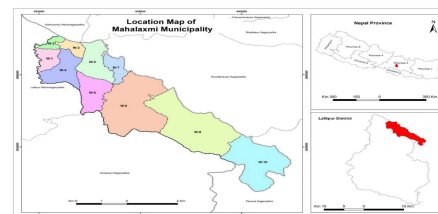


Standardization of Septic Tanks in Mahalaxmi Municipality: A Sustainable Approach to Wastewater Management

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INTRODUCTION

- The rapid urbanization and population growth in Nepal has significantly incremented waste and wastewater resulting to serious disposal problems and demand for effective management and treatment systems.
- The unsafe disposal of waste, wastewater and fecal sludge on one hand is polluting the water bodies and environment while on the other hand is posing the threat of water-borne diseases to public health.
- Due to lack of standardized guidelines for the design, construction, and maintenance of septic tanks has resulted in environmental degradation, public health risks, and infrastructural challenges. To combat these issues, Mahalaxmi Municipality has pioneered the implementation of ISO 24521, marking the first global application of this international standard for the management of wastewater services.
- This study highlights the challenges of existing septic tank practices and underscores the transformative potential of these innovations. By aligning local needs with international best practices, the municipality's approach ensures sustainable and safe sanitation for its rapidly urbanizing population. The findings demonstrate how standardization not only enhances wastewater management but also serves as a model for municipalities worldwide to achieve long-term resilience and sustainability.



METHODS

In April 2017, Government of Nepal endorsed 'Institutional and Regulatory Framework for Fecal Sludge Management in Urban Areas of Nepal'. Effective enforcement of the framework is a prerequisite for successful implementation of FSM service chain. However, this remains a huge challenge for Municipalities due to multiple reasons such as lack of or inadequate capacity on septic tank design and construction, lack of public awareness and most of all, the least priority of the local government on sanitation and fecal sludge management.

Standard septic tanks are one of the most prominent decentralized wastewater treatment systems for treating domestic wastewater. However, Municipalities are yet not being able to regulate construction of standard septic tanks. While this challenge exists, Mahalaxmi Municipality has succeeded in regulating construction of the standard septic tanks. The following methods describes how the Municipality has been able to achieve this.

1. Sanitation Situation Assessment and Planning

The comprehensive sanitation situation assessment was conducted in Mahalaxmi Municipality to gather detailed information on sanitation system, building, containments and containment emptying practice. The study supported understanding the existing sanitation system of the Municipality and prioritize the intervention areas.



Fig 1: Project Stages for safe Sanitation

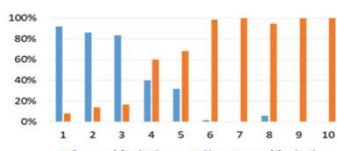


Fig 2: Sanitation System Coverage in 10 Wards of Mahalaxmi Municipality

2. Development of Regulatory Tool

Mahalaxmi Municipality approved and published its Fecal Sludge Management (FSM) By-Laws through its 7th Council Meet on 11 March 2020 and is the first ever on-site sanitation legal instrument in Nepal – "Mahalaxmi Rajpatra" publication.

This By-Laws provided the strong foundation for the operationalization and regulation of sanitation services in Mahalaxmi Municipality and for the safe management of on-site domestic sanitary waste thereby reducing risk to the public health and the environment

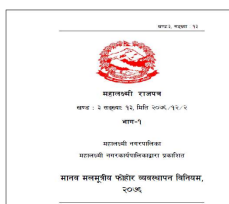


Fig 3: FSM By-laws

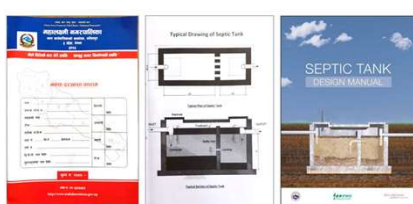


Fig 4: Guidelines for construction of Standard Septic Tank

3. Institutionalization of Standard Septic Tank in Building Design Permit

The construction of standard septic tanks has been made mandatory in all new house design permits. Mahalaxmi Municipality has included a two-page guideline on standard septic tank and soak away system as an integral component to the new house design permits. Building completion certificates are provided only to those households which have constructed standard septic tanks.

4. Dedicated Sanitation Cell to Oversee Sanitation Activities

5. Training Programs to Capacitate Human Resource

6. Campaigns to Make the City-dwellers Aware on Septic Tanks

7. Development and Establishment of IMIS

8. Development of Institutional and Monitoring Mechanism for Construction of Standard Septic Tank

9. Integration of IMIS with eBPS

When a new building is constructed in the municipality, the building as well as containment information in IMIS will be updated in real-time. With this, Mahalaxmi Municipality also becomes the first Municipality in Nepal to formally endorse the septic tank inspection mechanism in its building permit approval process.

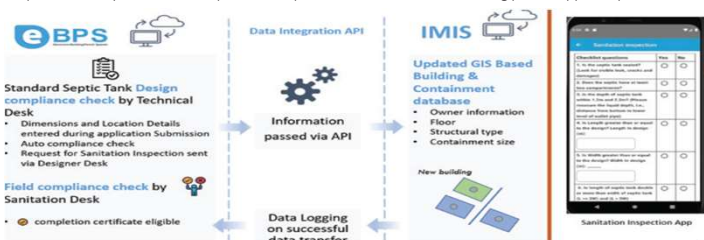


Fig 5: Integration of IMIS with eBPS

DISCUSSION AND RESULT

- HHS in wards 1 to 3 are served by sewer sanitation; wards 4 and 5 are moving towards sewer sanitation system; and wards 6 to 10 rely on non-sewered sanitation system.
- 67.17 percent of HHS rely on on-site sanitation system
- Develop a guideline for standard septic design and soak away system as an integral component to the new house design permits.
- To address the data and information limitations for sanitation planning and implementation, municipality introduced and established Integrated Municipal Information System (IMIS) in Mahalaxmi Municipality which is the first in Nepal. IMIS is an Information System developed to catalyze the City-wide Inclusive Sanitation (CWIS) approach and contribute to achieving SDG 6.2 outcomes. It is a convergence of web, mobile and GIS technologies developed on an open-source software platform.
- The IMIS now facilitates in planning, management and monitoring and evaluation of standard septic tank construction along with other sanitation systems and services. It also serves as a one common platform for sharing data and information amongst all departments of the Municipality.



Fig 6: Sanitation Inspection flow in eBPS and IMIS

Criteria	Compliance of Standard Septic tank
Pipe Outlet Level	Level difference between inlet and outlet pipe is within 10 cm to 15 cm and the outlet pipe is below the invert level
Chamber Length	Septic Tank has First chamber of 2/3rd and second chamber of 1/3rd of total length
Outlet Pipe Connection	Is the septic tank outlet pipe connected to soak away pits or sewerage network or none?
Partition Wall Depth	Holes in the partition wall provided is within 10 cm to 15 cm and at the half of liquid depth considered
Length of Septic Double	Length of Septic Tank is within the range (L >= 2W) and (L < 5W)
Septic Compartments	Septic Tank has atleast two compartments
Septic tank Depth	Depth of Septic Tank is within the range 1.2m and 2.2m
Width of Septic tank	Width of Septic Tank is greater than or equal to the design
Length of Septic tank	Length of Septic Tank is greater than or equal to the design
Septic Tank Sealed	Septic Tank is sealed

Fig 7: Standard Septic Tank Compliance check list

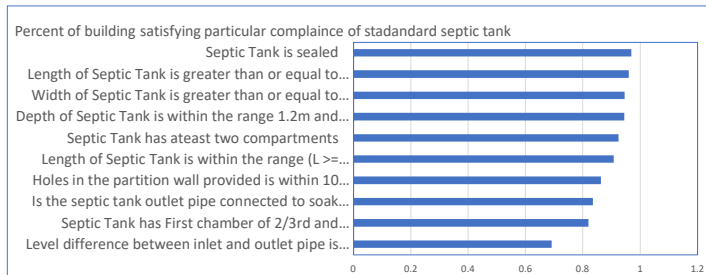


Fig 8: verification in Design and Field IMIS Mobile App

CONCLUSION

Mahalaxmi Municipality becomes the first Municipality in Nepal not only in developing and endorsing the FSM By-Laws but also in enforcement of By-Laws by regulating design and construction of standard septic tanks in the Municipality. Its replication is gradually visible in other Municipalities of Nepal as many Municipalities are developing FSM By-Laws and preparing itself for its implementation.. It will continue strengthening robust institutional and monitoring mechanisms. Further to addressing the entire sanitation service chain, it's now necessary for the Municipality to expedite the renovation of existing Fecal Sludge Treatment Plant and act on solutions for treatment of Fecal Sludge for its safe disposal or reuse. Standardizing septic tanks in Mahalaxmi Municipality has steps toward sustainable wastewater management. Implementing these guidelines will lead to improved sanitation, reduced health risks, and enhanced environmental quality. Successful implementation will require a combination of public awareness, financial incentives, and regulatory enforcement.