Improving Public Health through Mobile Sanitation: A Case Study of T.N. Palayam Panchayat

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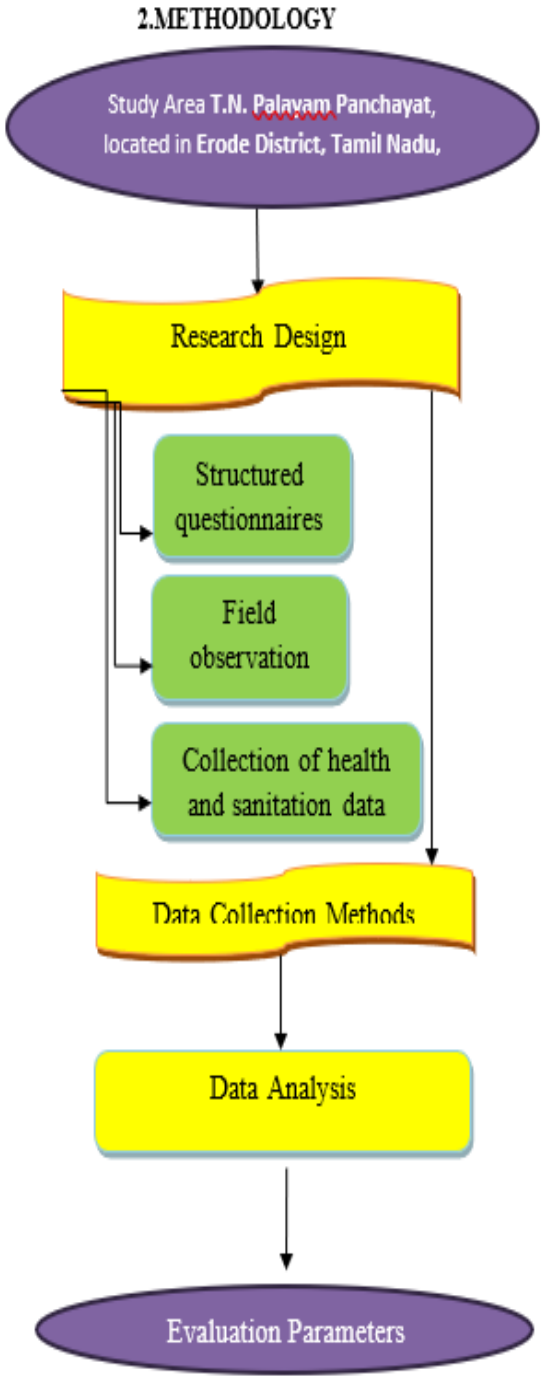
***Abstract*—Sanitation is a crucial component of public health, particularly in rural regions where access to permanent toilet facilities remains limited. This study focuses on the implementation and impact of mobile sanitation units in T.N. Palayam Panchayat, Tamil Nadu, as an alternative and sustainable solution to reduce open defecation and associated health risks. The research aims to evaluate the effectiveness of mobile toilets in improving hygiene standards, reducing disease prevalence, and enhancing community well-being. A mixed-method approach was adopted, combining field surveys, interviews with local residents, and observational assessments of sanitation practices before and after the deployment of mobile toilets. The findings indicate a significant improvement in sanitation coverage and a notable decline in waterborne diseases such as diarrhea and dysentery. Furthermore, awareness campaigns and community participation played a pivotal role in ensuring the acceptance and regular usage of the facilities. The study concludes that mobile sanitation systems offer a viable, cost-effective, and flexible solution for rural and semi-urban areas facing challenges in constructing permanent toilets. Recommendations are provided for scaling up such initiatives through public-private partnerships, community engagement, and integration with government sanitation programs such as the Swachh Bharat Mission.**

***Index Terms*— Mobile toilets, public health, Rural sanitation, Open defecation, T.N. Palayam Panchayat, Sanitation infrastructure, Sustainable development, Swachh Bharat Mission, Hygiene improvement, Community participation.**

I. INTRODUCTION

Access to safe and hygienic sanitation facilities is a fundamental requirement for human health and dignity. Despite major advancements under national programs like the Swachh Bharat Mission (SBM), rural and semi-urban regions in India continue to face challenges in achieving complete sanitation coverage. Many communities, particularly those in remote or economically weaker areas, still depend on open defecation practices due to inadequate infrastructure, lack of awareness, and limited financial resources. This situation poses serious threats to public health, contaminating water sources and increasing the prevalence of waterborne and vector-borne diseases such as diarrhea, cholera, and dysentery.To address these persistent issues, mobile sanitation units (mobile toilets) have emerged as a practical and flexible alternative to conventional toilet systems. Mobile toilets are designed for temporary deployment, making them especially useful during community gatherings, construction works, disaster situations, or in villages where permanent structures are not yet feasible. These units can be relocated as needed, require minimal land area, and can integrate eco-friendly waste disposal mechanisms such as bio-digester tanks. When implemented effectively, they can significantly improve hygiene conditions and promote behavioral changes toward safe sanitation practices.The T.N. Palayam Panchayat in Tamil Nadu serves as a representative example of a rural region where sanitation challenges persist due to geographical and socio-economic constraints. Although several government schemes have aimed to enhance toilet coverage, many residents still lack access to clean and private sanitation facilities. To bridge this gap, the introduction of mobile toilets was proposed as an innovative and community-cantered intervention. The level of awareness and acceptance of mobile toilets among residents, the effectiveness of these units in reducing open defecation practices, the health outcomes associated with improved sanitation access. The operational challenges faced in maintaining and managing mobile sanitation systems. Combining field surveys, interviews, and health data analysis, the study provides a holistic understanding of how mobile

sanitation can serve as a bridge between current deficiencies and long-term sustainable sanitation solutions.



II. METHODOLOGIES

2.1 Study Area

The study was carried out in T.N. Palayam Panchayat, Erode District, Tamil Nadu. The area consists of a population of around 3,000 residents with agriculture as the primary occupation. Limited sanitation facilities and open defecation were observed prior to the introduction of mobile toilets.

2.2 Research Design

A mixed-method approach was used, combining quantitative data from household surveys and health records with qualitative inputs from field observations and interviews.

2.3 Data Collection

- Primary Data:
  - Surveys of 100 households to assess toilet usage, hygiene awareness, and satisfaction.
  - Interviews with Panchayat officials, sanitation workers, and local health officers.
  - Field observation of mobile toilets for design, maintenance, and accessibility.
- Secondary Data:
  - Panchayat health reports and SBM database for pre- and post-implementation disease incidence.
  - Public health department records for waterborne disease trends.

2.4 Data Analysis

Data were analysed using Microsoft Excel and SPSS to evaluate the correlation between sanitation access and health improvements. Content analysis was used for qualitative findings. Comparative analysis determined changes in hygiene behaviour and disease frequency.

2.5 Evaluation Parameters

- Usage rate (%)
- Hygiene and maintenance condition
- Health impact (disease reduction)
- Community satisfaction
- Operational efficiency

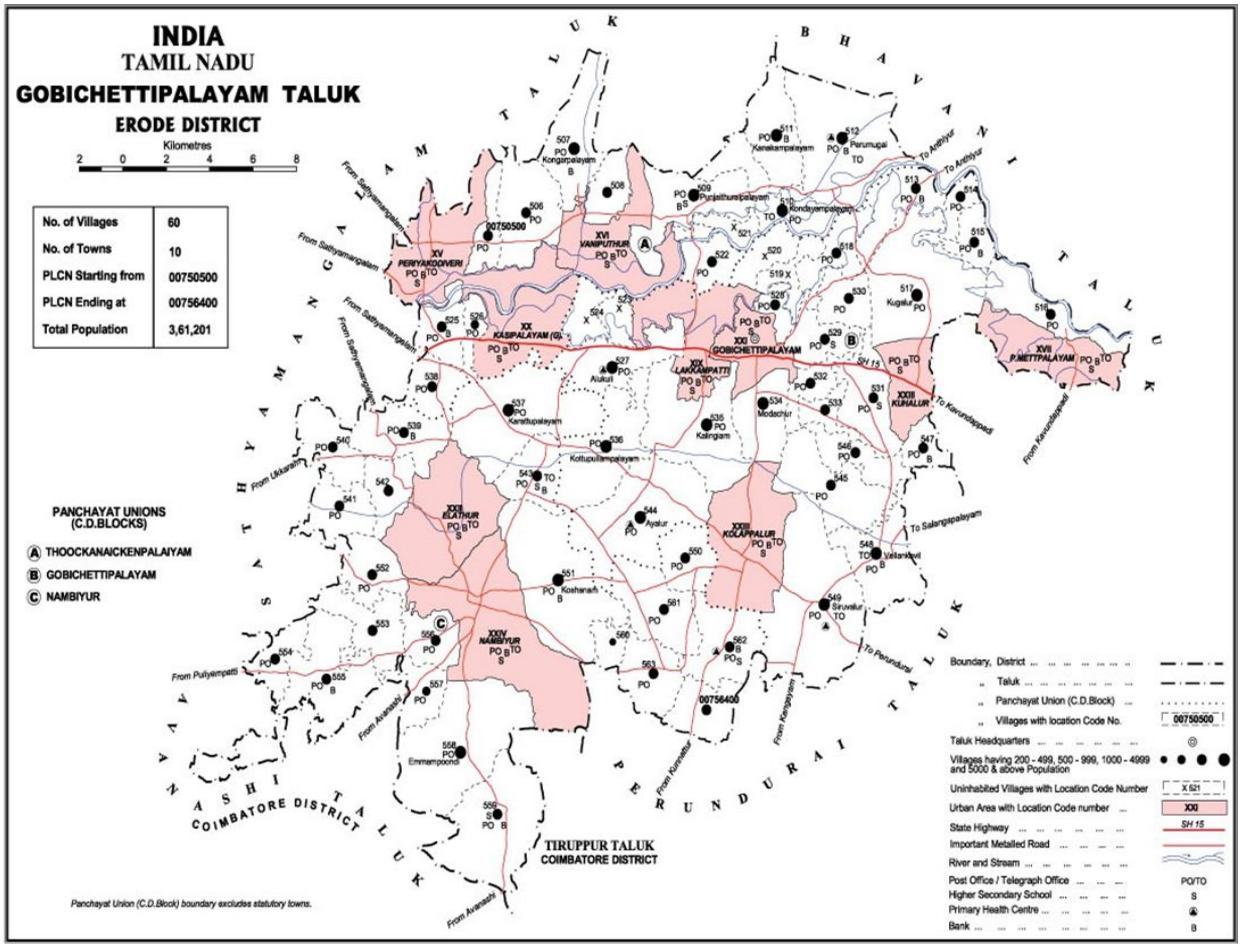


Fig:1 Gobichettipalayam Map

Alphabetical list of Villages with Location Code Numbers of 1991 and 2001
Name of the District: Erode

Name of Taluk: Gobichettipalayam Name of CD Block: Thookanaickenpalayam

S.no	Name of village	2001 Census location code number	1991 Census location code number
1	2	3	4
1	Akkaraikodiveri	00752500	080030007000700300
2	Arrakkankottaigramam	00750600	080030007000700040
3	Kanakampalayam	00751100	080030007000700100
4	Kavandampalayam	00750800	080030007000700060
5	Kondayampalayam	00751000	080030007000700090
6	Kongarpalayam	00750700	080030007000700050
7	NanjaiPuliampatti	00752200	080030007000700220
8	NanjaiThuraiyampalayam	00752100	080030007000700210
9	Odayagoundanpalayam	00753800	080030007000700460
10	Perumugai	00751200	080030007000700110
11	Pullappanaickenpalayam	00750500	080030007000700030
12	Punjaithuraipalayam	00750900	080030007000700080
13	Singiripalayam	00752600	080030007000700310

Village Directory Amenities and Land Use

(As on 1999)

Amenities available (if not available within the village, a dash (-) is shown in the column and next to it in brackets the distance in broad ranges viz.< 5 kms., 5-10 kms. and 10+ kms of the nearest place where the facility is available is given)

Serial number	Name of village & Location code	Total area of the village (in hectare)	Total population (2001 Census)	Number of households (2001 Census)	Educational	Medical	Drinking water	Post, telegraph and telephone	Commercial and co-operative banks	Agricultural, non-agricultural and other credit societies	Recreational & cultural facilities (Cinema/ Video Hall, Sports club, Stadium/Auditorium)	Communications (Bus service, railway station, waterway)
1	2	3	4	5	6	7	8	9	10	11	12	13

CD Block: Thookanayakanpalayam (0004)

1	Pullappanaicken-palayam -750500	369.6	2,931	802	P M(< 5)C(5-10)	HH MCW PHS H(< 5) PHC(< 5)	T HP W R SS-T,W	PO PH(315)	- CM(< 5) CP(< 5)	NCS ACS(< 5) OCS(< 5)	- CV(< 5) SP(10 +) ST(10 +)	BS RS(10+) NW(10 +)
2	Arrakkankottai -750600	1,019.20	3,217	871	P(2) M S C(5-10)	HH PHS H(< 5) MCW(< 5) PHC(< 5)	T HP W R SS-T,W	PO PH(225)	- CM(< 5) CP(< 5)	NCS ACS(< 5) OCS(< 5)	- CV(< 5) SP(10 +) ST(10 +)	BS RS(10+) NW(10 +)
3	Kongarpalayam -750700	1083.6	5956	1640	P M C(10+)	HH MCW CWC	T HP W SS-T,W	PO PH(159)	CP CM(< 5)	ACS NCS OCS(< 5)	- CV(< 5) SP(10 +)	BS RS(10+) NW(10 +)
						PHS H(< 5) PHC(< 5)					ST(10 +)	

4	Kavandam-palayam-750800	464.9	2106	585	- P(< 5) M(< 5) C(10+)	PHS H(< 5) MCW(< 5) PHC(< 5)	T HP W SS-T,W	PH(53) PO(< 5)	- CM(< 5) CP(< 5)	ACS NCS(< 5) OCS(< 5)	- CV(< 5) SP(10+) ST(< 5)	BS RS(10+) NW(10+)
5	Punjaithuraiyam-palayam-750900	1372.8	8312	2209	P(4) M S PUC I C(10+)	CWC PHS RMP H(10+) MCW(10+) PHC(< 5)	T HP W SS-T,W	PO PH(160)	CM CP(< 5)	ACS NCS(2) OCS(< 5)	ST(2) CV(< 5) SP(10+)	BS RS(10+) NW(10+)
6	Kandayam Palayam-751000	882.3	6988	2042	P M(< 5) C(10+)	MCW(2) RMP(2) H(< 5) PHC(< 5)	T HP SS-T,HP	PO TO PH(230)	- CM(< 5) CP(< 5)	ACS NCS OCS(2)	- CV(< 5) SP(10+) ST(< 5)	BS RS(10+) NW(10+)
7	Kannakkam-palayam-751100	903.1	6181	1744	P(5) M C(10+)	HH MCW(2) PHS H(10+) PHC(< 5)	T HP W SS-T,W	PO PH(175)	CP CM(< 5)	NCS(2) ACS(< 5) OCS(< 5)	CV SP(10+) ST(< 5)	BS RS(10+) NW(10+)

Fig 2: Thookanaickenpalayam Street View

Fig 3: Thookanaickenpalayam Street View

Fig 4: Thookanaickenpalayam Street View

Fig 5: Thookanaickenpalayam Street View

Fig 6: Thookanaickenpalayam Street View

Fig 7: Thookanaickenpalayam Street View

Fig 8: Thookanaickenpalayam Street View

III. RESULTS AND DISCUSSION

3.1 Increase in Sanitation Coverage

After the introduction of mobile toilets, sanitation coverage in T.N. Palayam increased from 62% to 91%. The mobile units were particularly useful in areas with limited water supply and where permanent toilets were not feasible due to space or cost constraints.

3.2 Reduction in Health Issues

irregular maintenance and waste disposal logistics were noted. Health records from the Panchayat health center indicated a 34% reduction in diarrhea cases and a 29% reduction in skin and parasitic infections within six months of implementation. Improved hygiene awareness campaigns further supported behavioral changes among residents.

3.3 Community Feedback

Survey results showed that 87% of respondents were satisfied with the mobile toilet facilities, citing cleanliness and convenience as key factors

3.4 Environmental Impact

The introduction of mobile sanitation units equipped with bio-digester tanks in T.N. Palayam Panchayat demonstrated a significant positive environmental effect compared to traditional pit latrines or open defecation practices. The bio-digester system, developed based on DRDO technology, facilitates anaerobic decomposition of human waste, converting it into methane gas and nutrient-rich effluent. This process eliminates the need for manual desludging and ensures zero direct discharge into open drains or water bodies.

Field observations revealed that the mobile toilets effectively minimized groundwater contamination and reduced surface pollution in the surrounding areas. Prior to the intervention, untreated sewage often percolated into the soil or ran off into irrigation canals, adversely affecting both human health and crop productivity. After deployment, microbial water quality testing from nearby wells showed a notable decrease in coliform count, indicating improved groundwater safety.

In addition, the adoption of mobile sanitation reduced uncontrolled waste dumping and odor nuisance commonly observed around open defecation sites. The sealed waste containment systems also discouraged the breeding of flies and mosquitoes, thereby mitigating vector-related diseases.

From a sustainability perspective, the mobile sanitation model aligns with the principles of circular waste management, where treated effluent can potentially be used as a bio-fertilizer after appropriate testing and dilution. The system operates on low water consumption, making it suitable for water-scarce regions. Moreover, the use of solar-powered lighting and ventilation systems in certain units enhanced energy efficiency and night-time usability, further supporting the environmental sustainability of the project.

Overall, the mobile sanitation model in T.N. Palayam proved to be eco-efficient, water-saving, and pollution-reducing, establishing a replicable framework for rural sanitation improvement under sustainable development goals (SDG 6 – Clean Water and Sanitation).

3.5 Implementation Challenges

Despite its overall success, the implementation of mobile toilets in T.N. Palayam Panchayat encountered several technical, operational, and social challenges that influenced the long-term sustainability of the system.

a) Operational and Maintenance Issues

The mobile units required regular cleaning, waste collection, and bio-digester monitoring. However, the Panchayat faced difficulties due to limited manpower and irregular maintenance schedules. In certain instances, waste overflow and odor issues were observed when desludging was delayed. Availability of spare parts, cleaning agents, and water supply for washing also varied seasonally.

b) Financial Constraints

Operational costs such as fuel for transport, cleaning supplies, and salary for sanitation workers created a financial burden on the Panchayat budget. Although initial funding was supported through government grants, the absence of a consistent revenue model (such as user fees or PPP-based support) hindered continuous operation. This highlights the need for a sustainable financial plan for long-term functionality.

c) Public Awareness and Behavioral Barriers

Initial resistance among local residents was observed due to cultural stigma and lack of awareness about mobile toilets. Some users associated shared mobile

toilets with poor hygiene. Awareness campaigns conducted by the local health department and NGOs were crucial in improving acceptance. Continuous education on sanitation benefits and personal hygiene is still required to achieve behavioral change at the community level.

d) Logistical and Technical Limitations

Transporting the mobile units to remote habitations posed logistical difficulties due to poor road access and limited vehicle availability. Additionally, the bio-digester performance was occasionally affected by improper usage such as disposal of solid waste or plastic materials inside the toilets, which disrupted microbial activity.

e) Institutional and Administrative Challenges

Lack of proper coordination between the Panchayat, sanitation workers, and local NGOs resulted in delays in service delivery. The absence of a dedicated management cell or supervision mechanism also affected accountability. Training programs for operators and regular monitoring systems were found essential for effective management.

f) Recommendations for Improvement

To overcome these challenges, the study suggests:

- Formation of village-level sanitation committees for supervision and feedback.
- Establishment of a PPP (Public-Private Partnership) framework for maintenance and cost-sharing.
- Introduction of user awareness and training programs to ensure responsible usage.
- Implementation of a digital tracking system for monitoring waste collection, cleaning schedules, and tank performance.
- Periodic evaluation by local health authorities to ensure hygiene compliance and efficiency.

IV. CONCLUSION

The study demonstrates that mobile sanitation units can play a crucial role in enhancing public health and sanitation behavior in rural communities such as T.N. Palayam Panchayat. The intervention led to increased toilet usage, reduced disease prevalence, and improved environmental conditions.

However, the success of such systems depends on effective management, maintenance, and community participation. Integrating mobile toilets with broader sanitation policies under Swachh Bharat Mission and involving local self-help groups for maintenance could make the initiative more sustainable.

Thus, mobile sanitation stands as a feasible, scalable, and sustainable approach to achieving inclusive sanitation in rural India.

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