

# Waste Bank Program for Households as A Means of Processing Inorganic Waste

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**Abstract** Waste management is crucial in the present day, particularly due to the increase in trash production caused by population growth. To address this issue, the government has implemented the Waste Bank Program, which aims to reduce the amount of waste stored at disposal sites. This program has had a significant impact on the management of household waste, which makes up the majority of all waste generated in Indonesia. Despite its importance, participation in the Waste Bank program is low in many communities. To address this issue, a community activity was organized in Sleman, Yogyakarta Special Region to promote and implement the Waste Bank program in one of the 44-family Neighborhood Units. The focus of this activity was the management of inorganic trash. During the six-month period from April to October 2021, the Waste Bank program had a significant increase in participation, with the percentage of community members taking part rising from 27% to 60%. As a result of these efforts, a total of 1,084 kg of inorganic trash was collected. This waste was primarily composed of paper, followed by plastic, various other materials such as iron, aluminum, and used cooking oil, and a smaller amount of glass. The report summarizes the steps taken, challenges encountered, and potential solutions implemented during the initiation of the Waste Bank program. Additionally, the community was able to save 16% of the revenue generated from the collected trash through monthly environmental fees. These findings provide valuable insight into the current state of waste generation and the community's situation, which can inform future efforts to reduce waste.

## 1. INTRODUCTION

Waste generation is a reality of modern civilization, as it is produced through various household and industrial activities. It is also inevitable that populations will grow over time. Previous research has shown that there is a correlation between population growth and an increase in household garbage (Fan et al., 2019; Supangkat & Herdiansyah, 2020; Ratya & Herumurti, 2017). To address this issue, it is necessary to implement a sound waste management system to mitigate the expected rise in trash production. Poor waste management can have negative impacts on the environment and human health, including groundwater contamination, unpleasant odors, and the spread of disease (Ogundele et al., 2018; Zahra, 2018).

In many societies, waste is often disposed of through open dumping, inefficient landfilling in final disposal sites, or by individuals discarding it in rivers or burning it (Asteria & Heruman, 2016). These waste management practices highlight the need for effective waste management strategies. However, the success of these efforts can be influenced by a range of technical, environmental, financial, sociocultural, and legal factors. As a developing nation, Indonesia shares similar waste management challenges with other emerging nations.

Waste management is the systematic and environmentally responsible process of minimizing and processing waste. Waste Bank is one of the programs

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implemented in Indonesia to combat this waste problem. This initiative is an application of Ministerial Regulation No. 14 of 2021 on Waste Management in Waste Banks. Waste Bank is defined in this regulation as a "facility for managing waste with the 3R principles (reduce, reuse, and recycle), as a means of education, behavior change in waste management, and the implementation of a Circular Economy, which is formed and managed by the community, business entity, and/or local government." This program can limit the amount of waste entering Final Disposal Sites (TPA). In addition to aiding in the reduction of waste sent to landfills, the community can reap direct economic and environmental benefits (Haryanti et al., 2018). With a series of benefits from the waste bank above, the existence of the waste bank program is still not widely followed by the wider community. In Yogyakarta, one of the cities with a relatively high population density (Badan Pusat Statistik, 2020), membership in the waste bank program did not reach 14.6% until 2016. This program's implementation still necessitates attention, for instance in providing the correct information to increase environmental awareness and attitude.

Preliminary observations in this research environment also show that waste management has so far been carried out by only paying garbage collectors to pick up trash. Garbage that is mixed between organic and inorganic waste often gives off an unpleasant odor, when scattered or even when it rains. Ignorance of waste management methods, low awareness of managing waste independently, and lack of socialization of good waste management are the things that cause this condition. This research is, therefore a type of community service because it introduces the waste bank program and invites the community to become directly involved in better waste management by beginning with garbage sorting. It is anticipated that this initiative will result in a cleaner environment as a result of increased resident awareness regarding trash management, mainly inorganic waste. This study describes the process of establishing a waste bank from its inception through its successful operation in an effort to provide an overview of the process being conducted, the obstacles encountered, and alternative options to ensure the program's sustainability.

## 2. METHOD

This independent waste bank management program is carried out in a housing complex consisting of 44 households, with the coverage of one Neighborhood Unit (RT), namely RT 17a, RW 07, Plosokuning IV, Minomartani, Sleman. This neighbourhood comprises households with an average of 2-3 children with middle economic levels. In the majority of households, both parents have daytime office jobs. This impacts the limited time available for further activities. This initiative will begin in April 2021 and is still active at present. The data presented in this manuscript covers the waste bank data from April 2021 to October 2021. The steps taken to carry out this program are divided into two general categories:

1. Socialization and the establishment of the waste bank

The initial target of the socialization was housewives, because they generally carried out waste management at home. This socialization activity was carried out through Neighbourhood Unit recitation/ social gathering activities of housewives' events and also through social media platforms such as WhatsApp Group. The explanation given is about the importance of sorting, the types of waste that can be sorted and how to sort it. In this stage, the level of community participation can be measured from their involvement.

2. Operational activities of the waste bank

After the socialization process is complete, and the community has obtained information about what a waste bank is and its mechanism, the operational stage can be carried out. At this operational stage, the level of community involvement in sorting and collecting can also be measured each time a waste collection is held. In addition, the amount and type of waste can be recorded as well. Some things to consider in this operational stage are:

- a. Schedule regular trash bank deposits  
This waste bank deposit scheduling is carried out to facilitate waste collection. Scheduling is currently done every two or three weeks.
- b. Recording of collected waste  
The recording process is carried out in each deposit period. The data recorded include the name of the depositor, the type of waste collected and its weight.
- c. Recap of waste deposit data  
The data recorded in stage 3 is then recapitulated using Ms Excel and multiplied by the price of each type of waste per unit weight to obtain the total rupiah amount deposited by each depositor. This amount will be accumulated over time as depositors' savings.
- d. Waste bank member savings report  
The data that is processed in stage 4 is then informed to each depositor via WhatsApp media. This process is currently still manual by contacting depositors one by one because the information system is still under development.
- e. Sales of waste to the Central Waste Bank  
The waste collection results in each period are sold to the Central Waste Bank, which is located in Guwosari, Pajangan, Bantul.
- f. Sales recap  
The sales proceeds are recorded in the Ms Excel document, and the funds obtained are used to pay for depositors' waste and the available balance is used for Neighbourhood Unit's cash and Waste Bank operations.

## 3. RESULT AND DISCUSSION

Before the implementation of the Waste Bank program, waste management in the RT 17a, RW 07, Plosokuning

IV, Minomartani, Sleman area was carried out by hiring garbage collectors to pick up waste. There had been no initiatives to promote independent waste management. Typically, households would place their waste in a trash can in front of their house, which would then be collected by the garbage collectors and taken to a final disposal site. Trash cans were provided by each household, some of which were covered and others were not. If the trash can was not covered, the garbage would often be scattered by cocks from the neighboring village searching for food. These chickens would only eat certain types of organic waste, but in one plastic bag, both organic and inorganic waste were often mixed. As a result, inorganic waste not eaten by the chickens would be scattered and potentially blown into the surrounding environment, especially when it rained and the garbage became wet and odorous. The water flow would also carry inorganic waste along the road. These conditions prompted researchers to encourage residents to start managing their waste independently through the Waste Bank program, which focused on inorganic waste that is easier to sort and produces less odor than organic waste.

This waste bank was formed through an agreement with the regional management, in this case, the Neighbourhood Unit management. Since most households are families whose parents work, the activities of the waste banks are still limited to sorting and collecting waste. The necessary

facilities, such as scales, sacks, and documentation, are provided on a self-supporting initiative. Currently, there is no community empowerment for waste processing, such as the creative reuse of used goods collected. This waste bank is expected to be one of the social activities with the community in addition to the regular social gathering held once a month.

### 3.1 Household participation

At the beginning of the waste collection activity which began in April 2021, there were 12 participating households out of a total of 44 households. As time goes by, the number of households involved is increasing until it reaches 26 households by October 2021. Fluctuations in home involvement are caused by waste disposal being scheduled on certain days, which all houses may not attend. In addition to the unsuitable timetable, there is a lack of enthusiasm surrounding waste sorting and collection, possibly because every family must pay maintenance fees, which include garbage collection. Thus, people will prefer not to do additional tasks, which is waste sorting, while the benefits they have not yet felt. However, there was an increase in the number of participations during this period as shown in the graph in Figure 1. One of the main reasons for this phenomenon is the economic factor that they are starting to get. Even though the amount is not too large, this thing can provide motivation to get involved in this activity.

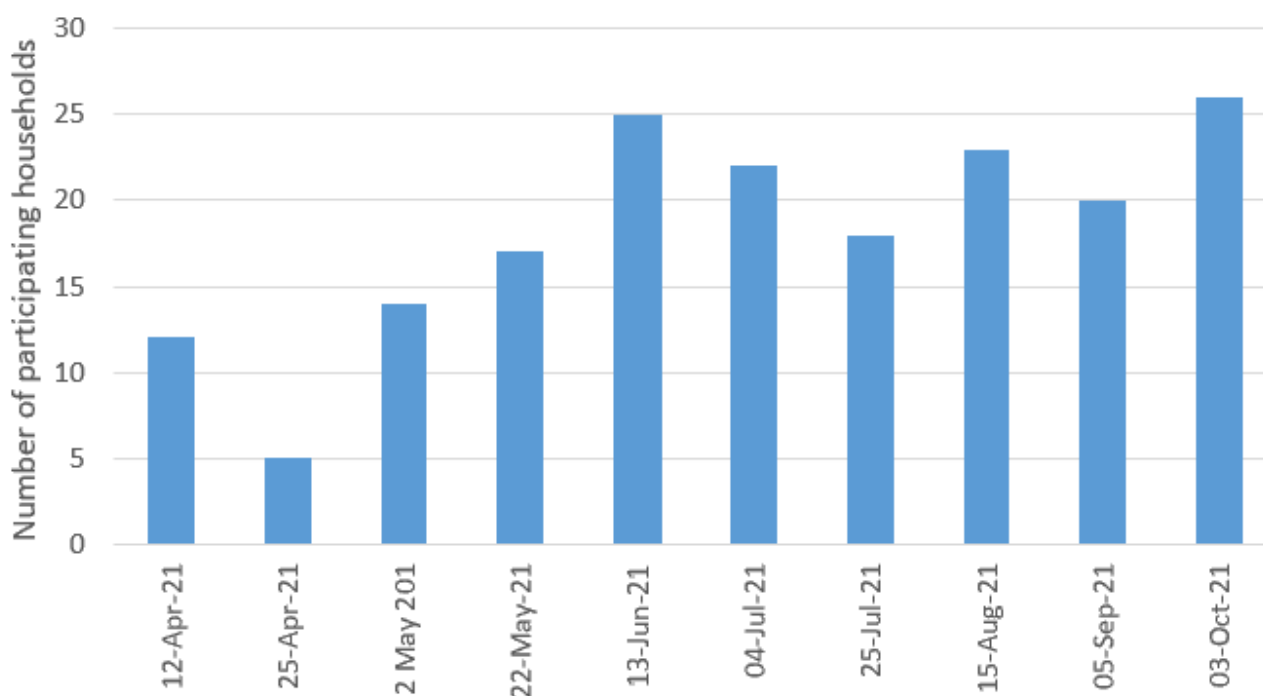


Figure 1. Total household participation from 12 April to 3 October 2021

### 3.2 Waste profile

Over the course of six months, the Waste Bank program was able to collect a total of 1,085 kg of inorganic waste, with the composition shown in Figure 2 (a). Based on

weight, paper waste made up the largest portion at 584 kg (54%), with cardboard waste being the dominant type. The second most common type of waste was plastic, comprising 292 kg (27%), in the form of plastic bottles, packaging,

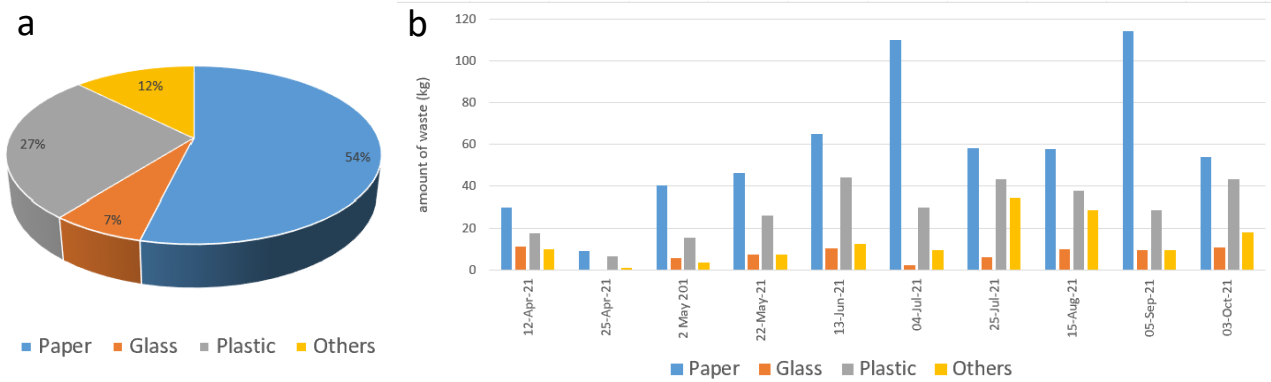


Figure 2 . (a) Proportion of types of waste; (b) Amount of waste in each deposit period by type

mica, and other plastic items. The third category was miscellaneous components, including iron, cloth, cans, aluminum, cooking oil, and other items besides paper, plastic, and glass, totaling 135 kg (12%). Glass waste made up the smallest portion at 74 kg (7%). This breakdown can provide important information on the consumption of products that have the potential to generate waste. Figure 2 (b) also shows that these proportions have remained consistent over time, with paper waste being the most dominant, followed by plastic waste, miscellaneous waste, and glass waste. This data can be used in the future as a starting point for developing strategies to reduce waste at its source.

### 3.3 Socioeconomic impact

An important factor that encourages households to participate in this waste bank activity is the financial benefits obtained. Currently, each household pays a

monthly environmental contribution of IDR 70 thousand. Figure 3 shows the total revenue earned during the 6-month period, which is around IDR 1.38 million. As much as 10% of this income is a social fund for waste bank operations. With an average participation of 18 families, the average income per households in 6 months is IDR 69,000 or IDR 11,500/household/month. Then with this income, the cost can be saved by 16%. Figure 3 also presents that the income has a rising pattern, which might cause by the increasing number of participants. Besides the number of participants, some events also can cause waste amount generated. As seen in Figure 3, there is an increasing trend in income from May to July 2021. It might be caused by an increase in the waste due to the Eid al-Fitr event, where most Muslims in Indonesia celebrate it with their families. The dominating waste is paper (see Figure 2 (b)) where a lot of paper packaging is produced from shipping hampers, both in the form of packaging and cardboard for delivery.

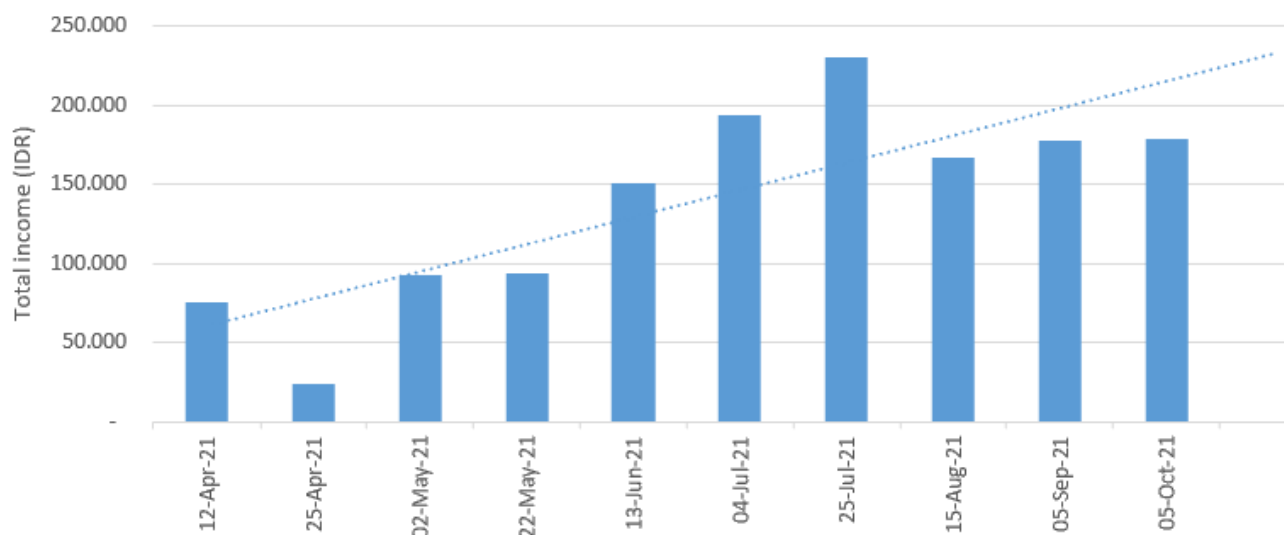


Figure 3 . Total income

### 3.4 Process, constraints, and alternative solutions

The implementation of this waste bank certainly deals with obstacles at its every stage. These processes and constraints can be summarized as follows:

1. The information session stage is carried out in housewives' recitation/social gathering activities. This activity introduces the types of waste and an overview of how to sort them. In this activity, the participants were quite enthusiastic to follow. In



this stage, almost all households attend the meeting. From the discussion, one of the obstacles when socializing is the numerous types of waste. For example, plastic waste consists of many products, such as plastic sachets (coffee, soap, shampoo, etc.), plastic packaging bottles, shampoo and other similar bottle products, plastic household appliances, and so on. If too many types of plastic waste are sorted, it is foreseen that it will be more complex and may result in reduced enthusiasm.

At the beginning of the operation, only 27% of households collected their waste, so difficulties in sorting became the biggest obstacle. Therefore, the categorization of waste is made as simple as possible for the above categories. To even make the sortation simpler, the categories can be simplified into plastic waste, paper waste and others, as shown in Figure 4. The main target for this stage is the interest in sorting waste which is expected to continue in the implementation of waste sorting at the household level. As time goes by, with this convenience, the number of participations can eventually increase up to 60%.

## 2. Waste collection schedule

Initially, several scheduling proposals were related to this during the initial socialization (phase 1), such as collecting once a week, every two weeks, or once a month. Several factors of concern are related to this collection schedule, such as the risk of odours arising when the collection time between waste deposits is too long. At the beginning of the program, the collection was carried out every three weeks. The amount of waste generated in three weeks was estimated at 150 kgs. However, due to the limited space to keep the waste until the central waste bank picks it up, the limited capacity of the personnel in handling the waste deposit, as well as the presence of the smells from the traces of food/beverage in the inorganic wastes due to the unclean washing, hence the deposit schedule is currently done once every two weeks.

## 3. Recording of waste deposits and deposit recapitulation

The recording method is still performed manually. Thus, it is required to transfer data from handwritten notes to a spreadsheet (Ms Excel), which is then processed to obtain each member's total savings. Processing the savings data is particularly challenging because the kind and quantity of waste fluctuate from period to period, making it difficult to compute the amount of savings using a spreadsheet. The development of a data-recapture-facilitating information system is being considered as a potential alternate approach. The system is anticipated to be completed and implemented by the middle of 2022.

## 4. Reporting of the waste bank member savings

Information on the amount of savings for each trash bank member is still manually done by sending customized messages to each member, which is extremely time-intensive. Consequently, along with the establishment of an information system for managing waste bank data, a website for members to view their funds was also created.

## 5. Selling the collected waste to the central waste bank

Selling each period's collected waste involves contacting the central waste bank and collecting the waste. As discussed previously, the stumbling block is the storage needed to temporarily hold collected waste until the central waste bank collects it. This issue gets more pressing when the amount of waste collected is substantial. As a solution from the Neighbourhood Unit, a vacant security post office has been converted into a temporary storage facility for the garbage initially deposited at a local resident's residence.

## 6. Sales recap

The sales recap is performed similarly to the deposit and savings recap using a spreadsheet. This process is also included in the design of the information mentioned above system that will be developed in the future.



Figure 4 . Waste categories: (a) paper waste; (b) plastic waste; (c) glass waste, and others

The initiation of the waste bank program in the community has been carried out through the process described above. This program cannot run without the participation of the community itself. Therefore, socialization is crucial to start a waste bank (Azizah et al., 2020; Fikriyyah & Adiwibowo, 2018) as knowledge contributes significantly to community participation (Rubiyanor et al., 2016). By October 2012, the number of households participating in sorting and depositing waste has reached 60% of the total population in the Neighbourhood Unit. After six months of operation, this number of participations is similar to other locations, such as Bogor (Fikriyyah & Adiwibowo, 2018). The average amount of waste per household per day is around 2 kg/household/day, which is also alike. Although not all residents are currently involved, hopefully, the remaining uninvolved residents will be interested in participating, especially when they understand the benefits. Therefore, one of the keys to the success of this program is public acceptance, where the socialization process plays an important role, not only at the beginning but also throughout the process. In addition, the community looks more enthusiastic when this program can provide real benefits to them. The immediately visible benefits are less garbage scattered in front of the house and savings obtained from the collected waste. The economic benefits and increasing public awareness of the environment will impact the growth of community participation (Azizah et al., 2020).

In addition to the campaign and socialization, the continuity of activities is a very important aspect to pay attention to. This sustainability includes aspects of physical infrastructures and waste bank management. These aspects also require immense support from the government and the community (Aryanti & Tukiman, 2016); in this case, they are the Neighbourhood Unit Head, the person with the administrative authority, and the respected persons in the Neighbourhood Unit.

The waste bank program has a lot of potential for development. The management process still needs improvement for more effortless waste management. Community empowerment can also be developed related to the idea of reducing waste and using recycled waste to support the 3R (reduce, reuse, recycle) concept. In addition, this program also sheds light on organic waste management as an essential program.

#### 4. CONCLUSION

The Waste Bank Program, which promotes independent waste management, has been implemented in a neighborhood unit with the participation of 60% of its residents. Over a period of six months, this initiative resulted in the collection of 1,084 kilograms of inorganic garbage that was sent to the central waste bank to be turned into recycled products. Government support, such as that provided by the neighborhood unit head, and public awareness of the importance of waste management are essential for the success of this program. The initiative is ongoing and has undergone various infrastructure and

management improvements. It is expected to continue processing organic waste independently as well.

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#### CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests in this research publication.

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