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## Social and Environmental Externalities of the Landfill: A Case Study of Bantargebang Landfill in Bekasi, Indonesia

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### Abstract

*The Bantargebang landfill in Bekasi, Indonesia, is one of the largest waste disposal sites, handling over 7,500 tonnes of waste daily from Jakarta and its surrounding areas. Despite its essential role in waste management, the landfill has significant social and environmental externalities. This study examines these negative impacts, particularly on local communities, including health issues, reduced property values, and environmental degradation such as water and air pollution. The research highlights the inefficiency of current waste management practices, despite technological advancements like the use of waste for energy production. Policy recommendations are provided to address the ongoing challenges, including the need for stronger regulations on plastic waste and better waste reduction initiatives. The study emphasizes the importance of sustainable and integrated waste management approaches to mitigate the landfill's adverse effects on both the environment and community well-being.*

**Keywords:** Bantargebang landfill, social externalities, environmental pollution, plastic waste, sustainable waste management

### Introduction

Jakarta as the capital city, cannot be separated from the waste problem. A dense population with all its activities produces a lot of waste. The problem is getting more difficult considering that the city of Jakarta has a very limited area, making it impossible to dispose of garbage in its own area. For this reason, the solution in dealing with waste is to have cooperation with the surrounding area (hinterland area) as a place for Jakarta's garbage disposal.

The increasing population and urbanization in Indonesia have led to an increase in the amount of solid waste generated. The waste problem is never finished at any time, if it does not increase, it will not run out until it is completely decomposed because the various existing materials are mixed up. The waste problem is also a social problem that is heartbreaking and takes lives because it is buried in piles of garbage. Even heavy equipment is unable to dredge up the mountains of garbage that continue to pile up every day.

One of the garbage dumps from Jakarta is in the City of Bekasi, namely the Bantargebang TPST. The Bantargebang Integrated Garbage Disposal Site (TPST) is formally managed by the Environment Agency and the Sanitation Service of the Provincial Government of Jakarta. The Bantargebang TPST, which is managed by the Provincial Government of Jakarta, has been operating since 1989, with a land area of 113.15 hectares consisting of 81.40 hectares of landfill and 23.30 hectares of infrastructure facilities. The total waste generation capacity reaches 7,708 tonnes/day. The composition and characteristics of the waste are 43% organic waste and 35% plastic and PET (PolyEthylene Terephthalate) or recyclable plastic (Maulana, 2014).

Besides having a disaster potential, waste also has great economic potential. The economic potential of recycling waste as industrial raw material. Economic benefits can be seen from the many users (users) at the Bantargebang Integrated Waste Disposal Site (TPST). Beneficiaries include scavengers, collectors, and grinders who work informally to take advantage of the economic potential of discarded waste (Nurtyasrini & Hafiar, 2016).

Bantargebang is one of the biggest landfills in Bekasi that handles waste from surrounding areas and Jakarta. This landfill can have significant negative externalities on the environment and human health (Amalia, 2022). One of the main negative externalities is the impact on the surrounding communities. The management of this solid waste has become a major challenge for the country, and landfills have been established as a solution for the disposal of solid waste. Bantargebang landfill has negative externalities including odors, flies, health problems, decreased property values, decreased overall quality of life, and loss of community cohesion (Nurhidayati, 2020).

The waste processing process that has been carried out is in accordance with public health procedures and theories but there are still many deficiencies in its implementation. Processing of waste at landfills has an impact on public health, namely that many people still suffer from diseases caused by this waste, such as respiratory infections, diarrhea, and dengue fever, which are supported by factors where various organisms and disease vectors reproduce (Ayen, Umar, Elwindra 2016).

The existence of waste also has an impact on the environment such as water pollution caused by waste leachate, air pollution caused by gases produced from waste decomposition micro-substances, soil pollution caused by chemicals from plastic waste, cans which will disrupt the level or condition of the soil so that difficult to use for farming (Firdaus, 2022).

## Problem Statement

In waste management, Bantargebang TPST applies a more environmentally friendly, integrated and sustainable concept. However, on the other hand, the negative perceptions of some communities and stakeholders regarding environmental and social issues still exist. For this reason, it is necessary to conduct a study related to the sustainable model of integrated waste management at the Bantargebang Bekasi TPST. The purpose of this research is to evaluate the sustainability status of integrated waste management at Bantargebang TPST.

The presence of landfills can have significant negative impacts on the surrounding communities. While the previous studies discussed in the literature review have provided evidence for these negative

externalities, research on the specific social impacts of Bantargebang landfill on the local community in Bekasi is limited.

The purpose of this study is to investigate the social impact of Bantargebang landfill on the local community, including its effects on property values and overall quality of life. The research aims to answer the following questions:

- How does the presence of Bantargebang landfill impact the social well-being of the local community?
- What are the recommendations for policymakers and local authorities to minimize the negative externalities of landfills on the local communities and to leverage the positive externalities?

This research is important as it will provide insight into the social impacts of Bantargebang landfill on the local community and inform decision-making about solid waste management in Bekasi and Indonesia in general.

This study employs a literature review approach to investigate the social impact of Bantargebang landfill in Bekasi. The literature review will consist of a comprehensive search and analysis of relevant research papers, reports, and other literature on the topic of landfills and their social impacts on communities. To identify the relevant literature, the study will conduct a comprehensive search of academic databases. The search will include articles, papers, and reports published in English and Indonesian languages. Additionally, the study will conduct a search of government reports, news articles, and other sources of information on the topic.

## Discussion and Analysis

Bantargebang is better known as an integrated waste disposal site or TPST by residents of Jakarta and Bekasi. President Jokowi calls waste management a priority. In Jakarta, every day more than 7,000 tonnes of waste are sent to Bantargebang. New technologies such as converting waste into fuel and waste decomposition have not been able to overcome this problem. In fact, if a waste powerhouse is operating in Jakarta, less than half of daily waste can be managed optimally (Kumparan, 2022).

Jakarta residents generate around 7,509 tonnes of waste which are transported using 1,200 trucks to Bantargebang. This means that there are still 6,509 tonnes of waste that are still the task of the Jakarta Provincial Government (Amalia, 2022). Bantargebang cannot yet be a solution to Jakarta's waste problem. The waste generated is still much more than can be processed, while Jakarta has no other alternative waste disposal sites.

The Bantargebang TPST is divided into six disposal zones (Maulana, 2016). Five zones are designated for disposal of waste from Jakarta, and one zone is designated for distribution of waste from Bekasi City. The discharge zone is described as follows:

1. Zone I is intended for waste originating from East Jakarta Municipality. Waste originating from this area consists of domestic, market and industrial waste from the Pulo Gadung area.
2. Zone II is a waste disposal zone originating from the Municipality of North Jakarta. Dominant market and domestic waste dumped here. In addition to domestic waste, the waste disposed of in this zone is market waste.
3. Zone III is waste originating from West Jakarta. Garbage consists of domestic, market and industrial waste. Some

of the waste from West Jakarta is disposed of at the Tangerang TPST because the location is closer.

4. Zone IV is a garbage disposal site for the Central Jakarta area. The most dominant waste is plastic, market waste, office waste.
5. Zone V is the disposal of waste originating from South Jakarta. The dominant waste is domestic waste, market waste and hotel and restaurant waste.
6. Zone VI is a waste disposal site originating from Bekasi City. Every day, an average of 750 tonnes of waste is disposed of in this zone, consisting of domestic waste, traditional markets, supermarkets, restaurants, and some industrial waste.

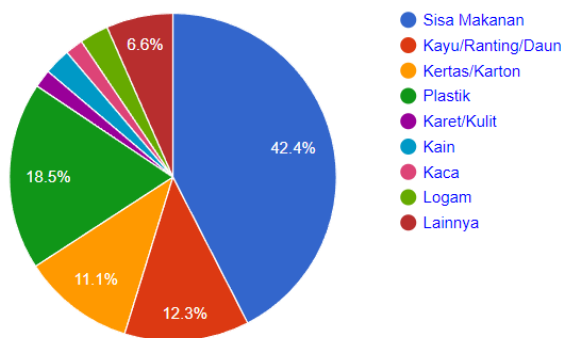
Based on the infographic, of the four waste zones, three of them have reached heights above 40 meters. As in Zone V, from the 25.05 hectares provided the height there has reached 46.99 meters. While in Zone II of the 22.41 hectares prepared, the height has

reached 44.50 meters. Likewise with Zone III, from 19.67 hectares the height has reached 48.99 meters. In practice, only zone I has a height of only 33.59 meters on 25.05 hectares of land. However, this is reasonable considering that it has been 32 years since the Bantargebang TPST has received shipments of garbage from Jakarta residents (Maulana, 2016).

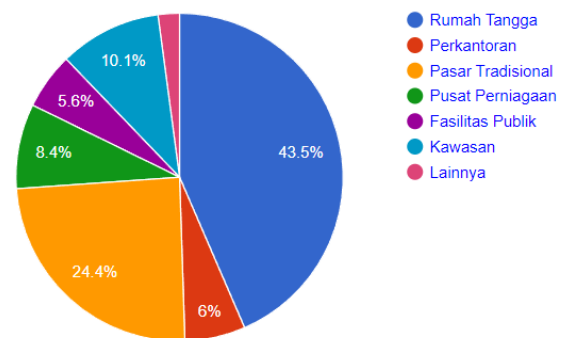
PLTSA Merah Putih in Bantargebang is the first PLTSA in Indonesia which is designed to operate 24 hours per day and 250-300 days/year, using waste fuel with a capacity of 100 tonnes per day. In addition to being processed into electrical energy, landfill at Bantargebang TPST will be processed into alternative fuels in the form of Refuse Derived Fuel (RDF). RDF itself is flammable waste which is then processed into fuel.

There is a table that displays a graph of the composition of waste achieved by districts/cities throughout Indonesia in 2022. The following is the table.:

**Komposisi Sampah Berdasarkan Jenis Sampah**



**Komposisi Sampah Berdasarkan Sumber Sampah**

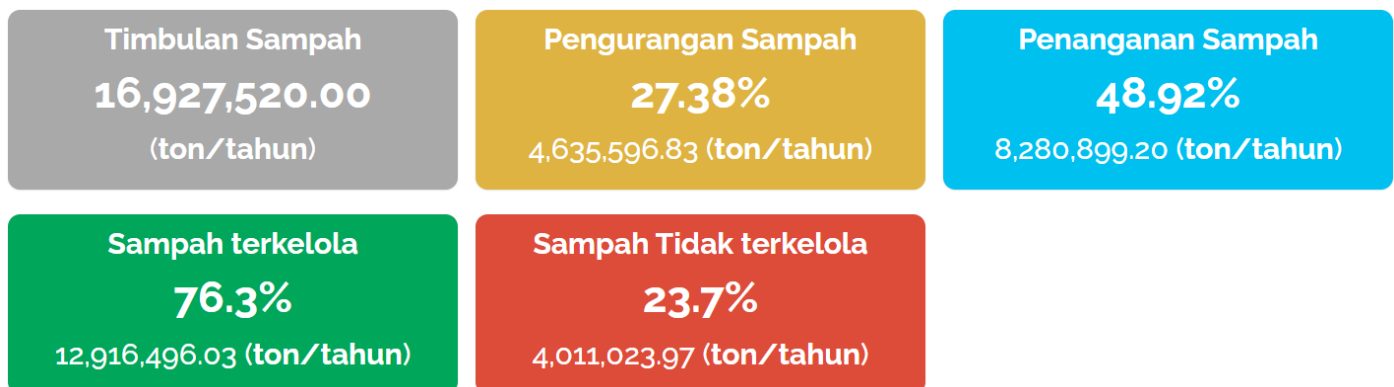


Source: [sipsn.menlhk.go.id](https://sipsn.menlhk.go.id)

The graph is divided into two types, namely the waste composition graph based on the type of waste and the waste composition graph based on the source of the waste. The graph of waste composition by type of waste shows the percentage of types of waste handled, and we find that 42.4% of waste comes from food waste and 18.5% is plastic waste. Meanwhile, the graph of waste composition based on waste sources shows the percentage of waste originating from households (43,5%), traditional market (24,4%), and others. This table provides an overview of the composition of waste handled by districts/cities in Indonesia and can be used as a basis for evaluating the success of waste management programs in each city.

And the table below displays data on the achievements of waste management achieved by 137 Regencies throughout Indonesia in 2022:

Capaian Kinerja Pengelolaan Sampah adalah Capaian Pengurangan dan Penanganan Sampah Rumah Tangga dan Sampah Sejenis Sampah Rumah Tangga. Data capaian dibawah ini adalah hasil dari penginputan data yang dilakukan oleh 137 Kabupaten/kota se-Indonesia pada tahun 2022



Source: [sipsn.menlhk.go.id](https://sipsn.menlhk.go.id)

This data is obtained through input carried out by each Regency and includes information such as the level of waste collection, the level of waste treatment, and the level of final disposal of waste. This table provides an overview of the condition of waste management in Indonesia and can be used as a basis for evaluating the success of waste management programs in general.

From the table above we can find out the achievements of reducing and handling household waste and household-like waste in 137 districts throughout Indonesia with data on waste accumulation of 16,927,520 tonnes/year. Of the total waste, 76.3% of the waste has been managed and 23.7% has not been managed, which is 4,011,023 tonnes/year.

The Bekasi City Government sees the increase in the volume of waste delivered every day to Bekasi City as a new problem, due to the increasing traffic jams on the garbage truck travel routes that already exist in the agreement between the Bekasi City Government and the Provincial Government of Jakarta. Waste management after being in Bantargebang also results in increased disease development for people who live adjacent to Bantargebang and those who depend on the economy as scavengers in Bantargebang TPST.

Bantargebang TPST is also a daily source of income for scavengers. Scavenger jobs in Bantargebang are very at risk of being buried by landslides. The impact of the Bantargebang TPST on the surrounding community is in the form of water pollution, air pollution, as a hotbed of disease, and a reduction in aesthetics. Soil pollution is not considered a loss for the community because the community still considers that the land in their area has not been polluted. The biggest loss felt by the community is the loss in the form of air pollution, this is because the loss in the form of air pollution is very difficult for the community to avoid. This is also a new problem for the government because they have to budget costs that continue to increase every year for waste management in the city of Jakarta, including compensation funds and grant funds.

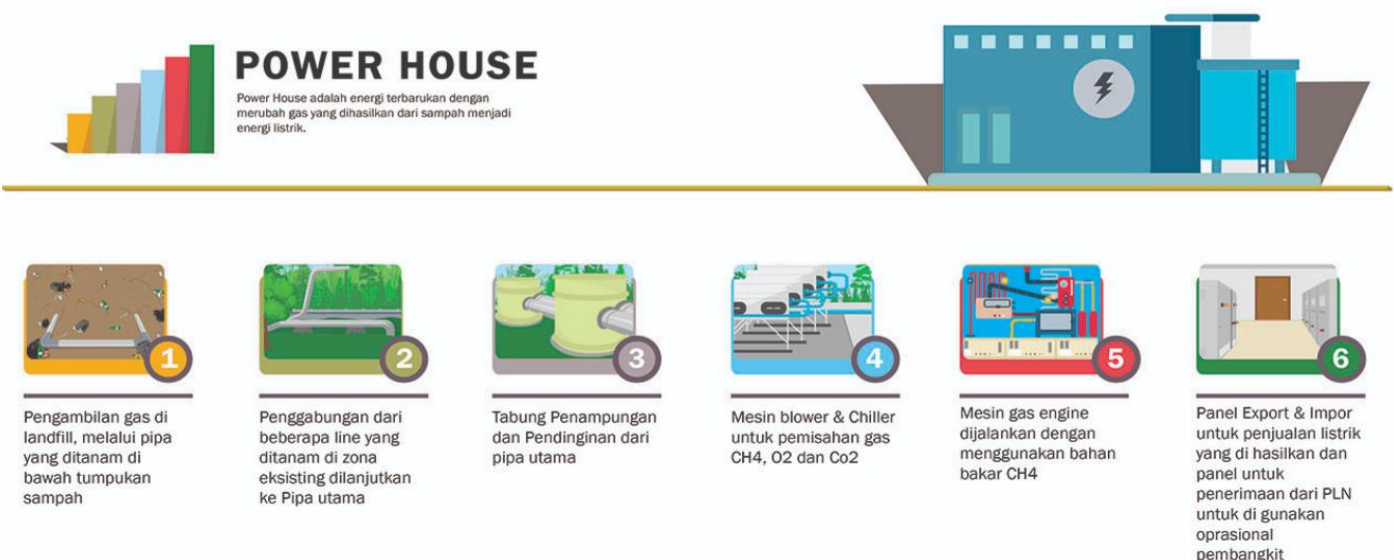
Waste management in the upstream that makes the Bantargebang landfill must receive 7.2 tonnes/day of waste from Jakarta every day, this has resulted in mountains of unnatural waste. The normal limit for a pile of garbage is 10-15 meters high, but in 2020 the pile of garbage has reached 30-40 meters. Likewise, waste management with open dumping has exceeded a height of 35 meters. The effective distance of air pollution (odor) reaches 10 km from the TPST point.

The problem of the capacity of TPST can be approached in two ways, namely through intensification and extensification program, for example expansion of the existing Bantargebang landfill with new land around the existing land. Responding to the above condition issues, Jakarta Provincial Government has realized part of the planned three packages of strategic waste management policies, namely:

1. Suppress or reduce waste from upstream sources, from homes, offices, markets to hotels and some of it.
2. Providing intermediate treatment facilities (ITF) or waste processing facilities within the Jakarta area.
3. Build a waste powerhouse (PLTSa).

From the 3 plans for the waste handling strategy policy package above, in 2019 the provincial government of Jakarta is collaborating with the Center for Environmental Technology (PTL) and the Agency for the Assessment and Application of Technology (BPPT) in a pilot for a Waste Powerhouse (PLTSa). The following is an illustration of how the Powerhouse is processed from waste into renewable energy power by converting the gas produced from waste into electrical energy:

Pembangkit Listrik Tenaga Sampah (Power House)



Source: *upstdlh.id*

In addition to tackling piles of waste and extending the useful life of the Bantargebang TPST, this effort also aims to encourage the use and development of waste management innovations to generate electricity (Republika, 2022).

With this strategy in waste handling, it is hoped that the Jakarta Provincial Government can manage waste properly and can even reduce the volume of waste. The success of this innovative method

of waste management by the Provincial Government of Jakarta is very important and is the hope of all of us.

Even though the management capacity is quite large to deal with the waste problem at Bantargebang landfill, since the government currently has 2 technology-based ways: landfill mining and the operation of Refused Derived Fuel (RDF), in fact this has not been able to overcome the mountain of garbage from the people of

Jakarta that continues to grow. And now, the space at the Bantargebang is increasingly limited.

According to Koran-Jakarta, as of 16 January 2023, almost all zones were full, with an average height of 40-50 meters. The volume of waste entering the Bantargebang TPST is around 7,500-7,800 tonnes/day, transported by as many as 1,300 trucks. The waste has not been sorted. TPST operates 24 hours a day. There are four exhaust points. General data submitted by Bantargebang TPST management on September 22, 2022 (Koran-Jakarta, 2022):

- In 2014 there were 5,664.48 tonnes; (30 days x 12 months = 2,039,212.8 tonnes).
- In 2015 the average was 6,419.14 tonnes/day.
- In 2016 the average was 6,561.99 tonnes/day.
- In 2017 the average was 6,875.49 tonnes/day.
- In 2018 the average was 7,452.60 tonnes/day.
- In 2019 the average was 7,702.07 tonnes/day.

This means that in fact there has been an increase in Jakarta waste sent to the Bantargebang TPST within 4-5 years. According to early 2020 information, after the flood, the waste that was disposed of at TPST reached 12,000 tonnes/day. From 2014 to 2019, the increase in waste to TPST was around 2 million tonnes to 2.7 million tonnes. Plastic waste dominates around 33% plus 2% PET. The data is a simulation of sampling. Nationally, the composition of plastic waste reaches 13-14%.

However, new thoughts and lifestyles now are developing for the sake of environmental sustainability and human health, namely that plastic is easily decomposed. A progressive solution is needed because plastic waste has become a national and global problem. Environmental activists and agencies, government, associations, some members of the public are starting to turn to plastic designs and products that are easily biodegradable. Some say biodegradable and compostable plastic.

The plastic is easy to decompose to speed up the decomposition cycle. Could be a few months, could be a year or two or two years. So, the decomposition process and the final result need laboratory testing and are very scientific. Because the ends have to be compostable. Bioplastics made from plants and animals are processed quite quickly, maybe only 3 months. While Oxo-biodegradable plastic can last 2-5 years. The tests are also scientific, and the end result is environmentally friendly or return to earth (Koran-Jakarta, 2022).

The existence of the Bantargebang TPST is still considered to have a social impact on the community and the surrounding environment. To address this, the Jakarta Provincial Government changed its policy, that TPST no longer only functions to serve the needs of the community (service center) in terms of waste management. But now, the role of TPST has taken into account the benefits or added value that can be generated from waste.

Efforts to reduce waste continue to be developed, although it is still limited and requires ongoing efforts. Therefore, the government needs to encourage and optimize the recycling business to improve sustainable waste processing technology systems. Another challenge is that waste management institutions are not yet optimal, both as regulators and as operators. The awareness of all stakeholders is needed to be involved in reducing waste independently, both in residential areas, commercial areas, and other places.

## Conclusion

The findings suggest that the presence of the Bantargebang landfill still has a negative impact on the social well-being of the local community, including decreased property values and decreased overall quality of life. As for dealing with piles of waste and extending the useful life of the Bantargebang TPST, waste management is carried out to produce electricity by PLTSA. Apart from being used as electrical energy, waste at the Bantargebang TPST is processed into an alternative material in the form of Refuse Derived Fuel (RDF).

However, it is still very ineffective in getting rid of the garbage that always comes every day. The government should implement a ban on the use of plastic bags for supermarkets to reduce waste. Society can comply with these regulations and participate in waste management so that it has economic value. And they need to be given lessons related to plastic waste which can damage nature, so they are aware of the need to maintain and always pay attention to their daily habits related to waste. The study concludes that policy makers should consider the social impacts of landfills when making decisions about solid waste management. This is quite complex because it must involve all levels of society, from the government to society.

The government must accommodate these various interests within the framework of legal regulations, within the framework of the Indonesian National Standard (SNI). So that there is legal certainty for all. In addition to efforts the encouraging biodegradable plastic products, solutions are also needed to reduce the use of plastic. Also, the government should make a regulation regarding plastic packaging producers so that they are fully responsible for their waste.

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