

Advancing Clean Water and Sanitation in India: Aligning Sustainable Development Goals for Improved Outcomes

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Abstract

India, with its vast and diverse population, faces significant challenges in providing equitable access to clean water and adequate sanitation. This is not only a matter of public health and well-being (SDG 3) but also crucial for achieving gender equality (SDG 5) as women and girls often bear the burden of water collection in rural areas. Improving water and sanitation infrastructure can have a ripple effect on several other SDGs. It can reduce waterborne diseases, contributing to better health outcomes, and ensure sustainable water management (SDG 6), which is vital for maintaining ecosystems (SDG 15) and combating climate change (SDG 13). Moreover, it can foster economic growth (SDG 8) by reducing healthcare costs and increasing productivity. Government policies and initiatives, in partnership with local communities and international organizations, are essential for developing sustainable water and sanitation systems. Investments in technology, infrastructure, and awareness campaigns are critical for long-term improvements.

Keywords: Industrialization, CLTS, Jal Shakti Abhiyan, IWRM, Public Awareness.

1. Introduction

The Sustainable Development Goals (SDGs), adopted by the United Nations in 2015, are a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030. These 17 interconnected goals are designed to address the global challenges we face, including those related to poverty, inequality, climate change, environmental degradation, peace, and justice. Among these goals, SDG 6 – ensuring the availability and sustainable management of water and sanitation for all – is particularly relevant to India, given its vast population, varied geography, and socio-economic diversity. India's commitment to the SDGs is reflected in its national policies and initiatives. The country has made significant strides in various areas, including health, education, and economic development. However, the challenges related to water and sanitation remain acute. Access to clean water and basic sanitation is essential for human health, environmental sustainability, and economic prosperity. It is a fundamental human right, crucial for achieving other SDGs, and a cornerstone of a dignified life.

India, constituting approximately 17% of the world's population, has access to merely 4% of

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the global freshwater resources. Rapid urbanization, industrialization, and population growth have put immense pressure on these limited resources. Water scarcity, pollution, and inadequate infrastructure exacerbate the challenge of providing clean water and sanitation to the entire population. According to the Jal Shakti Ministry, the nation's annual usable water supply amounts to around 1122 billion cubic meters (BCM). By 2050, the water demand is expected to rise to nearly 1180 BCM, potentially leading to a significant decrease in per capita water availability. Moreover, 60% of India's population resides in rural areas, where, based on the 2011 census, only 18% of households had piped water access, in contrast to 62% in urban areas. Rural women, often responsible for water management at home, endure considerable hardship in fetching water from distant sources, impacting their health, economic opportunities, and overall dignity.

Sanitation is another critical issue. Open defecation, due to the absence of toilets or cultural practices, poses serious health risks and contributes to water pollution. The Indian government's Swachh Bharat (Clean India) mission, launched in 2014, has made significant progress in building toilets and promoting sanitation. However, ensuring their sustained use and maintenance, along with managing solid and liquid waste, remains a challenge. Water and sanitation are deeply intertwined with other SDGs. Without access to clean water and basic sanitation, achieving good health and well-being (SDG 3) is challenging. Women and girls, who often bear the primary responsibility for collecting water, are disproportionately affected, impacting gender equality (SDG 5) and their opportunities for education (SDG 4). Moreover, inadequate water and sanitation facilities hinder economic growth (SDG 8) and contribute to environmental degradation (SDGs 14 and 15).

In conclusion, water and sanitation are critical components of India's development agenda. Achieving SDG 6 is not just about providing access to water and toilets; it's about ensuring sustainable, equitable, and inclusive development. This paper aims to provide a comprehensive overview of the current landscape, challenges, and opportunities in advancing clean water and sanitation in India, within the framework of the Sustainable Development Goals.

2. Methodology

The methodology for this research paper involves a systematic review of existing literature, government reports, and case studies relevant to the Advancing Clean Water and Sanitation in India. The approach includes qualitative analysis to interpret data and identify patterns, challenges, and best practices. The study also incorporates comparative analyses to understand different regional approaches within India, ensuring a comprehensive and diverse perspective.

3. The Nexus between SDG 6 and Other SDGs in India

In India, understanding and leveraging these interconnections is vital for achieving holistic and sustainable development. This section explores the nexus between SDG 6 and other SDGs,

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highlighting how they intersect and impact each other in the context of India.

- 3.1 SDG 6 and Health (SDG 3):** Access to clean water and sanitation is fundamental to public health. In India, waterborne diseases like diarrhea, cholera, and typhoid are prevalent, primarily due to contaminated water sources and inadequate sanitation facilities. Improving water quality and sanitation can significantly reduce the incidence of these diseases, thus contributing to SDG 3, which focuses on good health and well-being. Additionally, clean water is crucial for maternal and child health, reducing the risk of stunting and malnutrition, and improving overall life expectancy.
- 3.2 SDG 6 and Education (SDG 4):** The lack of clean water and sanitation facilities in schools is a significant barrier to education in India, particularly for girls. Girls often miss or drop out of school due to the absence of private and safe toilets, especially during menstruation. By improving water and sanitation facilities in educational institutions, India can make strides towards achieving SDG 4, which aims for inclusive and equitable quality education. Furthermore, education about water conservation and hygiene can foster a culture of sustainability and health.
- 3.3 SDG 6 and Gender Equality (SDG 5):** Women and girls are disproportionately affected by the lack of access to water and sanitation. They are usually responsible for water collection in households, which can be time-consuming and physically demanding, limiting their opportunities for education and employment. Improved water access and sanitation empower women and girls, reducing their workload and vulnerability to violence and harassment. Thus, advancing SDG 6 is crucial for achieving gender equality (SDG 5) in India.
- 3.4 SDG 6 and Sustainable Cities and Communities (SDG 11):** Urban areas in India face significant challenges regarding water supply and sanitation due to rapid urbanization and population growth. Ensuring sustainable water management and sanitation in cities is essential for making them inclusive, safe, resilient, and sustainable (SDG 11). This includes developing infrastructure for sewage treatment, reducing water pollution, and promoting efficient water use in urban planning.
- 3.5 SDG 6 and Climate Action (SDG 13):** Climate change significantly impacts water resources, affecting their availability and quality. In India, extreme weather events like floods and droughts, exacerbated by climate change, disrupt water supply and sanitation services. Adapting water management strategies to climate change is crucial for both mitigating its impacts (SDG 13) and ensuring sustainable water and sanitation (SDG 6).
- 3.6 SDG 6 and Life on Land (SDG 15):** Water sustainability is closely linked to the health of terrestrial ecosystems. In India, deforestation, land degradation, and wetland loss affect the

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water cycle, reducing the availability of clean water. Conversely, sustainable water management can aid in restoring land ecosystems and preserving biodiversity, contributing to SDG 15.

3.7 SDG 6 and Clean Energy (SDG 7): Water and energy are interconnected. In India, the energy sector is a significant water user, while water supply and treatment require energy. Promoting water-efficient technologies in energy production and using renewable energy sources for water treatment can advance both SDG 6 and SDG 7 (affordable and clean energy).

3.8 SDG 6 and Responsible Consumption and Production (SDG 12): Sustainable water management is vital for achieving responsible consumption and production patterns (SDG 12). In India, industries must adopt water-efficient practices and technologies to reduce water usage and pollution. This includes recycling and reusing water in industrial processes and minimizing wastewater discharge.

3.9 SDG 6 and Partnerships for the Goals (SDG 17): Achieving water sustainability in India requires collaboration across sectors and stakeholders, including government, NGOs, private sector, and communities. Partnerships (SDG 17) play a critical role in sharing knowledge, resources, and best practices for effective water and sanitation management.

The interlinkages between SDG 6 and other SDGs in India highlight the complexity and interconnectedness of sustainable development challenges.

4. Challenges in Achieving SDG 6 in India

Achieving Sustainable Development Goal 6 (SDG 6), which focuses on ensuring the availability and sustainable management of water and sanitation for all, poses significant challenges in India. These challenges stem from a range of factors including geographical diversity, rapid urbanization, socio-economic disparities, governance issues, and environmental concerns. This section outlines the key challenges that India faces in its pursuit of SDG 6.

4.1 Geographical and Climatic Variability: India's vast and diverse geography contributes to uneven distribution of water resources. Certain regions experience abundant rainfall, while others face chronic water scarcity. This variability, coupled with climate change, leads to extreme weather events like floods and droughts, further complicating water management. Seasonal variations in water availability pose challenges for consistent supply, affecting both rural and urban areas.

4.2 Population Growth and Urbanization: India's burgeoning population, which is expected to surpass China's by 2027, significantly strains existing water and sanitation infrastructure. Rapid urbanization leads to the growth of informal settlements or slums, which often lack basic water

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and sanitation facilities. The rising demand for water in cities, along with inadequate planning and infrastructure, results in water scarcity, contamination, and health hazards.

- 4.3 Pollution and Environmental Degradation:** Water pollution is a severe issue in India, with industrial effluents, agricultural runoff, and domestic waste contributing to the contamination of rivers and groundwater. This pollution not only affects the quality of drinking water but also harms aquatic ecosystems. The lack of adequate waste management systems exacerbates the problem, leading to further degradation of water bodies.
- 4.4 Inadequate Infrastructure and Maintenance:** Many parts of India lack the necessary infrastructure for water supply and sanitation. Where infrastructure exists, it is often outdated or poorly maintained, leading to significant losses and inefficiencies. The challenge is not just to build new facilities but to ensure their proper operation and maintenance.
- 4.5 Socio-economic Disparities:** Access to clean water and sanitation is closely linked to socio-economic status in India. Marginalized communities, including the rural poor and urban slum dwellers, often have limited access to these essential services. Socio-cultural practices and beliefs also influence the use and maintenance of sanitation facilities, particularly in rural areas.
- 4.6 Governance and Institutional Challenges:** Water management in India involves multiple governmental agencies, often leading to overlapping responsibilities and lack of coordination. Policymaking and implementation suffer from bureaucratic inefficiencies and lack of accountability. Furthermore, inadequate financing and investment in water and sanitation infrastructure compound the governance challenges.
- 4.7 Behavioral and Cultural Factors:** Behavioral practices, influenced by culture and tradition, play a significant role in water and sanitation management. For instance, open defecation is still practiced in certain areas despite the availability of toilets, due to cultural habits or lack of awareness about hygiene. Changing these behaviors is a significant challenge and requires sustained education and community engagement.
- 4.8 Data Gaps and Monitoring Challenges:** Reliable data on water quality, supply, and sanitation coverage is crucial for effective planning and policy-making. However, India faces challenges in collecting, analyzing, and utilizing data, partly due to the vastness and diversity of the country. This lack of accurate and timely data hampers the assessment of progress and the formulation of targeted interventions.
- 4.9 Impact of Climate Change:** Climate change is exacerbating water-related challenges in India, affecting the availability and predictability of water resources. Increasing temperatures, changing precipitation patterns, and rising sea levels pose significant risks to water sustainability and necessitate adaptive strategies.

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The challenges in achieving SDG 6 in India are multifaceted and deeply intertwined with the country's environmental, socio-economic, and cultural fabric. Overcoming these obstacles is essential for ensuring equitable and sustainable access to water and sanitation for all in India, thereby contributing to the broader goals of health, well-being, and sustainable development.

5. Case Studies and Success Stories

India's journey towards achieving Sustainable Development Goal 6 (SDG 6) has been marked by various challenges, but it also showcases several success stories and innovative approaches. These case studies highlight the potential for effective and sustainable solutions in water and sanitation management.

5.1 Jharkhand's Community-Led Total Sanitation (CLTS) Approach:

In Jharkhand, a state with historically low sanitation coverage, the Community-Led Total Sanitation (CLTS) approach has been a game-changer. This approach involves mobilizing communities to recognize the importance of sanitation and take collective action to become open defecation free (ODF). Villages in Jharkhand have successfully adopted this model, leading to significant improvements in sanitation and hygiene practices. The key to this success has been community ownership and participatory decision-making.

5.2 Rajasthan's Traditional Water Harvesting Systems:

In the arid state of Rajasthan, traditional water harvesting systems like 'johads' (small earthen check dams) and 'baoris' (stepwells) have been revived to combat water scarcity. These age-old techniques, which involve capturing and storing rainwater, have proven effective in improving groundwater levels and ensuring water availability throughout the year. The revival of these traditional practices, often led by local communities and NGOs, demonstrates the value of indigenous knowledge in sustainable water management.

5.3 Sujalam Sufalam Jal Sanchay Abhiyan, Gujarat:

Gujarat's Sujalam Sufalam Jal Sanchay Abhiyan is a mass water conservation campaign that has significantly enhanced water storage capacity through the deepening and widening of water bodies. This initiative has involved community participation, government agencies, and private sector contributions, resulting in increased groundwater recharge, improved irrigation facilities, and better water availability for drinking and domestic use.

5.4 Bangalore's Rainwater Harvesting (RWH) Initiative:

Bangalore, facing severe water scarcity and dependency on distant water sources, implemented a rainwater harvesting (RWH) initiative. Mandating RWH in both new and existing buildings, the city has seen a positive impact on groundwater levels and water self-sufficiency. This model

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showcases how urban areas can effectively manage water resources through policy intervention and public participation.

5.5 Swachh Bharat Mission (Clean India Mission):

The Swachh Bharat Mission, a nationwide campaign launched in 2014, aimed to eliminate open defecation and improve solid waste management. The mission has led to the construction of millions of toilets and significant improvements in sanitation coverage. While challenges remain in terms of usage and maintenance, the mission has brought sanitation to the forefront of India's development agenda.

These success stories provide a roadmap for other regions in India and similar contexts worldwide, showcasing practical and scalable solutions in the pursuit of SDG 6.

6. Strategies for Advancing SDG 6 in India

The following outlines several key strategies that could significantly advance the progress towards achieving SDG 6 in India:

- 6.1 Strengthening Policy and Governance:** Effective policy frameworks and governance structures are essential for sustainable water and sanitation management. This includes formulating clear policies, setting realistic targets, and establishing robust regulatory mechanisms. Strengthening interdepartmental coordination and ensuring alignment of state and national policies can enhance efficiency and effectiveness. Moreover, enhancing the capacity of local bodies and involving them in decision-making can lead to more context-specific solutions.
- 6.2 Promoting Community Participation and Ownership:** Engaging communities in the planning, implementation, and maintenance of water and sanitation projects is crucial. Community ownership ensures the sustainability of these projects and fosters a sense of responsibility towards the resources. Initiatives like Community-Led Total Sanitation (CLTS) have demonstrated the effectiveness of this approach in enhancing sanitation coverage and changing behaviors.
- 6.3 Leveraging Technology and Innovation:** Technology can play a pivotal role in addressing water and sanitation challenges. This includes the use of modern techniques for water purification, wastewater treatment, and efficient irrigation. Innovations in rainwater harvesting, water recycling, and leak detection can also contribute to water conservation. Moreover, technology can aid in monitoring and evaluation, ensuring transparency and accountability.
- 6.4 Enhancing Public Awareness and Education:** Awareness campaigns and educational programs are vital for changing behaviors and promoting sustainable practices related to water and sanitation. This includes educating communities about the importance of hygiene, water

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conservation, and the proper use of sanitation facilities. Schools can play a key role in inculcating these values in the younger generation.

- 6.5 Addressing Gender and Social Inequities:** Gender-sensitive approaches are necessary to ensure that the needs of women and girls are met, particularly in terms of access to sanitation facilities. Addressing social inequities also means focusing on marginalized communities and ensuring that they have equal access to water and sanitation services.
- 6.6 Integrating Water Resource Management:** Integrated water resource management (IWRM) is crucial for the sustainable use of water resources. This approach involves managing water in a holistic manner, taking into account the various uses and interdependencies. It requires coordination among different sectors and stakeholders, including agriculture, industry, urban development, and the environment.
- 6.7 Fostering Resilience to Climate Change:** Climate change adaptation strategies are essential for sustainable water management. This includes developing infrastructure that is resilient to extreme weather events, promoting water-efficient agricultural practices, and conserving natural ecosystems that support the water cycle, such as wetlands and forests.
- 6.8 Enhancing Data Collection and Monitoring:** Improving data collection, analysis, and dissemination is key for informed decision-making and policy formulation. Regular monitoring and evaluation of water and sanitation projects can help assess their impact and guide future interventions.
- 6.9 Encouraging Private Sector Involvement and Innovation:** Private sector participation can bring in additional resources, expertise, and innovation. Encouraging businesses to invest in water and sanitation projects, adopt sustainable practices, and develop new technologies can significantly contribute to achieving SDG 6.

7. SDG 6 Initiatives in India

- 7.1 Safe and Affordable Drinking Water:** The formation of the Ministry of Jal Shakti is a significant step towards addressing water governance and related challenges. Approximately 96% of households now have access to safe drinking water. The Jal Shakti Abhiyan focuses on water conservation, rainwater harvesting, and restoring water bodies.
- 7.2 Water Quality Management:** The Central Water Commission employs a comprehensive strategy to address both ground and surface water issues. Efforts to clean rivers and reduce contamination are ongoing. The Atal Bhujal Yojana (Atal Jal) aims to showcase community-driven sustainable groundwater management in specific water-stressed areas across Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh.

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- 7.3 Sanitation and Hygiene Enhancement:** Through the Swachh Bharat Mission, over 109 million household and community toilets have been constructed. The percentage of toilets increased from 88.8% in 2017 to 97.22% in 2019. India is ranked 88th in the SDG India Index for SDG 6. Challenges include improving localized water data systems, ensuring equitable toilet access across genders, upgrading skills and conditions for sanitation workers, and maintaining sanitation practices to prevent open defecation.
- 7.4 Jal Jeevan Mission:** This mission aims to provide safe and adequate drinking water to all rural households by 2024 through individual household tap connections. It includes essential components like source sustainability, grey water management, water conservation, and rainwater harvesting.

By adopting these strategies, India can make significant progress in ensuring access to clean water and sanitation for all, ultimately contributing to the broader goals of health, well-being, and sustainable development.

8. Conclusion

In conclusion, achieving Sustainable Development Goal 6 (SDG 6) in India, which aims to ensure the availability and sustainable management of water and sanitation for all, is a multifaceted challenge that requires an integrated and strategic approach. The journey towards this goal is not only about improving water and sanitation infrastructure but also about fostering sustainable practices, enhancing governance, promoting community participation, and addressing socio-economic inequalities. The success stories and innovative approaches observed in various regions of India demonstrate the potential for significant progress when efforts are inclusive, community-driven, and supported by effective policies and investments. With concerted efforts from the government, private sector, civil society, and communities, India can make significant strides towards realizing the vision of clean water and sanitation for every citizen, ultimately contributing to a sustainable, equitable, and prosperous future.

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