

IMPLEMENTATION OF CLEAN WATER AND SANITATION NETWORK CONSTRUCTION TO IMPROVE THE QUALITY OF LIFE SEA TRIBE COMMUNITIES



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Abstract

The Riau Archipelago is a region consisting of islands surrounded by ocean. One of the inhabitants of the Riau Islands is the sea tribe or sampan tribe. The characteristic of this sea tribe is that they carry out their activities in canoes and move from one strait to another. Tiangwangkang is a small village in the south of Batam Island, to the right of the 1 Barelang Bridge. As an old village, Tiangwangkang has classic problems, namely the availability of clean water and wastewater management. To fulfill one of the SDG goals, namely ensuring the availability and sustainable management of clean water and sanitation for everyone, the Batam City Government has implemented the Construction of Clean Water/Drinking Water Facilities in Tiangwangkang Old Village which is connected to the ATB (now Moya) Main Pipe water source in Trans Barelang Road. This clean water network reaches Lance Island, Panjang Island, Akar Island, and Tanjung Undap via underwater pipes. To overcome the habit of people who defecate directly into the sea, the Batam City Government built communal IPAL sanitation facilities, where each house is connected to a network of wastewater pipes that flow to the Communal IPAL, then the wastewater is processed at the WWTP to produce clear and environmentally friendly water. With the development of infrastructure and the arrangement of Tiangwangkang Old Village, it is hoped that the quality of life of the community will improve, as well as become a comfortable tourist destination for tourists.

Keywords: Clean Water, Implementation, Sanitation Network Construction

INTRODUCTION

Air cleanliness is important for an area (Nusyirwan et al., 2019). One of them is water cleanliness Tiangkawangkan Old Village. The Sea Tribe Community in Tiangkawangkan Old Village, Tembesi Village, Sagulung District, Batam City is a group of sea tribe people who have settled on the coast and live in an environment rich in marine resources. However, for years, they have faced serious challenges regarding access to clean water and adequate sanitation. The quality of life of the Sea Tribe community is limited by the lack of basic infrastructure such as a proper clean water network and adequate sanitation. Tiangkawangkan Old Village is one of the 37 Old Villages in Batam City. Tiangkawangkan Old Village is located in the south of Batam Island, before the King Fisabilllah Bridge or better known as 1st Of Barelang Bridge.

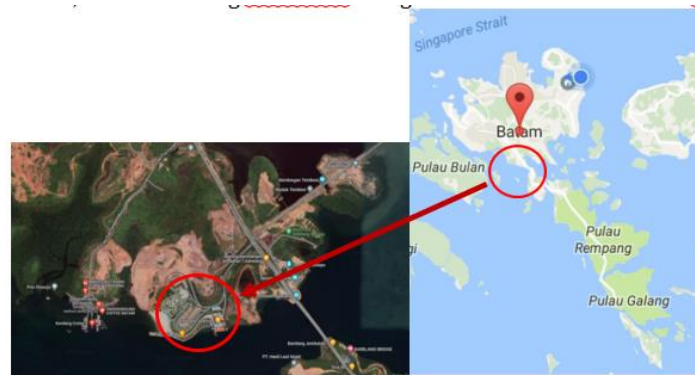


Figure. 1.

Location of Tiangkawangkan Old Village

In order to improve the quality of life of the Sea Tribe community, the government and related institutions have planned and implemented the construction of a clean water and sanitation network in Tiangkawangkan Old Village. This journal aims to document and analyze the implementation of this development and its impact on the quality of life of local communities. Good sanitation management will improve public health (Hargono et al., 2022).

The background to this journal is the need to address the health and environmental problems faced by the Sea Tribe community. Limited access to safe, clean water and adequate sanitation facilities has hurt their health and well-being. The construction of a clean water and sanitation network is expected to provide significant benefits in improving

sanitation conditions, reducing water-related diseases, and overall improving the quality of life of the Sea Tribe community (Rofiana, 2015).



Figure 2.

View of Tiangwangkang Old Village

This journal will likely discuss aspects such as development planning, technical implementation of the project, challenges faced during the process, community participation in the project, as well as the social, health, and economic impacts of these changes. By analyzing the implementation of this project, it is hoped that this journal can provide valuable insights for policymakers, development practitioners, and researchers in efforts to improve the living conditions of the Sea Tribe community and similar communities in coastal areas.

This research was carried out with a very important aim, namely to carry out a comprehensive analysis of the entire series of processes for implementing the construction of clean water and sanitation networks in the Tiangwangkang Old Village area which is located in Tembesi sub-district, Sagulung sub-district, which is an integral part of Batam City; The main focus of this research is to examine the multidimensional impacts including social and economic aspects that occurred as a result of the implementation of the project, and also to measure the significant changes that occurred in the quality of life of the Sea Tribe community after gaining better access to basic infrastructure such as clean water and proper sanitation.

RESEARCH METHOD

This research was conducted using a comprehensive and structured method that includes various stages of analysis. First, literature studies to understand the background

and context of the Sea Tribe community in Tiangwangkang Old Village as well as the history of problems with access to clean water and sanitation. Second, field surveys and observations were carried out to collect actual data about existing conditions before development, including the level of access to clean water, sanitation facilities and public health. Third, a series of interviews with local communities, community leaders, and related parties such as local governments and development institutions were conducted to obtain their views and experiences regarding the development of clean water networks and sanitation. Fourth, the collected data is analyzed with a focus on evaluating project implementation, including planning, technical implementation, costs and impact on local communities. Fifth, the impact of development, both qualitatively and quantitatively, is evaluated by taking into account changes in quality of life, access to clean water, water-related diseases, as well as social and economic changes. In addition, aspects of community participation in all stages of the project are also analyzed (Haldane et al., 2019). The results of this analysis will be used to develop constructive recommendations, with the hope of providing valuable guidance for policymakers, local governments, and development institutions.

RESULTS AND DISCUSSION

Clean Water Management in Tiangwangkang Old Village

To meet the need for clean water supply in Kampung Tua Tiangwangkang as well as nearby islands such as Lance Island, Panjang Island, Akar Island and Tanjung Undap, a sophisticated water supply system has been implemented. This system connects the area with the main water source located on the Trans Barelang Road through the use of the ATB (Moya) pipe. Thus, the supply of clean water is reliable and efficient can be guaranteed.

A grand reservoir with a large capacity of 200 M3 has been built to accommodate clean water from the Trans Barelang Road. From here, the water is then channeled through a network of pipes using powerful pumps to nearby islands (Post et al., 2018). Lance Island received a supply of 50 M3, as did Panjang Island and Akar Island with the same reservoir capacity. This ensures that each island has adequate access to clean water which is essential for daily life.



Figure 3.

Grand Reservoir

Apart from that, the clean water distribution process involves the use of pipes with a total length of 15,180 meters. Interestingly, around 4,000 meters of this pipeline network is under the sea. This shows a high level of technical expertise in implementing this complex water supply system. In this way, clean water supplies can reach all of these islands with high reliability and efficiency, safeguarding the basic needs of residents well.

The introduction of underwater drinking water pipe installations as a means of providing clean water around Tiangwangkang Old Village is a historic milestone in efforts to improve the quality of life of the Sea Tribe community in the area. Previously, the people in this village faced serious obstacles related to limited access to safe and secure clean water. With the existence of undersea pipeline infrastructure, they now have easier and more reliable access to the clean water that is so necessary for daily life.

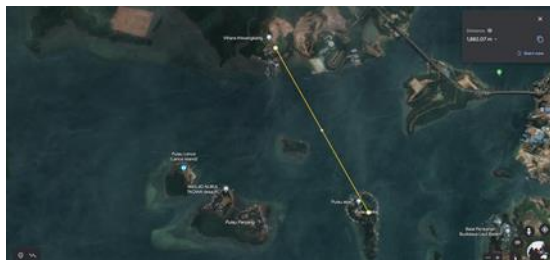
No	UNIT PELAYANAN	TAHUN PEMB.	JUMLAH SR		JUMLAH JIWA	
			2021	2022	2021	2022
PENYAMBUNGAN PIPA ATB/PT. MOYEA						
1	IKK Unit Pulau Buluh	2011	555	560	3.330	3.360
2	IKK Unit Pulau Lance	2015	35	36	210	216
3	IKK Pulau Tiangwangkang	2015	64	64	384	384
4	IKK Pulau Pulau Panjang	2015	128	129	768	774
5	IKK Pulau Akar	2015	97	90	582	540
6	IKK Tanjung Gundap	2018	114	115	684	690
	Jumlah		993	994	5.958	5.964

Figure 4.

Number of Small City Installation Service (IKK)

This has a major impact on improving their health, hygiene and comfort of life. The practice of drawing water from potentially contaminated sources has been replaced by safer and more controlled access via undersea pipelines. Government Batam City has built an underwater pipeline connecting Tiangwangkang Old Village with the surrounding islands, namely:

1. Tiangwangkang and Akar Island



2. Tiangwangkang and Panjang Island



3. Tiangwangkang Lance Island, and Tanjung Gundap



The underwater distribution piping network that has been implemented in this project utilizes high-quality HDPE pipes which are designed to provide optimal performance in distributing clean water to the community around Tiangwangkang Old Village. Apart from using HDPE pipes, this network is also equipped with various piping accessories such as gate valves, bends, tees, and other components that play an important role in regulating water flow. Subsea Distribution Pipeline Network:

The distribution piping network uses HDPE pipes and is also equipped with piping accessories such as gate valves, bends, tees, and others.

The length of the underwater distribution pipe used between Tiangwangkang to Tanjung Gundap is 3,773 M with the following details:

1. Installation of PE 100 PN 16 pipes (110 mm x 50 m) = 2850 m

2. Installation of PE 100 PN 16 pipes (110 mm x 50 m) = 740 m
3. Installation of PE 100 PN 16 pipes (90 mm x 50 m) = 310 m
4. Installation of PE 100 PN 10 Pipe (63 mm x 100 m) = 640 m.

All of these components were carefully designed and implemented with precision to ensure that this clean water distribution system operates with high efficiency and provides a reliable water supply to the community, meeting their needs with the high level of quality and sustainability desired in this project. And there are also two main pumps that supply water to Lance Island, ensuring a reliable supply for the area.



Figure 5.
Centrifugal pumps in Tiangwangkang



Pompa Centrifugal 5 liter/detik, head 50 meter	
Material Dasar	: Cast Iron
Material Impeller	: Stainless Steel
Flow	: 5 lt/d
Head	: 50 m
Power	: 4 – 5.5 kW
Frekuensi	: 50 Hz
Voltase	: 3 x 380-415D V
Nilai Kecepatan	: 2920-2940 rpm
Jumlah Tiang	: 2
Kelas Isolasi	: F

Figure 6.
Pump Specifications in Tiangwangkang

In Tiangwangkang Old Village there are 3 vertical pumps as distribution pumps to the surrounding islands, namely two main pumps and one backup pump. On Lance Island, there are two vertical pump units. Akar Island and Tanjung Undap do not have distribution pumps but have reservoirs of 50 M3 each. However, to overcome this situation, each

location, including Akar Island, Lance Island, and Tanjung Gundap, has been equipped with a reservoir with a capacity of 50 M3. This aims to ensure that each region continues to have sufficient water reserves, even when the main supply is disrupted. With this reservoir, the reliability of the water supply throughout the region is maintained.

Wastewater Management and Sanitation in Tiangwangkang Old Village

Not only is there clean water processing in Tiangwangkang Old Village, there is also wastewater treatment such as sanitation by building a Communal Waste Water Treatment Plant (IPAL) by the Batam City Government together with the Tiangwangkang Community Self-Help group. Success, initially the people of Tiangwangkang Old Village discharged their defecation directly into the sea. This affects the cleanliness of the environment in Kampung Tua Tiangwangkang, especially where there are 2 large kelongs/restaurants which are visited by many foreign and local tourists, namely Restaurant 188 Citra Utama and Kopak Jaya 007.

The development process carried out includes reviewing work in the field in the Tiangwangkang Old Village area as well as surveying the community's willingness to work together with the community in the construction of this Communal IPAL.



Figure 7.

Communal IPAL

WWTP is a set of technical equipment and equipment that processes/treats water left over from factory, household, etc. production processes.



Figure 8.

Water Closed

The WWTP uses environmentally friendly technology with modern technology and an anaerobic bacterial decomposition system as a replacement for ordinary septic tanks which are very susceptible to polluting the environment. using the system Biotechnology which uses microorganisms or decomposing bacteria as biofiltrate and decomposes domestic waste into water suitable for disposal into drainage. With this system, there is no need for suction anymore, because domestic waste will not settle. After all, it has been decomposed by decomposing microorganisms so it is very safe if thrown directly into the sea and is very environmentally friendly. The construction of the Communal IPAL and its installation was carried out by the community self-help group (KSM) Tiangwangang Sukses.



Figure 9.

Communal IPAL

The process of creating a Communal IPAL was carried out collaboratively by the Tiangwangkang community. This Communal IPAL was built on the beach side so the construction process had its challenges due to the influence of sea tides. When the sea water

recedes, the community works together to build a concrete IPAL building, although sometimes the sea water recedes from 2 to 4 in the morning.

The construction of the wastewater network installation is divided into three segments, looking at the position of the house, where the slope of the pipe from the house's toilet is very careful, so that there is no accumulation of waste in one of the pipe segments so that the wastewater does not flow smoothly towards the Communal IPAL.

The specifications for the Communal IPAL used are: Installation of Pipes in the Communal IPAL. The IPAL specifications used are:

- a. Basic Material: Fiberglass Reinforced Plastic (FRP)
- b. Capacity: 50 – 60 people
- c. Dimensions: 3 meters (Length) x 2 meters (Width) x 2 meters (Height)
- d. Number of Dividers: 3 pieces
- e. Number of Rooms: 4 pieces

In Tiangwangkang Village, 3 Communal IPAL Units and 2 flush tank units were built. The function of this flush tank is to clean the wastewater pipe network from the house to the Communal IPAL. This cleaning process is carried out periodically so that there are no blockages in the wastewater pipe network from the houses.



Figure 10.
Flush Tank

In installing pipes used:

1. Pipe Material

We use PVC as a material to channel used water and human wastewater in buildings. For waste and dirty water pipes, we chose PVC class D with a diameter that matches the plan. Connecting PVC pipes is carried out using good quality solvent cement. Before pipe connection, we clean the parts to be connected thoroughly, making sure that there is no dirt, water, or other substances present there. In addition, solvent cement must be applied evenly to the surfaces to be joined.



Figure 11.
Pipe Installation

2. Pipe Installation

We ensure that the connections between PVC pipes are carried out using quality solvent cement that has been approved by the supervisor or Director. On vent pipes, we cover all ends of pipes or fittings that are not used with hubcaps or plugs made from the same material. PVC pipes embedded in the ground are given a concrete pad foundation with a composition of 1 pc + 3 ps + 5 krI at every 3-meter distance. This foundation is also applied to branch and bend pipe connections. The standpipe (riser) is given a concrete foundation pad at the meeting point between the standpipe and the flat pipe on the ground floor. Before the pipes are connected to the fixture, we test the pipes first to ensure there are no leaks.

If the installation does not pass the leak test, we carry out repairs immediately. Testing costs, necessary equipment, and repair costs will be borne by the Service Provider. We cover the planting on the wall with finishing work. The pipes are installed in such a way that no unpleasant odors come out, there are no air cavities, and their position is

straight. For dirty water pipes with a diameter of more than 80 mm, we make a slope of at least 1%. Meanwhile, for pipes with a diameter smaller than or equal to 80 mm, we make a slope of at least 2%. Human waste pipes are installed with a minimum slope of 2%. The dead end of the pipe is equipped with a clean-out hole with a diameter of 50 mm or 80 mm. We also seal pipe ends and holes during the installation process to prevent dirt from entering the pipe.

CONCLUSION

In order to meet the need for clean water in Tiangwangkang Old Village and nearby islands such as Lance Island, Panjang Island and Akar Island, a sophisticated water supply system has been successfully implemented. Involving the use of ATB (Moya) pipes connecting the area with the main water source on the Trans Barelang Road, this system ensures a reliable and efficient water supply. A grand reservoir with a capacity of 200 cubic meters was built to accommodate water from the Trans Barelang Road, then channeled through a network of pipes connecting all the islands, namely Lance Island, Panjang Island and Akar Island, each receiving a supply of 50 cubic meters. The total length of the pipeline network is approximately 15,180 meters, with approximately 4,000 meters under the sea, demonstrating a high level of technical expertise.

The introduction of the underwater drinking water pipe installation is a historic milestone in improving the quality of life of the Sea Tribe communities in the region, overcoming the obstacle of their limited access to safe, clean water. This results in improved health, cleanliness and comfort of their lives. The Batam City Government has built an underwater pipeline connecting various islands, such as Tiangwangkang to Akar Island, Panjang Island, Lance Island and Tanjung Gundap. This subsea distribution piping network uses high quality HDPE pipes which are equipped with various piping accessories to regulate water flow efficiently. The total length of the pipe network reaches 3,773 meters, with various pipe diameters used.

Apart from clean water supply, efforts also include waste water management through the construction of a Communal Waste Water Treatment Plant (IPAL). Special steps in installing waste water pipes, using quality PVC, including the use of concrete pad

foundations and setting the pipe slope according to diameter, guarantees an efficient and effective system in managing waste water.

This entire project reflects the commitment of the government and project partners to improve the quality of life and welfare of the community in Tiangwangkang Old Village and its surroundings, as well as achieving sustainable development goals with a solid foundation for a better future.

It is hoped that after the construction of the clean water installation and construction of the communal IPAL, the Tiangwangkang community can meet standards in accordance with one of the SDGs goals, namely guarantee the availability and sustainable management of clean water and sanitation for everyone. In this way, the quality of life of the people of Tiangwangkang increases and Tiangwangkang Old Village becomes a safe and comfortable tourist destination for foreign and local tourists.

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