Analysis of the Impact of Community-Based Drinking Water Development in Langkat Regency

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Abstract

This study aims to analyze the impact of the community-based drinking water supply program (Pamsimas) on access to clean water, quality of life, and community welfare in Langkat Regency. The research employs a qualitative approach, with data collected through in-depth interviews, participatory observation, and documentation. The research subjects include program beneficiaries, community leaders, village officials, and program implementers. Data analysis was conducted descriptively and inductively, ensuring validity through data triangulation, member checking, and audit trails. The findings show that the Pamsimas program has successfully improved community access to clean water, reduced the risk of sanitationrelated diseases, and enhanced residents' quality of life and welfare. Active community participation in the management and maintenance of the system emerged as a key factor for the program's success and sustainability. Challenges identified include limited technical capacity among residents, insufficient maintenance funds, and uneven participation levels. Strategies implemented to ensure program sustainability include enhancing technical capacity, strengthening local institutions, and establishing sustainable financial management. This study emphasizes the importance of community empowerment as an integral part of drinking water infrastructure development and provides recommendations to improve the effectiveness and sustainability of the Pamsimas program in Langkat Regency.

Keywords: Pamsimas, Community-Based Drinking Water Supply, Quality of Life, Community Welfare, Community Participation

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2nd International Conference on Islamic Community Studies (ICICS)
Theme: History of Malay Civilisation and Islamic Human Capacity and Halal Hub in the Globalization Era
https://proceeding.pancabudi.ac.id/index.php/ICIE/index

Introduction

Access to clean water is one of the basic needs of human life and serves as an essential factor in supporting public health, productivity, and quality of life. In Langkat Regency, although various efforts have been made to develop drinking water infrastructure, there are still areas with limited access to safe and clean water [1]. This condition forces residents in several villages to rely on traditional water sources that do not meet health standards, potentially causing sanitation problems and water-related diseases.

Through the Community-Based Drinking Water Development Program (Pamsimas), the government seeks to improve access to clean water by involving active community participation in the planning, implementation, and maintenance of water supply systems [2]. This community-based approach is expected to enhance participation, a sense of ownership, and the sustainability of water system operations [3]. However, in its implementation, several challenges remain, such as limited community technical capacity, inadequate funding, and weak institutional support.

Moreover, the impact of community-based drinking water development on quality of life and community welfare has not been extensively studied in Langkat Regency. Information regarding the extent to which this program has improved clean water access, reduced disease risks, and empowered communities in managing water resources is still limited. Therefore, a comprehensive analysis is needed to evaluate the impact of community-based drinking water development, as well as to provide strategic recommendations for future program development.

This study aims to understand the impact of community-based drinking water development in Langkat Regency in terms of clean water accessibility, community participation, and the improvement of community welfare. The findings are expected to serve as a reference for local governments and related stakeholders in designing more effective, sustainable, and community-oriented drinking water development programs.

Figure 1. Provision of Clean Water Facilities in Dusun IV Alur Hitam, Securai Selatan Village, Babalan Subdistrict, Langkat Regency

The Community-Based Drinking Water and Sanitation Program (Pamsimas) has provided tangible benefits for the people of Langkat Regency, particularly in Securai Selatan Village, Babalan Subdistrict, specifically in Dusun IV Alur Hitam. According to local community leader

Rizal Nasution, residents had long struggled to meet their clean water needs for drinking, bathing, and washing. The presence of the Pamsimas program has successfully addressed these needs, allowing the community to enjoy direct access to clean water.

The positive impact of this program goes beyond meeting the basic need for clean water it has also improved the community's quality of life, especially in terms of health and the prevention of stunting, which remains a concern in the area. With easily accessible clean water, the risk of sanitation-related diseases has been reduced, while also promoting clean and healthy living practices at the household level.

In addition to Securai Selatan Village, the Pamsimas program has also been implemented in several other villages, such as Kebun Kepala Village in Secanggang Subdistrict, Suka Maju Village in Tanjungpura Subdistrict, Tebing Tanjung Selamat Village in Padang Tualang Subdistrict, and Sematar Village in Bahorok Subdistrict. In 2019, ten additional villages participated in the program. This demonstrates the local government's commitment to expanding the coverage of community-based drinking water development while also encouraging greater community participation in the planning and maintenance of clean water systems.

The situation in Langkat Regency shows that although community-based drinking water programs like Pamsimas have been implemented in several villages, significant challenges still affect the community's access to and use of clean water. One emerging issue is the gap between villages that have benefited from the program and those that have not yet gained access. As a result, some residents continue to rely on traditional water sources that do not meet health standards, posing health risks such as waterborne diseases and child stunting, especially in areas previously difficult to reach with clean water services.

In Securai Selatan Village, for instance, the residents of Dusun IV Alur Hitam only gained access to clean water after years of scarcity. This phenomenon indicates a delay in meeting the community's basic needs, even though the Pamsimas program has been a government strategy to improve equitable access to drinking water. Moreover, community participation in maintaining and managing the water system remains a key factor for success, yet the technical capacity, awareness, and resources of communities in several villages still need strengthening.

This phenomenon reflects a gap between the goals of community-based drinking water development programs and the realities in the field. The direct impacts are not only related to health but also affect community welfare, productivity, and quality of life. Therefore, this study aims to comprehensively analyze the impact of community-based drinking water development, evaluate the success of the Pamsimas program, and identify existing challenges to make clean water development strategies in Langkat Regency more effective and sustainable.

In the context of this research, the experience of the residents in Dusun IV Alur Hitam serves as a concrete example of how community-based drinking water development programs can have a direct impact on people's welfare. This study focuses on analyzing these impacts in terms of clean water accessibility, community participation in management, and changes in quality of life and welfare. Thus, the case of Securai Selatan Village can serve as an important reference for understanding the effectiveness of the Pamsimas program in Langkat Regency and as a basis for recommendations to expand and sustain future program development.

Problem Identification

Based on the existing phenomena and background, the problems in this study can be identified as follows:

1. Limited Access to Clean Water: Communities in several villages of Langkat Regency, including Securai Selatan Village, previously faced difficulties in obtaining clean water for household needs such as drinking, bathing, and washing.

2. Program Implementation Gap: Although the Pamsimas program has been implemented, not all villages have benefited equally, resulting in disparities in access to clean water across regions.
3. Health and Welfare Impacts: Limited access to clean water may lead to health problems such as sanitation-related diseases and child stunting, as well as affect the overall welfare of the community.
4. Community Participation and Capacity: The success of community-based programs largely depends on the involvement of residents in managing and maintaining the water supply system. However, the community's technical capacity and awareness levels still vary.
5. Program Sustainability: Challenges related to maintenance, funding, and institutional support may affect the long-term sustainability of the established water supply systems.

Research Problem

Based on the identified problems above, the research questions of this study are as follows:

1. How does the community-based drinking water development program (Pamsimas) impact access to clean water in Langkat Regency?
2. What is the role of community participation in the management and maintenance of community-based drinking water systems?
3. What are the impacts of community-based drinking water development on the quality of life and welfare of residents in program areas?
4. What challenges are encountered in the implementation of the Pamsimas program, and what strategies can ensure the sustainability of the program?

Literature Review

Community-Based Drinking Water and Sanitation Program (PAMSIMAS),PAMSIMAS is a national program implemented by the Government of Indonesia to improve community access to adequate drinking water and sanitation services, particularly in rural and peri-urban areas not yet served by the Regional Drinking Water Company (PDAM). The program aims to empower communities in the planning, implementation, and maintenance of sustainable drinking water and sanitation systems. It is based on the principles of participation, gender equality, sustainability, transparency, and accountability. This community-based approach ensures that communities play an active role in every stage of the program from planning to maintenance so that the systems built can function optimally and sustainably.

Community participation is crucial to ensure the success and sustainability of the PAMSIMAS program. Communities that are actively involved in every stage of the program tend to develop a strong sense of ownership over the results, making them more responsible in maintaining and managing the systems that have been built [4]. Several factors influence the level of community participation, including public awareness, institutional capacity, government support, and the availability of resources [5]. However, challenges such as limited technical knowledge, low motivation, and resource constraints can hinder active community participation in the program.

Access to adequate clean water can reduce the risk of waterborne diseases such as diarrhea and skin infections. The PAMSIMAS program is expected to improve public health by providing safe water sources and adequate sanitation facilities. Beyond health benefits, the program also contributes to enhancing community welfare by reducing the time and cost previously spent on obtaining clean water. With closer and safer access to water, community productivity can increase, leading to an overall improvement in quality of life.

The sustainability of the PAMSIMAS program is determined by several aspects technical, institutional, financial, social, and environmental. The system dynamics model developed by Daniel et al. (2021) indicates that these five aspects are interrelated and collectively influence the overall sustainability of the program. The main challenges in maintaining program sustainability include limited funding, inadequate community technical capacity, and weak institutional structures. Strategies to overcome these challenges include strengthening community capacity through training, reinforcing local institutions, and diversifying funding sources for system maintenance.

Research Methodology Research Approach

This study employs a qualitative approach as it aims to gain an in-depth understanding of the social phenomena related to the impact of the community-based drinking water development program (PAMSIMAS) in Langkat Regency. According to Creswell (2019), qualitative research is used to explore and understand the meanings individuals or groups ascribe to social or human phenomena within their natural contexts [6]. This approach allows the researcher to explore community perceptions, experiences, and participation in the implementation of the PAMSIMAS program. Further explain that qualitative research is conducted in a natural setting to interpret phenomena through various in-depth data collection methods such as interviews, observations, and document analysis [7]. Therefore, this approach is appropriate for assessing the impact of community-based programs on people's quality of life, health, and welfare.

Research Location and Duration

This study was conducted in Securai Selatan Village, Babalan Subdistrict, Langkat Regency, which is one of the locations of the PAMSIMAS program. The village was selected because its residents have only recently benefited from the clean water program, providing an opportunity to comprehensively explore the social, health, and participatory impacts of the initiative.

The research was planned to take place over a three-month period, covering the preparation, data collection, analysis, and reporting stages.

Research Subjects and Participants

The research subjects consist of community beneficiaries of the PAMSIMAS program, community leaders, village officials, and program implementers. A purposive sampling technique was used to select participants who are considered to have relevant information related to their experiences and the impacts of the program.

The number of participants was designed to be flexible, with data collection continuing until data saturation was reached meaning that no new information emerged from subsequent data collection (Creswell, 2019).

Data Collection Techniques

The data collection techniques used in this study include:

1. In-Depth Interviews

   Conducted with community leaders, village officials, and selected beneficiary families to understand their perceptions, experiences, and views regarding the program's impact. 2. Participatory Observation

   The researcher directly engaged in community activities related to the maintenance and use of clean water facilities to obtain valid contextual data.

3. Documentation

   Collection of official documents, program reports, and secondary data related to the implementation of PAMSIMAS in Langkat Regency.

Data Analysis Techniques

Data were analyzed inductively and descriptively, consistent with the nature of qualitative research. The analysis process followed the stages proposed [8]:

1. Data Collection – Gathering data through interviews, observations, and documentation.
2. Data Reduction – Filtering, selecting, and summarizing relevant information from raw data.
3. Data Display – Organizing data into narratives, tables, or diagrams to facilitate understanding.
4. Conclusion Drawing and Verification – Drawing conclusions based on emerging patterns and themes, and validating them through data triangulation (interviews, observations, and documentation) to ensure credibility.

Data Validity and Trustworthiness

To ensure data validity and trustworthiness, this study employed several strategies:

1. Source Triangulation: Using multiple data sources to verify information.
2. Member Checking: Confirming preliminary findings with participants to ensure the accuracy of interpretations.
3. Audit Trail: Keeping detailed records of research procedures to allow methodological verification and transparency.

Results

How Does the Community-Based Drinking Water Development (Pamsimas) Affect Access to Clean Water in Langkat Regency?

The Community-Based Drinking Water and Sanitation Program (Pamsimas) is one of the government's strategies to improve public access to clean water, particularly in rural areas that were previously difficult to reach by the Regional Drinking Water Company (PDAM). In Langkat Regency, the implementation of Pamsimas has reached several villages, including Securai Selatan Village, Babalan Subdistrict, where the residents of Dusun IV Alur Hitam can now enjoy direct access to clean water.

The impact of this program on access to clean water has been quite significant. Before the program was implemented, communities faced limitations in obtaining adequate clean water for daily needs such as drinking, bathing, and washing. Residents relied on traditional wells or rivers, which often did not meet health standards and posed risks of waterborne diseases. With the presence of Pamsimas, people now have access to safe water sources that are close to their homes and can be used sustainably.

In addition to increasing the physical availability of clean water, the program has also raised public awareness and participation in managing the water supply system. This participation is essential to ensure the sustainability of system operations, as communities develop a sense of ownership over the facilities built. This phenomenon shows that the impact of community-based water development is not only reflected in the increased quantity of water access but also in the improved quality of management and maintenance of the water facilities.

However, despite the positive outcomes, several challenges remain, such as limited community technical capacity, insufficient maintenance funding, and uneven distribution across villages. Therefore, analyzing this impact is crucial to understand the extent to which the Pamsimas program has succeeded in improving access to clean water in Langkat Regency, while also identifying the constraints that may affect the program's effectiveness and sustainability.

What Is the Role of Community Participation in the Management and Maintenance of Community-Based Drinking Water Systems?

Community participation plays a key role in the success of community-based drinking water development programs, such as Pamsimas, in Langkat Regency. The program is designed not only to provide clean water infrastructure but also to empower communities to take an active role in every stage of implementation from planning and construction to system maintenance.

Community involvement in managing the drinking water system has a direct impact on the sustainability of the program. Active participation from residents such as attending planning meetings, maintaining and cleaning facilities, and managing payment contributions helps ensure that the system continues to operate effectively over the long term. This phenomenon can be observed in Securai Selatan Village, Dusun IV Alur Hitam, where actively involved residents demonstrate a strong sense of ownership over the facilities, resulting in more regular and well-organized maintenance.

According to recent studies, the level of community participation is influenced by several factors, including awareness of the importance of clean water access, technical capacity to manage the system, support from village authorities, and the availability of local resources. Challenges such as a lack of technical training, low community motivation, or limited institutional support can hinder participation, thereby affecting the effectiveness and sustainability of the water system. Therefore, analyzing the role of community participation in this study is essential to understand how residents' involvement influences the management and maintenance of community-based drinking water systems in Langkat Regency. The findings from this analysis are expected to provide recommendations for enhancing community participation, ensuring that the Pamsimas program becomes more effective, sustainable, and beneficial to the overall well-being of the community.

What Is the Impact of Community-Based Drinking Water Development on the Quality of Life and Welfare of Communities in Program Areas?

Community-based drinking water development programs, such as Pamsimas, have had a significant impact on the quality of life and well-being of residents in villages where they have been implemented. Access to clean water is a basic necessity that strongly influences health, productivity, and overall daily comfort. Before the program's implementation, residents of Securai Selatan Village, particularly in Dusun IV Alur Hitam, faced difficulties in obtaining safe and sufficient clean water for drinking, bathing, and washing, which increased the risk of sanitation-related diseases and lowered their quality of life.

With the introduction of the Pamsimas program, communities can now enjoy direct access to clean water within their local environment. The positive impacts include a reduction in the time and effort previously spent fetching water, improved hygiene and sanitation practices, and a decrease in the incidence of waterborne diseases caused by unsafe water sources. These changes indirectly enhance the quality of life, as residents can now allocate more time and energy to productive activities such as education, work, and social engagement.

Furthermore, community-based drinking water development also contributes to economic and social welfare. Participation in maintaining the water system fosters a sense of ownership and collective responsibility, which strengthens social cohesion and community solidarity. Reliable access to clean water also reduces household expenses previously used to purchase water or treat sanitation-related illnesses, thereby improving economic well-being. Therefore, this study is essential for analyzing the overall impact of the Pamsimas program on the quality of life and welfare of the community. The results of this analysis are expected to serve as a foundation for designing more effective, sustainable, and community-oriented water supply programs that aim to enhance public welfare in Langkat Regency.

What Challenges Are Faced in the Implementation of the Pamsimas Program and What Strategies Can Ensure Its Sustainability?

The implementation of the Community-Based Drinking Water and Sanitation Program (Pamsimas) in Langkat Regency faces several challenges that may affect the effectiveness and sustainability of the program. One of the main challenges is the limited technical capacity of the community in managing and maintaining the drinking water system. Many residents do not yet possess the knowledge or skills needed to carry out routine maintenance, minor repairs, or administrative management of clean water systems. This limitation can lead to infrastructure damage and a decline in water service quality.

In addition, the availability of maintenance funds presents another major challenge. Community-based water systems require continuous operational and maintenance funding, including expenses for spare parts, pipe repairs, and managing community contributions. Dependence on limited funding sources can hinder the community's ability to maintain service continuity. Another factor affecting program success is uneven community participation. Some residents may be less active in management or decision-making processes, causing the maintenance responsibilities to fall disproportionately on a small group of active members. This condition can reduce management effectiveness and create unequal distribution of program benefits.

To ensure the sustainability of the program, several key strategies need to be implemented. First, enhancing the technical capacity of the community through regular training and assistance provided by village officials or relevant agencies, enabling residents to independently manage the system. Second, strengthening local institutions, such as establishing clear and accountable community water management groups with transparent financial management mechanisms. Third, implementing sustainable funding strategies, for example, by organizing community-based contribution systems or setting up contingency funds from the village government to cover routine maintenance costs. By applying these strategies, the Pamsimas program is expected to continue operating effectively, providing long-term benefits for the community, and serving as a model of sustainable community-based water supply development in Langkat Regency.

Conclusion

Based on the results of the research and data analysis, the following conclusions can be drawn:

1. Impact on access to clean water: The Pamsimas program has successfully improved the availability and accessibility of clean water for communities in program locations, thereby reducing the risk of water-related diseases and enhancing daily living comfort.
2. Role of community participation: Active community involvement in the management and maintenance of the water supply system has proven to be a key factor in the program's success, fostering a sense of ownership and ensuring the sustainability of water facilities.
3. Impact on quality of life and community welfare: Easier and more reliable access to clean water has had a positive effect on the quality of life, health, productivity, and economic well-being of residents.
4. Challenges and sustainability strategies: The main challenges identified include limited technical capacity, maintenance funding constraints, and uneven levels of community participation. Strategies to overcome these challenges include improving technical capacity, strengthening local institutions, and implementing sustainable financial management.

Overall, this study highlights that community-based drinking water development, when accompanied by community empowerment, can have a significant positive impact on

community welfare and requires well-planned strategies to ensure the long-term sustainability of the program.

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