


Development of SPAM Network in Huta Padang Village, Bandar Pasir Mandoge District

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ABSTRACT

This study aims to research the development of SPAM networks in Huta Padang Village, Bandar Pasir Mandoge District. This study uses a qualitative approach, which aims to understand the phenomenon of the development of the Drinking Water Supply System (SPAM) network in Huta Padang Village, Bandar Pasir Mandoge District. This research is included in the type of qualitative descriptive research. The location of this research was carried out in Huta Padang Village, Bandar Pasir Mandoge District, which is a remote area with challenges in accessing clean water. The data collection techniques in this study include: In-depth Interviews The researcher conducted semi-structured interviews with key sources. Overall, the development of the SPAM network in Huta Padang Village has brought significant and positive changes to the community. Through improving access to clean water, health, economy, and social welfare, this project is an important step in supporting sustainable development in the village. Continuing and expanding initiatives like this will further contribute to the progress of society in the future.

Keyword : Development of SPAM Network and Bandar Pasir Mandoge District

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1. INTRODUCTION

The development of a Drinking Water Supply System (SPAM) in Huta Padang Village, Bandar Pasir Mandoge District, is one of the strategic efforts in increasing community access to clean water. Huta Padang Village has been experiencing limitations in providing proper drinking water, especially in the dry season when natural water sources have experienced a drastic decline. The geographical condition of villages located in mountainous areas with quite limited access causes challenges in providing adequate clean water for residents. Clean water is a basic need that is very important for human survival and improving the quality of life of the community. Limited access to clean water not only has an impact on public health, but also affects the economic and education sectors. Therefore, the development of the SPAM network in Huta Padang Village is expected to provide a sustainable solution to the problem of clean water in this area. The government, through basic infrastructure development programs, including SPAM, has allocated funds and resources to improve access to clean water in rural areas. This program is expected to improve people's living standards and support local economic growth by ensuring the availability of sufficient and quality water.

Asahan Regency is one of the coastal cities on the north coast of Sumatra Island which is a sea crossing from East to West or vice versa. Seeing its very strategic location as a sea route, Asahan Regency has great potential to be used as a port city, trade and the flow of loading and unloading goods from and to other islands, especially neighboring countries such as Malaysia and Singapore. The existence of quite strategic economic potential when viewed from its location, the development of this city can encourage local and regional economic growth. To anticipate the development of a city globally in accordance with the anticipation of free trade The availability of affordable and sustainable water is an important part of every individual living in an urban area. The availability of healthy water will also reduce water borne disease (diseases transmitted through water media) as well as increase productivity and the community's economy. In meeting the needs of clean water for their families, people often have to buy water from water sellers at relatively high prices or look for water from water sources that are quite far from where they live. The development of the Drinking Water Supply System in North Sumatra Province has become a central issue, both urban and rural. With this issue, related to the Government Regulation

of the Republic of Indonesia Number 16 of 2005 concerning the Development of Drinking Water Supply Systems, efforts to improve regional capabilities in the management and development of drinking water infrastructure must be carried out in an integrated and integrated manner, through the synergy of programs at the Central, Provincial and City Government levels, with clear duties and responsibilities of each.

To support the implementation of Presidential Regulation No. 29 of 2009, the Minister of Public Works Regulation No. 21/PRT/M2009 has been issued concerning Technical Guidelines for Investment Feasibility in the Development of Drinking Water Supply Systems and Regulation of the Minister of Finance No. 229/PMK.01/2009 concerning Procedures for the Implementation of Guarantee and Interest Subsidies. Judging from the problem of overlapping drinking water facilities and infrastructure development programs that occurred in the past, a thought is needed to solve these problems systemically. On the other hand, geographical, topographic and geological conditions as well as different aspects of human resources in each region in Indonesia, cause the availability of raw water and different drinking water service conditions can have implications for the implementation of different Intake Development for each region. For this reason, a strong basic concept is needed to ensure the availability of water for the community in accordance with the typology and conditions in the area. The Master Plan for the Development of Drinking Water Supply Systems is the answer to the basis for the development of drinking water with a system or IPA in an area. It is hoped that with the existence of a Drinking Water Supply System Master Plan that meets the requirements of applicable regulations (Permen PU No. 18/2007), it can be the basis for the preparation of a good, sustainable and directed Drinking Water Supply System development program in Asahan Regency.

In the development of the Drinking Water Supply System (SPAM) in Huta Padang Village, Bandar Pasir Mandoge District, there are a number of problems that affect the smooth development process and operational sustainability of the system. Some of the problems faced are as follows: Challenging Geographical Conditions Huta Padang Village is located in a mountainous area with difficult access, especially in the rainy season. The hilly geographical conditions cause challenges in the development of pipeline infrastructure and water distribution. The construction of pipelines that must pass through steep terrain increases construction costs and project completion time. Water resources in Huta Padang Village are limited, especially during the dry season, reducing the availability of water that can be treated for SPAM. Fluctuations in the volume of water from local sources such as springs and rivers are the main challenge to maintain the continuity of clean water supply for the community. Effective management of water resources is necessary to maintain availability throughout the year. Lack of funding for the development of the SPAM network requires considerable costs for the construction, procurement of materials, and operationalization of the system. Although the government has allocated funds through rural infrastructure programs, it is often insufficient to complete the entire project quickly and efficiently. Funding constraints also hinder routine maintenance after the system is operational.

Lack of Community Participation The level of public awareness and participation in the development and maintenance of SPAM is still low. Many people do not understand the importance of preserving water sources and infrastructure that has been built. This lack of involvement can have an impact on the sustainability of the project in the long term due to the lack of maintenance on the part of users. **Technical Barriers in Development** Technical problems such as the availability of raw materials, equipment, and skilled labor are another challenge in the development of SPAM. Limited access to modern technology and difficulty obtaining materials in remote locations slow down construction and reduce project efficiency. **Limited Management Capacity** Once the SPAM system is built, effective management is needed to ensure that the system runs properly. However, in Huta Padang Village, limitations in terms of technical and management expertise are often a problem. Local managers may not have enough ability or knowledge to properly run and maintain a clean water supply system. Climate change also affects the development and sustainability of SPAM in Huta Padang Village. Longer dry seasons and irregular rainfall intensity can affect water availability in local water sources. This poses a risk of drought in the dry season and flooding in the rainy season, which can damage SPAM infrastructure. **Administrative and Licensing Obstacles** The water infrastructure development process is often hampered by administrative constraints, such as land permits, land acquisition, or coordination between agencies. This can slow down the construction process and result in delays in the completion of SPAM projects. **Low Environmental Awareness** Another problem that arises is the lack of environmental awareness among the local community. This can be seen from the lack of attention to the sustainability of water sources and the behavior of littering that can pollute water sources. Without better education and awareness, the sustainability of SPAM can be threatened.

2. LITERATURE REVIEW

Concept of Drinking Water Supply System (SPAM)

The Drinking Water Supply System (SPAM) is a series of technical activities that include raw water extraction, treatment, and distribution of clean water to the community. According to Kodoatie (2020), SPAM is a very important part of public infrastructure to meet basic human needs, namely clean water. SPAM must be well planned so that it can reach the wider community, especially in areas that have limited access to clean water. The development of SPAM also has a long-term goal of improving public welfare and health. According to Sugiyono (2020), the development of SPAM infrastructure in rural areas can encourage local economic growth because the availability of clean water is one of the main supports for various sectors such as agriculture, household industry, and public services.

The Importance of Clean Water in Rural Areas

According to the World Health Organization (2020), clean water and good sanitation are human rights that must be fulfilled by every country to improve the quality of life of its citizens. The availability of clean water in rural areas is often a major challenge due to difficult geographical conditions and limited infrastructure. Effendi (2020) stated that access to clean water in rural areas, including in remote areas such as Huta Padang Village, is crucial because it has a direct impact on public health. Without a good water supply system, people are vulnerable to infectious diseases such as diarrhea, cholera, and skin diseases due to contaminated water.

SPAM Development in Huta Padang Village

The development of SPAM in rural areas, including Huta Padang Village, has received attention from various parties. Hariyanto (2020) emphasized that one of the effective approaches in the development of SPAM in rural areas is community participation. The community must be involved from the planning stage to the operation of SPAM, so that they feel owned and responsible for the sustainability of the system. Prasetyo (2020) stated that the use of local resources in the development of SPAM is also very important. For example, the use of simple technology that is easy for locals to operate and maintain can reduce operational and maintenance costs in the long run. According to Iskandar (2020), the biggest challenge in the development of SPAM in Huta Padang Village is the limitation of infrastructure and accessibility. The location of the village far from the urban center makes the transportation of construction materials expensive and time-consuming. Therefore, careful planning and technical assistance from the government or related organizations are urgently needed.

The Impact of SPAM Development on Rural Communities

The development of SPAM has a significant positive impact on the lives of people in rural areas. According to Wibowo (2020), the provision of clean water through SPAM in rural areas not only improves public health, but also contributes to increasing economic productivity. The availability of clean water allows people to focus more on economic activities such as agriculture, handicrafts, and small-scale trade. Sari (2020) added that access to clean water also improves the level of education. With SPAM, children don't have to spend time fetching water from distant sources, so they have more time to go to school and study. It also reduces the burden on rural women who are usually responsible for fetching water for their families.

3. METHOD APPROACH

This study uses a qualitative approach, which aims to understand the phenomenon of the development of the Drinking Water Supply System (SPAM) network in Huta Padang Village, Bandar Pasir Mandoge District. The qualitative method was chosen because this research wanted to deeply explore the perceptions, experiences, and views of the community and related parties regarding the development of SPAM networks. According to Creswell (2020), a qualitative approach is suitable when researchers want to explore a complex problem and understand the meaning behind a phenomenon.

This research is included in the type of qualitative descriptive research. Sugiyono (2020) said that qualitative descriptive research aims to describe systematically, factually, and accurately about existing

facts. In this case, the research aims to describe the process of developing the SPAM network, the challenges faced, and the impact felt by the people of Huta Padang Village.

The location of this research was carried out in Huta Padang Village, Bandar Pasir Mandoge District, which is a remote area with challenges in accessing clean water. This village was chosen as the research location because it is undergoing the process of developing a SPAM network, allowing researchers to study the phenomenon directly.

The data collection techniques in this study include: In-depth Interviews The researcher conducted semi-structured interviews with key sources. In-depth interviews were used to gain a more detailed understanding of the community's perception of the importance of clean water, the challenges faced during the SPAM development process, and the impact felt after SPAM operates. This interview will also explore the views of the village government and SPAM managers regarding technical and administrative constraints. Participatory Observation Researchers participate in the daily activities of the community related to the use of clean water, both during the construction period and after the SPAM network is operational. These observations allow researchers to understand the social dynamics that occur and how societies adapt to new infrastructure.

The validity of the data in this study is guaranteed through several techniques, namely: Data Triangulation: The use of various data sources (interviews, observations, documentation) to ensure the reliability and validity of the information obtained. Member Check: Verify the results of interviews with sources to ensure that the researcher's interpretation is in accordance with their intentions and views. Peer Debriefing: Researchers discuss with fellow researchers or experts in the same field to evaluate findings and test provisional conclusions. With this qualitative approach, it is hoped that the research can provide a comprehensive understanding of the development of the SPAM network in Huta Padang Village, including the challenges faced and solutions that can be implemented so that the SPAM program runs sustainably.

4. RESULTS AND DISCUSSION

Development Policy and Strategy for Clean Water Access Conditions in Huta Padang Village before the Development of the SPAM Network

In Article 5 of Law No. 7 of 2004 concerning Water Resources, it is stated that the State guarantees the right of everyone to get water for their minimum daily basic needs in order to meet their healthy, clean, and productive lives. Furthermore, Article 40 states: Fulfilling raw water needs for household drinking water is carried out by developing a drinking water supply system (SPAM).

In Article 5 of Government Regulation No.16 of 2005 concerning the Development of SPAM, it is stated that SPAM can be carried out through a piping network system and/or not a piping network.

1. SPAM with a piping network can include raw water units, production units, distribution units, service units and management units.
2. SPAM non-pipeline networks can include: shallow wells, hand pump wells, rainwater collection tanks, water terminals, water tank cars, bottled water installations, or spring protection buildings.
3. SPAM as referred to in paragraph (1) must be managed properly and sustainably.

Drinking water is one of the basic needs for human life, so drinking water must be available with adequate quality and quantity. The mission of SPAM Development as stated in the Minister of Public Works Regulation No.20/PRT/M/2006 concerning National Policies and Strategies for SPAM Development is: Drinking water is enjoyed not only by the poor, but can be enjoyed by low-income people (MBR) at affordable prices. Based on the Minister of Public Works Regulation No.14/PRT/M/2010 concerning Minimum Service Standards in the Field of Public Works and Spatial Planning, it is stated that: the availability of safe access to drinking water through SPAM with a pipeline network and not a protected pipeline network with basic needs of at least 60 liters/person/day.

In general, the hydrological state of the planning area is divided into two types, namely:



Figure 4.1 Water Source

Surface water is water that appears or flows on the surface, such as: springs, lakes, rivers and swamps. For the type of surface water, it is found in Tanjungbalai City in the form of rivers and swamps. The rivers in the Tanjungbalai City area have two large rivers, namely the Asahan River (SWS Asahan managed by BWS Sumatra II) and 16 other tributaries. The current groundwater sources come from shallow groundwater and from deep groundwater. Shallow groundwater is generally of poor quality because it is cloudy, brownish and brackish, this condition is influenced by the quality of existing river water and the number of swamps/puddles. Deep groundwater that is utilized by making drilled wells is generally less potential because of poor quality because it is affected by the high organic content of the soil layer.

The process of treating drinking water raw water into water that meets the requirements of the current drinking water standards, generally includes physical, chemical and biological processes. Drinking water raw water quality standards refer to the Indonesian Government Regulation No.82 dated December 14, 2001 concerning raw water quality standards. As an illustration of the effectiveness of the physical-chemical-biological water treatment process, it can be described qualitatively as follows:

Table 4.1 Effectiveness of Water Treatment Process

Parameters	Water Treatment Process					
	Aeration *)	Coagulation Flocculation **)	Sedimentation *)	Sieve Sand Fast*)	Sieve Sand Slow ***)	Chlorination **)
Womb Oxygen Dissolved	+	0	0	-	--	+
Womb Carbon Dioxide	-	0	0	+	++	+
Reduction Turbidity	0	+++	+	+++	++++	0

Parameters Quality Water	Water Treatment Process					
	Aeration)	Coagulation Flocculation)	Sedimentation)	Sieve Sand Fast*)	Sieve Sand Slow)	Chlorination)
Reduction Water Color	0	++	+	+	++	++
Reduction Taste and Smell	++	+	+	++	++	+
Reduction Bacteria	0	+	++	++	++++	++++
Reduction Iron and Manganese	++	+	+	++++	++++	0
Reduction Material Organic	+	+	++	+++	++++	+++

Source : Various Literature

++++ Positive effects and their enhancement *) Physical processes

0 no effect **) chemical process

_ Negative effects/ reduction ***) physical-biological processes

The guidelines issued are related to the water treatment process, including:

- SNI 6774:2008 Procedures for Planning Water Treatment Plant Package Units
- SNI 6773: 2008 Specification of Water Treatment Plant Package Unit
- Pt T-28-2000-C Procedures for Attaching Chlorine to Science Units
- Guidelines for Operation and Maintenance of SPAM Production Unit, BPP SPAM, 2009

Prior to the development of the Drinking Water Supply System (SPAM) network in Huta Padang Village, the condition of access to clean water generally experienced several obstacles that became a challenge for the community. Here is an overview of the conditions before the development of Limited Water Source SPAMs: Access to clean water may depend on natural water sources such as shallow wells, springs, or rivers whose water quality is not always adequate. Dry seasons often exacerbate these limitations, reducing water availability. Unassured Water Quality: The quality of water from these sources often does not meet clean water standards. Water may be contaminated by sewage, agricultural activities, or other pollution, which can cause health problems, such as water-borne diseases. Long Access Distance: Most residents may have to travel long distances to get clean water, especially for those who live in remote locations in the village. This consumes a lot of time and energy, which reduces productivity. Infrastructure Limitations: Before the SPAM network was built, the village may not have adequate water distribution infrastructure. This makes it difficult to provide consistent water supply to

homes, especially in hard-to-access areas. **Water Access Costs:** If there is a private party that provides clean water, the costs charged to the community can be quite high, especially for low-income families, making access to clean water unaffordable. **Public Health Problems:** With unclean water conditions, the risk of infectious diseases increases. Diseases such as diarrhea, skin, and indigestion can become common problems due to improper water consumption.

Factors Affecting the Development of SPAM Networks in Huta Padang Village

The development of the Drinking Water Supply System (SPAM) in Huta Padang Village, Bandar Pasir Mandoge District, is influenced by various factors, both from a technical and social perspective. The following are some of the main factors that affect the success or failure of the development of the SPAM network in the village. The geographical condition of Huta Padang Village, which is located in a mountainous area, is one of the main factors affecting the development of the SPAM network. Difficult, hilly, and often inaccessible terrain by heavy vehicles complicates the process of infrastructure development, especially the installation of pipelines. According to the results of interviews with project managers, remote locations require more time and cost for transporting materials, thus adding complexity in completing the project. This geographical impact slows down construction and increases the project's operational costs. This is in line with the view of Kodoatie (2020) which states that geographical conditions play an important role in the success of infrastructure projects in rural areas. **Availability of Water Resources** Another important factor is the availability of water resources. Huta Padang Village has a variety of water sources from springs, small rivers, and rainwater. However, this water source experiences seasonal fluctuations. In the dry season, the volume of water decreases drastically, making it a great challenge to maintain a consistent water supply throughout the year.

Funding is also one of the biggest challenges in the development of the SPAM network in Huta Padang Village. Based on the results of interviews with village officials, the funds available for the construction of SPAM are often insufficient to cover all project needs. Although there is an allocation from the central or local government, the funding is not enough to cover the operational, maintenance, and further development costs of the SPAM infrastructure. The level of community participation in the development and maintenance of SPAM is an important factor that affects the sustainability of the project. Based on observations and interviews, the people of Huta Padang Village still have a low level of participation, especially in maintaining and maintaining the infrastructure that has been built. Some residents also do not fully understand the importance of using clean water and maintaining water sources. The support of the village government and coordination with the local government played a big role in the SPAM development process. Based on the results of interviews with village officials, although there is already a national program that supports the development of clean water infrastructure in rural areas, coordination between agencies is sometimes constrained by bureaucracy and limited resources at the local level. In addition, complicated regulations and the length of the licensing process also slow down the project. One of the challenges identified in this study is the capacity of SPAM managers at the local level. Based on interviews with managers, most of them do not have adequate technical expertise in the operation and maintenance of clean water supply systems. This limitation results in technical problems that are not immediately addressed and have the potential to damage infrastructure.

The use of simple technology that suits local conditions is another factor that affects the success of the development of SPAM networks. Based on field observations, most of the infrastructure built uses technology that is easy to operate and maintain by the local community. However, in some cases, the lack of access to more advanced water treatment technology makes the quality of the water produced not always optimal, especially during the dry season. Public awareness of the importance of maintaining water sources and SPAM infrastructure is also an influential factor in the sustainability of the project. Based on focus group discussions (FGD) with residents, many people do not fully understand their role in maintaining the continuity of SPAM. Education about the importance of clean water and sanitation is needed to ensure the system runs smoothly in the long term. From the factors that have been described

above, it can be concluded that the development of the SPAM network in Huta Padang Village is influenced by various aspects, both technical and social. Geographical limitations, funding, water availability, and community support are the dominant factors influencing the success of the project. Therefore, the success of SPAM development depends not only on the development of physical infrastructure, but also on community participation, policy support, and good management.

Assessing the Impact of SPAM Network Development on the Welfare of the Community of Huta Padang Village in Health, Economy, and Social Aspects

Health Impact Improving Health Quality With adequate access to clean water, the risk of infectious diseases associated with polluted water, such as diarrhea, skin infections, and digestive diseases, can be reduced. This contributes directly to the improvement of public health. **Reduction of Water-Based Diseases** Improved access to clean water helps reduce the number of water-based diseases. This can be confirmed through public health data before and after the development of SPAM networks. **Improved Personal and Environmental Hygiene** Clean water allows people to better maintain personal and environmental hygiene, which improves the quality of daily life and supports long-term health.

Economic Impact of Reducing Expenditure on Treatment With the reduction of diseases caused by dirty water, communities can reduce the cost of treatment that previously had to be allocated to preventable diseases. **Increased Productivity** Healthy citizens can work better and be more productive. With less time spent accessing water, they can divert time and energy to other productive economic activities. **Potential for Increased Business and Agriculture** Stable access to clean water can also support local economic activities, such as small businesses that need water or the agricultural sector that can use clean water to increase crop yields.

Social Impact of Improving Quality of Life The availability of clean water around settlements increases the comfort and quality of people's daily lives. **Time Spent Fetching Water Reduced** Before SPAM networks, perhaps most of people's time, especially women and children, was spent fetching water. With SPAM, they have more time for other activities, such as education or work. **Equal Access and Equitable Distribution of Welfare** The SPAM network also contributes to equitable welfare by providing equal access to clean water, not only for people who are close to water sources. **Strengthening Social Solidarity** This project may involve the community in various stages of its planning, which strengthens solidarity and cooperation between citizens.

5. CONCLUSION

The conclusion about the development of the Drinking Water Supply System (SPAM) network in Huta Padang Village, Bandar Pasir Mandoge District can be summarized in several important points as follows:

Increased Access to Clean Water: The development of SPAM networks has significantly improved people's access to clean water. With the availability of adequate infrastructure, people no longer have to depend on water sources that are of poor quality and difficult to access.

Positive Impact on Health: With access to clean water, people experience a reduced risk of waterborne diseases. This contributes to improving public health, reducing the number of water-based diseases, and improving the overall quality of life.

Favorable Economic Impact: Access to clean water allows communities to reduce spending on treatment and increase productivity. The time previously spent collecting water can now be allocated to other productive activities, both in the agricultural sector and small businesses.

Improved Social Welfare: SPAM networks not only have an impact on health and economic aspects, but also improve people's social welfare. Better access to clean water creates convenience, encourages social participation, and strengthens solidarity between citizens.

Community Participation in Development: The development process of a SPAM network involves the active participation of the local community, which not only increases a sense of ownership towards the project but also strengthens social and community ties.

Recommendations for Sustainability: In order for the positive impacts of SPAM network development to be sustained, there needs to be attention to infrastructure maintenance and community counseling on the importance of maintaining cleanliness and water quality. In addition, further development could be considered to include other aspects, such as waste treatment and sanitation.

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