



Improving Safely Managed Fecal Sludge Management in Tabek Village Through a Community-Led Total Sanitation (CLTS) Approach

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ABSTRACT

Ownership of sanitation facilities does not necessarily guarantee the achievement of safely managed sanitation if it is not accompanied by adequate fecal sludge management. This condition is still prevalent in Tabek Village, Dharmasraya Regency, where all households have septic tanks, yet none have ever been desludged, increasing risks of leakage, groundwater contamination, and environment-based diseases. This community service activity aimed to increase public awareness and commitment to safely managed sanitation through the community-led total sanitation (CLTS) approach. Participatory triggering based on participatory rural appraisal (PRA) included sanitation mapping, transect walks, fecal volume calculations, contamination route analysis, and social contracts. The activity involved 25 community representatives assisted by sanitarians from the local health center and health office. Results showed that 15 septic tanks lacked manholes, and none had been emptied due to limited knowledge and lack of information on desludging services. Visual and emotional triggering led to a collective commitment to desludge septic tanks between January and April 2026. This activity demonstrates that the CLTS approach is effective in shifting community paradigms from merely owning facilities to actively managing safe sanitation.

Keywords: CLTS, fecal sludge management, PRA, safely managed sanitation, triggering, SDGs, community empowerment

INTRODUCTION

Achieving access to safely managed sanitation is a crucial target of sustainable development goals (SDGs) 6.2 to ensure public health and environmental sustainability. The world health organization (WHO) defines safely managed sanitation as the use of an improved sanitation facility that is not shared with other households and where excreta are safely disposed of in situ or transported and treated at a designated fecal sludge treatment facility (WHO, 2018). Nationally, the Indonesian government established the National Strategy for community-led total sanitation (CLTS) through the Regulation of the Minister of Health No. 3 of 2014. This regulation emphasizes five pillars of behavior change, with the first pillar focusing on ending open defecation (OD) to break the chain of environment-based disease transmission. While data indicates an increasing trend in basic sanitation access in West Sumatra Province, the primary challenge has shifted from infrastructure provision to safe and sustainable sanitation management (BPS, 2024).

Problem identification in Tabek Village, Dharmasraya Regency, there is a significant gap between facility ownership and maintenance behavior. According to data from the

Dharmasraya Regency Health Office, Tabek Village has achieved open defecation free (ODF) status, reflected by the fact that 100% of the community has ceased open defecation practices. However, this achievement has not been followed by safely managed fecal sludge management; it was identified that not a single household has performed regular septic tank desludging (Dharmasraya Regency Health Office, 2025). This gap is rooted in low psychosocial risk perception and the normalization of neglected septic tanks, which scientifically poses a high risk of groundwater contamination and triggers the burden of disease (Cameron et al., 2013; Nastiti et al., 2025).

Previous literature has frequently focused on the transition from open defecation to latrine ownership (Ermayendri, 2017; Zahtamal et al., 2022). However, a systematic review by Venkataramanan et al. (2018) indicates that the success of behavior change approaches such as CLTS is not only measured by the construction of physical facilities but is also heavily influenced by construction quality and post-triggering factors. There remains a limited number of studies regarding the triggering of septic tank desludging behavior among communities that already possess physical facilities but face technical barriers and limited service information.

The conceptual framework of this activity is based on the CLTS theory, which emphasizes mobilizing internal motivation through collective responsibility without reliance on physical subsidies (Kar et al., 2008). This approach is integrated with the strengthening of social dynamics and local social capital to ensure the sustainability of intention into concrete action (Susilo et al., 2020). Given the risk of behavior change failure without adequate monitoring and service support (Venkataramanan et al., 2018; Sari et al., 2019), this community service fills that gap by integrating emotional triggering with a measurable commitment to follow-up plans.

Therefore, this community service activity is conducted as an effort to shift the village status from open defecation free to a safely managed sanitation village. The primary objective is to increase the critical awareness of the community in Tabek Village regarding the importance of fecal sludge management and to build a concrete commitment among residents to perform regular septic tank desludging for the sake of environmental health sustainability.

METHOD

This community service activity was conducted in Tabek Village, Timpeh Sub-district, Dharmasraya Regency, as it represents an area with relatively good access to sanitation infrastructure but remains at risk of environmental contamination due to low levels of facility maintenance. The activity involved 25 participants representing local households, supported by a facilitation team consisting of sanitarians from the Tabek Village Public Health Center. The triggering activities were facilitated by one sanitarian from Timpeh Community Health Center, one representative from the Dharmasraya Regency Health Office, and one student from the Master's Program in Environmental Engineering, and were conducted on December 13, 2025.

The implementation method referred to the National Community-Based Total Sanitation (Sanitasi Total Berbasis Masyarakat; STBM) Strategy as outlined in the Minister of Health Regulation No. 3 of 2014, integrating participatory rural appraisal (PRA) techniques to encourage community self-analysis (Kar et al., 2008; Ministry of Health, 2014). The technical steps of the triggering process were conducted systematically as follows: (1) Sanitation Mapping to visualize the spatial distribution of septic tanks; (2) Transect Walk to physically inspect the condition of tanks and the absence of manholes; (3) Fecal Volume Calculation to simulate the total waste accumulated over years; and (4) Contamination Route Analysis using the F-Diagram (feces, fingers, flies, fields, fluids, and food) to demonstrate

how untreated sludge reaches the community. The tools and materials used included triggering instruments standardized by the CLTS Handbook (Kar et al., 2008), such as flipchart paper (plano), markers, stationery, and simulation props to demonstrate fecal contamination routes.

This activity focused on participatory awareness building and social commitment formation through collective self-analysis. While no formal quantitative pre- and post-tests were administered, evaluation was conducted through participatory observation of the community's emotional shifts and the formalization of a Social Contract as a measurable commitment. It is acknowledged that long-term behavioral impact and the actual implementation of desludging will require sustained follow-up monitoring beyond this initial intervention.

RESULTS AND DISCUSSION

The community service activity was conducted using the CLTS approach through a systematic sequence of stages, including: (1) meeting introduction, (2) sanitation mapping, (3) transect walk, (4) fecal volume calculation (5) contamination route analysis, and (6) social contract. These stages aimed to progressively build the community's critical awareness regarding existing sanitation conditions and environmental health risks.

1. Introductory Phase

The community service activity in Tabek Village commenced with an introductory phase, consisting of facilitators introductions and an ice-breaking session to build rapport and reduce social distance between facilitators and participants. This stage was designed to create an open and participatory discussion environment, ensuring that community members felt comfortable expressing their views and experiences regarding their current sanitation conditions (Figure 1).



Figure 1. Introductory pahes and ice breaking

2. Sanitation Mapping

Sanitation mapping was conducted participatively by involving all participants to illustrate the condition of their settlement on large flipchart paper. The facilitator first explained the purpose of mapping, which was to identify the spatial relationship between residences, water sources, and sanitation facilities. Participants then drew a sketch of the residential area based on their daily knowledge and experiences.

During the mapping process, each sanitation element was marked using different colored papers to facilitate visual identification. Houses were marked with pink paper, water sources (wells) with blue paper, and septic tanks with yellow paper. This color-coded visual approach helped participants directly recognize the proximity between septic tanks and water sources, as well as the potential risks of environmental contamination (Figure 2)



Figure 2. Sanitation mapping

The mapping results revealed that all participants already possessed septic tanks; however, these facilities were not equipped with soak pits or drainage fields, and 15 units lacked inspection holes (manholes). This condition indicates that while physical sanitation access is categorized as "improved," the existing septic tanks do not meet the technical specifications of SNI 2398:2017 (BSN, 2017). This finding is consistent with the studies by Sari et al. (2019) and Ermayendri (2017), which reported that latrine ownership in rural areas is often not accompanied by septic tank construction that adheres to technical standards.

3. Transect Walk

The transect walk stage was conducted to verify the sanitation mapping results through direct observation of the participants' residential environment. Together with the community, facilitators followed a predetermined route based on the map to observe the physical condition of septic tanks, their distance from water sources, and the availability of maintenance access, such as inspection holes (manholes).

The field findings revealed that none of the participants' septic tanks had ever been emptied since their initial construction. Additionally, the lack of maintenance access significantly complicates the process of regular fecal sludge management. These field observations corroborated the previous mapping results and provided visual evidence of the community's existing sanitation facilities.

During the transect walk discussions, participants stated that the primary reasons for not desludging their septic tanks were a lack of awareness regarding the importance of regular desludging, the absence of information concerning desludging services in Tabek Village, and concerns regarding high costs. This condition is consistent with the findings of Sari et al. (2019), who reported that limited knowledge, lack of access to sanitation service information, and insufficient maintenance funds are the main barriers to behavioral change in sanitation management in both urban and rural areas of Indonesia.

4. Fecal Volume Calculation

The fecal load calculation was conducted as part of the triggering process to help participants understand the significant volume of waste generated and accumulated within their residential environment if not managed safely. Facilitators guided participants through a simple simulation using the assumption that human fecal production ranges from 100–250 grams per person per day (Farage et al., 2014).

Based on the discussion, it was assumed that each household consists of an average of four people. Consequently, the 25 participating households produce approximately 10–25 kg of feces per day. Over the course of one year, this amount is equivalent to roughly 3.6–9.1

tons of feces stored within septic tanks that have never been emptied. The results of this calculation triggered an emotional response from the participants, who realized that the long-term accumulation of fecal sludge poses significant, albeit invisible, environmental health risks.

5. Contamination Route Analysis

The contamination route analysis was conducted as part of the triggering process to help the community understand the transmission pathways of pathogens from feces to the human body. At this stage, facilitators used the F-Diagram approach to illustrate the relationship between feces, the environment, and humans. Participants actively identified potential contamination pathways occurring in their residential environment based on the sanitation conditions observed in the previous stages (Figure 3).



Figure 3. Identification of contamination routes

The contamination route mapping conducted by participants demonstrated that fecal sludge stored in septic tanks that are never emptied has the potential to contaminate the surrounding soil and groundwater. This contamination can be transmitted through water used for daily needs, originating from both wells and piped networks at risk of leakage. Additionally, participants identified contamination pathways through unhygienic hands, insects, and environmental surfaces frequently in contact with daily activities.

Prior to the triggering activity, most participants were unaware of the direct link between fecal sludge management and health risks. Following the contamination route mapping process, participants were able to explain how contamination enters the human body and causes environment-based diseases, such as diarrhea, as well as how to break the chain of contamination. This finding is consistent with the research by Nastiti et al. (2025), which indicates that increasing risk perception through participatory approaches can drive changes in public sanitation awareness and behavior. These results also reinforce the findings of Cameron et al. (2013), who stated that understanding contamination pathways is a critical factor in the success of community-based sanitation interventions.

6. Social Contract

The social contract is the final stage of the triggering process, aimed at ensuring a collective commitment from the community to improve unsafe sanitation practices. In this community service activity, the social contract was established after participants understood the existing sanitation conditions, the risks of contamination pathways, and the health impacts resulting from improper fecal sludge management.

The discussion results showed that all participants agreed that septic tanks that are never emptied have the potential to cause environmental pollution and health risks. This awareness prompted participants to declare a collective commitment, in both verbal and written forms, to perform regular septic tank desludging. Participants agreed that the

desludging activities would commence between January and April 2026, utilizing available desludging services through coordination with the local government and the community health center (Puskesmas) (Figure 4).



Figure 4. Social contract of the Tabek Village community

This social contract not only reflects increased knowledge but also indicates an initial rise in community awareness and behavioral intention toward safer sanitation practices, and therefore cannot be interpreted as a finalized behavioral change. This finding is consistent with the research by Zahtamal et al. (2022), which states that collective community commitment is a key factor in the sustainability of community-based sanitation programs. Within the CLTS framework, the social contract functions as an initial trigger to strengthen a shared sense of responsibility for sanitation management; however, the translation of this initial commitment into sustained practice requires post-triggering accompaniment, supportive local governance, and continued monitoring. Evidence from systematic reviews further suggests that sanitation behavior change is unlikely to be sustained without follow-up support and enabling institutional arrangements (Macleod et al., 2025). Therefore, the observed shift in awareness in this activity should be interpreted as an early indication of behavioral change potential, which still depends on subsequent facilitation and service readiness. Furthermore, the social contract approach in CLTS has proven effective in strengthening a sense of shared responsibility for sanitation management (Ministry of Health, 2014).

Nonetheless, the implementation of this social contract still faces limitations, particularly regarding the readiness of desludging services and the financial capacity of some community members. Therefore, continuous assistance and cross-sectoral support are required to ensure that the agreed commitments can be realized and sustained in the long term.

The findings in Tabek Village indicate that the primary barrier to safely managed sanitation access is not economic factors, but rather psychosocial and cognitive factors. This is consistent with research by Nastiti et al. (2025), which states that distorted risk perception is a major obstacle to septic tank maintenance. Through the CLTS method, the feelings of disgust and fear triggered during the "fecal volume calculation" successfully dismantled the community's normalization of neglected sanitation facilities.

Implementation and Challenges

This represents a crucial step toward meeting the SDG 6.2 target for safely managed sanitation. Although the triggering process successfully built behavioral intention, significant challenges remain in the post-triggering implementation phase. These challenges include:

- a. Service Access: A lack of information regarding available desludging service providers in Dharmasraya Regency.
- b. Technical Constraints: Most residents' septic tanks lack inspection holes (manholes), which complicates the mechanical desludging process.
- c. Cost: Concerns among residents regarding costs that are perceived as high for certain household groups.

Activity Impacts

The direct impact of this community service was an increase in residents' critical awareness, as indicated by the establishment of a social contract as an initial form of commitment toward safer sanitation practices. To maintain the results of the intervention, STBM monitoring volunteers have been formed at the village level to oversee the implementation of the residents' follow-up plans. These efforts are strengthened by coordination with village officials to integrate desludging services into the village environmental health program, in accordance with the spirit of the Minister of Health Regulation No. 3 of 2014 concerning community empowerment in STBM. This coordination involves integrating community commitments into the environmental health agenda at the village level.

Limitations and Recommendations

This community service has several limitations, including the small number of subjects (25 households) and the absence of laboratory-based biological impact measurements (such as well water quality) after the desludging process. For future activities, it is recommended to expand the scope of triggering to the district level and involve the Environmental Agency to ensure that the fecal sludge service chain—from transportation to treatment at the fecal sludge treatment plant (FSTP)—is adequately available.

CONCLUSION

Based on the results of the community service activities conducted, it can be concluded that the implementation of the CLTS approach through PRA techniques has significantly shifted the paradigm of the community in Tabek Village from merely owning sanitation facilities to actively managing safe sanitation. This activity has successfully achieved its primary objective: increasing critical awareness regarding the importance of fecal sludge management, which had previously been neglected due to a lack of information and the normalization of groundwater contamination risks. The emergence of collective commitment through social contracts serves as an indicator of the success of emotional triggering in mobilizing community responsibility to independently break the chain of environmental contamination.

To ensure program sustainability and the realization of community commitments, policy support from the government is required in the form of local regulations governing mandatory periodic septic tank maintenance. Furthermore, it is recommended to strengthen collaboration with desludging service providers to facilitate community needs post-triggering, particularly for households facing technical constraints in their sanitation facility construction. Regular monitoring by local health volunteers remain the primary key to ensuring that the motivation built does not fade, so that the transformation toward a village with safely managed sanitation access can be achieved permanently and comprehensively.

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