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Optimization of Management of the Final Disposal Area

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Abstract

The Telaga Punggur Landfill located in Nongsa District, Batam City, is the only waste management facility owned by the Batam City Government and plays an essential role in maintaining environmental cleanliness and public health. With a rapidly growing population currently reaching 1.25 million and continuously increasing, the volume of waste generated has also drastically exceeded the maximum capacity of the Telaga Punggur Landfill. It is feared that the Telaga Punggur Landfill may not be able to sustain managing all the waste produced in Batam City for long. The management of the Landfill faces various challenges such as limited land, insufficient budget, and modern technology, as well as a lack of interest from investors to collaborate with the government. Addressing these issues requires a more effective approach through cooperation between the government and private sectors. This study also proposes a partnership scheme based on Batam City Regulation Number 4 of 2018 concerning the Management of Regional Assets in the form of a collaboration plan for Infrastructure Provision (KSPI) or Utilization Cooperation (KSP) for waste management between the government and partners in Batam City. By analyzing and establishing the right cooperation, it is hoped that economic benefits can be realized, and the quality of the environment and public health can be enhanced. Through the use of modern waste processing technologies, such as the Waste to Energy (WTE) system, it is expected that the Telaga Punggur Landfill can operate more efficiently and sustainably. The results of this study indicate that innovation in waste management is a crucial step to address the environmental challenges faced by Batam City.

Introduction

The Telaga Punggur Final Disposal Site (TPA) located in Nongsa District is the only location and asset owned by the Batam City Government to accommodate and manage waste in Batam City. The Telaga Punggur Final Disposal Site (TPA) was established in 1997 by the Batam Authority as *a Sanitary Landfill,* which then in 2002 until now the operation of the Telaga Punggur TPA has been fully handed over to the Batam City Government through the Batam City Environmental Service with a change in waste management to *Open Dumping*.

With a population of 1.25 million people in Batam City which continues to increase with an average growth of 3.1% from 2021-2023 (Central Statistics Agency, 2024), *the volume* of waste produced has also increased from year to year, so that the management of the Telaga Punggur Final Disposal Site (TPA) is becoming increasingly important to be followed up optimally. The Telaga Punggur Final Disposal Site (TPA) not only functions as a final disposal site, but also has an important role in maintaining environmental cleanliness and public health. With an area of around 46.8 hectares, the Telaga Punggur Final Disposal Site (TPA) is targeted to accommodate waste from all over Batam City originating from household, industrial, commercial, and other sectors. According to data from the Batam City Environmental Service,

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in 2022, the Telaga Punggur Final Disposal Site (TPA) will be able to process around 850-1000 tons of waste per day. However, this capacity is often exceeded, which has an impact on environmental pollution and public health.

Although the Telaga Punggur Final Disposal Site (TPA) functions as a solution for waste management, there are many problems it faces. One of the main problems is the Batam City Government's suboptimal management of the Telaga Punggur Final Disposal Site (TPA). It faces several challenges, including limited land for the Final Disposal Site which has the potential to cause waste accumulation, lack of budget and modern waste processing technology causing the management process to be inefficient, and the lack of investor interest in cooperating with the Batam City Government in managing the Telaga Punggur Final Disposal Site (TPA) is the main issue in the Telaga Punggur Final Disposal Site (TPA) problem in Batam City.

The Telaga Punggur Final Disposal Site (TPA) which is also recorded as an asset or Regional Property of the Batam City Government actually has promising potential in providing benefits to both the Batam City Government and the people of Batam City, but unfortunately this has not been running optimally. Through Batam City Regional Regulation Number 4 of 2018 concerning Management of Regional Property, the Government has provided space for Private/Non-Government Parties to be able to collaborate in utilizing Regional Government Property which can maximize the potential in it. This collaboration and cooperation consists of several patterns that have their own advantages and disadvantages according to several conditions faced.

In this regard, the Management of the Telaga Punggur Final Disposal Site (TPA) through a cooperation scheme referring to Batam City Regional Regulation Number 4 of 2018 concerning Management of Regional Property must also be studied more deeply from several influential aspects, so that the government can determine a cooperation scheme that can present effective waste management that provides economic benefits, ranging from reducing waste management costs to contributing to improving sustainable environmental quality. Thus, steps to optimize the management of the Telaga Punggur Final Disposal Site (TPA) are not only important for maintaining public health, but also for supporting sustainable and profitable regional economic growth in the long term (Sidabutar & Indera. 2021).

Methods

This study uses a qualitative approach to explore the challenges and cooperation schemes in the management of the Telaga Punggur Final Disposal Site (TPA) in Batam City. The qualitative approach was chosen because it allows researchers to explore the views, experiences, and perceptions of stakeholders related to the management of the TPA (Creswell, 2014). The location of the study was determined in Nongsa District, specifically the Telaga Punggur Final Disposal Site (TPA), which is the only Final Disposal Site managed by the Batam City Government and is facing various challenges in its operations.

The research subjects consisted of several categories, namely officials of the Batam City Environmental Service who provided an understanding of related policies and regulations, implementers at the Telaga Punggur Final Disposal Site (TPA) UPT who provided information on the operational activities of the Telaga Punggur Final Disposal Site (TPA) UPT, local residents who provided views on the impact of the Telaga Punggur Final Disposal Site (TPA) UPT, officials at the Batam City Regional Financial and Asset Management Agency as administrators for recording and utilizing Regional Property, and representatives from the private sector who are able to collaborate with the government.

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Data collection techniques include in-depth interviews, focus group discussions, field observations, and collection of relevant documentation. Through semi-structured interviews, researchers will explore information about the challenges faced and expectations of the cooperation scheme. Meanwhile, discussions will also bring together various stakeholders to discuss the problems comprehensively (Krueger & Casey, 2015).

The data obtained will be analyzed using a content analysis approach , where researchers will categorize data into themes and sub-themes that are relevant to the formulation of the problem (Bungin, 2017). The analysis process is carried out iteratively to ensure that the resulting interpretation reflects the context and views of the respondents. To maintain data validity, source triangulation is carried out by comparing data from various stakeholders, as well as member checking to obtain feedback from respondents regarding the results of the initial analysis (Patton, 2015).

based on the description that has been discussed in several previous explanations related to the research methodology to achieve the targets and objectives of this research, the stages of research that will be carried out can be formulated. The description of the research stages can be seen in Figure 1.

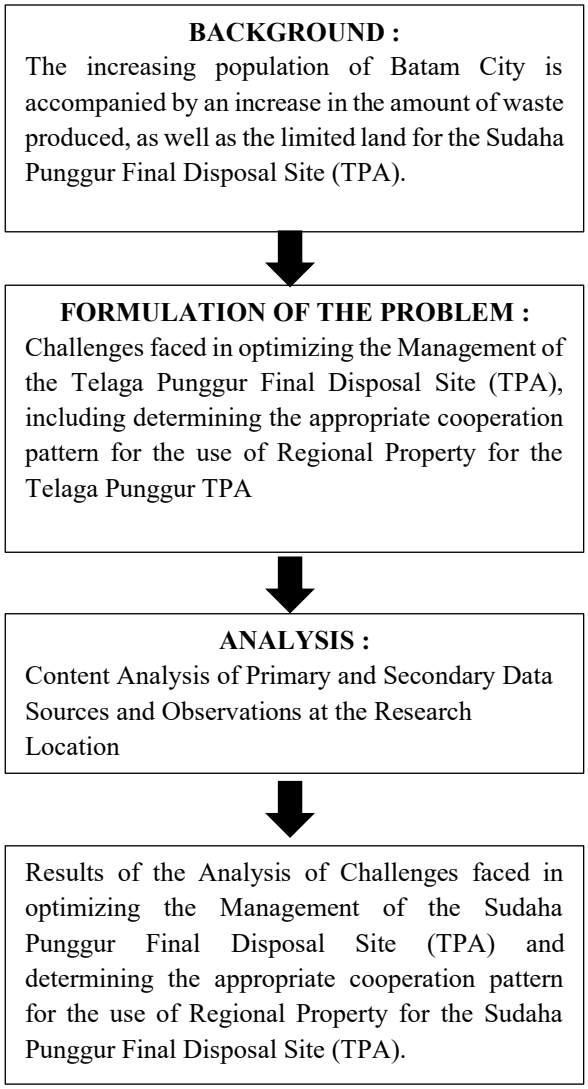

Figure 1. Research Stages/Framework Scheme

Source: Researcher

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Results and Discussion

General description

The Telaga Punggur Final Disposal Site (TPA) located at coordinates 1.0526788905132025, 104.1244009881357 is an area on the outskirts of Nongsa District, Batam City with an area of 46.8 Ha. The Telaga Punggur Final Disposal Site (TPA) located on Jalan Raya Telaga Punggut, Kabil Village, Nongsa District, Batam City has the following boundaries:

North : Tunas Kabil Industrial Area, Bukit Pelita Punggut Complex, Hokkie Hotel

South : Vacant Land, Kepri Law and Human Rights Training Center, PT. Labroy Ship Building Engineering

East : Jl. Pattimura, PT. Broad Far Indonesia, PT. Warlbor Internasional Indonesia, Sei Kasam PLTU

West : Empty Land, Scout Campground, Duriangkang Dam

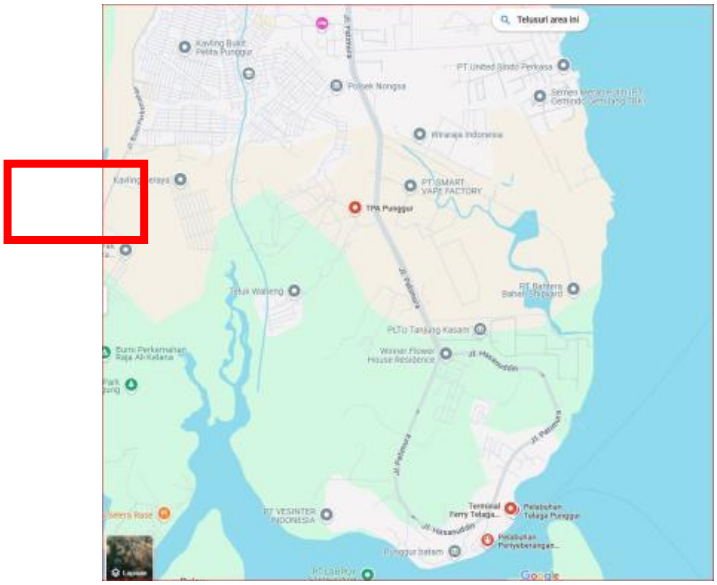

Figure 1Location Map of Telaga Punggur Landfill

Source: https://www.google.co.id/ maps/

Batam Mayor Regulation Number 60 of 2021 concerning the Detailed Spatial Planning Plan for the Planning Areas of Nongsa, Batam City, Bengkong, Batu Ampar, Lubuk Baja, Sekopang, and Batu Aji of Batam City for 2021 - 2041, the zoning in Nongsa District is divided into two Sub-Planning Areas (SWP), namely: 1) Sub-Planning Area (SWP) A, consists of part of Batu Besar Sub-district and Sambau Sub-district with an area of 7,156.45 Ha; 2) Sub-Planning Area (SWP) B, consists of part of Kabil Sub-district with an area of 2,726.61 Ha.

Physical Condition of Land

The hydrology around the Telaga Punggur Final Disposal Site (TPA), Nongsa District, Batam City, plays an important role in the natural drainage system of the area. This area is crossed by several small rivers and swamps that function as natural channels to drain rainwater and surface water. These small rivers generally flow into the waters of the Singapore Strait in the east, which is also the geographical boundary of the TPA area. In addition, the existence of swamps

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around the TPA acts as a water catchment area and ecosystem balancer, especially in reducing the risk of flooding by accommodating excess water during the rainy season.

In general, the type of soil around the Telaga Punggur landfill is dominated by podzolic and laterite soils, which are types of soil commonly found in tropical areas such as Batam. Podzolic soils have high sand content and low fertility levels, while laterite soils are characterized by high iron and aluminum content, as well as reddish color due to intensive weathering processes. In the landfill area itself, the soil has been modified due to waste disposal activities, so that the original soil layer is covered by waste material and clay soil used to cover the waste piles.

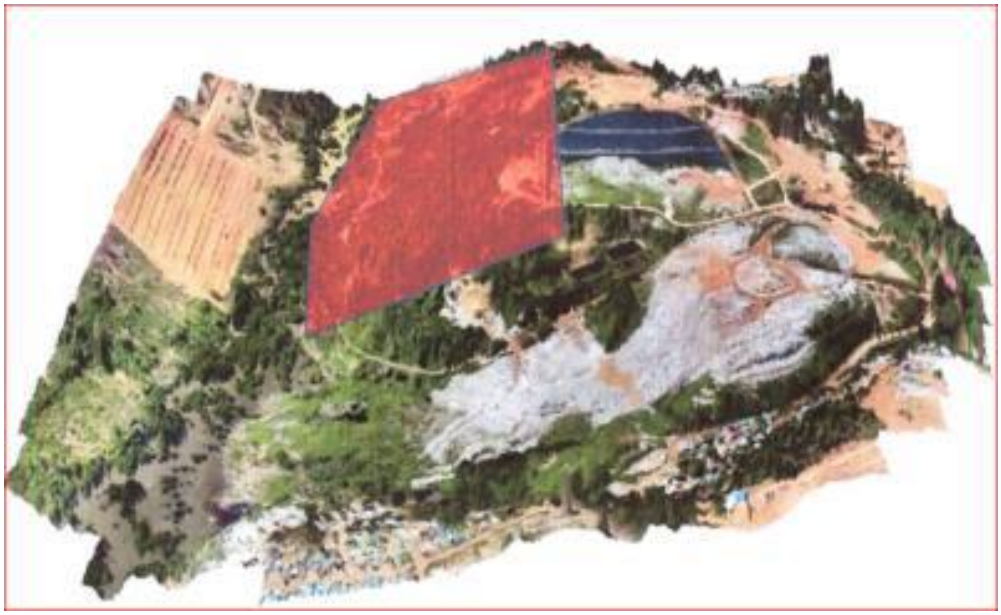

Figure 2BPKAD Batam City and DLH

Meanwhile, based on the topography of the land at the Telaga Punggur Final Disposal Site (TPA), it is a hilly area with a slope of between 0% and 20%.

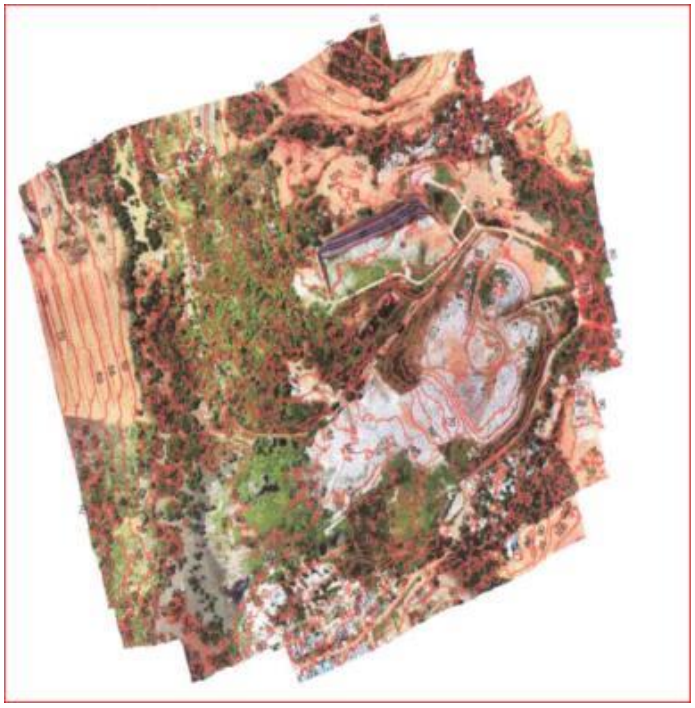

Figure 3Topology Map of Telaga Punggur Landfill

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Existing Land Use

Land use at the Telaga Punggur Final Disposal Site (TPA) as a whole has been utilized in accordance with the concept of sustainable utilization, this can be seen from several plots of areas at the Telaga Punggur Final Disposal Site (TPA) consisting of Existing Landfill covering an area of 12 hectares; Buffer Zone, Wetland, and Leachate covering an area of 12.3 hectares; land that has been used itself covering an area of 12 hectares consisting of a weighbridge, workshop, security office (total 2 hectares) and a TPA covering an area of 10 hectares. The Buffer Zone land itself covers an area of 6 hectares and leachate land covers an area of 6 hectares and wetlands cover an area of 8 hectares. Also included is the land that is the object of the optimization study, namely land that will be used to apply the use of renewable technology such as waste-to-energy power plants (PLTSa) or others covering an area of 12 hectares (Environmental Service, 2024).

Figure 4Existing view of Telaga Punggur TPA

Optimization Challenges

Land limitations for landfills

The Telaga Punggur Final Disposal Site (TPA) located in Nongsa District, Batam City, is the main waste management facility in Batam City that serves the waste disposal needs of Batam residents, this land has an important role in maintaining environmental cleanliness and health (Muhammad et al., 2020; Istiqa et al., 2024; Sari & Lodan, 2024; Salsabila et al., 2024). In general, the condition of the Telaga Punggur TPA land has now reached almost maximum capacity. It is feared that the available land will no longer be able to accommodate the increasing volume of waste along with population growth and economic activity in Batam City, which is estimated to reach 1.5 million people in 2025 (Central Statistics Agency, 2024). This causes various problems, both in terms of the environment and operational waste management (Ministry of Environment and Forestry, 2021).

The Telaga Punggur Final Disposal Site (TPA) is designed to accommodate a certain amount of waste, but with rapid population growth and industrialization in Batam, the volume of waste produced every day far exceeds the capacity that can be accommodated. According to data from the Batam City Environmental Service, the volume of waste can reach 1,150 tons per day,

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far above the ideal capacity of the TPA (Environmental Service, 2024). As a result, the pile of waste is getting higher and wider, resulting in a decline in the quality of the surrounding environment. Bad odors, groundwater pollution, and methane gas emissions resulting from the waste decomposition process are serious problems faced by the surrounding community (Ministry of Environment and Forestry, 2021). In addition, limited land also causes the waste disposal process to no longer be carried out optimally, increasing the risk of environmental pollution (Zarif et al., 2022).

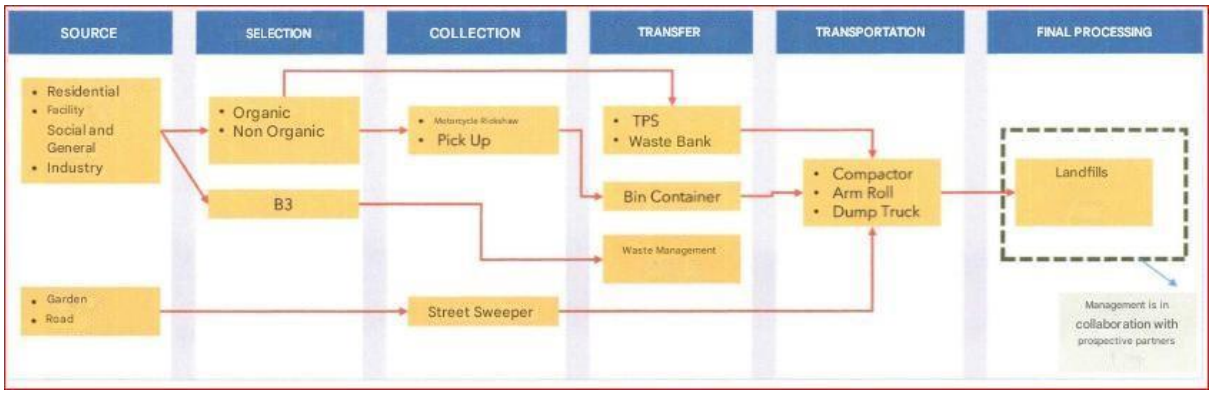

Figure 6. Batam City Waste Distribution Flow

Source: Final Business Case Batam MSWM, PT. SMI, 2024

Currently, around 850 - 1,150 tons of Batam Island waste per day is dumped at the Telaga Punggur landfill. Telaga Punggur is the only landfill location available for disposal.

waste in Batam; therefore, Telaga Punggur Landfill requires proper planning to maximize the amount of waste that can be disposed of in the future. Based on current practices and future projections, it is estimated that Telaga Punggur Landfill may have a remaining capacity of less than 10 years (Environmental Agency, 2025). According to a report from the Central Statistics Agency, population growth and economic activity in Batam are predicted to continue to increase, which will contribute to an increase in waste volume (Central Statistics Agency, 2024). Therefore, Batam City needs to consider several forms of waste treatment that will remove as much waste as possible from landfill and maintain the ability to manage (and reduce) waste in the future. One solution to this problem is to use the Waste to Energy (WTE) waste management system, which can reduce waste volume and produce clean energy (Ministry of Environment and Forestry, 2021).

Figure 7. Estimated Age of Land of Telaga Punggur Landfill

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Land limitations are one of the main problems faced by the Telaga Punggur TPA, which illustrates that the land available for waste disposal is increasingly limited, while the need for waste disposal continues to increase. Batam City, as one of the cities with rapid economic growth, produces a significant volume of waste every day. Based on data from the Environmental Service, the volume of waste produced by the industrial, trade, and household sectors reaches around 1,150 tons per day (Environmental Service, 2023). These activities contribute greatly to the waste generation that must be managed. However, the existing landfill area cannot be expanded significantly due to geographical limitations and land ownership around the location, making it difficult to find alternative locations for the development of new landfills (Ministry of Environment and Forestry, 2021; Zarif et al., 2022). This highlights the need for innovative waste management strategies to be able to face the challenges of high population growth and economic activity while protecting the environment (Omer, 2008; Berry & Rondinelli, 1998; Zhang et al., 2010; Ghisellini et al., 2016; Shrivastava, 2018).

This land limitation also has an impact on waste management operations. The waste disposal process, which should be carried out in stages and in a controlled manner, is not optimal because the available land is full (Nanda & Berruti, 2021; Sondh et al., 2022). As a result, waste is often piled up beyond its intended capacity, increasing the risk of landslides and environmental pollution (Basri, 2024). In addition, land limitations also hamper efforts to implement a more modern waste management system, such as a *sanitary landfill system* or waste processing into energy. Research shows that implementing a more sustainable management system such as *Waste to Energy technology* can be very beneficial in reducing waste volume and producing renewable energy (Hidayati & Rachmawati, 2022). However, until now, the Telaga Punggur TPA still relies on conventional methods that are less environmentally friendly (Zarif et al., 2022).

Lack of Budget and Modern Waste Processing Technology

The Telaga Punggur Final Disposal Site (TPA) in Nongsa District, Batam City, is one of the main waste management facilities that handles domestic and industrial waste from the area. However, the Telaga Punggur TPA faces various serious problems, especially related to the lack of budget and modern waste processing technology. These two factors are the main causes of inefficiency in the waste management process, which ultimately has a negative impact on the environment and the surrounding community (Husnaini et al., 2022; Mor & Ravindra, 2023; Fadhullah et al., 2022).

One of the main problems faced by the Telaga Punggur TPA is the limited operational budget. The budget allocated for waste management is often insufficient to meet daily operational needs, such as equipment maintenance, fuel purchases, and labor wages. This budget limitation causes many facilities and equipment at the TPA to not function optimally. For example, the waste collection fleet that should be routinely repaired and replaced often experiences damage, reducing the efficiency of waste collection from its source to the TPA (Setiawan & Kurniawan, 2023).

In addition, the lack of budget also has an impact on the quality of landfill infrastructure. Drainage systems, soil protection layers, and methane gas processing facilities that should be important components in modern waste management cannot be built or repaired properly. Research shows that inadequate infrastructure increases the risk of environmental pollution, such as leachate leakage into the soil and water sources, as well as hazardous methane gas emissions (Pratiwi & Dasuki, 2023; Ma et al., 2022). This not only endangers the environment, but also the health of the people living around the landfill.

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Budget constraints also affect the quality of human resources (HR) working in landfills. With a minimal budget, wages and training for workers are often inadequate. Research shows that effective waste management requires a skilled workforce that understands modern waste processing processes (Thomas-Hope, 1998). Lack of training and incentives for workers leads to low productivity and motivation, which ultimately worsens the overall performance of landfills (Setiawan & Kurniawan, 2023).

An equally serious problem is the lack of modern waste processing technology at the Telaga Punggur TPA. Currently, this TPA still relies on the open dumping method of waste disposal, namely piling up waste in open areas without further processing. This method is outdated and not environmentally friendly because it can cause various problems, such as air, soil, and water pollution. In addition, the open dumping method is also inefficient in managing the increasing volume of waste.

Modern waste processing technologies, such as sanitary landfills, incineration, or waste *-to-energy* , have not been implemented at the Telaga Punggur TPA. Sanitary landfills, for example, are a more environmentally friendly waste management method because they use a protective layer to prevent leachate from leaking into the ground and a methane gas processing system to reduce greenhouse gas emissions (Sari & Amiruddin, 2022). However, the implementation of this technology requires large investments, both for infrastructure development and long-term maintenance.

In addition, *waste-to-energy technology* that can convert waste into a source of electrical or heat energy has not been utilized at the Telaga Punggur TPA. In fact, this technology not only helps reduce the volume of waste but also produces energy that can be used for community needs (Prasetyo et al., 2023). The lack of modern technology has caused the Telaga Punggur TPA to be unable to manage waste efficiently and sustainably.

Lack of Investor Interest in Waste Management in Batam City

The Telaga Punggur Final Disposal Site (TPA) in Nongsa District, Batam City, is a vital facility that handles waste management for the entire city area. However, the management of this TPA faces various serious challenges, one of which is the lack of investor interest in investing or collaborating with the Batam City Government in managing the TPA. This lack of investor interest is caused by various factors, ranging from high financial risks, regulatory uncertainty, to negative perceptions of waste management projects. As a result, efforts to increase the efficiency and modernization of the Telaga Punggur TPA have been hampered, even though this is very much needed to overcome the increasingly complex waste problem.

One of the main reasons for the lack of investor interest is the high financial risk associated with landfill management projects. Investment in waste management, especially to implement modern technologies such as sanitary landfills or *waste-to-energy* , requires a very large capital. The cost of infrastructure development, equipment purchases, and daily operations can reach billions of rupiah (Setiawan et al., 2023). In addition, the return *on investment (* ROI) in waste management projects often takes a long time, which makes many investors reluctant to get involved, because they prefer projects with a faster and more certain ROI (Febriansah & Meiliza, 2020).

In addition, uncertainty in terms of income is also a inhibiting factor. For example, in *waste-to-energy projects* , the income generated from the sale of electricity or other energy is highly dependent on the efficiency of the technology and the government's energy pricing policy. If the energy price set by the government is low or uncompetitive, the income generated may not be commensurate with the investment costs incurred (Fitri & Zahar, 2019). This risk makes investors think twice before committing to a landfill management project. Another factor that

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influences investor interest is the uncertainty of government regulations and policies. Waste management, especially those involving modern technology, requires clear and consistent regulatory support from the government. However, existing policies often do not support or even hinder private investment. For example, complicated licensing processes and convoluted bureaucracy can make investors feel uncomfortable and reluctant to get involved.

Then, the lack of incentives from the government is also a problem. Incentives such as tax breaks, subsidies, or income guarantees can be an attraction for investors. However, if these incentives are absent or inadequate, investor interest will decrease. Uncertainty in policy changes is also a concern. Investors need legal certainty and stable policies to ensure that their investments are safe and profitable in the long term (Caferra & Falcone, 2023).

Negative perceptions of waste management projects are also a factor inhibiting investor interest. Many investors consider waste management projects as less attractive and high-risk businesses. This is due to the stigma that waste management is a dirty, unprofitable business, and full of technical and environmental challenges. In fact, with modern technology, waste management can be a profitable and environmentally friendly business.

Waste management projects often face resistance from the surrounding community. Communities may reject the presence of a landfill or waste processing facility near their settlements because they are concerned about the negative impacts on the environment and health. This resistance can trigger social and legal conflicts, which ultimately increase the risk for investors. Therefore, many investors choose to avoid these types of projects.

The lack of investor interest in the management of Telaga Punggur TPA has a significant impact on the efficiency and sustainability of waste management in Batam City. Without private investment, the Batam City Government must bear the entire cost of managing the TPA, which often exceeds the available budget. As a result, many facilities and equipment at the TPA cannot be repaired or upgraded, reducing operational efficiency.

In addition, lack of investment also hampers the implementation of modern technology in waste management. Without adequate technology, Telaga Punggur TPA still relies on conventional methods such as *open dumping* , which is not environmentally friendly and has a high risk of pollution. This causes various environmental problems, such as air, soil, and water pollution, as well as health problems for the surrounding community.

Cooperation in Management of Telaga Punggur Final Disposal Site (TPA)

In realizing the development of waste management based on *Waste To Energy* at the Telaga Punggur Final Disposal Site, of course it must be implemented based on the applicable regulatory corridor considering that the Telaga Punggur Final Disposal Site is one of the regional assets or assets of the Batam City Government which since 2002 until now has been operated by the Batam City Environmental Service. The regulation as referred to is Batam City Regional Regulation Number 4 of 2018 concerning Management of Regional Assets, which has the following utilization scheme;

Table 1. Regional Regulation Number 4 of 2018 concerning Management of Regional Assets

Utilization Type	Partners	Object	Term	State Revenue	Partner Selection
Rent	Individuals, BUMN/D, other business entities, government support units	Land and/or buildings other than T/B	Max 5 years, can be extended	Rent/rent amount	Direct Appointment

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Borrowing and Use	Local Government, Village Government	Land and/or buildings other than T/B	Max 5 years, can be extended once (can be extended per legislation)	None	Licensing of users of goods
Utilization Cooperation	BUMN/D, Private (except individuals)	Land and/or buildings other than T/B	Max 30 years, can be extended (or up to 50 years for KSP Infrastructure Provision)	Fixed contributions, profit sharing, KSP results	Direct appointment allowed except for BMs of a special nature
Build Operate Transfer/Build Transfer Operate	BUMN/D, Private (except individuals), other legal entities	Land	Max 30 years, **cannot** be extended	Annual contributions, BGS/BSG results for government purposes	Tender
Infrastructure Provision Cooperation	PT, BUMN/D, foreign legal entities, cooperatives	Land and/or buildings other than T/B	Max 50 years, can be extended	Clawback (excess profit sharing) and KSPI results in form of infrastructure	As per statutory provisions

Considering that the Telaga Punggur Final Disposal Site development project is included in the infrastructure project, the cooperation scheme used in this Analysis is the Infrastructure Provision Cooperation (KSPI) and Utilization Cooperation (KSP) scheme. This takes into account the large investment costs, so that it requires a fairly long period of cooperation. The turnover of economic value that arises from the cooperation scheme in question can be seen from the flow of income, namely the sale of electricity (kwh) generated from the conversion of waste processing, to prospective PLN Batam partners which are projected according to the current tariff and are predicted to increase in a certain period, in addition, in the 30-year KSPI and 30-year KSP schemes, it is projected that there will be tipping fee income.

On the other hand, the flow of expenditure can consist of two main categories: Cost of Sales and Operating Cost. The Cost of Sales component includes costs for direct resources required in production, such as water, fuel, spare parts, and operational and maintenance (O&M) costs (Khan et al., 2024). Meanwhile, the Operating Cost component includes indirect costs, such as indirect labor, overhead, training, marketing, insurance, and other administrative costs.

The flow of income and expenditure is considered important because every transaction that exists triggers economic growth and has a positive multiplier effect on a business sector involved. Through the interaction between income and expenditure, economic activities can stimulate demand, create jobs, and improve the welfare of society as a whole.

One of the main problems in managing regional goods (assets) is the disorder in managing data on goods (assets). This causes the regional government to have difficulty in knowing for sure the assets that are controlled/managed, so that the assets managed by the regional government tend not to be optimal in their use. According to Siregar (2004) there are several stages of asset management that can be carried out to increase the assets owned, namely asset inventory, legal audit, asset assessment, asset optimization, and asset supervision and control where if these five stages of asset management are carried out properly, it will provide great benefits for the government in increasing efficiency, effectiveness and creating added value in managing assets that are more orderly, accountable, and transparent.

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Until now, many private companies/business entities, both domestic and foreign, have been interested in investment activities at the Telaga Punggur TPA, but from the results of the approach, no mutual agreement has been found on the management and utilization patterns of the Telaga Punggur TPA. The Batam City Government cannot help too much regarding the budgeting required for the management and operation of the Telaga Punggur TPA due to the very limited government budget.

Benchmark: Benowo Final Disposal Site (TPA) Surabaya, East Java

Figure 5. Benowo PLTSa Plant

Benowo Final Management Site (TPA) is an urban waste management project with the development of a Waste Power Plant (PLTSa) with an area of 37.4 hectares (*landfill area* 22 hectares), Benowo PSEL carried out by the Surabaya City Government began in 2012 by collaborating with PT. Sumber Organik (SO).

Figure 6Benowo Surabaya

Electricity generated from waste management is distributed to the State Electricity Company (PLN) as a consequence of the Cooperation between PT. Sumber Organik and PLN. The Surabaya City Government is collaborating with PT. Sumber Organik with the concept of 'Bangun Guna Serah' *(Build Operate and Transfer)* for 20 (twenty) years.

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PLTSa Benowo is one form of development of new energy power plants (EBT) developed by the Surabaya City government with the private sector using the Gastafication Power Plant method to process waste into electricity. By using gasification technology, PLTSa Benowo is able to produce 12 MW of electricity through processing 1,000 tons of waste per day. Of this capacity, 9 MW is sold to PLN, then 2 MW is used for the operational needs of PT. Sumber Organik (SO) and the remaining 1 MW as *redundant.*

Cooperation with IPP *(Independent Power Producer)* PT. Sumber Organik with PLN is carried out until 2032. The electricity purchase price is 13.35 US cents per / kWh which is in accordance with Presidential Regulation Number 35 of 2018. The advantage of this Benowo PLTSa technology is that there is no waste left compared to previous technologies that still use residue. In this case, the Surabaya City Government is working with PT. Sumber Organik in managing waste into electricity, the cooperation uses an agreement called BOT *(Build Operate Transfer),* the cooperation contract is valid for 20 years starting from August 8, 2012).

Conclusion

Waste management is a systematic, comprehensive, and continuous activity that includes waste reduction and handling. Some challenges in the management of the Telaga Punggur Final Disposal Site (TPA) include; limited land for the Final Disposal Site, lack of budget and modern waste processing technology, and minimal investor interest in cooperating with the Batam City Government in managing the Telaga Final Disposal Site (TPA), making Batam City have to immediately innovate in waste management. The application of technology that can reduce waste significantly but is environmentally friendly is a priority.

Referring to Batam City Regional Regulation No. 4 of 2018 concerning Management of Regional Property through the Infrastructure Provision Cooperation Plan (KSPI) or Cooperation for Utilization (KSP) of waste management between the government and partners in Batam City, the development of waste-to-energy power generation facilities (Waste To Energy) for waste asset management at the Telaga Punggur TPA is considered to be a solution for optimal waste management.

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