International Journal of Advanced Science and Research
www.allsciencejournal.com
ISSN: 2455-4227
Received: 14-08-2025, Accepted: 12-09-2025, Published: 27-09-2025
Volume 10, Issue 2, 2025, Page No. 39-43

Impact of sewerage interventions on urban health and service delivery: Evidence from the Madhya Pradesh Urban Development Project (MPUDP)

Dr. Sonali Tripathi[1], Dr. Alka Modi Asati[2], Peeyush Dhar Tripathi[3]
[1] Project Head, Kalpataru Gramodhyog Samiti, Bhopal, Madhya Pradesh, India
[2] Assistant Professor, Community Medicine, Sunderlal Patwa Government Medical College, Mandasur, Madhya Pradesh, India
[3] Urban Economist, Kalpataru Gramodhyog Samiti, Bhopal, Madhya Pradesh, India

Abstract
Urban sanitation infrastructure is a critical determinant of public health and socio-economic development in India. The Madhya Pradesh Urban Development Project (MPUDP), supported by the World Bank and implemented by the Madhya Pradesh Urban Development Company Limited (MPUDC), aimed to address challenges in sewerage systems across four towns of Madhya Pradesh, namely Chhindwara, Dharampuri, Shajapur and Bhedaghat. The study employed a mixed-methods approach, combining quantitative household surveys (5870 households), focus group discussions (FGDs), key informant interviews (KIIs), and secondary data analysis from MIS/GIS, DPRs, and health records to assess the project's outcomes. Findings indicate significant improvements in sewerage infrastructure and household connections, a reduction of 36–41% in sanitation-related diseases, enhanced institutional capacity through tariff efficiency and GIS/MIS adoption, and increased community engagement, particularly women's participation in decision-making. The study concludes that MPUDP has made substantial progress toward achieving Sustainable Development Goals (SDGs) related to health (SDG 3), clean water and sanitation (SDG 6), and sustainable cities (SDG 11), while also serving as a replicable model for other states. While MPUDC implemented sewerage interventions in seven towns under the project, the present research specifically focused on four towns.

Keywords: Urban development, sewerage, public health, madhya pradesh, world bank, sustainability, impact assessment

Introduction

Urbanization in India has grown rapidly over the past few decades, creating increasing demand for reliable and sustainable sanitation services. Effective sewerage infrastructure is essential not only for maintaining environmental hygiene but also for ensuring public health, reducing the incidence of waterborne diseases, and supporting overall socio-economic development. However, in many medium and small towns, sewerage systems remain inadequate, with limited household connections, poor treatment facilities, and weak institutional management. This gap in sanitation infrastructure often results in untreated wastewater discharge, groundwater contamination, and heightened vulnerability to diseases such as diarrhea, cholera, and other sanitation-related infections.

Recognizing these challenges, the Madhya Pradesh Urban Development Project (MPUDP) was launched with support from the World Bank and implemented by the Madhya Pradesh Urban Development Company Limited (MPUDC). The project targeted improvements in sewerage networks, household connections, sewage treatment plant (STP) operations, and institutional strengthening across four towns: Chhindwara, Dharampuri, Shajapur, Bhedaghat. These towns represent a mix of urban typologies, where the need for improved sanitation was critical to sustainable growth and quality of life.

Current Status of Sewerage System

At present, the town does not have any formal sewerage scheme. Household sewage is either disposed of into individual septic tanks or discharged directly into open drains. The effluent from these septic tanks eventually flows through open roadside channels and reaches the river.

In addition, untreated sewage and wastewater from open drains and nallahs also directly enter the river, which is considered the lifeline of Madhya Pradesh and serves as a crucial source of drinking water for several downstream villages and towns.

This practice has resulted in the following problems

1. Unhygienic conditions within the town area.
2. Pollution of the river, threatening aquatic life as well as downstream users.
3. Groundwater contamination, as effluents seep into the soil, further degrading the quality of local water sources.

Given these circumstances, the establishment of a scientifically designed and sustainable sewerage system

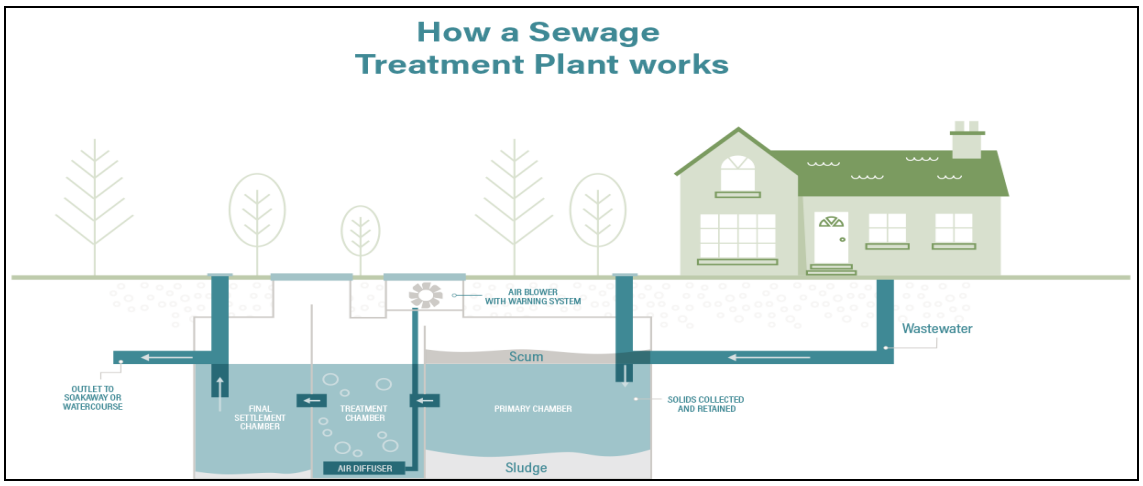
The Sewage Treatment Plant Process

1. Wastewater Inflow (from households)
2. Primary Chamber
3. Treatment Chamber
4. Final Settlement Chamber
5. Outlet
6. Sludge and Solid Collection

Aims and Objectives of the assignment

1. To evaluate the effectiveness of MPUDP interventions in expanding sewerage coverage.
2. To measure improvements in service reliability and sanitation outcomes.
3. To assess the impact on public health, particularly reduction in sanitation-related diseases.
4. To examine institutional strengthening and community engagement efforts.
5. To identify lessons for sustainability and replication in other urban contexts

Treatment Plant



Scope of Work

- To measure, evaluate and appraise the direct benefits as per the key performanceindicators as mentioned in the MPUDP 's Project Appraisal Document (PAD) Results Framework.
- To develop and evaluate indicators using a scientific methodology for the selectedindirectbenefits in the subproject area.
- To evaluate, pursue, and collect indirect benefits using the developed indicators, aswellas to monitor progress in the subproject areas.
- To identify good practices, lessons, and knowledge made by project implementationand evaluate the best practices that the project has bought and present using the latestappropriate digital medium/ documentary film and also prepare a compendium forpublicationpurpose.

The project's were threefold

1. **Enhancing Sewerage Service Delivery:** expanding coverage, ensuring treatment compliance, and improving accessibility for households.

2. **Reducing Sanitation-Related Diseases:** lowering the prevalence of diarrhea and related waterborne diseases through better infrastructure and hygiene awareness.

3. **Strengthening Institutional Capacity:** improving tariff collection, promoting community engagement, training Urban Local Body (ULB) staff, and integrating technology (GIS/MIS) for efficient management.

By combining physical infrastructure upgrades with capacity-building and community participation, MPUDP sought to deliver a holistic solution to urban sanitation challenges.

Significance of the Study

This study is significant in several ways

1. **Public Health Impact:** By analyzing pre- and post-intervention health data, it provides evidence of how improved sewerage systems directly contribute to reducing sanitation-related diseases. This is particularly important for vulnerable groups such as children, women, and the elderly, who are disproportionately affected by poor sanitation.

2. **Evidence-Based Policy Making:** The findings will help policymakers, urban planners, and funding agencies (like the World Bank and state governments) design future sanitation projects more effectively by learning from the MPUDP experience.

3. **Socio-Economic Development:** Improved sanitation reduces healthcare costs, prevents productivity loss due to illness, and creates a cleaner urban environment, thereby boosting the local economy and living standards.

4. **Institutional Strengthening:** The study highlights how urban local bodies can be empowered through training, community engagement, and the use of technology, ensuring the sustainability of sewerage systems beyond the project period.

5. **Community Participation and Gender Inclusion:** By documenting participation levels, especially of women in consultations and grievance redressal mechanisms, the study underscores the importance of inclusive approaches in sanitation projects.

6. **Replicability for Other States:** The outcomes and lessons from MPUDP serve as a model that can be replicated in other Indian states and developing countries facing similar urban sanitation challenges.

Literature Review

Studies consistently show that improved sanitation infrastructure significantly reduces public health risks. According to the World Health Organization (2019) [4], inadequate sanitation is a major contributor to waterborne and hygiene-related diseases globally. In the context of India, initiatives such as AMRUT and the Swachh Bharat Mission have aimed at improving urban sanitation; however, challenges remain in ensuring equitable access and sustainable management of sanitation services (Joshi & Tiwari, 2017) [1].

The implementation of large-scale sewerage projects, such as the Madhya Pradesh Urban Development Project (MPUDP), offers a unique opportunity to evaluate their impact on urban health and service delivery, particularly in medium and small towns where sanitation infrastructure is limited. Evidence from similar projects internationally

suggests that integrated sewerage interventions not only reduce the prevalence of waterborne diseases but also strengthen institutional capacity and community participation (K'oyugi, 2018; Sultana, 2020) [2, 3].

Methodology

1. Research Design

A mixed-method approach was employed, combining quantitative and qualitative data collection techniques.

2. Data Sources

Primary Data: Household surveys (5870 households across 4 towns), Focus Group Discussions (FGDs), Key Informant Interviews (KIIs).

Secondary Data: MPUDC Management Information System (MIS), Geographic Information System (GIS) data, Detailed Project Reports (DPRs), Census data, health records, contractor progress reports.

3. Sampling

Sampling Method: Stratified random sampling across socio-economic categories and gender.
Sample Frame: Wards in project towns.

Table 1: Sample survey data – 10 % of total household of ULB

ULBS Covered Under The Sewerage Projects			
ULB	**Number of Households**	**No of Wards**	**Sample Survey 10% of Household**
Chhindwara	39,000	39	3900
Dharampuri	2500	15	250
Bhedaghat	1200	10	120
Shajapur	16,000	29	1600
Total	58,700	93	5870

4. Evaluation Framework

Direct Indicators: Household sewerage connections, STP operational compliance, public satisfaction.

Indirect Indicators: Health outcomes, school attendance, livelihood opportunities, tourism growth.

Analysis and Results

1. Sewerage Coverage Across Towns

Table 2: Sewerage Infrastructure Achievements

Town	Household Connections	Sewerage Coverage (%)	STP Operational Compliance (%)
Chhindwara	12,000	64	85
Shajapur	8,000	65	88
Dharampuri	6,000	60	87
Bhedaghat	4,500	58	82

The Madhya Pradesh Urban Development Project (MPUDP) has made significant strides in improving sewerage infrastructure, public health outcomes, community engagement, citizen satisfaction, and institutional capacity across participating towns. Sewerage coverage varied across towns, with Chhindwara achieving 64% coverage, Shajapur 65%, Dharampuri 60%, Bhedaghat 58%,.Operational compliance of Sewage Treatment Plants (STPs) was generally high, ranging 88% in Shajapur, reflecting the effectiveness of the sewerage systems alongside the expansion of household connections.

2. Health Outcomes Post-Intervention

Table 3: Reduction in Sanitation-Related Diseases

Town	Diarrhea Cases (per 1,000) Before	Diarrhea Cases (per 1,000) After	% Reduction
Chhindwara	48	29	39.6%
Shajapur	42	25	40.5%
Dharampuri	38	24	36.8%
Bhedaghat	35	21	40%

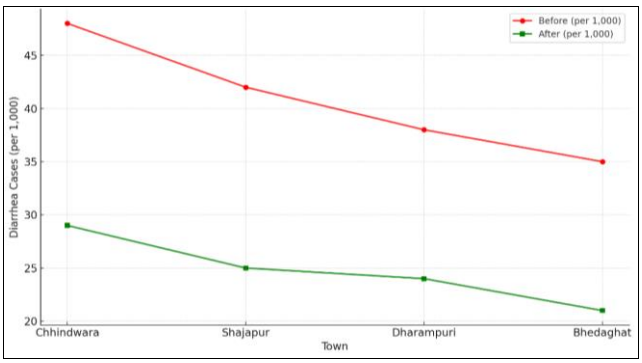


Fig 2: Reduction in Sanitation-Related Diseases

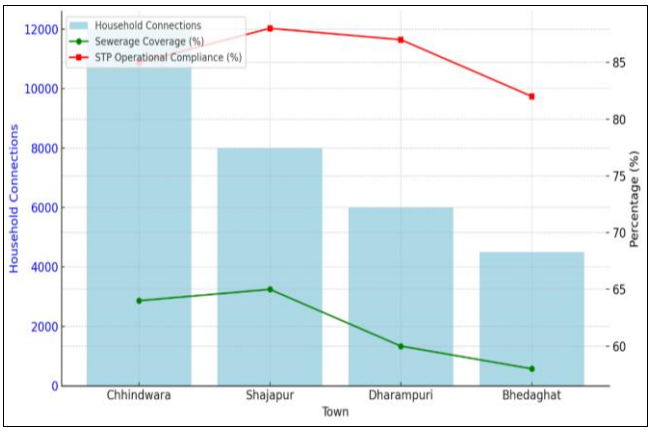


Fig 1: Sewerage Infrastructure Achievements

The analysis of sanitation-related diseases indicates that the Madhya Pradesh Urban Development Project (MPUDP) has significantly reduced the incidence of diarrhea cases across the participating towns. In Chhindwara, cases declined from 48 to 29 per 1,000 population, reflecting a 39.6% reduction, while in Shajapur, the cases decreased from 42 to 25, marking the highest reduction of 40.5%. Dharampuri showed a fall from 38 to 24 cases per 1,000 (36.8% reduction), and Bhedaghat reported a decline from 35 to 21 cases (40% reduction). These findings highlight that the improvement in sewerage infrastructure and effective treatment systems under MPUDP have contributed directly to lowering sanitation-related diseases, thereby improving public health outcomes.

3. Community Participation in Sewerage Projects

Table 4: Participation in Consultations

Activity	Total Participants	% Women Participants
FGDs and Community Meetings	160	46%
Grievance Redress Engagement	500	50%
Training for O&M Staff	1,200	20%

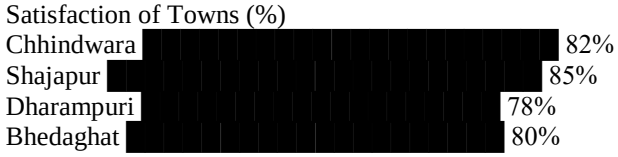
Community participation was actively promoted through focused group discussions, grievance redressal engagements, and training programs for operation and maintenance (O&M) staff. A total of 160 individuals participated in FGDs and community meetings, with women constituting 46% of participants. Grievance redress engagements involved 500 participants, half of whom were women, while 1,200 O&M staff attended training programs, although only 20% were women, highlighting areas for greater gender inclusion in technical training.

4. Public Satisfaction with Sewerage Services

Figure No.3

Table 5: Public Satisfaction Levels

Town	Satisfaction (%)
Chhindwara	82
Shajapur	85
Dharampuri	78
Bhedaghat	80



Public satisfaction with sewerage services showed positive trends, with Chhindwara recording 82% satisfaction, Shajapur 85%, Dharampuri 78%, Bhedaghat 80%. These figures suggest that overall service quality was well received, though some towns slightly fell below a benchmark target of 80%.Public satisfaction with sewerage services showed positive trends, These figures shows that overall service quality was well received, though some towns slightly fell below a benchmark target of 80%.Public satisfaction with sewerage services showed positive trends,

5. Institutional Strengthening Metrics

Table 6: Key Institutional Improvements

Metric	Improvement Post-MPUDP
Tariff Collection Efficiency	>85% in major towns
GIS/MIS Adoption for O&M	Implemented in 7 towns
Community Engagement Increase	2× original target
Training of ULB Staff	100% of key staff

Strengthening under MPUDP was notable. Tariff collection efficiency exceeded 85% in major towns, while GIS/MIS systems for O&M were adopted in seven towns. Community engagement levels doubled relative to initial targets, and all key Urban Local Body (ULB) staff underwent targeted training, thereby enhancing operational and managerial capacity to sustain improvements in sewerage service delivery.

Discussion

MPUDP demonstrates that integrated interventions in sewerage infrastructure can yield measurable improvements in health, service delivery, and institutional performance. Achievements align with Sustainable Development Goals (SDGs) 3 (Good Health), 6 (Clean Water & Sanitation), and 11 (Sustainable Cities).

Best Practices Identified

- Information, Education, and Communication (IEC) campaigns and women's involvement in FGDs created strong ownership.
- Energy-efficient Sewage Treatment Plants (STPs) promoted sustainability.
- GIS/MIS adoption enhanced transparency and monitoring.

Comparative Perspective

Similar studies from Kenya (K'oyugi, 2018) [2] and Bangladesh (Sultana, 2020) [3] indicate that the success of donor-supported sanitation projects depends on local institutional capacity, echoing MPUDP's lessons.

Conclusion

The Madhya Pradesh Urban Development Project (MPUDP) has demonstrated that well-planned sewerage interventions can significantly improve urban health outcomes, service delivery, and institutional performance in medium and small towns. By integrating physical infrastructure with institutional strengthening, community engagement, and technology adoption, the project achieved measurable gains in sewerage coverage, tariff collection, disease reduction, and citizen satisfaction. Notably, sanitation-related diseases reduced by 36–41% across project towns, and public satisfaction consistently exceeded 78%. The active participation of women in decision-making processes further highlights the importance of inclusive approaches in urban infrastructure development. While the study focused on four towns, the broader project spanned seven towns, indicating the potential scalability of such interventions. The lessons learned emphasize that sustainable sanitation improvements require not only technical solutions but also community ownership, financial viability, and institutional capacity. These findings provide valuable insights for policymakers, funding agencies, and urban local bodies, offering a replicable model for other Indian states and developing countries aiming to meet the Sustainable Development Goals (SDGs) on health, sanitation, and sustainable cities.

References

1. Joshi S, Tiwari R. Evaluation of urban infrastructure projects in India: A case study of Swachh Bharat Mission. Journal of Urban Planning and Development,2017:143(4):04017019.
2. K'oyugi B. Institutional capacity and sustainability of donor-funded water projects in Kenya. International Journal of Water Resources and Environmental Engineering,2018:10(1):1-9.
3. Sultana S. Assessing the impact of donor-funded water supply projects in Bangladesh. Environmental Science and Policy,2020:112:1-9.
4. World Health Organization (WHO). Water, sanitation and hygiene: Key facts, 2019. Retrieved from https://www.who.int/news-room/fact-sheets/detail/water-sanitation-and-hygiene
5. Hutton G, Varughese M. The Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene. World Bank, Washington, DC, 2016.
6. Mara D, Lane J, Scott B, Trouba D. Sanitation and health. PLoS Medicine,2010:7(11):e1000363.

7. UNICEF & WHO. Progress on household drinking water, sanitation and hygiene 2000-2020: Five years into the SDGs. Geneva: World Health Organization, 2021.
8. Jain M, Singh A. Urban sanitation in India: A review of policies and progress under Swachh Bharat Mission. Environment and Urbanization ASIA,2020:11(1):25-42.
9. Prüss-Ustün A, Bartram J, Clasen T, Colford JM, Cumming O, Curtis V. *et al*. Burden of disease from inadequate water, sanitation and hygiene in low- and middle-income settings: A retrospective analysis of data from 145 countries. Tropical Medicine & International Health,2014:19(8):894-905.
10. Narain V, Singh A. Urban sanitation in small towns of India: Challenges and opportunities. Journal of Water, Sanitation and Hygiene for Development,2019:9(3):467-476.
11. Ministry of Housing and Urban Affairs (MoHUA). National Framework for Service Level Benchmarks in Urban Sanitation. Government of India, 2020.