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Trust, Leadership, and Money Incentives and the Promotion of Participation in Community-Based Recycling Activity: Which One Works?

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Front cover photo: Weighing activity of Depok waste bank, Depok, Indonesia. Photo by Alin Halimatussadiah

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May, 2016

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TRUST, LEADERSHIP, AND MONEY INCENTIVES AND THE PROMOTION OF PARTICIPATION IN COMMUNITY-BASED RECYCLING ACTIVITY: WHICH ONE WORKS?

Alin Halimatussadiah, Diah Widyawati, Shanty Syahril

EXECUTIVE SUMMARY

The Government of Indonesia enacted the Waste Management Act in 2008. This policy modified the government's waste management focus from one that was centered on collection, transport, and disposal toward one where waste reduction, reuse, recycling, treatment, and disposal are key components (eco-waste management). Depok is one of the municipalities that responded to this call. Named one of the dirtiest metropolitan cities in Indonesia in 2005, Depok launched the Integrated Waste Treatment and Management System in 2006. A total of 40 waste treatment units were built to support waste-reduction and waste-recycling activities. However, the system failed to operate as expected. The main problem was that the community had not been used to sorting their waste, which is necessary in eco-waste management; but by 2013, waste banks were flourishing in Depok. Waste banks collect inorganic waste from their members to be further recycled by industries that can use this waste. Since 2013, the decentralized waste treatment unit (*Unit Pengolah Sampah* or UPS) has repositioned its role with a focus solely on the processing of organic waste.

Waste banks incentivize communities to recycle; it is thought that nonmonetary factors can induce participation in waste bank activity, namely, trust and leadership. In many studies, trust has been proven to encourage participation in community activity as it lubricates cooperation. A good leader functions as an instrument that can organize community resources to achieve a common goal.

This study aims to test the significance of the following factors in promoting participation in waste bank activity: (1) trust in a community member, (2) the leadership of a waste bank administrator, and (3) economic incentives. Three data sources were used: (1) experimental data for measuring trust and leadership; (2) a survey aimed at individuals and at waste banks; and (3) secondary data, mainly collected from members' deposit books and waste bank selling forms, to measure economic benefit. In addition, the role of waste banks in supporting eco-waste management in Depok municipality was also analyzed in this study.

Estimation results showed that the willingness of households to join a waste bank depends on their pro-social behavior, which is reflected on the contributions they make to a public goods game (conducted as part of this research project). Pro-social behavior also induces sorting behavior. Waste bank members tend to conduct more waste sorting than nonmembers. This evidence shows that the waste bank program is important in encouraging waste sorting. We also found that leadership and economic incentives induce positive participation in waste bank activity. However, we couldn't find any relationship between trust and participation. The waste bank leader acts to create a market for recyclable scraps, generating an economic incentive to participate. Economic incentives work well and could be adapted by the government to expand recycling activity.

The role of waste banks is important for promoting the sorting of waste, reducing inorganic waste, and encouraging home or communal composting. Local government should support waste banks and ensure the sustainability of waste bank activity. Other benefits also emerge as waste banks can be used to create other community activities.

1.0 INTRODUCTION

1.1 National and Depok Municipality Waste Regulation

Indonesia has ratified international frameworks on waste (i.e., Basel Convention in 1993, Kyoto Protocol in 2004). In addition, Indonesia has a number of laws on waste relating to health, housing, industry, and the Environmental Management Act. The management of domestic waste is carried out under local regulations, which can be different between regions (MOE 2016). Using this regulatory framework, waste management is partially regulated and sectorally regulated, which makes it ad hoc and far from comprehensive. Indonesia's approach has been focused on end-of-the-pipe solutions. Wastes were collected and transported to a disposal site. The disposal sites were mostly landfill, and the locations were not usually in accordance with planning objectives. As a result, various problems emerged, such as environmental pollution, social conflict, and illness among the people living around a landfill site.

In order to respond to these problems, the government enacted Waste Management Act No. 18 in May 2008. The Act adopted a new waste policy direction, which went beyond creating clean living conditions toward reducing the waste stream to landfill. Table 1 describes the paradigm shift in waste management and Table 2 describes how Waste Management Act No. 18 of 2008 articulated this shift. The policy structure was modified as well, from one that was focused on collection, transport and disposal, to one that is oriented toward reduction, reuse, recycling, treatment, and disposal. According to the Act, central government is responsible for establishing waste policy and strategy at a national level and for developing cooperation between local governments. Local governments can determine waste policies at the local level with consideration of national waste policy. Local governments also have responsibility for the running of waste management, for fostering and managing waste management implementation, and for controlling and evaluating it.¹

Table 1. Paradigm shift in national waste management policy

Criteria	Previous	Current	Future
Pressure	Worsening pollution due to waste	Overload landfill capacity	Climate change, raw material, and fossil fuel exhaustion
Objective	Create clean living conditions	Reduce waste to landfill	Construct a zero-waste society
Implementation strategy	Collection-Transport-Disposal	Reduce-Reuse-Recycle-Treatment-Disposal	Effective production/consumption-material recovery Energy harvesting

Table 2. Paradigm shift brought about by Waste Management Act No.18 of 2008

Parameter	Old Paradigm (End-of-the-Pipe)	New Paradigm (Waste Reduction from Front)
Age of final dump site	Short, seeking new area is difficult and expensive	Longer, just heaping up solid waste management residue from previous step
Transportation	More trucks used, wasteful, high GHG emissions	Fewer trucks used, economical, energy saving, low GHG emissions
Impact on the environment	Prone to pollution due to waste lye, landslides, fires, odor, flies	Less pollution because wastes have been sorted and processed close to source

Note: GHG = greenhouse gas

¹ *Waste Management World* (1 April, 2016)

From 2008 to 2012, government regulations were released (PP No. 81, in 2012) regarding household solid waste management. Delays in this policy's implementation, according to the Head of Indonesia Solid Waste Association (InSWA) Sri Bebasary, have been caused by a lack of socialization (InSWA 2012).

Tempo.Co news portal (17 December, 2005) reported the Ministry of Environment of Indonesia cited to be Depok one of the dirtiest metropolitan cities in Indonesia. In response, Depok municipality launched the Integrated Waste Treatment and Management System (*Sistem Pengolahan dan Pengelolaan Sampah Terpadu* or SIPESAT) in 2006. In order to implement SIPESAT, the local government constructed a decentralized waste treatment unit (*Unit Pengolah Sampah* or UPS). *Monitor Depok* (29 November, 2008) reported that UPS wastes were to be processed directly into valuable and economic materials, without the need for transportation to landfill. Accordingly, a pilot UPS was built at Perumahan Griya Tugu Asri, Kelurahan (county) Tugu, Kecamatan (subdistrict) Cimanggis. The waste treatment unit (i.e., UPS) workers sorted the waste after household collection and treated the organic waste to reduce its volume. The construction and operational cost for six months came from the local government budget.

Depok municipality considered the pilot scheme to be successful and came up with a follow-up plan to construct a UPS in every county (*kelurahan*) (MPWH 2014). However, *Okezone.com* news agency (29 December, 2008) reported that many communities were against the construction of a UPS within their neighborhood because of its potential environmental impact if not properly managed. The concerns of communities were well-founded—most of the UPSs failed to operate as expected, and their function changed merely to temporary waste collection points (*Tempat Pembuangan Sementara*, TPS). The UPS workers were overwhelmed by the volume of incoming waste that had not been sorted.

Momentum finally gathered after waste banks in Depok began to flourish at the beginning of 2013. According to the news report of *Pos Kota* (19 November, 2013), from a start of just a few waste banks in 2011, the number of waste banks reached 300 units by the end of 2013, with many of them operating independently.² As a community-led activity, waste banks educated their communities to sort their wastes, and gave monetary incentives for recyclable materials.

In communities where waste banks are well-developed, the waste treatment unit (i.e., UPS) operated by the local government repositioned its role by focusing on processing organic waste into compost. UPSs started to approach waste bank coordinators³ to make them disseminate information to communities on the importance of sorting organic waste to be further reused as compost. As a result, several UPSs finally operated by implementing simple composting technology and getting a continuous supply of organic waste from households.

In May 2014, Depok enacted Local Regulation No. 5 on Waste Management (Figure 1). This regulation took effect on 1 January, 2015, and clearly indicates that Depok has adopted a decentralized waste management system (BORDA 2016). The system is based on three management principles:

1. Waste separation into three groups—organic waste, recyclable waste, and residual waste at the household level;
2. Recycling, reusing, and selling of separated recyclable waste to markets and industries for profit (can be to the waste bank); and
3. Composting of organic waste on site or at the nearest UPS waste treatment unit to create usable soil additives and fertilizer.

² This number represents the number of waste banks in The Waste Bank Association in Depok.

³ A waste bank coordinator coordinates a number of waste bank units in one or two subdistricts.

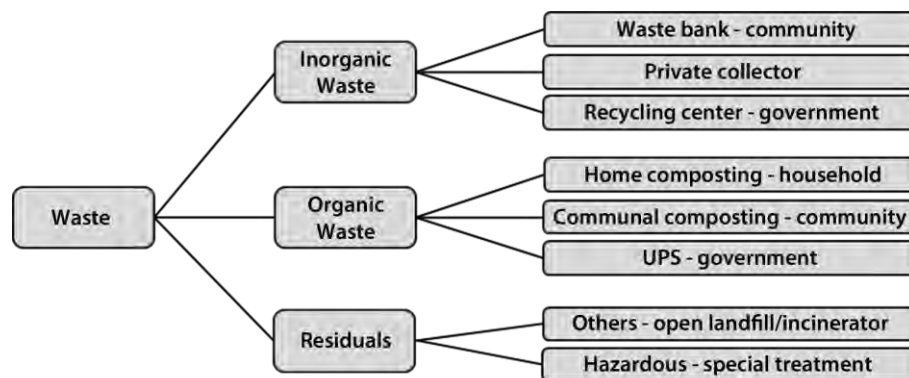


Figure 1. Waste management system in Depok under the new waste regulations⁴

Based on the new regulations, waste banks carry out the role of Depok's waste management system. Waste banks, in parallel with private waste collectors and the recycling centers, act to reduce organic waste by channeling the waste to be further recycled. There are existing private waste collectors in Depok. However, unlike waste banks, most private collectors take only the valuable recyclable waste. By selecting high-value scrap, private collectors can offer higher prices to households. Besides, with waste bank and private collectors, in the near future, households can dispose of their inorganic waste at recycling centers, which are in the early stages of development. Recycling centers will be managed by the local government.

Organic waste is the largest type of waste produced by households, which usually comprises 50%–60% of the total waste generated. However, to make use of this waste type, waste segregation is essential. Three kinds of composting methods are usual in Depok: using a biophore, using a composting hole, and using a Takakura system.

Residual wastes, the other type of waste, contain hazardous residues that cannot be further recycled. The aim is that only nonrecyclables go into landfill. As an alternative to landfill, the local government plans to build an incinerator. As for hazardous waste, a special division will process this waste.

1.2 The Development of Waste Banks in Depok Municipality

Several communities in Depok establish waste banks (*Bank Sampah*). Setting up a waste bank is a community-based program that focuses on reducing waste by recycling. Once a waste bank has been set up, the local people participate in the waste management initiative and deposit materials from their domestic waste that can be recycled in a routine activity called a "weighing activity." The waste bank then sells the recyclables to the appropriate industry for further recycling or reuse. The weighing activity is conducted regularly, for example once a week. The administrator managing the operation of a waste bank works on a voluntary basis with little financial incentive. The administrators are entitled to receive 10% of the total revenue generated by the waste bank unit. However, in several locations, the administrators return this 10% incentive to the community in order to support community activities.

The participation of women is very high in terms of being both depositors and administrators. Most of these women are non-working housewives. *Depok News* (19 March 2015) reported that in some waste banks, women not only collect the waste, but they also recycle for economic benefit. They make scrap into several products such as (shopping) bags, sandals, and handicrafts.

The first recorded waste bank was built in 2008 in Sukmajaya subdistrict, with another in Pancoran Mas subdistrict one year later. In 2011, another waste bank was built in Pancoran Mas subdistrict and one in Beji subdistrict. The latter waste bank, *Bank Sampah Depok* (BSD), has since expanded into hundreds of locations. Meanwhile, the Association of Waste Banks in Depok was established in November 2013. Its main

⁴ The figure is based on the following sources: (1) Local Regulation No. 5 of 2014 on Waste Management, (2) Instruction letter from the 2014 Depok mayor, which details Local Regulation No. 5 of 2014, and (3) Results of the FGD with members of the Waste and Cleansing Department, Depok municipality.

task is to disseminate the idea of waste banks and to establish waste banks throughout Depok. It is estimated that there are now nearly 500 waste banks, with an additional 300 joining the association. A waste bank coordinator (*Bank Sampah Utama*) acts to manage the operation of Waste Bank Units (*Bank Sampah Unit*) under his/her coordination. A waste bank coordinator covers one or two subdistricts. His/her main task is to collect inorganic wastes from waste bank units and to supervise the operation of waste bank units under his/her coordination. The coordinator also expands waste bank units in his/her area by disseminating information to the community.

The dissemination of information about waste banks usually takes place in community meetings, such as *arisan*,⁵ neighborhood association meetings, religious meetings, or other kinds of community gatherings. Information dissemination about waste banks in a community can be conducted because of the demand from the community or an offer from the waste bank coordinator in an area that is well received by the community. The person who initiates the dissemination activity usually becomes the administrator of the waste bank.

The number of waste banks in Depok has grown very quickly. Based on the data collected in this study, there are 265 waste bank units across five subdistricts under the Waste Bank Association. The distribution of the waste banks in the five locations is concentrated on the subdistricts of Sukmajaya and Beji,⁶ the places where *Bank Sampah Depok* operates. Table 3 shows the distribution of waste banks across subdistricts in Depok.

Based on the survey results, most waste banks (63%) in Depok were established in 2013 (Figure 2). This was the time when Mr. Muhammad Supariyono—who later became the head of the Waste Bank Association—actively helped *Bank Sampah Depok* to expand its locations. After 2014, the expansion of waste banks reduced sharply. It is estimated that the number of waste banks in Depok is currently around 500.⁷ In 2014, Depok municipality had a target of building 2,000 waste banks. Looking at this data, this target seems too ambitious.

Table 3. Distribution of waste banks under the Waste Bank Association

County (Kelurahan)	Number of Waste Bank Units
Subdistrict Sukmajaya	76
Subdistrict Cilodong	51
Subdistrict Tapos	60
Subdistrict Cipayung	46
Subdistrict Cimanggis	32
TOTAL	265

Source: Depok Waste Bank Association

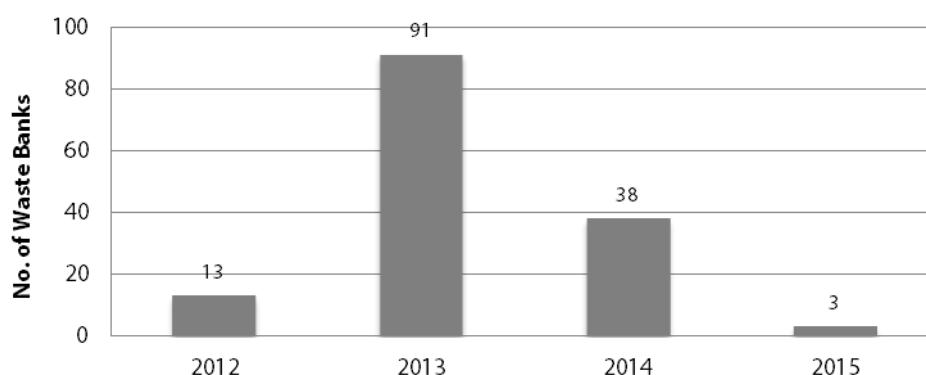


Figure 2. Years when waste banks were established (n = 145)

⁵ *Arisan* is a community credit scheme. In *arisan*, regular social gatherings are conducted, which involve the regular collection of money from every member of the group. At every gathering, one group member will be randomly chosen to collect the money. Every group member will get the money in one cycle of *arisan*.

⁶ The authors could not collect data from subdistrict Beji.

⁷ This is an estimation of the number of waste banks that have been established up to January 2015; the figure does not consider those which may no longer be operating.

1.3 Research Problem

The main obstacle to implementing the new waste regulations in Depok is community education—the community has to sort the waste and dispose of it into the right channels. Waste banks play an important role in educating people to sort waste; they give incentives to deposit recyclable scrap, which then reduces inorganic waste. Likewise, waste banks, to some extent, help to promote composting from organic waste. Therefore, analyzing the factors that induce participation in waste banks becomes important. Some literature has found trust and leadership to be important factors in promoting participation in community activity. Other literature emphasizes the importance of economic incentives in encouraging individuals to participate in waste recycling.

1.4 Research Objectives

This study aims to determine the factors that induce participation in waste bank activity, sorting behavior, and the expansion of membership of waste banks. We suggest that trust, leadership, and economic incentives have roles to play in a successful waste bank.

1.5 Research Questions

The following are the research questions that arise in this study:

1. What factors induce households to join a waste bank?
2. Are waste bank members more likely to sort their household waste than nonmembers?
3. Does trust among community members, effective leadership (of the waste bank administrator), and economic incentives induce members' participation in waste bank activity?
4. What factors induce waste bank expansion?

2.0 LITERATURE REVIEW

2.1 Trust and Collective Action

Trust is defined as the subjective probability of an agent's assessment of another agent that s/he will perform a particular action (Gambetta 2000). Therefore, the act of trust involves a risk of loss if the trustee does not perform the expected action (Ostrom and Walker 2003). Trust also involves an opportunity for both the trustor and the trustee to increase their welfare (Ostrom and Ahn 2007). The lack of trustworthiness could lead to a loss to one or some agents. Trust lubricates cooperation and reduces transaction costs between people, and thus liberates resources (Pretty and Ward 2001). Trust reduces people's fear of exploitation. The concept also relates to the perception of fairness and collective efficacy (de Cremer 1999).

There are two categories of trust based on the intensity of social ties—*thick trust* and *general trust*. Thick trust develops in personal relations (Newton 1999), whereas general trust is the belief of the common people's trustworthiness (Glaeser et al. 2000). Individuals interact with people whom they know; they also do with people in general. Thus, not only do we make decisions to trust someone we know well but, in some cases, we have to decide whether or not to trust people in general. With thick trust, we trust people that we know based on experience through interaction; on the other side, in general trust, we trust those we do not know because of our confidence in a known social structure. Ostrom and Ahn (2007) have argued that generalized trust can reflect the average level of trustworthiness in a society. If one acknowledges that the average trustworthiness of people may differ across the size of communities and the vertical movement of regions, then it may affect the way collective-action problems are solved across communities. Hence, the concept of general trust and underlying general trustworthiness become important in determining the involvement of a member of a society in solving environmental problems collectively.

2.2 Leadership to Promote Community Participation

Several studies have given empirical evidence on how leaders can induce individuals to participate in collective action. Jack and Recalde (2015) have described how communities in rural Bolivia tend to participate more when the leader sets a good example, which increases voluntary public good provision. The contribution of the leader increases the likelihood that members follow. Rivas and Sutter (2009) suggest that an endogenous leader is more efficient than an exogenous one. An endogenous leader is a voluntary leader, while an exogenous leader is an assigned leader. A voluntary leader tends to give a higher contribution than an exogenous leader (Rivas and Sutter 2011).

The type of leader that is appropriate for community activity is a servant leader who encourages engagement, self-motivation, and positive behavior. Servant leadership is different from traditional leadership, which focuses on personal integrity. Servitude goes beyond self-ego and builds a working culture of empowerment of people and creates value for the community at large. Servant leaders have to build trust by selflessly serving others first. The relationship between leaders and followers is central to servant leadership. Servant leaders grow the confidence of their followers to be self-confident and inspire them to become servant leaders themselves. This transformation can encourage a culture of servant leadership within a community (Liden et al. 2008).

2.3 Money Incentives to Stimulate Recycling Activity

Yau (2010) provides evidence on how economic incentives work to motivate households in a private housing estate in Hong Kong to participate in recycling their waste. The reward scheme seems to have had a significant positive relationship with the per-household weight of recyclables collected. In Portland, Oregon, USA, Hong and Adams (1999) find that households respond to a price increase for waste disposal by increasing their recycling in order to avoid charges for waste disposal. The importance of a pricing scheme can be seen in Thøgersen's (2003) study. He compared a fixed fee and a pay-by-weight scheme of garbage collection. The result shows that the weight-based fee induced households to recycle and compost more in the garden. Market incentives for recycling have also worked to encourage household waste recycling in an upstate New York county. Using the instrument of pricing waste-disposal services according to the quantity of waste generated, curbside pickup was found to have had the greatest effect on reported recycling behavior (Reschovsky and Stone 1994).

3.0 RESEARCH METHODOLOGY

3.1 The Model

In this study, we apply four models for the estimation. The first model answers the first research question, i.e., what factors induce households to join a waste bank? The equation is given as follows:

$$Memberstatus_i = f(Social_i, L_i, HC_i, CC_i, EBC_i). \quad \text{Equation (1)}$$

The model is estimated using probit/logit estimation. We suppose that there are five characteristics that might be related: pro-social behavior, the leadership of the waste bank administrator, household characteristics, community characteristics, and economic benefit from the waste bank.

The second model is given as follows:

$$Sorting_i = f(Social_i, L_i, HC_i, CC_i, EBC_i, Memberstatus_i). \quad \text{Equation (2)}$$

This second model, estimated using a probit/logit model, tries to examine whether the independent variables used in Model 1 and member status are related to household-sorting behavior. Sorting activity by household is important to support the implementation of eco-waste management.

Therefore, we would like to know whether waste banks promote sorting behavior to their members. Note that from the results of the survey, we found that a portion of the nonmembers conduct waste sorting.

The third model is then given as follows:

$$PR_m = f(Trust_m, L_m, HC_m, CC_m, EBC_m). \quad \text{Equation (3)}$$

In a waste bank, member participation varies. Participation rates in waste bank activity affect the goal of the waste bank program to reduce waste. We empirically model that the participation rate of a waste bank member (PR) is determined by the individual trust level of a waste bank member ($Trust$), the type of leadership of the waste bank administrator (L), the socioeconomic characteristics of a waste bank member (HC) and community (CC) where they live, and the expected benefit of joining the waste bank program (EBC). The participation rate of a member to engage in waste bank activity is measured by the number of times s/he attends the weighing schedule (since becoming a member).

The fourth model is given as follows:

$$Membergrowth_{wb} = f(Trust_{wb}, L_{wb}, WBC_{wb}, EBC_m). \quad \text{Equation (4)}$$

The fourth model tries to answer the fourth research question, i.e., what factors affect the growth of membership in a waste bank? We suppose that the trust level and the leadership of the waste bank administrator affect membership growth. There are also several waste bank characteristics that may affect member expansion, such as the age of the waste bank and waste bank productivity.

3.2 Study Site and Data Collection

This study took place in Depok municipality. Several activities were conducted, i.e., experimental game, in-depth interviews, focus group discussions (FGD), survey of waste bank members and nonmembers, survey of waste bank administrator and neighborhood association leader, and secondary data collection. The additional information collected from small seminars, which were carried out during the dissemination of the survey results, enriched the analysis of the data collected.

The respondents of the in-depth interview were composed of the head of the Waste Bank Association, the waste bank coordinators, and the head and the staff of the cleansing department in Depok municipality. Two kinds of FGDs were conducted by inviting selected stakeholders:

1. The Waste Bank Association in Depok, including the head of the waste banks and the coordinators of waste banks in six areas; and
2. The local government of Depok, including the head of the cleansing department, the staff of the planning department, and the staff of the environment department.

In the survey activity, there were three different self-completion surveys:

1. *Household*. This questionnaire was distributed to 426 individuals from 21 waste bank areas.⁸ An individual represented a household. Both waste bank members and nonmembers filled in the questionnaire. The questionnaire was about the perceptions of others (trust), risk preference, participation in community activity, household waste treatment behavior, and socioeconomic characteristics. The respondents were the experiment participants. They were asked to fill in the questionnaire after they finished the game (see Section 3.3).
2. *Waste bank administrator*. This questionnaire was about waste bank characteristics, the respondent's socioeconomic characteristics, perceptions of others (trust), and a question on leadership. Some 468 questionnaires were distributed to cover 234 waste banks in five subdistricts. We distributed two questionnaires to each waste bank, but we only analyzed the questionnaire answered by the leader of the waste bank.⁹ This number represents all the waste banks under the Waste Bank Association we were able to cover.

⁸ The survey took place after the experimental session.

⁹ The other questionnaire was filled in by the waste bank administrator.

3. *Community leader (head of neighborhood association)*. The questionnaire was about community characteristics, the respondent's socioeconomic characteristics, and perceptions of others (trust). A total of 234 questionnaires were distributed in five subdistricts.

From the survey results, we analyzed the participation of communities in waste banks, the participation of waste bank members, the sorting behavior of both members and nonmembers, and their perceptions of the new waste management law (which specifies an obligation to sort household waste).

In the individual survey, 426 questionnaires covering 21 waste banks in five subdistricts were completed. The respondents consisted of 73% members; the rest were nonmembers. Out of the member respondents, 19% were waste bank administrators. In the waste bank administrator survey, 296 questionnaires from 151 waste bank locations were completed. In the community leader survey, 146 questionnaires were collected.

For secondary data collection, we collected data of members' deposit books from 125 waste bank locations, and selling forms from 126 waste bank locations. The selling forms record the revenue of waste banks as a result of each weighing activity.

3.3 The Experiment

The experimental method has been widely used to measure trust, leadership, and pro-social behavior. For social, trust, and leadership, we used experimental games. For pro-social behavior, we used a simple public goods game. For trust, we used a trust game adapted from Berg, Dickhaut, and McCabe (1995). For leadership, we used a leadership game adapted from Rivas and Sutter (2009). The detailed experimental design is described in Section 3.3.1. For household characteristics, we used a questionnaire filled in by the individuals who had joined the experiment. For community characteristics, we used the information obtained from questionnaires that had been distributed to the waste banks.

We used video animation to guide participants in playing the game. The aim of using video animation was to deliver instruction in a standard manner. In the implementation, we still used direct conversation in the introduction (using a Power Point presentation) and in the question-and-answer section. Some conversations during the game were unavoidable.

Two games were played in the experiment sequentially: a trust game and a leadership game. The trust game was adapted from Berg, Dickhaut, and McCabe (1995); the leadership game was adapted from Rivas and Sutter (2009). Several modifications were made. For the trust game, we applied the *strategic trust game*, a game where each player can have both a role as a trustor (A) and a trustee (B). Through this kind of game, we can get money sent by A from all participants. Money sent by A becomes the measurement of trust (as the proxy of social capital) in this study.

After playing the trust game, the participants played the second game. The second game consisted of three sessions, with three repeated rounds in each session. In the first session (Rounds 1–3), the participants played the standard public goods game, followed by the exogenous leadership game in the next session (Rounds 4–6) and the endogenous leadership game in the last session (Rounds 7–9). In the second session, we assigned the head of the waste bank to become the leader (the first mover). The leadership of the waste bank administrator is measured by the amount of money (average value) the leader contributed during Rounds 4–6 of the leadership game.

The games were considered independently of each other because the payoffs of the two games were determined through a lottery at the end of the experiment to avoid the endowment effect and/or the experience effect. Each participant received IDR 50,000 (USD 3.57) as an endowment before the first game was played. (See Sections 3.3.1 and 3.3.2 for the procedure of the games played).

We conducted two pilot experiments before we proceeded with the real experiment. The participants were students (undergraduate and graduate) and academic staff. Twelve people participated in the first pilot experiment on 26 January, 2015; nine people participated in the second pilot experiment on 28 January, 2015. The pilot experiments lasted for about 2.5 hours. At that time, the video animation was only ready for Game 1.

3.3.1 The trust game

All participants played as Player A and then as Player B. First, all the participants were told that s/he were to play as A and could decide any amount of money from her/his endowment (IDR 50,000 or USD 3.57) to be sent to her/his anonymous partner B. Any IDR that s/he sent to B would be tripled by the experimenter before being handed to B. The participants, as Player A, submitted their decisions in written form. There were 11 options, with amounts ranging from IDR 0 to IDR 50,000 (USD 3.57) in IDR 5,000 (USD 0.35) increments.

After acting as Player A, all participants were told that s/he should now play as B and could decide any amount of money to be sent back to her/his partner Player A from the money that s/he had received previously from A through the experimenter (after being tripled). There were 10 possible scenarios regarding the amount of money that A could send to B, ranging from IDR 5,000–50,000 (USD 0.35–3.57) in IDR 5,000 (USD 0.35) increments, and s/he could request to make decisions for each scenario. The participant, as Player B, submitted their decision in written form. The role of each participant, whether s/he was Player A or Player B, was determined via lottery at the end of the experiment.

3.3.2 The leadership game

We placed the participants into two groups. In each session, the experimenter consistently set Group 1 to have 10 members, with the remaining participants placed in Group 2. Therefore, the number of participants in Group 2 varied depending on the total number of participants. The game consisted of three sections and each section had three rounds (repeated play). Hence, we played a total of nine rounds.¹⁰ In the first three rounds (Rounds 1–3), we played a simple public goods game. Each participant was asked to decide how much money s/he was willing to contribute to the group, which was then distributed back between each group member. Each IDR that s/he contributed reduced her/his money. The experimenter announced the total contribution, and each participant received back a quarter of the total contribution.

In the second section of the game, we played the leadership game for three rounds (Rounds 4–6), with the waste bank administrator exogenously assigned as the first mover. The first mover was unknown to the other participants. We arranged this scenario so that the chairman or the waste bank administrator would belong to Group 1 and become the first mover in the leadership game. The value of the leadership variable was generated from the contribution of the administrator who acted as the first mover.¹¹

As the first mover, s/he had to first make a decision on how much money s/he would contribute to the group; this decision was indicated by making a cross in the value chosen on his/her worksheet. The rest of the group participants, acting as the second movers, had not yet made a decision. The experimenter collected the worksheet and announced the contribution of the first mover. After this announcement, all the remaining participants made a decision on his/her worksheet. Since the first mover had already made a decision, s/he put a cross mark in the IDR 0 value on his/her worksheet. The rest of the participants, the second movers, made their decision by putting a cross mark against the value that they wanted to contribute to the group on his/her worksheet. The experimenter collected the worksheet and announced the total contribution of all the participants in the group (the first mover's contribution and the second movers' contribution). Then all participants could count their payoffs.

In the last three rounds (Rounds 7–9), the third session, we played the endogenous leadership game. We asked all the participants who wanted to be the first mover to nominate themselves by putting a cross on a card. If more than one person was willing to be the first mover, then the person was chosen via a lottery. The first mover was kept anonymous to the other participants. The payoff of the leadership game was determined by lottery—in which round, out of nine rounds, the participant would receive his/her payoff.

¹⁰ In the first two sessions, we played for 15 rounds (five rounds in each section). However, we observed that the duration was too long and the participants were already exhausted. So we reduced the rounds to nine (three rounds in each section).

¹¹ We cannot have the value of leadership from Group 2 because the number of participants in Group 2 was not consistent in each session.

4.0 THE ROLE OF TRUST, LEADERSHIP, AND MONEY INCENTIVES IN PROMOTING PARTICIPATION

4.1 Trust in the Waste Bank Community

There are several indicators that made us examine the necessity of trust in waste bank operation and in waste bank development. The establishment of waste banks is usually initiated by an informal leader in the community. She works using her own resources to establish the waste bank in her community. The leader has her own expectations regarding the participation of her community in supporting the waste bank. Community participation relates to the trust that the future waste bank leader puts in the community. Another aspect of trust was found in the operation of waste banks. Although the waste bank offers monetary incentives, for several groups of people, the incentive given is not significant; in which case, motivations other than monetary incentives alone must encourage a community to participate in waste bank activity.

From the experiment results, we found that the range of money sent by A in the trust game that included all participants was between IDR 0 and IDR 50,000 (USD 3.57). The average of each session was different, with the range being between IDR 8,182 (USD 0.58) and IDR 18,333 (USD 1.30). The value of money sent by A represents the general trust of the participant to all the participants in the respective session. The average value of money sent by A members and A nonmembers was slightly different; surprisingly, the figure was lower for waste bank members. However, we found that the nonmember contribution showed more variation than the member contribution.

The value of money sent by B represents trustworthiness—the willingness to pay back the trust given by A. On average, B sent more money to A. The payback ratio for all the money sent by A's value is more than 1. This payback ratio is the ratio of money sent by B relative to the money sent by A. However, the ratio tended to decrease as A increased the money sent. The variation of money sent by B was higher as the money sent by A increased.

4.2 Leadership of Waste Bank Administrator

The role of the waste bank leader is important to the sustainability of waste bank activity as well as to waste bank member expansion. Together with the waste bank administrator, the leader of a waste bank approaches the community to join the waste bank and to participate in waste bank activity by depositing their inorganic waste. The leader is also the person who is usually proactive in establishing a waste bank in a community.

The number of waste bank administrators varies, ranging from 1 to 20. Most waste banks (87%) have between three and eight administrators, who are mostly women. Most waste bank leaders are elected by the waste bank members (59%). Some waste bank leaders (26%) are elected by the head of the neighborhood association (*Rukun Warga/Rukun Tetangga*)¹² or by the waste bank coordinator. Some people voluntarily apply to become waste bank leaders (14%). Most waste bank leaders are actively involved in community activities such as *Posyandu* (the community health post) or PKK (the women's activity post).

Usually, the administrators are entitled to 10% of the total revenue generated by the waste bank unit. However, most of waste bank administrators do not receive monetary incentive. Some of the administrators give the money to the community to support community activities. A small fraction of waste bank leaders think that the incentive received is not much. However, the majority of waste bank administrators do not have a problem with not getting this level of incentive. Most waste bank administrators feel that they receive nonmonetary benefits in terms of social networking, knowledge acquisition, better environmental conditions in the community, waste reduction, and happiness because they are being useful to others.

¹² The neighborhood association exists at the sublevel below the village (*kelurahan*) and consists of RW (*Rukun Warga*) and RT (*Rukun Tetangga*). One RW consists of several RT and one RT covers about 50 households. The community chooses their heads of RT and RW through a forum or by voting. The RT and RW administrators usually work on a voluntary basis or do not get paid. The RT and RW become government tools to administer the village with regard to government regulations or development programs.

The experimental game results show, interestingly, that the contribution of waste bank administrators in the trust game was lower than that of the members and nonmembers. Rounds 4–6 of Game 2 was the leadership game with assigned leadership. In the first round of this leadership game (Round 4), the average contribution of the waste bank leader was higher than that of the group. However, looking at the lower contribution of her group members, the leader might lower her contribution in the next round. As in the next round, the average contribution of the group increased, the leader again increased her contribution. The figures given in Table 4 show the mean value of each session. The summary statistics of the value of our main variables (i.e., trust and leadership) are given in Table 5 and represents the value of money sent by A, as the proxy of trust of individual, and the contribution of the waste bank administrator in the leadership game, conducted in Rounds 4–6.

Table 4. Summary statistics of Game 1 results (per session)

Descriptive Statistics	Mean (Weighted)	Mean	Max	SD	Ratio B/A
Participants	20	12	25	4	
Average Money Sent As					
A	14,085	8,182	18,333	2,990	
B (1)	9,137	6,471	11,429	1,372	1.83
B (2)	15,607	12,727	21,667	2,399	1.56
B (3)	19,989	14,545	29,130	3,834	1.33
B (4)	25,242	15,455	34,524	4,586	1.26
B (5)	31,100	21,111	43,750	5,931	1.24
B (6)	37,240	28,889	50,000	5,950	1.24
B (7)	43,746	23,611	56,500	7,416	1.25
B (8)	48,700	30,000	66,429	9,171	1.22
B (9)	56,384	39,722	75,476	9,190	1.25
B (10)	61,876	33,611	84,048	13,175	1.24

Note: SD = standard deviation

Table 5. Summary statistics of selected results of Game 1 and Game 2 (per session)

Descriptive Statistics	Mean (Weighted)	Min	Max	SD
Participants*1	20	12	25	4
Ave money sent by A	14,085	8,182	18,333	2,990
Admin	13,601	5,000	25,000	6,502
Member	14,154	7,500	17,667	3,344
Nonmember	14,547	6,667	30,000	5,589
Ave 1 st mover's contribution R4–R6	17,302	3,333	50,000	11,649
Round 4 contribution				
1 st mover	16,905	5,000	50,000	13,084
Ave contribution	14,317	7,500	26,500	5,014
Round 5 contribution				
1 st mover	16,429	–	50,000	12,762
Ave contribution	16,876	7,500	28,000	5,041
Round 6 contribution				
1 st mover	18,571	–	50,000	16,669
Ave contribution	18,241	9,000	9,000	5,699

4.3 Economic Benefits of Waste Bank Activity

Waste bank activity generates many benefits. Waste banks not only create a monetary incentive for their members, they also increase the social connectedness of the community through the routine weighing schedules. In addition, the environmental benefits of waste banks outweigh their original purpose; they reduce inorganic waste and also promote the reuse of organic waste. All things considered, waste banks create economic, social, and environmental benefits for the community.

The value of the inorganic waste that the members deposit in the waste bank is noted in each individual's deposit book; this can be periodically withdrawn as cash. The time to withdraw the money saved is different across the waste banks. Usually, when the waste bank is established, there is agreement on when the members can withdraw their money. In reality, the withdrawal time depends on when the waste bank unit gets the money from the waste bank coordinator. Note that the waste bank unit functions as a collector of inorganic waste from households, and the waste bank coordinator collects the inorganic waste from the waste bank unit to be sold on to the industry that can use it or to a big waste collector to be further recycled. There is no exact schedule when the waste bank coordinator must give the waste bank unit its deposit; however, some waste bank coordinators regularly pay the waste bank unit.

Based on the results of the survey sent to the waste bank unit leaders, most leaders (45%) stated that there is no exact schedule for the withdrawal of the members' savings. We suggested that the waste bank unit could make the payment schedule when they have received money from the waste bank coordinator. Most waste bank units that have a routine schedule for the withdrawal of savings make that withdrawal every year (35%). There are also waste banks that routinely prepare money for withdrawal every month (11%). The shortest frequency of withdrawal is every week (2%). The withdrawal of savings is important because it relates to the credibility of a waste bank as a business unit.

The average deposit per weighing activity is about IDR 10,318 (USD 0.73),¹³ with a range of IDR 4,164–94,438 (USD 0.29–6.74). On average, waste bank revenue per weighing activity is IDR 167,430 (USD 11.95), ranging between IDR 42,630–547,748 (USD 3.11–39.12). Figure 3 describes the variation in waste bank revenue per weighing activity.

The price offered to waste bank members for recyclables deposited is different between waste bank coordinators. A waste bank coordinator acts as a business unit. They announce the price list to the waste bank units for a given period, usually for three months or based on the fluctuating prices of the recyclables. The waste bank offers a longer list of recyclables that can be deposited by members compared to the recyclables that can be bought by private waste collectors. However, the prices offered by private waste collectors are often more competitive than those of the waste bank because the former only take high-value added recyclables. Several waste banks offer prices higher than private waste collectors in order to attract members.

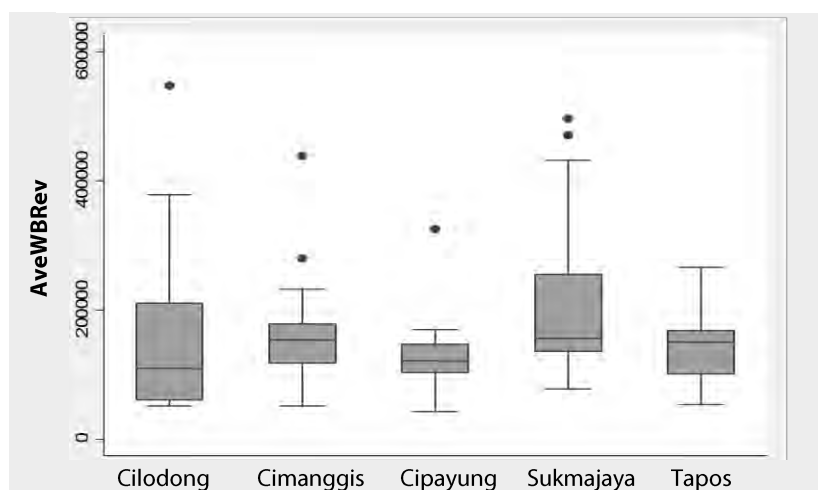


Figure 3. Boxplot of average waste bank revenue per weighing activity (n = 117)

¹³ USD 1 = IDR 14,000 (August 2015).

Aside from the monetary incentives from the inorganic waste deposited, waste bank members can obtain other value-added goods, both economically and socially. Several waste banks produce products made of recycled materials. Recyclables are transformed into bags, stationery, flowers, purses, and other kinds of crafts. However, only a few waste banks make products that can go to market, including for export. Most of these crafts are consumed within the community. The weighing activity also cultivates connections between waste bank members. Several community activities, such as doing sports together or developing a small business such as catering, have come about as a result of waste bank members collaborating. In one location, there was even an activity to buy meat together after they withdraw their savings, in order to secure a lower price.

4.4 Estimation Model Results and Analysis

During the in-depth interviews conducted by the researchers with the representatives of Depok City Cleansing Department, about 60% of the waste in Depok City comes from households; thus, waste segregation at the household level is important in a city-level eco-waste. Waste banks play a significant role in educating households to carry out waste separation. From the survey results, it was found that both waste bank members and nonmembers do waste segregation. The model below tries to examine the relationship between the two. For policy makers, it is important to know if waste bank members tend to separate waste more than nonmembers do. If so, being a waste bank member promotes the sorting habit.

Another area of interest comes from those who have already joined waste banks. The participation rate of members attending the weighing activity varies within waste banks and across waste banks. We suppose that several factors induce active member participation in a waste bank. It is important to evaluate the participation rate of waste bank members as this rate affects the amount of waste reduction.

At the waste bank level, the expansion of membership in a waste bank might be a strong indicator of waste bank success. Therefore, we also examined what factors induce membership expansion in a waste bank. In brief, we have four models to be tested:

Model 1: What factors induce households to become waste bank members?

Model 2: Are waste bank members more likely to sort their domestic waste than nonmembers?

Model 3: What factors induce member participation in a waste bank?

Model 4: What factors induce the expansion of waste bank membership?

In Models 1 2, using probit and logit estimation, we used data at an individual level for both members and nonmembers. In Model 3, using simple regression, we used the data for members only. In Model 4, using simple regression, we used data at the waste bank level. Table 6 shows the variables used in the four models. The estimation results of Models 1 and 2 and their respective descriptive statistics are shown in Tables 7, 8, and 9.

Table 6. Description of variables used in the models

Variable	Description
Waste bank membership	Waste bank membership (1 = waste bank member)
Sorting	Sorting waste (1 = sort their waste)
Intensity of member attendance	The intensity of member's attendance at the weighing schedule (the frequency of member attendance/the frequency of weighing schedule, for the period since the household became a member)
Growth in waste bank membership	Number of waste bank's members divided by number of waste bank's initial members
Trust	Participant's individual trust score from trust game (the money sent by A in the trust game)
Contribution to public good provision	Participant's contribution to the public goods game (the money sent by participants in Game 2, Rounds 1–3, averaged)
Leader's contribution	Leadership score from leader's contribution in public good game (the money sent by the waste bank administrator in Game 2, Rounds 4–6, averaged)
Average waste bank revenue	The average of waste bank revenue per weighing schedule
Age	The age of the participant
Education	Participant's education (1 = undergraduate or higher)
Income	Participant's income 1 (1 = IDR 1.000.000–3.000.000 [USD 71.42–214.28])
Income 2	Participation income 2 (1 = > IDR 3.000.000 [USD 214.28])
Ethnic diversity	The ethnic diversity score (1 = completely diverse, 0 = completely uniform)
Family members	Number of participant's family members
Share household revenue	Household's shared revenue from waste bank
Type of community (1 = structured)	Waste bank's type of community (1 = structured, 0 = unstructured)
Own house (1 = owned)	Participant's home ownership (1 = own their house, 0 = do not own their house)
Waste bank leader's trust score	The waste bank leader's trust score from questionnaire
Waste bank leader's leadership score	The waste bank leader's leadership score from questionnaire
Waste bank's age (in months)	The age of the waste bank in months
Waste bank productivity	The number of waste bank members divided by the number of waste bank administrators
Waste bank leader's age	The age of the waste bank leader
Javanese ethnicity	The ethnicity of the waste bank leader (1 = Javanese, 0 = not Javanese)
Leader's education	Waste bank leader's level of education (1 = high school or below, 0+ higher than high school)
Total waste bank revenue	A waste bank's total revenue from the waste sold since the first weighing schedule, up to the last one

Table 7. Descriptive statistics of Models 1 and 2

Variable	Obs	Mean	SD	Min	Max
Waste bank membership	410	0.673	0.470	0.000	1.000
Contribution in PGG	366	12.732	9.892	0.000	50.000
Leader's contribution	410	18,126.020	11,289.050	3,333.333	50,000.000
Waste bank revenue	410	18,285.370	29,559.960	5,808.047	151,516.500
Age	367	44.812	10.022	16.000	73.000
Education	410	0.466	0.499	0.000	1.000
Income	410	0.290	0.454	0.000	1.000
Income	410	0.373	0.484	0.000	1.000
Ethnic diversity	410	0.619	0.104	0.418	0.783

Note: Obs = number of observations; PGG = public goods game

Table 8. Estimation results of Model 1

Dependent Variable: Membership Status		
Independent Variable	Probit	Logit
Contribution in PGG	−0.01239000*	−0.01991580*
Leader's contribution	−0.00000141	−0.00000281
Average waste bank revenue	−0.00000089	−0.00000128
Age	0.02336900***	0.03953780***
Education	0.00798500	0.00167270
Income	−0.30632000*	−0.50730710*
Income	−0.16384000	−0.26692050
Ethnic diversity	0.96536100	1.59893500
Constant	−0.80287000	−1.37616100
Observations	334	334
Log likelihood	−200.81942000	−200.79136000
Chi-squared	17.70000000	17.45000000
Pseudo R-squared	0.04470000	0.04480000
Percentage correctly predicted	70.06%	69.76%

Note: *, **, *** refers to values that are significant at 10%, 5%, and 1% levels.

Table 9. Estimation results of Model 2

Dependent variable: Sorting		
Independent Variable	Probit	Logit
Trust	−0.00000530	−0.00000918
Leader's contribution	0.00000065	0.00000154
Average waste bank revenue	−0.00000234	−0.00000391
Ethnic diversity	−2.38507000***	−4.21493000***
Contribution in PGG	0.01985700**	0.03414600**
Family member	0.01909000	0.03392600
Education	0.18570100*	0.35574600*
Waste bank membership	0.89668700***	1.48219700***
Constant	0.70078700	1.19352800
Observations	313	313
Log likelihood	−171.07121000	−170.81403000
Chi-squared	40.43000000	40.94000000
Pseudo R-squared	0.10570000	0.10700000
Percentage correctly predicted	73.16%	73.16%

Note: *, **, *** refers to values that are significant at 10%, 5%, and 1% levels.

Model 1 tries to answer the research question, “What factors induce a household in a community to join a waste bank?” From the estimation results, it can be concluded that the contribution of an individual to the public goods game is related to their willingness to join a waste bank. The results also show that the older the participant, the greater his/her willingness to join.

In Model 2, we tried to answer the question, “Which factors relate to the sorting behavior of a household?” From the estimation results, we found four variables that significantly affect sorting behavior, namely, ethnic diversity, contribution to the public goods game, level of education, and waste bank membership status. The contribution made to the public goods game represents pro-social behavior, which is relevant as a factor in inducing sorting activity. Waste sorting takes quite a lot of time, especially when trying to make it a habit; therefore, pro-social behavior is needed. Another significant variable is education. Individuals who have academic degrees (or higher) tend to sort their waste. The last significant variable is membership status. This result could be a positive argument for why the waste bank program is important—waste banks have proved to be effective at getting their members to conduct waste sorting.

Tables 10 and 11 summarize the data and estimation results of Model 3. From the estimation results, we found that individual trust has an insignificant effect on participation rate, followed by the descriptive statistics of the variable used. On the other hand, the leadership shown by the waste bank leader has a positive impact on members' participation rates. The role of the waste bank leader is important right from the waste bank's establishment. In most cases, the waste bank leader is the person who initiates the establishment of the waste bank. It is also the waste bank leader who encourages households in the community to join the waste bank. Furthermore, the leader encourages their members to actively participate in waste bank activity.

Another variable that induces participation rate is the average waste bank revenue. This value represents the expected monetary incentive from waste bank activity. As expected, the higher the revenue of a waste bank, the higher the participation rate of its members. Another significant variable is the share of a member's average revenue as a proportion of the total waste bank average revenue. This share represents the value of waste collected from a member relative to the other members. This may indicate that rather than being driven by a social motive, a household's decision to participate in a waste bank activity is driven by self-interest to gain economic benefit by attending waste bank activities.

Table 10. Descriptive statistics for Model 3

Variable	Obs	Mean	SD	Min	Max
Sorting	410	0.685366	0.464937	0.000000	1.000000
Trust	409	14,242.050000	1,1638.450000	0.000000	5,0000.000000
Leader's contribution	410	18,126.020000	1,1289.050000	3,333.333000	5,0000.000000
Average waste bank revenue	410	18285.370000	29,559.960000	5,808.047000	151,516.500000
Ethnic diversity	410	0.618929	0.103995	0.417778	0.78316
Contribution to public goods provision	366	12.732240	9.892263	0.000000	50.00000
Family member	366	4.213115	1.505585	1.000000	11.00000
Education	372	2.346774	0.784393	1.000000	5.00000
Waste bank membership	387	0.762274	0.426242	0.000000	1.00000

Table 11. Estimation result of Model 3

Dependent Variable: The Intensity of Member Attendance		
Independent Variable	Coefficient	Standard Error
Trust	0.0000697	0.0001112
Leader's contribution	0.0003476***	0.0001270
Average waste bank revenue	0.0002229***	0.0000570
Share household revenue	1.1797990***	0.1577726
Ethnic diversity	52.6990600***	16.6364700
Type of community (1 = structured)	4.2448290	3.4421160
Family member	1.1664350	0.9204008
Own house (1 = owned)	-1.5819490	3.8657070
Education	-5.2651580*	3.0572870
Income	-0.1509039	3.4415200
Income	1.0311810	3.4376710
Constant	-12.3701500	12.7128600
Adjusted R-squared	0.2606000	
R-squared	0.2951000	
F	8.5600000	
Prob> F	0.0000000	
Observation	237	

Note: *, **, *** refers to values that are significant at 10%, 5%, and 1% levels.

Ethnic diversity is positively correlated to the participation rate of a member. This finding is different from those of Alesina and La Ferrara (2000), Miguel and Gugerty (2005), and de Oliveira, Eckel, and Croscon (2010). These researchers found a lower contribution to public goods in highly diverse communities. This lower contribution is a result of the preference for ethnic homogeneity (Alesina and La Ferrara 2000), heterogeneous tastes for the type of collective goods across ethnic groups (Alesina and La Ferrara 1999), and the ability to impose sanctions within ethnic groups (Miguel and Gugerty 2005). However, Schundeln (2012) found that an increase in ethnic heterogeneity is associated with an increase in the willingness to contribute to public goods. He argued that more ethnic diversity may be associated with higher uncertainties about the expected contributions of other individuals. This will lead to higher private contributions to public goods through the ethnic diversity factor rather than through ethnic homogeneity. This argument could support an analysis of why the higher ethnic diversity, the more likely individuals are to contribute to community activities such as the waste bank program. Depok municipality is known for having a high rate of immigration. The people who migrate to Depok come from different ethnicities and backgrounds. These differences may induce them to act more tolerably, to work toward a better environment, and to be active in community programs.

The results also showed that the level of members' education negatively correlated to their participation in waste bank activity. Chakrabarti, Majumder, and Chakrabarti (2009) and Rupasingha (1997) found a contradictory impact. Beard (2005) also found that in order to participate, there should be a minimum educational level. However, Beard (2005) cited that people who are highly educated are more likely to contribute their money, not their time. In the case of waste banks, the participation most needed is in the form of sorting waste and bringing recyclables to the weighing schedule, which require time.

Model 4 (Tables 12 and 13) estimated what factors affect the growth of waste bank membership. The waste banks that were established first have the highest growth (from the initial level) compared to new waste banks. Another significant variable is waste bank productivity.

Table 12. Descriptive statistics for Model 4

Variable	Obs	Mean	SD	Min	Max
Waste bank membership growth	109	10.16016	16.671350	1.54545	134
Waste bank leader's trust score	139	6.52518	1.229651	3.00000	8
Waste bank leader's leadership score	119	53.49580	6.233961	38.00000	75
Waste bank's age (in months)	142	26.73239	6.768634	6.00000	46
Waste bank productivity	138	8.72320	4.806980	0.50000	30
Waste bank leader's age	148	43.88514	8.084186	17.00000	70
Javanese ethnicity	151	0.55629	0.498475	0.00000	1
Leader's education	153	0.69281	0.462844	0.00000	1
Total waste bank revenue	109	487,0810	4,629,957	104,880	29,000,000

Table 13. Estimation results of Model 4

Dependent Variable: Growth of Waste Bank Membership		
Independent Variable	Coefficient	Standard Error
Waste bank leader's trust score	1.73345400	1.78350900
Waste bank leader's leadership score	0.12911950	0.38053720
Waste bank's age (in months)	0.58368660*	0.34413790
Waste bank productivity	1.55080700***	0.53771650
Waste bank leader's age	0.42136200	0.30525530
Javanese ethnicity	-4.78658500	4.73804400
Leader's education	5.40943000	4.78187500
Total waste bank revenue	-0.00000026	0.00000044
Constant	-54.32896000*	29.93388000
Adj R-squared	0.17440000	
R-squared	0.27440000	
F	2.74000000	
Prob> F	0.01230000	
Observation	67	

5.0 THE ROLE OF WASTE BANKS IN SUPPORTING ECO-WASTE MANAGEMENT IN DEPOK MUNICIPALITY

5.1 The Growing Number of Waste Banks

Although the actual number is more than this figure, we recorded 265 waste bank locations in five subdistricts under the Waste Bank Association. The distribution of waste banks in five locations is concentrated in the subdistricts of Sukmajaya and Beji,¹⁴ the places where Bank Sampah Depok operates (Table 3 shows the distribution of waste banks across subdistricts in Depok).

Most of the waste banks (63%) in Depok were established in 2013. This was during a period when Mr. Supariyono—who later became the head of the Waste Bank Association—actively helped Bank Sampah Depok to expand its locations. The first waste bank was established in February 2012 in subdistrict Sukmajaya. After 2014, the expansion of waste banks reduced sharply. To date, it is estimated that there are around 500 waste banks in Depok. In 2014, Depok municipality had a target of building 2,000 waste banks, a target which now seems unlikely to be achieved.

5.2 Participation in Waste Bank Activity

Based on 2007 data (Adipura Report), it is estimated that waste generation from households in Depok has reached 60%. We may assume that this figure will rise as the number of young families migrating to the area is increasing, creating a 4% population growth. In relation to eco-waste management at the municipal level, the number of households that implement *reduce, reuse, and recycle* activities becomes important. The most important activity that households perform is waste sorting and the channeling of waste to be further recycled and reused. The expansion of waste bank membership generates more households who are involved in sorting and channeling waste.

On the average, the membership of a waste bank is 21 households. Some 61% of waste banks have a membership of between 20 and 50 households. The smallest waste bank membership is six and the biggest is 135 households (Figure 4). Figure 5 shows the proportion of households in a waste bank area that become waste bank members. No waste bank can cover all the households in the community where it is located. Only 10% of waste banks can cover 60%–90% of the households in the community, 36% of waste banks can cover 30%–60% of the households in the community, and most waste banks (54%) can cover only 30% and below. Given the low intake of households in a community that become waste bank members, 77% of waste banks still try to attract members. The waste bank administrator/s find/s it difficult to recruit new members because some households prefer to sell to private waste collectors because the waste bank does not offer competitive prices. Participation in a waste bank is difficult for working mothers because they usually do not have the time to sort the waste and attend the weighing schedule. Information dissemination is still needed to inform households of the importance of waste sorting.

According to waste bank leaders, the participation level of members is mostly moderate (Table 14). Only 10% of waste banks have high member participation. The 12% of waste banks that have low member participation said that this was due to many households being home to full-time workers who do not sort their household wastes and who are not willing to go to weighing activities. In some cases, low participation occurs because household domestic waste is decreasing. Usually, at the opening of a waste bank, participation is high because most of the members have a lot of scrap that needs to be taken to the waste bank. When this scrap has been disposed of, the inorganic waste that can be taken to the waste bank reduces.

Less than half of waste bank administrators think that their members' participation trend is steady. Although more than a quarter of administrators said that the participation trend is increasing, another quarter are experiencing a trend of decreasing member participation (Table 15).

¹⁴ We cannot collect data from subdistrict Beji.

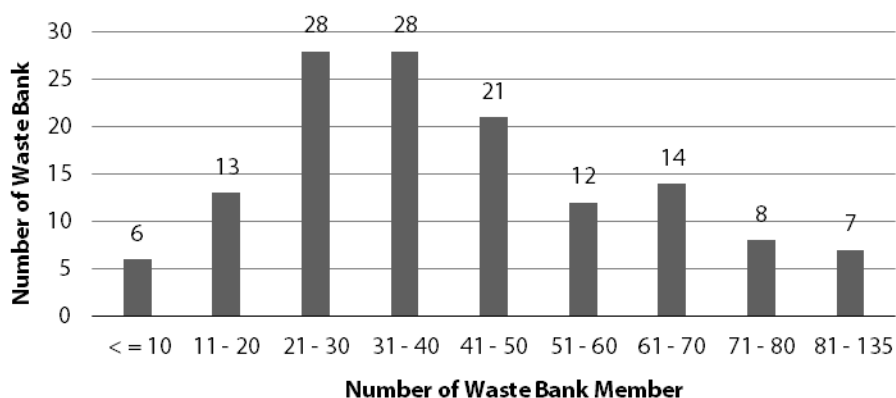


Figure 4. Distribution of the number of waste banks based on members (n = 137)



Figure 5. Proportion of households that become waste bank members (n = 124)

Table 14. Participation level of waste bank members

Participation Level of Members	Number of Waste Banks	Percentage
High	16	10.60%
Moderate	69	45.70%
Low	18	11.92%
Mixed	48	31.79%
TOTAL	151	100.00%

Table 15. Members' participation trends

Members' Participation Trends	Number of Waste Banks	Percentage
Increasing	41	27%
Decreasing	37	25%
Steady	70	46%
Don't know	3	2%
TOTAL	151	100%

The evidence of steady and decreasing trends in member participation can also be described in three graphs created from the data gathered from the three waste banks. These figures are taken from members' deposit books, which record the attendance of every member in the waste bank. The typical trend is that as the number of members goes up, the attendance at the weighing schedule does not increase; instead it remains steady or even has a tendency to decrease at some waste banks. Figures 6, 7, and 8 describe the membership expansion and members' attendance at the weighing activity.

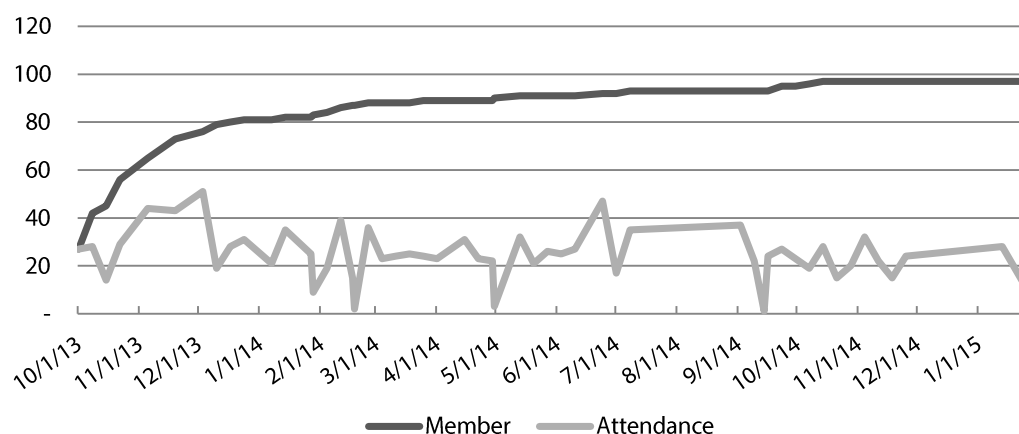


Figure 6. Number of members and their attendance at the waste bank weighing activity, waste bank in Sukmajaya subdistrict

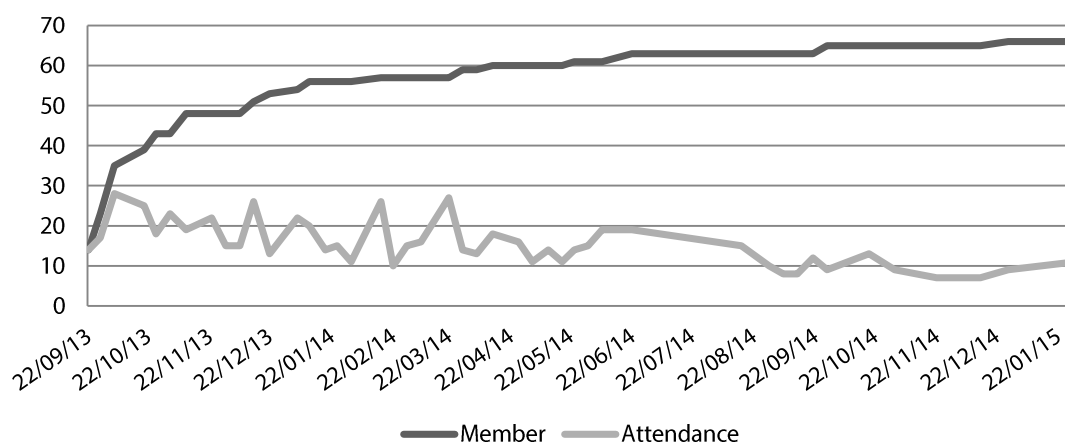


Figure 7. Number of members and their attendance at the waste bank weighing activity, waste bank in Cilodong subdistrict

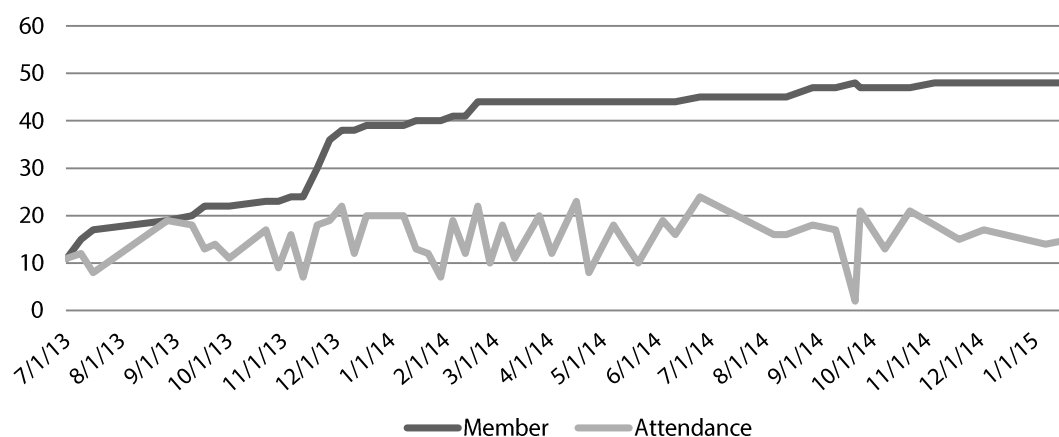


Figure 8. Number of members and their attendance at the waste bank weighing activity, waste bank in Tapos subdistrict

About 82% of the administrator respondents have problems managing their members. The problems faced include low participation of members (43%), inappropriate sorting (46%), inappropriate classification of inorganic waste deposited (74%), and not all members sell/deposit their waste to the waste bank (66%). Table 16 shows the proportion of waste bank members that sort their waste, according to the administrator. Participation in sorting waste among waste bank members is not yet optimal—only 16 waste banks experience almost full participation in sorting by members. With regard to the appropriateness of sorting, the members of only 18 waste banks sort their waste appropriately (Table 17).

Table 16. Proportion of waste bank members that sort their waste

Proportion of WB Members Sorting Their Waste	Number of Waste Banks	Percentage
All/almost all members sort their waste (90%–100%)	16	11%
Most members sort their waste (60%–90%)	53	35%
About half of the members sort their waste (40%–60%)	41	27%
Few members sort their waste (20%–40%)	27	18%
Very few members sort their waste (0%–20%)	13	9%
Total	150	100%

Table 17. Appropriateness of members' sorting

Appropriateness of Sorting	Number of Waste Banks	Percentage
Almost all members do appropriate sorting (90%–100%)	18	12%
Most members do appropriate sorting (60%–90%)	55	38%
About half of the members do appropriate sorting (40%–60%)	42	29%
Few members do appropriate sorting (20%–40%)	19	13%
Only a few members do appropriate sorting (0%–20%)	11	8%
Total	145	100%

5.3. Organic Waste Composting

Waste banks generate more benefits than expected. Not only do they reduce domestic inorganic wastes, they also lessen organic wastes. Waste banks promote organic waste composting in their communities, especially in their members. About 41% of waste banks take part in promoting organic waste composting. Disseminating information about the importance of composting organic waste and information on how to compost organic waste usually takes place in the same session as the dissemination of information about the waste bank itself. In some areas waste bank administrators organize special sessions to conduct experiential learning for members and for the community as a whole on how to produce homemade or communal composting. In areas where the UPS is working, waste banks help manage the logistics of the organic waste that has to be transported to the UPS. When this happens, waste banks help UPS to obtain a continuous supply of organic waste for composting. However, the coverage of UPS is still low. Out of all our waste bank samples, only 30 waste banks were covered by government services to handle organic waste through UPS.

We found that members of waste banks sort their waste; nonmembers sort them as well. There are many ways that households treat organic waste after sorting; some just sort it, not process it into compost, some conduct home composting, some give their waste over to communal composting managed by the community or to composting collected and transported to the UPS. However, the amount of waste sorted by members (Table 18) is higher than that sorted by nonmembers. In addition, members tend to sort their waste more often than nonmembers (Table 19).

Table 18. How much waste is sorted by waste bank members and nonmembers

How Much Waste is Being Sorted	Nonmembers		Members	
Almost all (90%–100%)	19	16%	32	12%
More than half, but not all (60%–<90%)	19	16%	95	37%
About half (40%–<60%)	27	22%	77	30%
Less than half (20%–<40%)	35	29%	29	11%
Less than a quarter (<20%)	22	18%	24	9%
Total	122	100%	257	100%

Table 19. How often waste is sorted by waste bank members and nonmembers

Waste Sorting	Nonmembers		Members	
Almost never	13	10%	7	3%
Rare	55	42%	54	20%
Quite often but not every time	24	18%	63	24%
Always/every time	38	29%	140	53%
Total	130	100%	264	100%

Before a waste bank is established, community education regarding the waste bank takes place. The community is trained on how to sort their waste into three categories: inorganic waste, organic waste, and residual waste. Households are motivated to clean the inorganic waste before it is deposited at the waste bank. Although the waste bank only receives inorganic waste, most waste banks educate their members to manage their organic waste through composting. Households can dispose of residual waste into trash cans, which are then transported to a landfill site.

The government wants to utilize the UPSs, and this aim has driven the change in the dissemination of information about how to segregate waste and changes in the community waste collection system. The end objective is to create a three-tier waste collection system: organic waste to UPS, residual waste to landfill, inorganic waste to waste banks. In areas where this kind of dissemination takes place, a waste bank is established. When a waste bank has been established, the government also supports the expansion of the waste bank's operations.

5.4 The Sustainability of Waste Bank Activity

Despite the positive externalities created by waste bank activities, several waste banks are experiencing periods where they do not engage in weighing activities. One reason for a waste bank to cease operation is because of technical problems driven by unsustainable cash flow management. From discussions with several waste bank coordinators, it is clear that unsustainable cash flow usually occurs at the beginning of a waste bank's operation. As membership numbers and the amount of waste collected increases, a waste bank can cover its operational/variable costs. Nonetheless, waste banks cannot cover 100% of their fixed costs. A few waste banks receive trucks from private companies as part of their corporate social responsibility activities. However, distribution of this kind of support is not equal across waste banks. Some waste banks have closed due to difficulties in financing their business.

About 44% of the waste banks stated that they have experienced a reduction in the frequency of their weighing activity. The reductions range between 1 and 14 months, and the average is 3 months. Some 44% of waste banks have experienced a reduction in weighing activities of two months or less. The main reason for inactivity is a long holiday (Ied Fitr/Christmas/New Year), rainy weather or because the administrator/s did not have time to conduct the weighing activity. Around 4.5% of waste banks have experienced inactivity of six months or more. Several reasons for these periods of inactivity exist, e.g., the activities of the waste bank coordinator were stopped, the waste collected was reduced, or the administrator/s and members became demotivated.

Waste banks compete with private waste collectors. Private waste collectors offer higher prices for recyclable inorganic waste, but they only take valuable waste, which means that they reduce less waste than

waste banks, which take a bigger range of recyclable inorganic waste. In some waste banks, to motivate members to sort all of their waste, members can deposit non-valuable inorganic waste. The waste banks perform a cross-subsidy for inorganic waste types. In consequence, some members sell their valuable inorganic waste to private waste collectors, and sell their low-value scrap to the waste bank. This practice further weakens the finances of waste banks.

Some waste banks suffer from complaints. About 47% of waste banks receive complaints from their members. The complaints are usually about fluctuating prices, the monetary value of deposits not being as high as expected, a less-than-ideal location for the weighing activity, the weighing activity area not being clean, too-short weighing schedules, and the 10% revenue deduction that is taken from members' deposits. There are also complaints about members' disbursements not being paid on time, and about reductions in the type of inorganic waste that is accepted. These two latter problems relate to the policies of the waste bank coordinator/s, not the waste bank unit.

Several actions have to be taken to allow waste banks to be financially sustainable. According to the waste bank coordinators, the biggest costs incurred are storehouse rent and transportation costs. One waste bank has proposed using an idle UPS site as a storehouse but, at time of writing, the government has not given permission to do this. More collaborative work is needed to integrate the role of stakeholders in waste management in Depok, particularly as waste banks support local governments in educating communities to sort their waste, thereby complying with the recently issued Local Regulation No. 5 of 2014 on Waste Management. Depok municipality is now obliged to get households to sort their waste. The expansion of waste banks is needed to expand the market for recycling and to educate households to sort their waste, thereby optimizing the utilization of UPS for organic waste recycling.

5.5 Waste Banks in the New Waste Regulation Era: Problems and Challenges

Waste banks reduce waste. In order for waste recycling to function, the active participation of the public is required. The effectiveness of recycling depends on collective action (Everett and Peirce 1992). Because of the non-excludability feature of the environmental impact of recycling, it is sensitive to the free-rider problem (those people who are not willing to recycle). Domestic waste recycling then becomes an environmental collectivism (Yau 2010). As a community activity, participation in the waste bank program becomes important to the success of waste bank activity. In the case of waste banks in Depok, recycling activity emerged as collective action. In this kind of collective action, participation is incentivized in many forms, namely, money and other benefits that emerge via an increase in social interaction, such as information exchange, which increases the opportunities to gain economic and non-economic benefits.

On the power of monetary incentives to induce participation, Yau (2010) provides evidence of how economic incentives worked to motivate households in a private housing estate in Hong Kong to participate in recycling their waste. The reward scheme put in place on the housing estate seems to have had a significant positive relationship with the per-household weight of recyclables collected. In Portland, Oregon, Hong and Adams (1999) found that households responded to an increase in the price offered for recycling by increasing their recycling, thereby avoiding charges for waste disposal. The importance of a pricing scheme can be seen in Thogersen (2003). Thogersen compared fixed fee and pay-by-weight schemes of garbage collection. The result showed that the weight-based fee induced households to recycle and compost more in the garden.

In Depok, monetary incentives seem to have power. An empirical study conducted using an experiment (Halimatussadiyah and Widyawati 2015) found that rather than being driven by social motives, a household's decision to participate in waste bank activity was driven by the self-interested motive of gaining economic benefit. However, not all households are motivated by money. In some areas, there are waste banks that have members who give part or all of their waste deposits to community activity. In these cases, waste sorting activity is motivated either by environmental awareness or by benefits derived from community activity.

The study also underlines the importance of the waste bank leader. The role of waste bank leader is a significant factor in inducing community participation in waste bank activity. If a leader pays a higher contribution toward public goods, it indicates that s/he pays more attention to the community program and will put more effort into encouraging the involvement of the community in the program. In the case of

waste banks, the leader sets up the market for recycling, which generates a monetary incentive for its members to recycle. Without the waste bank leader, this “market” would not exist.

Jack and Recalde (2015) describe how communities in rural Bolivia tend to participate more when the leader sets a good example, which increases voluntary public good provision. If the leader sets a good example by giving a generous contribution, it is more likely that the members will follow suit. Rivas and Sutter (2009) suggested that an endogenous leader is more efficient than an exogenous one. An endogenous leader is a voluntary leader, while an exogenous leader is an assigned leader. A voluntary leader tends to give a higher contribution than an exogenous leader (Rivas and Sutter 2011).

The social motives of the waste bank leader can be identified by looking at who becomes a waste bank leader. Most waste bank leaders are community activists, i.e., the administrator of the neighborhood association, the *Posyandu*¹⁵ activist leader, the PKK¹⁶ leader or activist, and some religious and political activists. These are all voluntary activities, and as 80% of waste bank administrators stated that they do not receive any financial incentive, leadership itself becomes the dominant factor in moving these people to action. However, in some waste banks, there are leaders that have no other role in the community other than that of waste bank leader.

An empirical study (Halimatussadiah 2015) that tried to estimate the overall waste reduction achieved by waste banks showed that the waste bank program could reduce the waste generated by 1.9%, with the trend increasing to 5.6% by the end of 2015, and 12.9% by the end of 2016. These figures are much lower than the targeted waste reduction of 40% from 2,000 waste banks in Depok (Depok City Government 2015). At the very most, Depok could reduce waste by 12.9% with 2,500 waste banks—if this number of waste banks is reached (Halimatussadiah 2015). If we compare the waste reduction figures for waste banks in Depok with that for waste banks in Thailand, we find a lower figure for Depok. There are approximately 500 waste banks in Thailand, and they collect 18,000–30,000 tons of waste per year (Sasaki 2006). In Depok, the figure is only 11,040 tons per year.

A waste bank cannot stand alone and operate sustainably without the active participation of its members. In order to achieve waste reduction targets, participation is needed in the following forms: people need to become waste bank members, members need to sort household waste, inorganic waste must be recycled optimally, members need to reduce their organic waste by composting, and most importantly, efforts need to be made to reduce the quantity of inorganic substances that are used in the first place, thus reducing the need for these items to be disposed of. The survey results show that the involvement of communities in becoming waste bank members is still low. Policy interventions that push participation require an understanding of people’s behavior regarding waste treatment at household level. The new waste regulation (Local Government Regulation No. 5 of 2014 on Waste Management) states that local government will not charge a service fee for waste collection and transportation, and this is a good policy. This policy is supported by a study that provides empirical evidence that households have a negative WTP for sorting their waste; unlike other kinds of waste management attributes (frequency of collection, odor in temporary dump site), where households have a positive WTP. This means that sorting is considered a cost to a household (Fatimah and Halimatussadiah 2015).

Waste banks need back-up support from broader institutions, such as local government. Waste bank business can be considered sociopreneurship. Waste banks are different from private waste collectors, who are solely motivated by profit. To make waste banks financially sustainable, support has to be given, especially in the early stages of the business when economy of scale has not yet been reached.

Troschinetz and Mihelcic (2009) conducted a qualitative analysis of 23 case studies in developing countries and identified barriers and/or incentives to recycling. The important factors include: government policy, government finances, waste characterization, waste collection and segregation, household education, household economics, the local recycled-material market, technological and human resources, and land availability. Waste banks have roles to play in overcoming several of the problems mentioned above, namely, government finance, waste collection and segregation, and household education. With these objectives in mind, local government could support the development of local recycled-material

¹⁵ Health community activity

¹⁶ Women’s empowerment community activity

markets, land availability, and a supporting fund and supporting policies that are in tune with the waste bank program.

In order to operate sustainably, waste banks need support from local government, local leaders, and communities. A total of 80% of waste bank administrators feel that they need support to improve their performance in operating waste banks. This support includes training in sorting methods, in producing recycled products, in managing the waste bank; sharing sessions between waste banks; and the information dissemination on the latest regulations. Administrators also need equipment such as large plastic bags/containers and rope, as well as more people to help them.

Waste banks also need support from the leader of the area's neighborhood association. Although 68% of waste bank leaders feel supported by the neighborhood association, there are several waste banks where the involvement of the neighborhood association leader is minimal. Neighborhood associations could support waste banks by becoming waste bank members, by giving permission to build waste banks in the community, by providing a weighing schedule location and waste bank equipment, by allocating a budget for waste bank operation (e.g., meals), and by promoting the waste bank within the community.

According to Waste Regulation No. 5 of 2014, every household in Depok has to sort their waste. In this regulation, the involvement of waste banks and neighborhood associations are important to support the implementation of the law. Neighborhood associations are expected to manage waste management at community level. They should also take part in disseminating information about sorting waste to communities. Neighborhood associations also have to manage the collection of organic waste from each household to the temporary location before the local government officer takes responsibility for transporting it to the UPS, where it will be further recycled to compost. On the other hand, waste banks are expected to take part in managing recyclable waste. Another disposal point for recyclables is the recycling center. The recycling center is managed by local government. Almost 60% of waste bank administrators in Depok already know the new waste regulations. The regulations contain obligations for households and for neighborhood associations. Although some waste bank administrators and heads of neighborhood associations are quite optimistic that households can sort their waste (Table 20), the proportion of administrators and heads who think that this will be impossible to implement is still significant (more waste bank administrators than heads of neighborhood associations are pessimistic).

Table 20. Perceptions surrounding the implementation of the new waste regulations

Rule	Perception of Waste Bank Leader		Perception of Neighborhood Association Leader	
	Very Possible/ Possible	Less Possible/ Not Possible	Very Possible/ Possible	Less Possible/ Not Possible
Every household has to sort their waste	67%	33%	71%	29%
Neighborhood association has to build an organization to manage waste management at community level	77%	23%	80%	20%
Neighborhood association helps to educate the community on how to sort their waste	77%	23%	87%	13%
Neighborhood association conducts collection and transportation to the temporary dumpsite/UPS	45%	55%	59%	41%
Inorganic waste managed by waste bank	79%	21%	84%	17%
Inorganic waste managed by recycling center	78%	22%	80%	21%
Residual waste collected and transported to landfill regularly	75%	25%	76%	25%
No retribution (service) fee for collection of household waste	54%	46%	39%	61%
Punishments for noncompliance are: collection service stopped, penalty, three months in jail or money penalty max IDR 25 million (USD 1785.71)	60%	40%	50%	50%

There are also some doubts from waste bank administrators regarding whether neighborhood associations will be capable of conducting their duties within the new waste regulations. The survey results show that respondents are ready to implement the regulations. However, they have doubts as to whether their community is ready to implement the regulations. Waste bank leaders are not sure whether neighborhood associations can carry out the tasks of disseminating waste sorting information, managing the sorted waste, collecting the waste, and transporting the waste. On the other hand, the heads of neighborhood associations are quite sure that waste banks can carry out inorganic waste management. With regard to the enforcement of sanctions (the punishment to be enforced if households do not comply with the regulations), it seems that neighborhood association leaders are more pessimistic than waste bank leaders.

6.0 CONCLUSION

The new waste management laws, both at the national and local levels, move from conventional waste management toward eco-waste management. This shift requires several changes, including an appropriate management system and behavioral change. This shift in emphasis and approach also requires a multi-stakeholder contribution in order to ensure the success of the new waste management regulations. One of the stakeholders that have an important role in the new regulations is the waste bank and its members. The waste bank supports local government by changing community behavior so that people treat their household waste properly by sorting it, which makes recycling or reuse possible. In Depok, the rapid development of waste banks made it possible for the local government to reduce its responsibility for managing inorganic waste, allowing it to focus on managing organic waste and non-recyclable waste.

Waste banks emerge as a waste reduction solution. Community participation in a waste bank program is important to the success of the waste bank. This study looked at the factors that encourage waste bank participation, specifically whether the social capital of an individual and the leadership of the waste bank administrator contribute to the participation of the community. The experimental method was used to measure social capital and leadership. Participation rates and economic benefits were measured through the attendance rate at waste bank activities. Other variables were measured through questionnaires.

Our results found that the leadership of the administrator is a significant factor in inducing community participation in waste bank activity. If a leader pays a higher contribution towards public goods, then it indicates that s/he pays more attention to the community program and will put more effort into encouraging the involvement of the community in the program. The monetary incentive given in terms of waste deposits made is another factor that makes participation higher. On the other hand, we did not find any significant relationship between trust and participation rates in waste bank activity. It seems that, rather than being driven by social motives, household decisions regarding participation in waste bank activity are driven by the self-interest of economic benefit. Local government should offer incentives to households to sort their waste (to be recycled further) as sorting waste is a cost incurred by the household.

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