

## Waste Infrastructure Planning in Tanjung Balai City

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### ABSTRACT

This study aims to examine Waste Infrastructure Planning in Tanjung Balai City. This qualitative research method, a study of waste infrastructure planning in Tanjung Balai City can provide a deep understanding of the conditions and obstacles faced. This qualitative approach allows researchers to identify solutions that are relevant to local conditions based on the perspectives of stakeholders and the community. The results of the research Recommendations for improvement include increasing the capacity of the landfill, adding a waste transportation fleet, and implementing a waste separation system from the source. The government also needs to establish firm policies and regulations and encourage private sector participation through mutually beneficial partnerships. Overall, waste infrastructure planning in Tanjung Balai City requires full support from various parties, including the government, the community, and the private sector. The suggested steps are expected to create a sustainable and environmentally friendly waste management system, thereby improving the quality of life of the people of Tanjung Balai and maintaining the cleanliness of the city's environment.

**Keywords:** Waste Infrastructure Planning and Tanjung Balai City

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### 1. INTRODUCTION

The city of Tanjung Balai, like many cities in Indonesia, faces major challenges in waste management as the population and economic activity increase. The increase in population has a direct impact on the volume of waste produced, both household waste, small industry, and commercial activities. In recent years, the issue of waste management has become increasingly urgent in the city due to the limitations of existing infrastructure and supporting facilities. Problems related to the waste management system in Tanjung Balai City were explained. The city is likely to experience an increase in the amount of waste due to the increase in population and economic activity. In addition, the limitations of waste infrastructure often lead to suboptimal management, such as the lack of adequate landfills, the lack of waste transportation fleets, and low public awareness in waste management.

Waste handling according to Law Number 18 of 2008 concerning Waste Management, includes sorting activities in the form of grouping and separating waste according to the type, amount, and/or nature of waste, collection in the form of taking and transferring waste sources from Temporary Shelters (TPS) or Integrated Waste Processing Sites (TPST), transportation in the form of bringing waste from sources and/or from TPS or from TPST to landfills, processing in the form of changing the characteristics, composition, and amount of waste, and/or final processing of waste in 3 forms of safely returning waste and/or residues from previous processing results to environmental media. Integrated waste management in border areas is one of the main keys to achieving sustainable environmental targets by 2045. The government emphasizes the importance of integrated efforts to manage waste throughout Indonesia, including border areas that often face specific challenges. Waste management is not only the task of the central government, but also requires the participation of local governments and the community. In the next few years, we need to accelerate more effective and efficient waste management measures, especially in border areas that have their own challenges.

Local governments must play a more active role in formulating waste management policies. This Master Plan will be a guideline for them to plan concrete steps in their respective areas. Waste management cannot be done partially. We need a holistic approach, including increased levies and larger budget allocations for waste management in the regions. Sustainable waste management is one of the

government's priorities in realizing Indonesia's vision 2045. In this vision, Indonesia is expected to become a clean and free country from waste problems. However, to achieve this target, a strong commitment is needed from all parties, from the central government to the community. Waste management is not only about providing infrastructure, but also changing people's behavior. We must start small, such as reducing the use of single-use plastics and increasing public awareness to dispose of waste in its place. This is our common duty, not just the government.

Some of the main factors that are the background of the problem in waste infrastructure in Tanjung Balai are as follows, Limited Capacity of Landfills (TPA) available in Tanjung Balai City have limited capacity and are not equipped with adequate facilities. Along with the increase in the volume of waste, the capacity of this landfill is not enough to accommodate the waste produced by residents every day. This situation results in the accumulation of garbage that can cause air pollution, groundwater pollution, and health threats to the surrounding community. Lack of Fleet and Waste Transportation Facilities in Tanjung Balai City lacks a fleet of waste transportation both in terms of number and condition. This causes the process of transporting waste from the source to the landfill is often delayed, resulting in the accumulation of waste in several residential areas and public roads. This problem has an impact on the aesthetics of the city and the comfort of the community, as well as increasing the risk of spreading diseases due to unclean environments. Low Level of Public Awareness in Waste Management **Education related to waste sorting, reducing, and recycling among the community is still low. This causes a lack of community participation in maintaining cleanliness and managing waste properly. Without support from the community, the existing infrastructure will not be able to function optimally.** Limited Waste Management Infrastructure Waste treatment infrastructure, such as recycling and composting facilities, is still very minimal in Tanjung Balai City. The majority of waste is directly disposed of in landfills without going through a sorting or processing process that can reduce its volume. This condition accelerates the accumulation of waste in landfills and increases the negative impact on the environment. Environmental and Health Impacts Inadequate waste infrastructure has the potential to cause significant environmental pollution. Accumulated garbage can clog waterways, increase the risk of flooding, and pollute the air and soil. The accumulation of waste in the environment is also a source of disease spread and reduces the quality of life of the surrounding community.

The above problems show that Tanjung Balai City needs better and sustainable planning and development of waste infrastructure. Comprehensive solutions need to include increasing the capacity of landfills, providing adequate fleets and transportation facilities, and community counseling to increase awareness and participation in waste management. These conditions demand more comprehensive and sustainable waste infrastructure planning in Tanjung Balai City. With good planning, it is hoped that more effective waste management, appropriate use of technology, and increased public awareness to protect the environment can be achieved. Waste is one of the challenges as well as a threat to the sustainability of the city. One of the degradation of environmental quality is triggered by waste that is not properly managed. Based on Ministerial Regulation Number 33 of 2010 concerning Waste Management Guidelines Article 3, the way that can be done to reduce waste is to limit the generation, recycling, and/or reuse of waste. Effective handling of the waste problem starts from the source, namely households, and has been regulated in Law of the Republic of Indonesia Number 18 of 2008 that waste management is not only an obligation of the government, the community, and business actors also have a responsibility in managing waste.

## 2. LITERATURE REVIEW

### Definition and Concept of Waste Infrastructure

Suharyadi (2019) defines waste infrastructure as a system that includes facilities, equipment, and methods designed to collect, transport, process, and dispose of waste in a way that is safe for public health and the environment. According to him, waste management must be based on the 3R principle (Reduce, Reuse, Recycle) to minimize the volume of waste that ends up in landfills.

### The Importance of Structured Planning

Wijaya (2019) stated that structured waste infrastructure planning is an important step to anticipate an increase in the amount of waste along with population growth and urbanization. Wijaya emphasized that effective planning must consider technical, social, and economic aspects so that infrastructure can function optimally and sustainably.

### Capacity and Location of Landfill

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According to Hadi and Kusuma (2019), one of the common obstacles in waste management is the limited capacity of landfills. They suggested the importance of periodic evaluation of landfill capacity and the selection of strategic landfill locations by considering environmental impacts and accessibility. Landfills that are too full and not managed properly will cause serious environmental pollution, such as groundwater and air pollution.

#### **Increasing Public Awareness**

Amir (2019) argues that good waste infrastructure must be supported by public awareness in managing waste. Amir said that education and socialization regarding waste sorting and recycling are very important to reduce the volume of waste produced and increase the effectiveness of existing infrastructure. Community participation in waste management will ease the burden on the government and extend the life of the landfill.

#### **Application of Technology in Waste Management**

Kurniawan (2019) emphasized that waste processing technology, such as recycling and composting, can help reduce waste that ends up in landfills. According to him, local governments need to consider investing in environmentally friendly technology to improve the efficiency and sustainability of the waste system. The right technology can minimize environmental impact and maximize the reuse of recyclable materials.

### **METHOD APPROACH**

Sugiyono (2019) defines a qualitative method as a method used to research the natural condition of an object, where the researcher is the main instrument. This approach allows researchers to understand the meaning behind the behavior, views, and attitudes of the informants towards the problem of waste management in Tanjung Balai. Sugiyono emphasized the importance of flexibility in qualitative methods so that researchers can adjust the data collection process according to the context of the field.

Moleong (2019) explained that data collection techniques in qualitative research include in-depth interviews, observations, and documentation. In the context of waste infrastructure planning, interviews with stakeholders such as the government, waste managers, and the community, help identify obstacles and expectations for waste infrastructure. Field observation is also needed to understand the existing infrastructure conditions and waste management practices in the community.

Miles and Huberman (2019) explained that qualitative data analysis is carried out through the process of data reduction, data presentation, and drawing conclusions. Data obtained from interviews and observations must be analyzed in depth to find emerging patterns or themes. In the context of this study, the pattern sought may include inhibiting factors in waste infrastructure and public perception of waste management efforts by the government.

Patton (2019) stated that data triangulation is a technique to validate findings using various data sources or different data collection methods. In this study, triangulation can be carried out by comparing the results of interviews, field observations, and documentation data related to waste infrastructure in Tanjung Balai. This triangulation ensures that the data obtained has strong validity.

### **3. DISCUSSION**

#### **What is the current condition of waste management infrastructure in Tanjung Balai City**

Tanjung Balai City faces various problems in waste management in line with the growth of the population and economic activities. The condition of waste management infrastructure in this city is still inadequate, thus posing several serious challenges related to public health and the environment. The following are some of the conditions and problems faced in waste management infrastructure in Tanjung Balai City:

1. **Limited Landfill Capacity**

The capacity of the landfill in Tanjung Balai City is inadequate to accommodate the increasing volume of waste. Existing landfills often experience a buildup of waste that results in environmental pollution, including the potential for water and air pollution. This also accelerates the decline in the life of landfills and requires expansion or more efficient waste management.

2. **Lack of Waste Transportation Facilities and Infrastructure**

The city of Tanjung Balai is experiencing limitations in terms of waste transportation facilities. The existing transport fleet is often insufficient to reach the entire city area, causing the

accumulation of garbage in several residential areas and public facilities. This shortage leads to slow waste transportation, which has an impact on environmental cleanliness and public health.

3. Less than Optimal Waste Management Technology

The waste management system in Tanjung Balai City still relies on conventional methods without adequate recycling or processing processes. The lack of waste processing technology causes most of the waste to be directly disposed of in landfills, without going through sorting or processes that can reduce the volume of waste. In fact, technologies such as composting or recycling can help reduce the amount of waste that ends up in landfills.

4. Low Public Awareness of Waste Management

Community participation in waste management is still low in Tanjung Balai. Education and awareness regarding waste sorting, reducing the use of plastic, and the habit of maintaining environmental cleanliness have not been implemented thoroughly. This low awareness results in the practice of indiscriminate waste disposal and low participation in waste management programs held by the government.

5. Budget Limitations for Waste Management Infrastructure

The Tanjung Balai City Government faces financial constraints in improving and expanding waste management infrastructure. Budget limitations have an impact on the procurement of transportation, processing, and more adequate landfill construction facilities. Collaboration with the private sector and the public is needed to overcome these budget constraints, but these efforts still need to be improved.

6. Impact on Health and the Environment

The condition of inadequate waste infrastructure has a negative impact on the environment and public health. The accumulation of garbage in urban environments leads to the risk of disease, air pollution, and water pollution. In addition, accumulated and untreated garbage can clog waterways resulting in flooding, especially during the rainy season.

Based on the above problems, it can be concluded that Tanjung Balai City needs a significant improvement in waste management infrastructure, including increasing landfill capacity, procurement of transportation fleets, application of waste processing technology, and increasing awareness and community participation.

#### **What factors are obstacles in waste management in the city**

Various inhibiting factors that affect the effectiveness of waste management in Tanjung Balai City. These inhibiting factors complicate the efforts of the government and the community in dealing with the waste problem, which ultimately negatively impacts the environment and the health of citizens. Here are some of the main inhibiting factors faced:

1. Limitations of Infrastructure and Facilities Infrastructure and waste management infrastructure facilities in Tanjung Balai are still minimal, ranging from the limited capacity of the landfill to the insufficient number of waste transportation fleets. Garbage haulers are often unable to reach the entire city area, causing garbage to accumulate in some residential areas. This limitation makes waste management inefficient and less than optimal.
  2. Budget Limitations and Budget Resources The budget allocated by the city government for waste management is still limited. This budget has an impact on the government's ability to improve infrastructure, purchase new fleets, and build modern waste management facilities. The lack of budget also hampers education and socialization programs about waste management to the community.
  3. Low Awareness and Community Participation. The level of awareness of the people of Tanjung Balai City in terms of waste management is still low. Many residents throw garbage carelessly and do not understand the importance of waste sorting or recycling efforts. This low community participation worsens the condition of waste in the city, because the government needs active support from the community to create a clean and healthy environment.
  4. Lack of waste treatment technology. Waste management in Tanjung Balai still relies on conventional methods that do not involve significant sorting or recycling. The city does not yet have advanced waste treatment technology, such as composting or incinerators, to effectively reduce the volume of waste. As a result, most of the waste is only collected and disposed of in landfills, which results in the accumulation of waste and the acceleration of the decline in landfill capacity.
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5. Constraints on Planning and Waste Management Policies. The lack of careful planning and effective policies in waste management is also one of the inhibiting factors. Existing waste policies are not fully implemented, and there is often no strict oversight of waste disposal practices. The weak regulatory system makes it difficult to enforce the correct waste disposal rules and encourages the public to behave in a disciplined manner.
6. Lack of Education and Socialization on Waste Management. The lack of education and socialization programs regarding waste management makes people not understand their roles and responsibilities. This lack of education results in a low public understanding of the negative impact of waste on health and the environment, as well as a lack of participation in recycling or waste sorting programs.
7. Impact of Urbanization and Population Growth. The rapid population growth in Tanjung Balai City has increased the volume of waste produced every day. Urbanization that is not accompanied by good waste management planning worsens the waste condition in this city. The increasing amount of waste is not proportional to the available waste management infrastructure capacity, thus accelerating the problem of waste accumulation in various locations.
8. Dependence on Conventional Management Systems. The city of Tanjung Balai is still very dependent on the conventional waste management system, which is collecting and disposing of waste to the landfill without additional processing processes. This system is not only inefficient, but also increases the risk of environmental pollution and public health. Without initiatives to change or improve this system, waste management problems will continue.
9. Lack of Cooperation with the Private Sector. In many cities, collaboration with the private sector has been proven to help address waste management problems, but Tanjung Balai City is still minimal in this regard. The lack of cooperation with the private sector results in a lack of innovation and additional funds for the development of waste infrastructure. Support from the private sector can be in the form of investments in processing facilities or more efficient waste management technology.

By understanding these inhibiting factors, this study is expected to provide the right recommendations to overcome the obstacles of waste management in Tanjung Balai City. There needs to be a collaborative effort between the government, the community, and the private sector to create a more sustainable and environmentally friendly waste management system.

### **What are the steps that can be taken to improve the effectiveness of waste infrastructure in Tanjung Balai**

To increase the effectiveness of waste infrastructure in Tanjung Balai City, several strategic steps can be taken. These measures include improving infrastructure, improving technology, and policy approaches involving community and private sector participation. Here are the steps that can be taken, Planning is needed to increase the capacity of the landfill in Tanjung Balai City, including the possibility of land expansion or the construction of a new landfill. In addition, the implementation of a sanitary landfill system can reduce the impact of pollution from discarded waste, so it is more environmentally friendly and can extend the life of the landfill. The government can increase the waste transportation fleet and optimize transportation routes so that services cover the entire city area. Efficient routing can ensure that garbage is transported on a scheduled basis and prevent the accumulation of garbage in residential areas. Adopting waste treatment technologies, such as recycling systems, composting, or incinerators, can reduce the volume of waste that must be disposed of in landfills. This technology also allows the use of organic waste as fertilizer or alternative energy. The city of Tanjung Balai can start with a pilot program or cooperation with institutions that have expertise in this field.

It is important for the government to increase public education about waste management, including how to sort waste at home and the importance of recycling. Socialization programs in schools, community centers, or local media can increase public awareness of environmental cleanliness and reduce the habit of littering. Encouraging the community to separate organic and inorganic waste from households will make the recycling and waste processing process easier. The government can provide separate waste containers in each residential area and hold simple training on waste sorting. Increasing the budget allocation for waste management will allow for infrastructure improvements and the provision of more modern waste management technology. Aside from the regional budget, additional funding can be sought through assistance from the central government, partnerships with the private sector, or international donors focused on environmental programs. Involving the private sector and

NGOs in waste management programs can increase efficiency through investment and innovation. The private sector can participate by providing technology, investing in processing facilities, or supporting educational programs. This partnership can be realized through the Corporate Social Responsibility (CSR) or Public-Private Partnership (PPP) scheme.

The government can implement stricter regulations related to waste management, including sanctions for violations such as littering. This policy can also include incentives for communities or companies that are active in recycling and waste reduction programs. Organic waste can be processed into compost for agriculture or even an alternative energy source (bioenergy). By creating a program that allows the productive use of waste, Tanjung Balai City can reduce its dependence on landfills and get additional benefits from waste. To ensure the success of the above steps, it is necessary to carry out periodic monitoring and evaluation of waste management infrastructure. This evaluation can involve indicators such as the volume of waste that has been successfully managed, the level of environmental cleanliness, and the level of community compliance with waste policies. The results of this evaluation can be used as a basis for further improvement. With the implementation of the above steps, the effectiveness of waste infrastructure in Tanjung Balai City is expected to increase, which will ultimately create a cleaner and healthier environment for the community.

#### 4. CONCLUSION

The results of the research are related to waste infrastructure planning in Tanjung Balai City, which is expected to provide solutions to improve waste management effectively and sustainably. Based on the analysis that has been carried out, here are the main conclusions:

Currently, waste management infrastructure in Tanjung Balai City is still minimal and inadequate. Landfills have limited capacity, the waste hauling fleet is insufficient to serve the entire region, and waste processing facilities such as incinerators or recycling facilities are not yet available. This infrastructure limitation is the main obstacle in efforts to realize effective waste management. Factors such as budget limitations, low public awareness, lack of private sector participation, and weak regulations also hinder the effectiveness of waste management. This shows the need for a more comprehensive and collaborative approach in dealing with the waste problem in Tanjung Balai.

Education about effective waste management is still not optimal, so the community does not understand the importance of waste sorting and reduction. Public awareness must be increased through socialization programs and sustainable environmental campaigns. The use of waste management technologies, such as composting, recycling, and converting organic waste into energy, is important to reduce the volume of waste that ends up in landfills. The use of this technology can extend the life of the landfill and reduce the negative impact of waste on the environment.

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