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# Assessing Public Acceptability of Affordable Wastewater Treatment Methods in Nagpur

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## Abstract

This study assesses the public acceptability of affordable wastewater treatment methods in Nagpur, a rapidly urbanizing city in India. As urban centers expand, effective and economical wastewater management becomes increasingly crucial for public health, environmental sustainability, and socio-economic development. This research synthesizes findings from a comprehensive literature review and case studies to identify key factors influencing public acceptance of low-cost wastewater solutions. These factors include cost, perceived benefits, ease of use, and alignment with socio-cultural values. The study highlights successful community engagement strategies and best practices that have fostered public trust and participation in wastewater management initiatives. By understanding the socio-economic and cultural dynamics specific to Nagpur, this paper provides actionable recommendations for policymakers, urban planners, and environmental advocates. The findings aim to facilitate the implementation of sustainable, cost-effective wastewater treatment methods that are widely accepted by the public, thereby addressing the critical challenges of urban wastewater management in Nagpur.

**Keywords – community engagement, sustainable development, socio-cultural factors, environmental sustainability**

## Introduction

The fast population expansion and developing urban centres in India are hallmarks of urbanisation, which is creating major obstacles for the development of infrastructure, especially in the area of wastewater treatment. A good example of this tendency is the burden that growing urban populations are putting on wastewater treatment facilities and other infrastructure in cities like Nagpur. Safeguarding public health, ensuring environmental sustainability, and facilitating ongoing urban expansion and economic progress all depend on effective wastewater treatment.

A microcosm of the larger issues confronting metropolitan centres in India is Nagpur, which is located in the Vidarbha area of Maharashtra. The city's wastewater management system is having trouble keeping up with the increasing population and industrialization. Pollution of natural water sources, public health risks, and socioeconomic inequities are just a few of the many implications of insufficient wastewater treatment.

In metropolitan areas where resources are limited, finding affordable wastewater treatment solutions is crucial for tackling these issues. Affordability and accessibility play a crucial role in determining how widely used and successful these solutions are. Nevertheless, it becomes clear that public acceptance is a crucial component impacting the effectiveness and longevity of wastewater treatment programmes. If politicians, urban planners, and environmentalists in Nagpur and other cities like it in India want to encourage sustainable urban growth, they must understand what makes the people accept it.

Many reasons, including changes in demography, industrialization, and the movement of people from rural to urban regions, are contributing to the extraordinary expansion of India's metropolitan areas. Consumption, waste, and wastewater output all rise in tandem with urbanisation. Both urbanites and rural residents who rely on downstream polluted water sources are vulnerable to the environmental and health hazards posed by improper wastewater management.

When it comes to sustainable development, wastewater management is just as important as it is for protecting the environment. Water pollution is reduced, aquatic habitats are preserved, and agricultural output is supported by the availability of clean water for irrigation, all thanks to effective wastewater treatment. Further, it helps accomplish Sustainable Development Goals

(SDGs), especially SDG 6 (Clean Water and Sanitation) and SDG 11 (Sustainable Cities and Communities), all of which are crucial to India's plan for economic growth.

Wastewater management in urban areas of India is fraught with difficulties, notwithstanding the gravity of the problem. Some of these difficulties include unequal distribution of wealth, outdated or nonexistent infrastructure, a lack of funding, outdated or insufficient technology, unmet regulations, and regulatory loopholes. Untreated or inadequately treated wastewater is released into bodies of water in several metropolitan areas because wastewater treatment facilities are either nonexistent, overcrowded, or antiquated. These difficulties also affect Nagpur. The ever-increasing daily amount of wastewater is putting a strain on the city's wastewater treatment system. According to studies from the Central Pollution Control Board (CPCB), a large amount of wastewater in Nagpur is released into the environment without treatment, which endangers the health of residents downstream and pollutes local water supplies.

Fortunately, there are efficient and inexpensive wastewater treatment systems that show promise in meeting these issues. Suitable for application in varied urban environments, these strategies prioritise cost-effectiveness, simplicity, and flexibility to local circumstances. Anaerobic digestion, built wetlands, decentralised treatment systems, and the use of treated wastewater for non-potable uses including irrigation and industrial operations are a few examples. Affordable wastewater treatment solutions can only be implemented if they are well-received by the community and relevant stakeholders. Perceived efficacy, dependability, safety, and price are some of the aspects that impact how the public views these procedures. When it comes to wastewater management projects, public attitudes and behaviours are greatly influenced by socio-cultural norms, community participation, and participatory decision-making procedures.

The findings of this research have important consequences for environmental management, urban planning, and policymaking in Nagpur and other cities like it in India. Aiming to enhance community involvement and participation in sustainable urban development projects, the study seeks to support evidence-based decision-making and strategic interventions by explaining the variables impacting public acceptance of inexpensive wastewater treatment systems. In order to encourage the use and expansion of cost-effective wastewater treatment technologies in urban India, the results will help shape strategies and suggestions tailored to the local environment.

## Literature review

The increasing prevalence of water insecurity, the frequency and severity of floods, and the pollution of water resources pose tremendous difficulties to water management systems across the world. Eighty percent of sewage is now being released into the environment untreated, as reported by the United Nations (UN WWAP, 2017).

When there isn't a proper system in place for disposing of human waste, pollution seeps into every aspect of society, making people sick and reducing economic activity, which in turn stunts growth. In 2017, the United Nations World Water Assessment Programme (UN WWAP) calculated that society would reap 5.5 USD in benefits for every USD invested on sanitation.

There is still a long way to go before wastewater treatment in the Global South is both practical and affordable, especially in today's dynamic metropolitan settings. The "networked city" concept is becoming more and more acknowledged as an unrealistic ideal that does not take into account the challenges and realities of the Global South and does not meet the wastewater sector's current SDG targets (MoUD, 2008; Massoud et al., 2009; Libralato et al., 2011; Larsen and Gujer, 2013). According to various studies (Balkema et al., 2002; MoUD, 2008; Molinos-Senante et al., 2010, 2015; Ganoulis, 2012; Wichelns et al., 2015; Ricart et al., 2019), as well as the primary goal of safeguarding human health and the environment, innovative methods and technologies are needed to achieve sustainability in all its aspects, including economic

feasibility, social equity and acceptance, technical and institutional applicability, environmental protection, and resource recovery.

According to Binz et al. (2012), UN WWAP (2017), Van Welie and Romijn (2018), and Van Welie et al. (2018), the sanitation sector is one of several that stands to benefit the most from the transition from "waste"water treatment to resource recovery systems. Markard et al. (2012), Swilling and Annecke (2012), and Lachmann (2013) all agree that regimes, landscapes, and niches must all undergo modifications in order for the transition to take place. The primary concern in the Global South continues to be the provision of universal access to sanitation systems, in contrast to the industrialised world's struggle with lock-in mechanisms brought on by long-term investments in centralised infrastructure and habits that have resulted from society's and consumers' passive participation. This is a golden opportunity for developing nations to skip ahead of the curve by creating more environmentally friendly sanitation systems that take into account all aspects of sustainability.

Since decentralised ecological systems offer socially acceptable, low-maintenance, environmentally friendly, and relatively inexpensive alternatives, they can play an important role in bringing about this new reality (Parkinson and Tayler, 2003; Massoud et al., 2009; Libralato et al., 2011; Larsen and Gujer, 2013). To fully and appropriately use these technologies, however, regulatory institutions must break down old obstacles and pave the way for new opportunities.

An ongoing concern in India is the treatment of wastewater, particularly in the country's rapidly expanding cities. Metropolitan, first- and second-class cities treated 19,827 MLD of the 53,998 MLD that was generated in 2013, according to the Central Pollution Control Board (CPCB), but in 2017, only 13.5 percent of the sewage was effectively treated, according to the same source (CPCB, 2013 and CPCB, 2017c). Diarrhoea is remains one of India's top five health burdens, despite a decline in importance over the last several years. According to the Indian Council for Medical Research (2017), the disease burden or Disability Adjusted Life Year (DALY) rate for TB, iron-deficiency anaemia, and diarrhoea was 2.5 to 3.5 times higher than worldwide rates and nations with comparable geographical locations. In addition to the problems already mentioned, over half of the nation is under water stress, and predictions for the future show an even worse picture in terms of water availability (MoWR, 2017; WBSCD, 2019). There is an immediate and critical need for a unified perspective on water supply and wastewater treatment.

## Objectives of the study

- To assess the current status of wastewater management infrastructure in Nagpur, focusing on existing challenges and deficiencies.
- To identify and evaluate affordable wastewater treatment methods suitable for implementation in Nagpur, considering local socio-economic and environmental factors.
- To investigate the factors influencing public acceptability of affordable wastewater treatment methods in Nagpur, including perceptions of effectiveness, safety, and environmental impact.

## Research Methodology

To achieve these objectives, the study will employ a mixed-methods approach, incorporating both qualitative and quantitative research methods. A comprehensive literature review will be conducted to gather and analyze existing research, policy documents, and case studies related to affordable wastewater treatment methods and public acceptability in urban contexts. Primary data collection will involve surveys, interviews, and focus group discussions with key stakeholders, including residents, policymakers, urban planners, environmental experts, and representatives from local industries and community organizations.

The selection of participants will be guided by the principles of purposive sampling to ensure representation from diverse socio-economic backgrounds and demographic groups within

Nagpur. Qualitative data analysis will involve thematic coding and content analysis to identify patterns, themes, and insights related to public attitudes, perceptions, and preferences regarding affordable wastewater treatment methods. Quantitative data analysis will include descriptive statistics and inferential analysis to examine correlations and associations between variables influencing public acceptability.

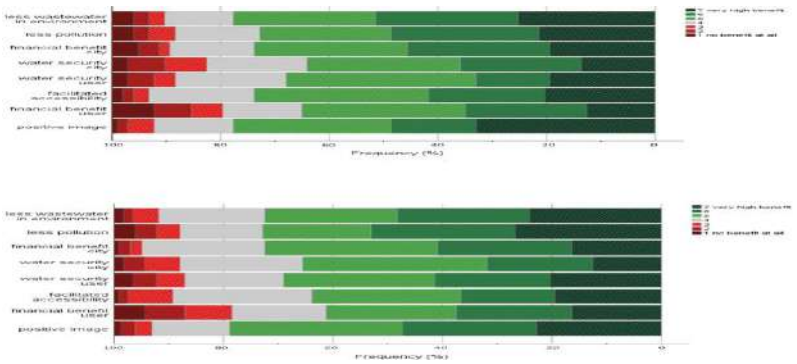
## Data analysis and discussion

The perceived benefits of on-site wastewater treatment systems, as perceived by mandated users, can encompass several key advantages that influence their acceptance and adoption. These benefits typically include:

1. **Cost-Effectiveness:** On-site systems often require lower upfront costs compared to centralized wastewater treatment facilities. Mandated users may perceive cost savings in installation, maintenance, and operation over the long term.
2. **Independence from Centralized Infrastructure:** Users mandated to adopt on-site systems may value the independence from reliance on centralized infrastructure. This can provide reliability in wastewater treatment, especially in areas prone to disruptions in service.
3. **Environmental Sustainability:** Many on-site systems emphasize eco-friendly practices such as recycling water for irrigation or groundwater recharge. Mandated users may appreciate the environmental benefits of reducing their water footprint and minimizing pollution of local water bodies.
4. **Flexibility and Adaptability:** On-site systems can be tailored to specific site conditions and wastewater characteristics, offering flexibility in design and installation. Mandated users may see this customization as an advantage in meeting regulatory requirements effectively.
5. **Improved Property Value and Compliance:** Compliance with wastewater regulations through on-site systems can enhance property value and ensure legal compliance, which mandated users prioritize to avoid fines or legal repercussions.
6. **Community and Public Health Benefits:** Effective wastewater treatment improves community health by reducing the spread of waterborne diseases and enhancing overall sanitation standards. Mandated users may recognize these public health benefits as significant.
7. **Ease of Installation and Operation:** Mandated users often appreciate the simplicity of on-site systems in terms of installation and ongoing operation, particularly when compared to the complexities of large-scale centralized facilities.
8. **Support for Local Economy:** Choosing on-site systems can support local businesses involved in their design, installation, and maintenance, contributing to the local economy.

These perceived benefits underscore why mandated users may favor on-site wastewater treatment systems, aligning with their needs for cost-effective, environmentally sustainable, and compliant wastewater management solutions.

**Graph 1 Perceived benefits of on-site systems as perceived by mandated users**



## Conclusion

In conclusion, this study has explored the perceptions and experiences of mandated users regarding on-site wastewater treatment systems, highlighting several key insights and implications. The findings underscore the significance of perceived benefits in influencing acceptance and adoption of these systems among mandated users. Throughout the study, it became evident that mandated users value the cost-effectiveness, independence from centralized infrastructure, and environmental sustainability offered by on-site systems. These factors not only meet regulatory requirements but also align with user preferences for reliable, customizable, and compliant wastewater management solutions.

Moreover, the study revealed that on-site systems contribute to improved property value, community health, and local economic support, further enhancing their appeal to mandated users. These benefits underscore the broader implications for urban planning, policy formulation, and regulatory enforcement aimed at promoting sustainable wastewater management practices. Moving forward, recommendations from this study emphasize the importance of continued support for research and innovation in on-site wastewater treatment technologies. Policymakers, regulatory authorities, and urban planners can leverage these insights to enhance public awareness, streamline regulatory frameworks, and incentivize the adoption of on-site systems among mandated users.

By prioritizing affordability, effectiveness, and user acceptance, stakeholders can foster a collaborative approach towards achieving sustainable urban development goals. This study contributes to the evolving discourse on wastewater management by providing actionable insights that can inform decision-making and policy development, ultimately ensuring resilient and inclusive urban environments for generations to come.

## References


- Alcalde-Sanz, L., and Gawlik, B. M. (2014). Water Reuse in Europe: Relevant Guidelines, Needs for and Barriers to Innovation.
- Alcalde-Sanz, L., and Gawlik, B. M. (2017). Minimum Quality Requirements for Water Reuse in Agricultural Irrigation and Aquifer Recharge - Towards a Legal Instrument on Water Reuse at EU Level. EUR 28962EN, Publications Office of the European Union.
- Amoah, P., Keraita, B., Akple, M., Drechsel, P., Abaidoo, R. C., and Konradsen, F. (2011). Low-Cost Options for Reducing Consumer Health Risks from Farm to Fork Where Crops Are Irrigated with Polluted Water in West Africa. IWMI Research Report 141, Colombo.
- An Taisce (2015). Domestic Wastewater Treatment in Ireland: Septic Tanks. A Report on the Progress of the National Inspection Plan (0000), The National Trust Fund of Ireland.
- Asano, T., Burton, F. L., Leverenz, H. L., Tsuchihashi, R., and Tchobanoglous, G. (2007). Water Reuse: Issues, Technologies and Applications. New York, NY: McGraw-Hill.
- Balkema, A. J., Preisig, H. A., Otterpohl, R., and Lambert, F. J. D. (2002). Indicators for the sustainability assessment of wastewater treatment systems. Urban Water 4, 153–161.
- Beltran, J. M. (1999). Irrigation with saline water: Benefits and environmental impact. Agric. Water Manage. 40, 183–194.
- Bhardwaj, R. M. (2005). Water Quality Monitoring in India-Achievements and Constraints. IWG-Env, International Work Session on Water Statistics, Vienna.
- Binz, C., Truffer, B., Li, L., Shi, Y., and Lu, Y. (2012). Conceptualizing leapfrogging with spatially coupled innovation systems: the case of onsite wastewater treatment in China. Technol. Forecast. Soc. Change 79, 155–171.

- Cordell, D., Drangert, J.-O., and White, S. (2009). The story of phosphorus: global food security and food for thought. Global Environ. Change 19, 293–305.
- CPCB (2009). Guidelines For Development of Location Specific Stringent Standards.
- CPCB (2013). Performance Evaluation of Treatment Plants in India under funding of NRDC. CPCB (2015). Inventorization of Sewage Treatment Plants. CPCB (2017a). Water Quality Criteria.
- CPHEEO (2013). "Chapter 7: Recycling and reuse of sewage," in Manual on Sewerage and Sewage Treatment Systems (New Delhi: Ministry of Urban Development, Government of India).
- CSE Bharat lal Seth (nd). What Should Be the Coliform Standard in India's Sewage Treatment Protocol in Order to Promote Safe Reuse of Reclaimed Water for Domestic, Industrial and Agricutlural Use; Are Stringent Standards Affordable?. New Delhi: Centre for Science and Environment.
- Deccan Herald (2019). NGT Order: 50 Karnataka SPTPs Need to Be Upgraded.