International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 11 | Nov - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Where is My Loo? - Location-Based Sanitation Assistance Application

Arti Bawane [1], *Gunjan Gawande* [2], *Mandar Tule* [3], *Rushikesh Girbane*[4], *Saisidhartha Paidi*[5], *Vidhya Bharti*[6], *Dr. Priti Bihade*[7]

[1] *CSE(Cyber Security), G H Raisoni College of Engineering & Management Nagpur*
[2] *CSE(Cyber Security), G H Raisoni College of Engineering & Management Nagpur*
[3] *CSE(Cyber Security), G H Raisoni College of Engineering & Management Nagpur*
[4] *CSE(Cyber Security), G H Raisoni College of Engineering & Management Nagpur*
[5] *CSE(Cyber Security), G H Raisoni College of Engineering & Management Nagpur*
[6] *CSE(Cyber Security), G H Raisoni College of Engineering & Management Nagpur*
[7] *CSE(Cyber Security), G H Raisoni College of Engineering & Management Nagpur*

Abstract - In many cities, finding a clean and safe public toilet is still a daily struggle for people, despite all the progress in urban development. To help solve this issue, "Where Is My Loo?- Location-based Sanitation Assistance Application" was developed as a web-based platform that helps users easily locate nearby public restrooms. The system is built using Node.js, Express.js, and MongoDB Atlas for its backend, and EJS with Bootstrap for a simple and responsive user interface.
The main goal of this project is to make public sanitation more accessible and inclusive by allowing users to add new toilet locations, share reviews, and rate facilities based on cleanliness and safety. By encouraging people to contribute information, the application creates a community-driven database that supports hygiene awareness and social responsibility. Ultimately, "Where Is My Loo?- Location-based Sanitation Assistance Application" aims to use technology as a tool to improve everyday life and support the creation of cleaner, healthier, and smarter cities for everyone.

Key Words: public Sanitation, web-based platform, Location-based Sanitation Assistance, community-driven, Node.js, MongoDB Atlas, hygiene awareness, smart cities.

1.INTRODUCTION

.Access to clean and safe sanitation is a basic human right, yet it remains one of the biggest challenges faced in modern urban life. Even with initiatives like the Swachh Bharat Mission improving toilet infrastructure across India, many people still struggle to find public restrooms that are clean, functional, and accessible. This lack of information often leads to discomfort, health risks, and social inconvenience, particularly for women, the elderly, and individuals with disabilities.

To address this everyday issue, "Where is My Loo – Location-based Sanitation Assistance Application" was developed as a web-based application designed to help users locate nearby public toilets quickly and reliably. The platform uses Node.js, Express.js, and MongoDB Atlas for a strong backend and EJS with Bootstrap for a responsive, user-friendly interface. What makes this project unique is its crowdsourced model users can add new toilet locations, share reviews, and rate cleanliness, making the data accurate and community-driven.

Beyond just being a location-based service, the platform promotes awareness about hygiene, inclusivity, and shared responsibility. It bridges the gap between citizens and local authorities by providing real-time insights that can also support better urban planning. In essence, the application is not just a technological solution it's a step toward creating cleaner, healthier, and more inclusive cities through collective participation and smart innovation.

2. METHODOLOGY

The development of this application followed an adaptive, user-centered methodology focused on building a reliable and socially beneficial sanitation platform. The project employed the Agile development approach, allowing flexibility, teamwork, and iterative progress through continuous testing and refinement during design, development, and deployment. This ensured the system evolved according to real user needs rather than following a fixed plan.

The application was designed using the Model View Controller (MVC) architecture to enhance modularity and maintainability. The Model layer, powered by MongoDB Atlas, managed dynamic storage and retrieval of user, location, and review data. The Controller layer, built with Node.js and Express.js, handled authentication, validation, and communication between the interface and the database. The View layer, developed with EJS and Bootstrap, delivered a responsive, accessible, and user-friendly interface across devices.

Fig -1: Implementation of Web Application

The workflow was designedto be simple and community-driven. Users could locate nearby toilets, check cleanliness ratings, and view accessibility information using the Mapbox API. Registered users could also contribute by adding new toilet listings, uploading photos, and writing reviews. To ensure accuracy, every submission was validated before being

stored. Administrators monitored entries and managed reported issues through a secure dashboard to maintain data integrity.

When a user accessed the site, the system checked for authentication and processed all requests through Express.js controllers, fetching data securely from MongoDB and rendering it dynamically through EJS templates. Security measures like AES-256 encryption, HTTPS communication, and input sanitization safeguarded user information.

Comprehensive testing validated the platform's performance. Functional and integration testing ensured system stability, while user acceptance testing gathered real-world feedback to refine usability. After successful evaluation, the system was deployed on Render Cloud Hosting with GitHub integration for version control and MongoDB Atlas for secure, automated backups.

Overall, the methodology combined modern web technologies, cybersecurity practices, and a crowdsourced model to transform a real-world sanitation issue into a sustainable, community-driven digital solution promoting inclusivity, accessibility, and hygiene awareness**.**

I. DISCUSSION

The discussion highlights how digital innovation can be effectively applied to solve real-world sanitation challenges through an adaptive, user-focused design approach. The use of the Agile development model proved instrumental in maintaining flexibility throughout the process. Each development phase included testing, feedback collection, and refinement, ensuring that the system steadily evolved into a more stable, accessible, and user-friendly platform. This iterative process allowed the design and features to adapt naturally to changing user requirements, rather than being limited by rigid planning.

The overall architecture also contributed significantly to the system's performance and scalability. By following the Model View Controller (MVC) framework, the development team ensured a clear distinction between data handling, logic implementation, and user interface design. This structure not only enhanced efficiency but also simplified future updates and feature integration without compromising existing functionality. It also supported effective data management and maintained high responsiveness even under increased user activity.

A key strength observed during implementation was the active role of community participation. Allowing users to add, review, and update data made the system more dynamic and accurate. This participatory element encouraged public involvement, strengthened trust in the platform, and fostered a sense of collective responsibility toward maintaining hygienic public spaces. Such a model demonstrates how community-driven data can complement government or institutional efforts to improve urban sanitation.

However, the continued success of the system depends on maintaining user engagement and ensuring data authenticity. Regular moderation is essential to prevent misinformation and outdated records. Future development could benefit from integrating artificial intelligence for automated content verification, GPS validation, and predictive analysis of sanitation needs. These enhancements would not only improve accuracy but also support more efficient resource allocation by local authorities.

In summary, the discussion emphasizes that technology, when developed with inclusivity and adaptability, can play a transformative role in addressing everyday public needs. The project demonstrates how a combination of digital innovation, secure architecture, and community collaboration can lead to practical, sustainable solutions that enhance hygiene, accessibility, and urban living standards.

II. RESULT

The implementation of this platform produced encouraging results that demonstrated the effectiveness of technology in improving sanitation accessibility and public awareness. The web-based platform successfully allowed users to locate nearby public toilets based on proximity, cleanliness, and accessibility. The integration of Mapbox API provided real-time map visualization, enabling users to find the nearest toilet with accurate distance and location details.

System testing confirmed that the platform performed efficiently across different devices and internet conditions. Response times for searches remained quick, generally below two seconds, ensuring a smooth user experience. The backend, powered by Node.js and Express.js, effectively handled multiple concurrent requests without performance issues. MongoDB Atlas ensured reliable data storage and retrieval, with proper validation to prevent duplicate or false entries.

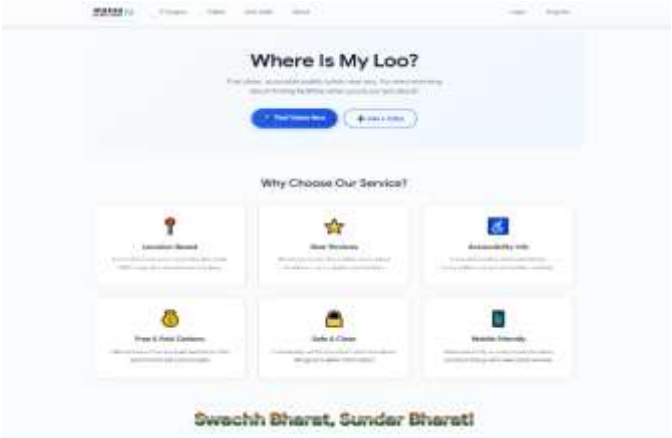

Fig-2: UI of Web Application

User feedback collected during testing indicated high satisfaction with the interface design and ease of navigation. Participants appreciated the ability to contribute by adding new toilet locations and sharing honest reviews. The admin dashboard also worked effectively, allowing moderators to verify listings, monitor reports, and maintain data accuracy. Security measures like AES-256 encryption, HTTPS communication, and session-based authentication provided users with confidence in data privacy. Overall, the results validated the project's goal of offering a secure, scalable, and community-driven sanitation locator system.

IV. LITERATURE SURVEY

Contemporary research on digital sanitation solutions reveals a significant paradigm shift from static infrastructure provision to technology-enabled participatory sanitation management. Multiple studies have demonstrated the transformative potential of digital platforms in bridging information accessibility gaps in public sanitation facilities.

Gupta and Ramchandani (2019) conducted pioneering research on mobile and web-based technologies for enhancing toilet discovery in Indian urban contexts. Their findings emphasized that digital sanitation platforms function not only as navigation aids but also as trust-building mechanisms by

reducing user uncertainty and increasing confidence in facility availability and quality. The integration of GPS technology, real-time updates, and intuitive interface design transforms maps from static repositories into living, community-driven resources.

The India Sanitation Coalition (2020) documented Google's Public Toilet Locator initiative, implemented in collaboration with India's Ministry of Housing and Urban Affairs, exemplifying the potential for large-scale digital sanitation interventions. By integrating verified toilet data directly into Google Maps, the initiative leveraged existing digital infrastructure to make sanitation information accessible on an unprecedented scale. However, the evaluation identified critical limitations, including outdated entries, incomplete facility coverage, and insufficient data validation mechanisms, highlighting the necessity for continuous data governance and public engagement.

Mukasa et al. (2021) provided valuable insights into digital sanitation solution implementation in resource-constrained environments using the SaniDigS platform in Kampala, Uganda. Their participatory system design, which incorporates user-driven reporting, maintenance requests, and cleanliness tracking, demonstrates that community involvement can transform passive users into active stakeholders in sanitation management. This approach has proven particularly effective in informal settlements, where traditional institutional oversight remains limited.

The convergence of Internet of Things (IoT) technologies and artificial intelligence (AI) represents an emerging frontier in sanitation management. Jiang et al. (2020) illustrated how sensor-based monitoring systems enable real-time collection of environmental and functional data including occupancy status, water levels, and air quality. AI-powered analytics enable predictive maintenance and resource optimization, thereby transforming reactive management into proactive service delivery.

Recent studies emphasize that successful digital sanitation platforms require simultaneous attention to technological sophistication, user-centered design and equitable accessibility. The literature collectively demonstrates that bridging the sanitation accessibility gap necessitates the integration of reliable data management, intuitive user interfaces, and meaningful community participation.

3. CONCLUSIONS

"Where Is My Loo?- Location-based Sanitation Assistance Application" demonstrates how thoughtfully designed technology can meaningfully address persistent public health challenges through user empowerment, community collaboration and transparent governance. By bridging the critical gap between sanitation infrastructure availability and accessibility, the platform contributes substantially to improving urban quality of life, public health, and the broader smart cities movement.

The project illustrates fundamental principles applicable across civic technology domains: that technological sophistication alone proves insufficient without human-centered design, that successful platforms require simultaneous attention to infrastructure, interface, and community engagement, and that sustainable solutions emerge from collaborative relationships between technologists, citizens, and institutional stakeholders.

As cities globally confront persistent sanitation challenges, "Where Is My Loo?- Location-based Sanitation Assistance Application" presents a replicable model demonstrating how digital innovation, grounded in the principles of inclusivity and transparency, can transform essential public services into responsive, community-driven ecosystems.

ACKNOWLEDGEMENT

The authors gratefully acknowledge Dr. Priti Bihade for her guidance and mentorship throughout this project. We extend our appreciation to the Department of Computer Science and Engineering (Cyber Security) at G H Raisoni College of Engineering and Management, Nagpur, for their institutional support and resources. We thank all users who participated in the testing and provided invaluable feedback that refined the platform's functionality and usability.

REFERENCES

1. K. Gupta and S. Ramchandani, "Feasibility of digital applications for toilet locating and monitoring services in urban areas," *Jaipuria Int. J. Manage. Res.*, 2019.

2. India Sanitation Coalition, "Google locate the public toilet: Case study on Google Maps toilet locator initiative in Delhi NCR and Madhya Pradesh," 2017.

3. C. H. Mukasa et al., "User needs and design features of sanitation digital solutions in urban slums of Kampala, Uganda: The SaniDigS platform," *Front. Public Health*, vol. 11, 2021.

4. Y. Jiang et al., "Development of internet of things and artificial intelligence for intelligent sanitation systems: A literature review," *J. Infrastructure Policy Dev.* 8, no. 12, 2024.

5. S. Sengupta et al., "Role of technology in success of rural sanitation revolution in India," in *Proc. 12th Int. Conf.*, Apr. 2019.

6. K. V. Horadi et al., "Smart public toilet management and monitoring system using IoT," *Int. J. Adv. Res. Sci. Commun. Technol.*, vol. 4, no. 1, pp. 344-352, 2024.

7. N. P. Mahalsekar et al., "Intelligent hygiene monitoring system for public toilets," 2022. [Online]. Available: https://www.ijert.org

8. Rayven IoT Solutions, "Public toilet monitoring solution," 2022. [Online]. Available: https://www.rayven.io

9. P. Jain, K. Sharma, "A smart toilet system for cleanliness and user satisfaction," *Int. J. Novel Res. Dev.*, vol. 8, no. 11, 2023.

10. Ministry of Housing and Urban Affairs, "Locate public toilets on Google Maps: MoHUA partners with Google," 2018. [Online]. Available: https://www.pib.gov.in

BIOGRAPHIES

Arti Bawane, Student at GH Raisoni College of Engineering and Management, Nagpur

Gunjan Gawande, Student at GH Raisoni College of Engineering and Management, Nagpur

Mandar Tule, Student at GH Raisoni College of Engineering and Management, Nagpur

Rushikesh Girbane, Student at GH Raisoni College of Engineering and Management, Nagpur

Saisidhartha Paidi, Student at GH Raisoni College of Engineering and Management, Nagpur

Vidhya Bharti, Student at GH Raisoni College of Engineering and Management, Nagpur

Dr. Priti Bihade, HOD, CSE (Cyber Security) Department, GH Raisoni College of Engineering and Management, Nagpur