

## COMMUNITY CONSCIOUSNESS AND SUSTAINABLE SANITATION: CONTRIBUTING TO SDG 6 TARGETS IN RURAL REGIONS

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### ABSTRACT

**Purpose:** Access to improved sanitation is a key indicator in achieving the Sustainable Development Goals (SDGs), particularly SDG 6.2, which targets universal and equitable access to safe and sustainable sanitation services. This study aims to assess the sanitation conditions in three districts of North Sulawesi—Minahasa, South Minahasa, and North Minahasa—by examining the availability of latrines and septic tanks in both permanent and non-permanent households.

**Theoretical Framework:** The study is based on the Community-Based Total Sanitation (STBM) approach, which comprises five key pillars and emphasizes community involvement and behavioral change to achieve sustainable sanitation outcomes.

**Methodology:** A descriptive-quantitative research design was applied, utilizing primary field data on household sanitation infrastructure, disaggregated by housing type. The data were collected through surveys and field observations to evaluate disparities in sanitation access.

**Findings and Discussion:** The results indicate that permanent households demonstrate high access to basic sanitation facilities (90-97%). However, significant gaps remain among non-permanent households, particularly in South Minahasa, where 10% of homes lack adequate sanitation. These findings underscore a persistent inequality that requires targeted policy and programmatic responses.

**Research Implications:** This study recommends reinforcing STBM implementation through public education, infrastructure enhancement, and regular monitoring to close the sanitation access gap and accelerate progress toward national and global targets.

**Originality/Value:** This research contributes original insights into localized sanitation disparities and highlights the critical role of community-based strategies in promoting equitable and sustainable sanitation development.

**Keywords:** sanitation, STBM, SDG 6.2, latrine, septic tank, sustainable development, sustainable development goals (SDGs).

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### 1 INTRODUCTION

Adequate sanitation forms a crucial foundation for public health, environmental well-being, and overall sustainable development. Sanitation is

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critical to maintaining public health and environmental integrity (Tumwebaze and Niwagaba, 2013). Among various sanitation solutions, well-managed septic tank systems offer an effective and decentralized approach for domestic wastewater treatment, particularly in rural regions where centralized treatment infrastructure is often limited or non-existent (WHO/UNICEF, 2019). The lack of access to safe sanitation, including effective wastewater treatment systems like septic tanks, significantly contributes to the spread of waterborne diseases, malnutrition, and a diminished quality of life, disproportionately affecting populations in rural areas (UNICEF, 2021).

Indonesia, an archipelago comprising thousands of islands, has numerous rural areas. Rural contexts are often characterized by lower population densities and dispersed geographies, making the implementation of expensive and complex centralized wastewater treatment systems challenging. North Sulawesi Province, located at the tip of the Sulawesi island peninsula, is 1 of the 36 provinces in Indonesia. The administrative region of North Sulawesi is divided into 4 cities and 11 regencies with 1,664 villages/urban villages ([https://id.wikipedia.org/wiki/Sulawesi\\_Utara](https://id.wikipedia.org/wiki/Sulawesi_Utara)). In many rural areas, the availability of sanitation facilities, particularly septic tanks, poses a significant challenge in efforts to improve living standards and well-being. Minahasa Regency, North Minahasa Regency, and other regencies, as developing rural areas, are experiencing significant population growth, accompanied by an increase in domestic waste.

Rural areas often face limited access to adequate sanitation services, including septic tank facilities. This condition can have serious impacts on public health, leading to the spread of diseases and damaging groundwater quality and the surrounding environment (Pranata, 2012), (Wardhana, 2004). Therefore, an in-depth understanding of the availability of septic tank facilities in rural Minahasa Regency, North Minahasa Regency, and other regencies is crucial for designing policies and programs that align with local needs and challenges.

In these scenarios, appropriately designed and maintained septic tanks offer a viable and cost-effective solution for treating domestic wastewater at the household or small community level. The natural processes within septic





tanks allow for the separation of solids and partial decomposition of organic matter before the relatively cleaner effluent is released into the environment, reducing the risk of contamination to groundwater and surface water sources (Mara, 2003).

Despite the recognized potential of septic tanks in improving rural sanitation, their availability and utilization often face various constraints. Factors such as the initial construction costs, lack of public awareness regarding the importance of safe sanitation, land limitations, and the absence of technical guidance and institutional support can hinder the widespread adoption of these systems (Jenkins & Scott, 2007). Furthermore, improper design, construction, and maintenance of septic tanks can pose new environmental and health risks, such as groundwater contamination by nitrates and pathogens (Foster & Chilton, 2003).

Therefore, this study aims to comprehensively examine the significance of the availability of adequate septic tank facilities in rural areas as a crucial component in improving public health and achieving the Sustainable Development Goals (SDGs), particularly SDG 6 concerning clean water and sanitation. Through an in-depth analysis of the challenges and opportunities associated with the implementation of septic tank systems in rural settings, this research seeks to identify effective strategies for enhancing access, utilization, and sustainable management of septic tanks, ultimately contributing to the improved quality of life and well-being of rural communities.

## 2 THEORETICAL FRAMEWORK

This study examining the significance of septic tank availability in rural areas for public health and sustainable development will be guided by a synthesis of several interconnected theoretical perspectives:

2.1 The Health Belief Model (HBM): This model posits that an individual's likelihood of adopting a health-protective behavior, such as utilizing and maintaining a septic tank, is influenced by their perceptions of susceptibility to a disease, the perceived severity of the disease, the perceived benefits of taking action, and the perceived barriers to taking action (Rosenstock, 1966).



In the context of this study, the HBM helps to understand how rural communities' awareness and beliefs about waterborne diseases and the effectiveness of septic tanks in preventing them influence their adoption and consistent use of these facilities. It also highlights the role of perceived barriers, such as cost or lack of knowledge, in hindering adoption.

**2.2 The Theory of Planned Behavior (TPB):** Extending the HBM, the TPB suggests that behavioral intention is the most proximal determinant of behavior. Intention, in turn, is influenced by three factors: attitude toward the behavior (positive or negative evaluation), subjective norms (perceived social pressure to perform or not perform the behavior), and perceived behavioral control (individual's belief about their ability to perform the behavior) (Ajzen, 1991). This framework is relevant for understanding how community attitudes towards septic tanks, social norms within rural communities regarding sanitation practices, and individuals' perceived control over constructing and maintaining septic tanks affect their adoption and use.

**2.3 The Capability, Opportunity, Motivation-Behavior (COM-B) System:** This framework offers a broader perspective on behavior change by suggesting that any behavior (B) is a result of the interaction between an individual's Capability (C), Opportunity (O), and Motivation (M) (Michie et al., 2011). Capability includes physical and psychological abilities to engage in the behavior. Opportunity encompasses physical and social factors that enable the behavior. Motivation involves reflective (conscious evaluations and plans) and automatic (emotions and habits) processes that drive behavior. Applying COM-B to this study helps identify the specific capabilities (e.g., knowledge, skills), opportunities (e.g., access to resources, infrastructure), and motivations (e.g., health concerns, social norms) that influence the adoption and consistent use of septic tanks in rural areas.

**2.4 Sustainable Development Goals (SDGs) Framework:** This overarching framework, particularly SDG 6 (Clean Water and Sanitation), provides the broader context for understanding the importance of adequate sanitation. SDG 6 aims to ensure availability and sustainable management of water and sanitation for all. The provision and proper use of septic tanks in rural areas directly contribute to achieving the targets of SDG 6, such as improving water



quality by reducing pollution and wastewater discharge, and ensuring access to adequate and equitable sanitation and hygiene for all (United Nations, 2015). This framework underscores the macro-level significance of the research topic and its contribution to global development agendas.

### 3 METHODOLOGY

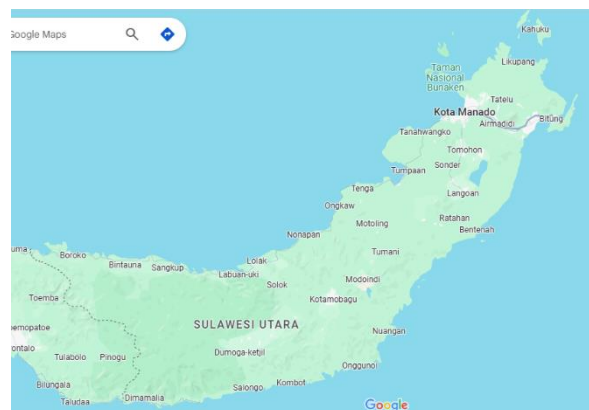
#### 3.1 TIME AND LOCATION OF STUDY

This study was conducted in selected villages across three regencies: Minahasa, South Minahasa, and North Minahasa, located in North Sulawesi Province, Indonesia. The selection of villages was carried out using a random sampling method, based on the assumption that the villages within these regencies share similar characteristics in terms of settlement patterns, accessibility, and basic sanitation conditions.

The research was carried out over a period of two months, from January to February 2025.

**Figure 1**

*Map of North Sulawesi*



Source:  
([https://www.google.com/maps/@1.2925594,124.7043677,9.5z?entry=ttu&g\\_ep=EgoyMDI1MDUxNS4xIKXMDSoASAFQAw%3D%3D](https://www.google.com/maps/@1.2925594,124.7043677,9.5z?entry=ttu&g_ep=EgoyMDI1MDUxNS4xIKXMDSoASAFQAw%3D%3D))





## 3.2 RESEARCH METHODS

This research utilized a qualitative descriptive approach, primarily through **field observations** and **semi-structured interviews**.

### 3.2.1 Field observation

Direct observations were conducted to assess the physical conditions of housing and sanitation facilities, particularly the availability of household latrines and septic tanks. Observers also noted the condition of the surrounding environment, including drainage systems and the proximity of latrines to water sources.

### 3.2.2 Interviews

Semi-structured interviews were conducted with household heads or occupants, as well as with local village officials. The interview instrument consisted of open-ended questions to allow for more in-depth responses. Key topics explored through the interviews included:

- Availability of household latrines;
- Public awareness and attitudes regarding the use of latrines;
- Common defecation practices among households without latrines;
- Local government efforts or programs to promote sanitation awareness and the use of household latrines.

The collected data were analyzed descriptively to identify sanitation conditions and challenges in rural areas of the Minahasa region, and to evaluate their alignment with national sanitation programs and the targets set by the Sustainable Development Goals (SDGs).



## 4 RESULTS AND DISCUSSIONS

### 4.1 RESULTS

Based on the field research and data collection, the following results were obtained:

**Table 1**

*Research Result*

District	Permanent Housing with Septic Tank (%)	Non-Permanent Housing without Septic Tank (%)
Minahasa	95%	5%
South Minahasa	90%	10%
North Minahasa	97%	3%

Field observations revealed that permanent houses are typically equipped with private household latrines located inside the home. Excreta are managed using simple yet watertight septic tanks. In contrast, non-permanent houses often lack both private latrines and septic tanks. Among the approximately 10% of households without private sanitation facilities, around 90% rely on shared communal latrines connected to basic septic systems. The remaining portion still practice open defecation, typically in gardens or nearby rivers.

North Minahasa ranks highest in sanitation coverage, followed by Minahasa and South Minahasa. These findings suggest regional disparities in the implementation of sanitation infrastructure and programs.

### 4.2 DISCUSSION

Access to adequate and safe sanitation is a crucial indicator in achieving the Sustainable Development Goals (SDGs), particularly **SDG 6**, which targets universal access to clean water and sanitation. This study assessed the availability of latrines and septic tanks in both permanent and non-permanent housing across three districts in North Sulawesi—Minahasa, South Minahasa, and North Minahasa—and contextualized the findings within the framework of





national programs such as the **Community-Based Total Sanitation (STBM)** initiative and the **National Medium-Term Development Plan (RPJMN) 2020-2024**.

The results highlight a sanitation gap that requires targeted and strategic interventions to ensure both national and global goals are met. Specifically, **SDG 6.2** states:

“By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.”

While septic tanks are recognized as a viable solution for improving rural sanitation, their availability and utilization face multiple challenges. These include high initial construction costs, limited public awareness about the importance of safe sanitation, land constraints, and the lack of technical guidance and institutional support (Jenkins & Scott, 2007). Furthermore, improper design, construction, and maintenance of septic tanks can result in new environmental and health risks, such as groundwater contamination with nitrates and pathogens (Foster & Chilton, 2003).

Therefore, this study aims to comprehensively examine the importance of septic tank availability in rural areas as a vital component in improving public health and achieving the SDG 6 targets. Through an in-depth analysis of the challenges and opportunities associated with septic tank implementation in rural settings, the study seeks to identify effective strategies for enhancing access, utilization, and sustainable management of septic systems—ultimately contributing to the improved quality of life and well-being of rural communities.

#### Health and Policy Implications

- Non-permanent houses with minimal sanitation access are the main targets of government and NGO interventions.
- Educational programs and technical assistance are needed for the construction of healthy toilets and septic tanks.
- Household-based sanitation mapping must be strengthened so that interventions can be more targeted.

#### Compliance with National Programs: STBM and RPJMN



## STBM (Community-Based Total Sanitation) Program

STBM has 5 main pillars:

### 4.2.1 Stop open defecation

Stop the practice of defecating in open places such as rivers, gardens, or rice fields. The main goal is to prevent the spread of disease through environmental contamination.

Example:

- Villagers who previously defecated in rivers, now build healthy toilets in their homes.
- Assistance program for residents to make simple toilets from local materials (cement, used drums, etc.).

### 4.2.2 Washing hands with soap

Encourage the habit of washing hands with soap at 5 important times:

- After defecating
- Before eating
- Before breastfeeding or feeding children
- After cleaning children
- Before preparing food
- Installing handwashing facilities near toilets and kitchens.
- CTPS campaigns in schools with educational songs and posters.
- Using used jerrycans as containers for handwashing water ("tippy tap" model).

### 4.2.3 Household drinking water management

Ensure that the water consumed by the family has gone through a processing process to be safe from biological and chemical contamination.

Example:



- The community uses slow sand filters, boils water, or uses chlorine before drinking.
- Implementation of drinking water storage in closed containers to prevent contamination.

#### 4.2.4 Household waste management

Regulate the disposal and sorting of waste from its source so that it does not pollute the environment and cause disease.

Example:

- Sorting organic waste (food scraps, leaves) to be made into compost.
- Inorganic waste such as plastic bottles is sold or recycled.

Creation of a waste bank at the RT/RW or village level

#### 4.2.5 Management of household liquid waste

Regulate the disposal of wastewater such as washing water, bathing water, and kitchen water so that it does not pollute the environment.

Example:

- Creation of household wastewater channels (greywater) leading to infiltration wells.
- Utilization of washing waste to water plants (reuse).
- Creation of environmental drainage systems with natural filters (stones, gravel, sand).

## 5 CONCLUSION

Based on the results of data analysis from Minahasa, South Minahasa, and North Minahasa Regencies, it can be concluded that access to toilets and septic tanks is relatively high among permanent houses, with a percentage above 90%. However, there are still groups of non-permanent houses that do not have basic sanitation facilities, especially in South Minahasa (10%).



This condition shows that although in general the Minahasa Raya region has approached the national target and SDG's in terms of proper sanitation coverage, there are still disparities in access that need to be addressed immediately. The STBM approach, with its five pillars, is very relevant to accelerate the achievement of universal access to sanitation, especially with a focus on behavioral change and community empowerment.

## SUGGESTIONS

1. Focus on vulnerable groups, especially non-permanent houses, in the sanitation access improvement program, with a community-based approach.
2. Expand the STBM program comprehensively, not only in the first pillar, but also in the management of drinking water, liquid waste, and household waste.
3. Increase education and promotion of public health through village cadres, schools, and places of worship to support behavioral change.
4. Support for household-scale sanitation infrastructure through technical assistance and material subsidies for the construction of toilets and simple waste processing systems.
5. Regular monitoring and evaluation to identify progress and obstacles to implementation at the village level, as well as to map areas with inadequate sanitation.

With an inclusive and integrated strategy, it is hoped that all communities in Minahasa Raya can enjoy safe, sustainable, and dignified sanitation services, in line with the spirit of SDG 6 and Indonesia's national development commitments.



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