG) 6- ensuring availability and sustainable management of water and sanitation for all- holds

great importance for India. Water is a fundamental resource that people utilize to fulfill their living needs and supports India's other agencies of economic growth: public health, environmental sustainability, and social equity. There are great challenges in water governance toward sustainable development and prosperity with the population explosion, rapid economic growth and the diverse socio-environmental landscape of India. This research examines water governance vis-à-vis gender and SDG 6, with the emphasis placed on empowering rural women as a recourse to tackle the plethora of water issues in the country.

Economic Development

India's economy is directly dependent on agriculture, which is the primary source of livelihood for nearly half of its population. Agriculture, in turn, depends heavily on the availability of water for irrigation and the cultivation of crops. Agriculture contributes a substantial share of the national product of India and is the backbone of its food security. Water shortages and inefficient irrigation systems are among the greatest threats to this all-important sector. Sustainable water management in agriculture is, therefore, important not only for agricultural productivity but also for economic stability in the country. Furthermore, since rural women constitute a significant portion of the agricultural workforce, integrating them into water management is vital for sustaining this sector.

Different industries, including mining, power generation, and textiles, use significant amounts of water in their operations. An increase in industrial activities since post-independence has led to a further increase in water demand in the already water-scarce situation. Water governance, therefore, becomes an inevitable mechanism to strike a balance between agriculture, industry, and domestic consumption with a view to safeguarding water resources for the next generation to use in the sustained economic growth of India.

Thus, water can also be considered an economic resource as well as a vital input in the development of the country. In so doing, managing water resources sustainably is critical, not only to drive the economy but also to guarantee that such development does not compromise the environment and the welfare of the people. The study also emphasizes the need for water governance frameworks that would promote efficient uses of water resources in all sectors so that economic growth takes place in an environmentally sustainable manner.

Public Health

Access to clean drinking water and adequate sanitation is one of every person's fundamental right; as such, it is directly related to public health. In India, access to water and sanitation has not improved to the expected levels and remains a significant issue, especially in rural regions and impoverished urban slums. Public health is still seriously threatened by waterborne illnesses including cholera, diarrhea, and dysentery, particularly in rural regions with limited access to sanitary facilities and safe water sources. Poor infrastructure for water and sanitation makes it easier for infections to spread, which raises morbidity and mortality even further, especially for high-risk populations like the elderly, children, and the impoverished.

Addressing these issues is, therefore, not only urgent and critical to public health but also to lessening the economic burden of waterborne diseases. Far from being a burden on the already interrupted healthcare system of the country, every water-related illness adding on becomes a serious issue. The country's prospects for reducing such preventable diseases and enhancing the general quality of life of its people much lie with improved water governance, with considerable investments in water purification technologies and promotion of sanitation practices.

Rural women empowerment, on the other hand, serves as a very strong determinant of public health outcomes. Women, traditionally responsible for water collection in many rural communities, are often the first to hear about waterborne disease outbreaks within their communities. Therefore, including women in water management discussions helps influence hygiene behavior, clean water use, and improved water infrastructure, resulting in healthy communities.

Environmental Sustainability

Water governance carries with it the burden of environmental sustainability. India is home to a variety of ecosystems, from rivers and wetlands to groundwater aquifers, which are needed to maintain biodiversity and climate resilience. These water bodies support flora and fauna, irrigate crops, and sustain local livelihoods. However, the reliability of these water bodies is being affected by a synergistic

combination of over-extraction, pollution, and climate change.

Pollution from industrial effluents, agricultural runoff, and untreated sewage has now severely affected rivers in India such as the Ganges and Yamuna. Flood retention, water purification, and wildlife habitat are some of the important functions served by wetlands, which are now being drained and encroached upon for the sake of development. Over-extraction of groundwater aquifers for agricultural and domestic use represents another major environmental concern in India, particularly in water-stressed areas like Rajasthan and Punjab.

Thus, for SDG 6 to be realized, India should adopt IWRM (Integrated Water Resource Management) practices that counteract effects on ecosystems. IWRM recognizes the necessity of holistic water management and stressing the mutual requirements of humanity and the environment. By protecting and assuring better water body management for sustained use, biodiversity will be upheld and therefore guarantee the resilience of communities whose livelihoods depend on these ecosystems.

In this context, empowering rural women becomes critical. Since women are users and custodians of water resources, they are in a better position to observe local environmental problems. Women are also at the forefront of conserving water, managing irrigation systems, and protecting local water bodies. Therefore, integrating women's voices into governance frameworks will place India's water management policies on the path towards environmental sustainability.

Equity and Social Justice

The principle of equity assiduously ensures that everybody, irrespective of gender, income, or location, has access to safe water and sanitation. Meeting this target in India requires that the vast divergence in water access between urban and rural areas, and among various socio-economic groups, be addressed. Affected by inadequate water infrastructure and poor management practices, rural areas bear the brunt of inequities: women, in particular.

The duty of fetching water for the household invariably rests with women in rural India, oftentimes requiring them to walk for hours to reach the nearest source of water. In most instances, water is collected from contaminated sources: jeopardizing the health of their family members. Thus, although rural women are primary users and managers of water at the household and community level, they are often excluded from decision-making processes of water policy formation and management practice implementation. This exclusion perpetuates gender inequality while hurting the effectiveness of the water governance strategies.

The SDG 6 emphasis on the issue of equity brings into focus the needs of disadvantaged populations — especially women, children, and low-income communities — who are frequently the last to benefit in the race to attain clean water and sanitation. Providing rural women with access to power by ensuring an active role in water governance will help India build an equitable and inclusive society. The social equity created by women participating in decision-making with respect to water goes hand in hand with the functional equity created in water policies aimed at serving the needs of vulnerable communities. Realizing substantial steps in sustainable water management in India requires an amalgamation that tackles water governance issues on an axis of gender-equitable participation. It is necessary to achieve SDG 6 to leave no one behind in building an equitable and sustainable future for all.

This study deals with the empowerment of rural women in a bid to advance SDG 6. Realizing substantial steps in sustainable water management in India requires an amalgamation that tackles water governance issues on an axis of gender-equitable participation, enhancing access to clean water and sanitation. It is necessary to achieve SDG 6 to leave no one behind in building an equitable and sustainable future for all.

III. OBJECTIVE

The paper critically analyses the water governance structures and policies in India in relation to Sustainable Development Goal 6 (SDG 6) on water and sanitation and assesses their contribution to resolving the various challenges posed in this regard. This study, therefore, seeks comprehension of the extant water management systems and establishments regarding the efficacy of current policies and programs. The specific objectives of the present study are as follows:

- To analyze the present-day water governance structures and corresponding policy frameworks in India.
- To identify the most critical challenges currently facing India in realizing SDG 6 with respect to water governance.
- To assess the efficacy of the existing water management policies and programs in India.
- To evaluate the specific role and necessity of empowering rural women within these governance frameworks to achieve sustainable water security.

Thus, through these objectives, this paper seeks to add to the discourse on water governance in India by offering a lucid picture of the present-day situation of water management, the challenges arising, and the successes of policies pertaining to SDG 6. Furthermore, it highlights the essential role of empowering rural women in confronting these challenges to realize SDG 6 in India.

IV. LITERATURE REVIEW

As presented by Singh and Sharma (2025), the proposed framework will build the digital twin for water governance in rural Indian villages, focusing on solving crucial issues of water management. The authors contend that the digital twin stimulates improved decision-making, resource allocation, and policy formulation in these areas. With the linkage of real-time data from sensors and IoT devices, the digital twin system is poised to monitor water use, availability, and quality accurately. This new technology intends to optimize water use, cut down on inefficiencies, and grant ease of access in a sustainable manner. Participation of the community and access to data is also emphasized in this study as being critical to the long-term viability of the presented solutions. In sum, Singh and Sharma are calling for a data-driven, technology-enabled framework for rural water governance that can be adapted and scaled across rural India for the sustenance of the environment and livelihoods of the people.

Duc et al. (2024) conducted a systematic review of water governance in Asian countries, touching on challenges the stakeholders face and governance frameworks in place and pathways toward achieving water-related Sustainable Development Goals. The authors highlight several main challenges: weak institutional frameworks, lack of stakeholder coordination, and the influence of climate change on water resources. This review provides various governance models across many countries, where an urgent need for integrated and adaptive activity in water management emerges. The review will also give insight into how policy and regulations and participatory governance in the community may improve water governance. The authors contend that in the end, water governance must be congruent with the larger SDG focus, particularly with respect to equitable access and sustainable use of water. It is also suggested that technology, data-sharing platforms, and cooperation across borders may prove prolific in addressing the present governance challenges. One must agree this work has given good coverage regarding the state of water governance across Asia, with recommendations made for sustainable solutions that address the specific need within the regions.

Kumar et al. (2024) examine the idea of water neutrality, along with the challenges it poses, policy implications, and recommendations for sustainable groundwater management. Water neutrality involves allowing for the consumption of water only when that consumption is compensated for by an equivalent amount of water conserved or restored. The authors highlight the barriers in putting this notion into practice: poor infrastructure, lack of awareness, and the difficulty of measuring water use and offsets. The authors study the current policies and regulations that support or oppose the achievement of water neutrality, indicating that there is a need to enhance governance frameworks and properly define water neutrality. The paper also recommends several measures such as implementation of water-efficient technologies, rainwater harvesting, and restoration of ecosystems to assist companies and communities in working toward water neutrality. The authors assert that strategies to realize water neutrality with sustainable groundwater management should integrate more robust policies, public-private partnerships, and active community participation.

Nandi & Swain (2024) discuss the role of groundwater systems in attaining the Sustainable Development Goals (SDGs), especially SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action). These authors argue the groundwater resource is critical in the provision of clean water access, especially in water-scarce areas, as well as in the key adaptations to

combat climate-change consequences. They mention sustainable groundwater management adds to water security and resilience to climate change-thus linking water availability with agricultural practices and ecosystem health. The paper outlines how over-extraction, contamination, and climate-induced variability affect groundwater in a negative manner, stressing the necessity of integrated, science-based management approaches. Other key ideas raised by Nandi and Swain include the promotion of policies underscoring groundwater conservation, measuring its availability, and equitable distribution-surmising that efforts to achieve SDG 6 and SDG 13 must be collaborative across sectors and scales. The paper concludes with a call to provide that sustainable groundwater management provides the very basis for the achievement of global sustainability targets.

The paper by Neeti et al. (2024) looks at the challenges and opportunities in Integrated Water Resources Management (IWRM), a paradigm critically important for the sustainable management of water resources. Neeti et al. (2024) portray key challenges as insufficient stakeholder coordination, inadequate data for management, and climatic changes affecting water resources. The socio-economic as well as political complexities encountered during the implementation of IWRM raise another challenge for the authors, especially in territories that are governed in a limited way. On the opportunity side, technological advancement, such as the development of remote sensing and GIS, will support better data collection and analysis. The authors state that integrating local knowledge and stakeholder participation is essential for effective management options. According to Neeti et al. (2024), significant barriers exist in practice, but IWRM offers great promise for balanced and equitable water use and is thus a sure route for sustainability. The authors argue for a globally collaborative and technology-driven approach to solving the convergence problems and competing opportunities that IWRM faces.

Evaristo et al. (2023) analyze institutional hurdles in realizing SDG 6 (Clean Water and Sanitation), with a view toward dissecting the complexity of governance, policy coordination, and synergy that are perceived as obstacles to advancement in that direction. The authors contend that notwithstanding global consensus on the significance of clean water and sanitation, the institutional framework usually fails to meet the differing requirements therefrom by various communities, especially in developing regions. Other challenges cited include fragmented water management systems, insufficient local capacity, lack of political will, and inadequate funding for sustainable water infrastructure. The paper also discusses institutional reforms, introducing more integrated and inclusive governance models with multiple stakeholders-that is, with the participation of communities, private sectors, and governments. Evaristo et al. urge for stronger regulatory frameworks, collaboration regarding capacity building, and efforts to transcend these institutional hurdles. They propose a shift toward integrated and adaptive approaches in water governance to achieve social justice in water access and sustainability.

Mahato (2023) discusses approaches toward the advancement of clean water and sanitation in India, especially linking local efforts to the overarching Sustainable Development Goals (SDGs). The author insists on the importance of SDG 6 (Clean Water and Sanitation) for India, where the persistence of water scarcity, pollution, and infrastructural problems are a major concern. Mahato also studies the nexus of water management, sanitation practices, and public health with respect to key issues like lack of an enabling policy environment, inadequate funding, and lack of community participation. The paper discusses different initiatives aimed at improved water access and quality, ranging from government programs to modern technologies such as wastewater treatment and water purification technologies. Mahato further recommends stakeholder coordination, better monitoring systems, and active public-private partnerships to attain SDG 6 targets. While emphasizing the importance of a holistic approach that accounts for environmental sustainability, social equity, and economic development, the author calls for sustainable, long-term improvements in water and sanitation outcomes across India.

Jana et al. (2021) explore how India's water sector policies have changed over time, with a particular emphasis on initiatives to address water scarcity through structural and institutional changes. It examines different water utility strategies, emphasizing how they prioritize efficiency and conservation. The assessment concludes that the absence of a need-specific institutional framework has made many programs only partially effective,

exacerbating the water situation. Water resource management has been the primary focus of the Indian water sector, with sustainable methods like water metering being neglected.

V. SIGNIFICANT GAPS

The thematic exploration in existing literature encompasses several components of water governance and management, yet very little focus is placed on crucial demographic stakeholders in the water arena, such as rural women, who are central to the realization of SDG 6 (Clean Water and Sanitation). Singh and Sharma (2025) mention digital twin technology for water governance in rural Indian villages but do not build on how empowering rural women in water decision-making could improve effectiveness and sustainability in their system. In a similar vein, Duc et al. (2024) provide a wide-ranging view of challenges in water governance in Asia but do not apply the gender lens to barriers or opportunities in access and management of water. Meanwhile, Kumar et al. (2024) discuss groundwater sustainability and water neutrality but do not examine the role of local communities, namely, women, in groundwater management practices. Nandi & Swain (2024) discuss the role of groundwater systems in SDGs but do not examine the specific contributions that rural women could make in assuring equitable distribution of water. Moreover, Mahato (2023) speaks of stakeholder coordination and improved governance in India but, again, does not adequately consider gender-responsive policies for rural women's participation in water management solutions.

This underlines a critical gap in understanding how the empowerment of rural women through specialized policies and practices can ameliorate institutional and societal impediments to water governance and, consequently, contribute to more inclusive and effective strategies for the attainment of SDG 6.

VI. METHODOLOGY AND ANALYSIS

Research Methods and Process

This study adopts a multi-phased methodology to evaluate with scrutiny the existing literature on water governance in India, particularly with respect to challenges and opportunities on the way toward Sustainable Development Goal 6 (SDG 6). The research process, therefore, consists of systematic collection, analysis, and synthesis of information from a wide range of peer-reviewed publications, literature reviews, and reports from reputable agencies ScienceDirect, Sage, and other reputed journals. The study is intended to assist with useful insight into the current water governance framework in India, with the effectiveness of this system, and the role of gender, especially rural women in overcoming water-related challenges.

Source Databases

With a surge of online publications and open-access resources, nowadays, it has become almost impossible to conduct exhaustive searches even with well-defined criteria. Careful design in ensuring that the investigation is thorough and academically rigorous was considered with respect to focus on research publications drawn from amongst the more commonly used web-based databases. The primary source of the database selected for this study is Web of Science (SCI/SSCI).

The Web of Science (SCI/SSCI) was chosen for several reasons:

- Total Coverage of SCI and SSCI Journals: Web of Science serves as an appropriate source for interdisciplinary research, as it covers journals under the Science Citation Index (SCI) and the Social Science Citation Index (SSCI). Water governance, one subtheme of the discussed topic, lies at the intersection of environmental sciences (including hydrology and water resource management) and social sciences (including governance, policy, and gender studies). The use of Web of Science enriches the research with broad, balanced, and quality representation from both the sciences and social sciences.
- Very Selective Indexing: Web of Science is known for its incredibly selective indexing of journals, which assures its researchers that eminent, well-respected, and widely cited journals are included. This gives more credibility to the sources and strengthens the argument that the journals included in the study are academically sound. Given the complexity of water governance issues in India and the multifaceted approach needed to study these issues, it really matters that these sources have credibility that can be supported.

- Adequate Bibliometric Analyses: Web of Science is among the few comprehensive databases allowing adequate bibliometric analyses. This would be vital for mapping citation networks, researching trends in a field, and identifying landmark studies. This will allow this research to follow how water governance studies have emerged and flourished in India and assess their valuable contributions and literature gaps.

Newer journals may not always be included in the Web of Science, which is the reason for the extra search to locate more recent publications regarding water governance in India. To widen the study scope and integrate cutting-edge research, three specialized journals were identified as supplementary source databases. These articulate targeted research into water governance and related subjects in India by contributing newer insights that may not have been indexed so far in Web of Science.

(1) MDPI Journal of Water: An open-access, peer-reviewed publication of high-quality research on water resources, water management, and governance issues is the MDPI Journal of Water. In view of the journal's emphasis on water-related challenges, policies, and solutions toward sustainable development, it is significantly relevant to the present study. The open-access status of the journal ensures that all articles circulate widely, which makes it a timely source for realizing emerging trends in water governance in India.

(2) ScienceDirect Journal Water Policy: In the Water Policy journal on ScienceDirect, issues of water management governance are being studied with policies in focus. This journal is regarded as an authority in this area of water governance, public policies, institutional structures, problems faced in water scarcity, pollution, and equitable access. This journal outlines the political and governance facets of the management of water, crucial for understanding the hindrances and enabling the opportunities in fulfilling that SDG 6 in India.

(3) South Asia Research by Sage Publications: South Asia Research is a peer-reviewed journal of Sage Publications, addressing research around the South Asian region including India. South Asia Research covers a diverse range of topics, but it is often loaded with governance, policy, and social issues directly associated with the study of water governance in India. Given its regional focus, this journal would serve as an excellent source to understand some of the unique challenges with water in India along with the socio-political dynamics governing water resource management.

This study aims to provide thorough and up-to-date analyses of water governance in India, challenges in the realization of SDG 6, and rural women's role therein through a synthesis of research from these three specialized journals and the general, good quality sources from Web of Science. The inclusion of broad and specialized sources gives the findings a comprehensive appeal, which are also cognizant of more current research trends in the area.

Selection Criteria and Results

Although it was established that a set of clear and explicit selection criteria had to be formulated and strictly observed to ensure that the research would conform with the specific goals and objectives of the study, the principal aim of such selection criteria concerned filtering out irrelevant studies and ensuring that only high-quality, empirical, and evidence-based research articles that directly concern water governance on India and the empowerment of rural women are subjected to analysis.

These criteria below were strictly observed during the screening and selection process.

Inclusion criteria: Included were peer-reviewed journal articles published in English, reporting empirical, evidence-based studies. The inclusion criteria were as follows:

1) Water Governance of India Focus: The study must direct its inquiry toward water governance in India. This included research on institutional frameworks, policies, and governance structures dealing with water management. Articles that merely considered specific dimensions of water management, say, water pollution, harvesting, or wastage were excluded if they merely related to their investigations concerning governance mechanisms and procedures in India.
2) Data-Backed/Empirical Studies: The study had to have some facts empirically based, either qualitative or quantitative. Purely theoretical, conceptual, or anecdotal studies were excluded. This ensured that the research was evidence-based and therefore provided some tangible conclusions concerning the issues surrounding water governance.

3) Empowerment of Rural Women in Water Governance: The objective of the study was to investigate rural women's role in water governance in India, especially in relation to the empowerment of rural women and its link with SDG 6. Only articles describing qualitative or quantitative data relevant to the empowerment of rural women in the context of water management and their influence on water governance policy were included in the study. If a paper did not provide empirical evidence for involvement or empowerment of rural women in water governance, it was excluded.
4) Sufficient Sample Size: For achieving reliability and validity of the found results, only studies conducted with a reasonably large sample were included. Experimental, quasi-experimental, or survey-based studies that counted participants of fewer than 20 were excluded from the present analysis. On the other hand, studies with statistically relevant larger samples were included to enhance statistical significance and generalizability of findings.
5) Published in Peer-Reviewed Journal Articles: Only articles published in highly regarded peer-reviewed journals were considered. This helped ensure that the quality of research conducted was maintained, studious peer review was adhered to, and other academic standards were practiced.

Following the initial retrieval of articles across the databases, duplicate records were removed. The remaining articles underwent a rigorous screening of titles and abstracts, followed by a full-text assessment against the pre-defined inclusion criteria.

Fifteen studies thus advanced to the final analysis after being subjected to the above inclusion and exclusion criteria. Each of these selected studies had met the above criteria and provided an immense amount of empirical data on major themes of water governance, the empowerment of rural women, and their relationship with SDG 6 in India.

The screening and selection process thus ensured that the research work of this study has been based on high-quality, evidence-based articles of direct relevance to the objectives of the research. The study thereby attempts to present a thoroughly comprehensive, accurate, and reliable assessment of the role of rural women in water governance in India and how this relates to the fulfilment of SDG 6.

VII. GOVERNMENT PROGRAMME AND POLICIES

The urgent need for water conservation in India underscores the fact that effective water resource management is crucial for sustainable development, economic growth, and public health. With a burgeoning population and increasing demands on water, India faces major challenges in providing equitable access to to clean and sufficient water. The diversity in geography and varying levels of water availability in the country have resulted in effective water governance being the cornerstone not only for economic growth but also for social development (Jacque et al.2024; Vyas & Nath, 2021).

Recognizing the gravity of water scarcity and pollution, the Indian Government has set in place several major schemes to conserve water and improve its management in various sectors. The aim is to secure water not only for agriculture, industrial, and domestic needs but also for long-term sustainability. The policy initiatives of the Indian Government, for any sector pertaining to water, have focused on wastewater conservation, good water use, and construction of water storage infrastructure to meet the needs of a large population. The measures have balanced securing water for use against the preservation of water quality for use by future generations (Mohan et al., 2024).

These are amongst the many initiatives undertaken by the government in large-scale projects to augment water storage capacity involving the construction of reservoirs, rainwater harvesting structures, and groundwater recharge schemes. The infrastructure is considered timely in confronting the cyclical nature of water availability, as India undergoes certain phases of drought and flooding which always seem to get in the way of water supply. Other programs such as the Jal Jeevan Mission intend to supply piped water to every rural household by 2024 and Namami Gange, which includes work on cleaning and rejuvenating the country's major rivers, including Ganges.

Despite these programs being able to show the extent of change that has been accomplished, we are still left with an unimaginable need for a comprehensive framework that encompasses water management with sustainable practices. The fast population growth in India against the limited resources of water demands a policy incorporating a balance among water

distribution, quality, and conservation. The continuous urbanization and industrialization processes are putting further stress on the resources; thus, the proposed policy should put sustainability at the fore.

A sustainable water governance policy framework must consider technical and infrastructural aspects of water management, as well as socio-economic components. The water governance policies must address the needs of marginalized communities, especially rural women as they are primarily responsible for water gathering and management in the household. Education, access to resources, and participation in decision-making processes are critical to empowering these women who traditionally have been at the grassroots conserving water (Ahmed & Araral, 2019).

Furthermore, a set of capable, wise, and well-informed policymakers is needed for effective water governance that could tackle the plethora of conflicting challenges posed to water management. Policymakers should have an in-depth understanding of the scientific and technical regime concerning local water systems, with perceptions of climate change impacts, alongside the socio-cultural dynamics of water use. This becomes fundamental to the design and execution of policies that could promote a balance between economic growth and environmental protection while also ensuring social equity.

Jal Shakti Abhiyan (JSA) Overview and Achievements

The Jal Shakti Abhiyan-a campaign for water conservation-of the government of India addresses the problem of water scarcity in the country. Inaugurated in 2019, the Abhiyan emphasizes community participation, the rejuvenation of traditional water bodies, and sustainable water management practices across all water scarcity regions of India. It aims to increase community resilience to water scarcity through proactive initiatives, government interventions, and community participation. The theme of the program, "Catch the Rain - Where It Falls, When It Falls," promotes the relevance of rainwater harvesting and localized water conservation efforts.

Jal Shakti Abhiyan, Phase I and Phase II

The Jal Shakti Abhiyan phase I was launched on 1 July 2019, covering 1592 blocks out of 2836 in 256 districts across India facing crisis in water stress. Major activities emphasized for immediate action and intervention include the following:

- Water conservation and rainwater harvesting: Publicizing rainwater harvesting techniques and systems to capture and store rainwater, particularly in the monsoon season.
- Renovation of Traditional Water Bodies/Tanks: Reviving and repairing the ancient water structures viz. ponds, lakes, and tanks situated in the neighborhood so that immediate local water availability will be improved.
- Reuse and Recharge: Enhancing the sustainability of groundwater resources by recharging the bore wells and other underground water sources.
- Conservation of Watershed: Managing the water from a watershed management perspective to halt soil erosion and guarantee water availability in the future.
- Intense Afforestation: Raising plantations as a part of soil and water conservation, thereby increasing the water retention capacity of the soil.

By 30 September 2019, the first phase of the campaign was completed, marking the beginning of Phase II from 1 October 2019 to 30 November 2019. Phase II emphasized community participation and enhanced the implementation of water conservation activities at the grassroots level.

Key Achievements of the Jal Shakti Abhiyan

The index of an achievement list shows that the Jal Shakti Abhiyan has made significant strides in water conservation at the grassroots level, involving several stakeholders like local communities, NGOs, and government departments. Some remarkable achievements include:

- Water Conservation Strategies by Gram Panchayats (GPs): Water conservation strategy plans were developed in more than 2.03 lakh out of a total 2.69 lakh Gram Panchayats (GPs) in the entire country by the JSA, with active participation from local communities. These strategies often comprised structures for water storage, rainwater harvesting, and restoration of traditional water bodies.
- Renovation of Water Bodies: Water bodies in total occurred in the categorization of 15.32 lakh under the program, indicating an extensive effort aimed at repairing, restoring, and rejuvenating ponds, tanks, and other natural sources of water in the country.

- Raise Awareness Among the Public and Participation: One of the major successes of JSA is that it has created a huge awareness regarding water conservation through campaigns, workshops, and public outreach programs. This program has involved local communities, NGOs, and government agencies in spreading awareness and education concerning some sustainable water use practices. Thus, the participation of the public increased significantly in activities like rainwater harvesting, tree planting, and restoration of traditional water bodies.

Ongoing efforts of Jal Shakti Abhiyan 2023

The Jal Shakti Abhiyan takes its early successes forward, with the present edition of the program aimed at improving water conservation efforts in India's most water-stressed districts. Central Nodal Officers and Technical Officers visited 121 of the 150 water-stressed districts for monitoring the implementation of water conservation measures, further cementing community-driven initiatives and institutional support.

Current status of Jal Shakti Abhiyan 2023

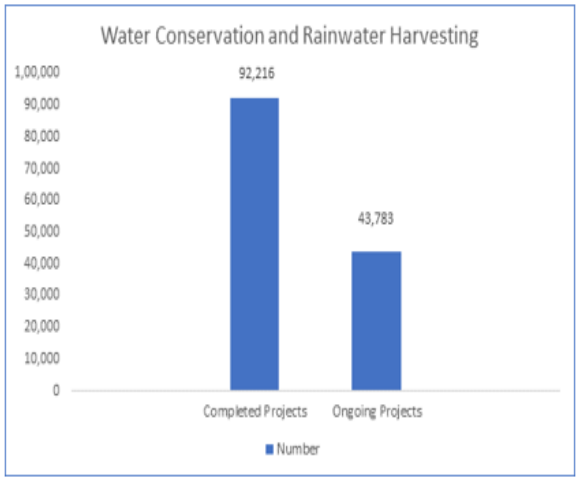

Figure 1: Current Water Conservation and Rainwater Harvesting
(Source: Press Information Bureau, Government of India)

- Completed: 92,216
- In progress: 43,783
- Expenditure: ₹39,781 lakh (approx. 39.78 crores)

From the ongoing and completed projects, we find that interventions cover a wide area of water-stressed zones in India. The expenditure of ₹39,781 lakh is an indication of the financial commitment involved in ensuring the success of these water conservation measures.

Key Water Management Programs and Policies in India

India's water management includes several ambitious initiatives and programs for sustainable water management in the country. Water scarcity as well as water pollution and inequitable distribution require a coordinated approach of the government together with the active participation of local communities. It is in this context that key governmental schemes such as Atal Bhujal Yojana (ABY), Jal Jeevan Mission, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), and Namami Gange Program have played an important role in India's water governance. These programs are aimed at immediate solutions to human-induced stresses on water resources and also at long-term sustainable and equitable water resource management.

Atal Bhujal Yojana (ABY)

Initiated in December 2019, the Atal Bhujal Yojana (ABY) comes under the Government of India's scheme to deal with the gigantic problem of groundwater depletion. It is a World Bank-supported scheme under the Jal Jeevan Mission that aims to tackle groundwater management issues in India through community participation and good governance. The scheme promotes sustainable groundwater use by combining an array of existing projects with the formulation of new groundwater management programs.

The ABY targets 8,562 Gram Panchayats in 80 districts across seven states, namely Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh. Its major objectives are to improve community-led groundwater management, capacity building for local interventions, and awareness-raising at the local level. By providing a framework for participatory groundwater governance, ABY aims to promote sustainable best practices in these local communities for the long-term sustenance of groundwater resources. For this participatory framework to be truly effective, it is imperative that rural women are explicitly included in these capacity-building interventions, shifting their roles from passive water collectors to active groundwater managers.

The scheme has been awarded the Excellence Award for "Best Sustainable Water Management - Government" during the 16th Water Digest Water

Awards: 2023 in recognition of its innovative practices in groundwater management.

Jal Jeevan Mission (JJM)

Launched in 2019, the goal of the Jal Jeevan Mission is to provide every rural household in India with clean and adequate drinking water by 2024. This program deals with individual household tap connections, emphasizing source sustainability through rainwater harvesting, greywater management, and water conservation.

Among the major advantages of JJM is the improvement of public health by diminishing the impact of waterborne diseases like cholera, typhoid, and diarrhea, rampant in rural pockets where now potable water is made available. By declining these diseases, it has also remedied the expensive healthcare costs and elevated the lifestyle of rural folk. Crucially, by bringing tap water directly to households, the JJM significantly reduces the physical and time-consuming burden traditionally placed on rural women, providing them with the necessary time and energy to participate more actively in local water governance and economic activities.

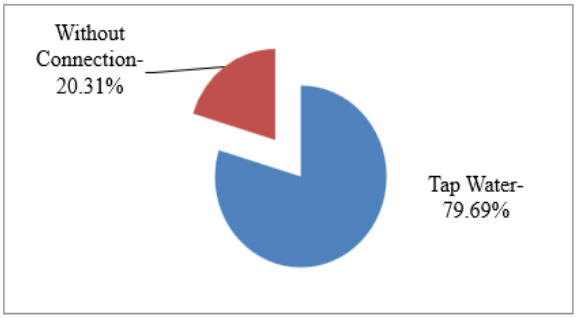

Figure 2: Current Status of current status of Jal Jeevan Mission, Department of Drinking Water & Sanitation Ministry of Jalshakti on January 2025

As of January 2025, JJM has connected 15.43 million households with tap water, registering 79.69% achievement against the target. Source sustainability is further ensured through community-initiated adoption and resourceful water management, guaranteeing lasting benefits from improved access to water.

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) was launched in 2015-16 with the primary objective of improving irrigation coverage and ensuring the best management of water resources in agriculture. Since the water sector is dominated by agriculture in India, the basic premise, though, for PMKSY is to enhance irrigation potential, improve water use efficiency, and encourage sustainable water conservation practices by farmers.

The program has two components:

- The Accelerated Irrigation Benefit Programme (AIBP), which finances major and medium irrigation projects.
- Har Khet Ko Pani (HKKP), which aims at development of irrigation infrastructure for small and marginal farmers, especially in drought-prone and tribal regions.

Moreover, PMKSY supports the formation of Water User Associations (WUAs) in order to foster participatory irrigation management. Ensuring women farmers are actively represented in these WUAs helps to empower them in the decision-making process, thus enhancing local accountability and assuring the sustainability of irrigation systems maintenance.

The project has already identified 99 major and medium irrigation projects, with the AIBP now funded by the Long-Term Irrigation Fund (LTIF). To this end, progress is already reported with the completion of 62 irrigation projects and various stages of implementation for many more.

Micro-irrigation schemes under the PMKSY include drips and sprinkler irrigation, covering a total acreage of 11.02 lakh hectares in the country. These irrigation methods, being very efficient in terms of water use, are expected to considerably reduce water wastages in areas facing water scarcity.

Namami Gange Program

The Namami Gange Program, started in June 2014, is one of the most ambitious projects of the Indian government for the rejuvenation of the Ganga and its tributaries. The Ganga is of cultural and ecological importance, as it provides water for more than 40 percent of the population in India. However, for centuries, the river has suffered from pollution due to the discharge of untreated sewage and industrial waste. Some of the key interventions are:

- Sewage treatment and waste management
- Afforestation
- Riverfront development
- Biodiversity conservation
- Public participation

The government has allocated a budget of ₹16,011.65 crore for the program, out of which ₹15,015.26 crore

has been allocated for various works. As of October 2023, 270 projects have been completed and another 180 are presently being implemented. In addition, a platform known as PRAYAG has been developed in 2023 to monitor water quality and the performance of effluent treatment plants (ETPs) along the river. The Namami Gange program has contributed significantly to the cleaning of the river, and efforts will continue until March 2026 for the restoration of the ecological health of the river for the benefit of posterity.

VIII. RECOMMENDATIONS

To increase the effectiveness of India's water governance and policy frameworks, the following steps can be taken:

- Central and state Coordination: For better policy enforcement, there should be seamless integration between the Centre and States so that there are no delays in assistance. Furthermore, this can be enhanced by providing improved training, funding, and decision-making ability to Gram Panchayats and local governing bodies, alongside supporting state-level water regulatory organizations for better monitoring.
- Encouraging the adoption of sustainable farming methods: To improve water efficiency to achieve SDG 6, policymakers should promote sustainable agriculture methods that reduce water waste and encourage conservation. The following strategies could be helpful: encouraging drip irrigation practices, crop-rotation, and mixed farming methods which can be very beneficial for agriculture. The expansion of organic farming is also a critical step toward sustainable water use.
- Community Participation and Women's Leadership: The community, with a mandated inclusion of rural women in local decision-making roles, must be involved in water governance initiatives for them to flourish and guarantee long-term sustainability and effective resource management. Water conservation, equitable access, and enhanced accountability are all possible outcomes of growing grassroots participation. The following strategies can be used to increase community involvement in water governance: direct allocation of funds to Gram Panchayats and local bodies, engagement of local people for the conservation of water, grassroots-level campaigns, and widespread advertisement through print and digital media to encourage active participation.
- Strengthening of Infrastructure and Technology: Although the government is investing in infrastructure and technology, significant gaps remain, particularly in rural areas where internet connectivity is weak and infrastructure is aging. When local bodies do not get adequate funds to solve the problems in their areas, resolving localized water crises becomes highly difficult. The government should invest in modern irrigation systems, regular interactive sessions for farmers, localized waste management methods, and rainwater management at the grassroots level.

- Strengthen the Monitoring of Water Quality:There is an urgent need to strengthen water quality monitors to detect contaminants early and allow for faster reaction times. A stronger focus must be placed on rural areas and industrial zones. This can be achieved by utilizing advanced technologies such as satellite imagery, digital monitor indices, IoT sensors, and rapid detection kits.

IX. CONCLUSION

This paper has critically examined India’s water governance landscape, focusing on various government programs and policies aimed at ensuring sustainable water management and achieving SDG 6. Through programs like the Atal Bhujal Yojana, Jal Jeevan Mission, Pradhan Mantri Krishi Sinchayee Yojana, Namami Gange, and Jal Shakti Abhiyan, India is working towards sustainable water governance. These programs aim to address issues of water scarcity, water quality, and equity in accessing water resources. They have demonstrated a significant commitment to improving water availability and have contributed to increased awareness, community participation, and substantial improvements in water infrastructure.

A crucial element of this success lies in the involvement of rural communities, especially women. Integrating women in water conservation not only furthers the objectives of these campaigns but also contributes to the empowerment and sustenance of

these communities, thus aiding in the delivery of SDG 6, namely, ensuring access to water and sanitation for all.

However, despite these positive strides, challenges such as water pollution, groundwater contamination, and inaccessibility of clean water, particularly in rural and marginalized areas, persist. Given the enormity of India's water crisis, these measures will have to be buttressed and extended further. To effectively address these issues, India must continue enhancing its water governance framework by fostering greater community involvement—mandating women's leadership at the grassroots level—increasing investments in sustainable infrastructure, and improving policy coordination at national, state, and local levels.

The success of water management policies and programs relies on both governmental leadership and active participation from the people. Ensuring access to safe and clean water is a fundamental human right and an essential component of a healthy environment. Moving forward, it is crucial for both the government and citizens to work collaboratively, maintaining a shared responsibility for safeguarding India's precious water resources. Only through sustained collective efforts can the country ensure long-term water security for its growing population and contribute meaningfully to the achievement of SDG 6.

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