

Presiding over a Flood of Waste

A case study on a local movement for domestic waste management at the household level, Bandung City, Indonesia

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Abstract

Municipal solid waste (MSW) management is a profound environmental issue in Indonesia. Approximately 69% of Indonesian municipal waste is transported to landfill sites. These sites infuse surrounding ecosystems with toxic compounds, degrade land quality and lead to health and sanitation issues. These factors when combined with poor domestic waste treatment and increased flood susceptibility during the rainy season, leads to serious water management issues. Therefore a project, established by a non-governmental organisation, encouraged local people to practice good domestic waste management at the household level. The case study was conducted in Bandung City, Indonesia, where residents managed their household waste using a waste bank method. Waste banks encourage householders to sort their waste, thereby minimising waste volumes transported to landfill sites.

The study was based on an adaptive co-management concept where both primary and secondary sources were used. The study analysed the contribution of waste banks to overcome waste problems and to analyse factors necessary for improvement. The goal of any waste bank programme is the encouragement of key behaviours; user awareness of domestic waste self-management, raising user responsibilities and implementing more sustainable domestic waste management practices. Based on the findings of this study, the waste bank project extended learning opportunities for non-governmental organisations, supporting stakeholders and residents. The project also potentially reached sustainable development goals for responsible consumption and production. However, a barrier to the project was the lack of incentive and political willingness to enforce policies. The outcome of this research will help local authorities and related stakeholders to improve domestic household waste management.

Keywords: Adaptive co-management, domestic waste, municipal waste, self-management, waste bank, Bandung municipality.

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List of Abbreviations

| | |
|---------|---|
| BEMA | Bandung Environmental Management Agency |
| HL | Hijau Lestari |
| ICWRMIP | Integrated Citarum Resource Management Investment Programme |
| JICA | Japan International Cooperation Agency |
| MSW | Municipal Solid Waste |
| NEC | National Electricity Company |
| NEMA | National Environmental Agency |

1. Introduction

1.1 The research question

Countries with high economic activity (production and consumption) in the Global South tend to have issues with municipal waste treatment (Fei, Qu, Wen, Xue, & Zhang, 2016). Municipal solid waste management is a serious environmental issue in Indonesia, especially in Bandung, the capital city of West Java with a population of 2.5 million (Rahayu, Putri, Hani, Hasan, & Mursyid, 2012). The rapid progress of urbanisation, income per capita growth and a lack of ecological awareness, are some of the prominent factors that contribute to unmanageable levels of municipal waste (Damanhuri, Wahyu, Ramang, & Padmi, 2009; Guerrero, Maas, & Hogland, 2013).

In Indonesia, most municipal waste is transported to landfill sites and managed by local authorities, including the Bandung Municipality (Damanhuri et al., 2009; Guerrero et al., 2013; Rahayu, Putri, Hani, Hasan, et al., 2012). Bandung produces 1,600 metric tonnes of municipal waste per day, mainly generated by private households¹ (Bandung Statistics Centre, 2015). However, the sanitation company in charge of handling municipal waste in Bandung can only handle approximately 1,100 metric tonnes per day. There is no waste separation, therefore all waste ends up in the only active landfill in Bandung (Appendix 1) (Martowibowo & Riyanto, 2011).

These landfill sites infuse surrounding ecosystems with toxic compounds, degrading land quality (i.e. surrounding farm land) and leading to health and sanitation issues (Hamer, 2003; Surakusumah, 2008). Heavy metal particles and carcinogenic chemicals present at these landfills are washed into local water courses (streams, rivers and potentially the water-table) (Hamer, 2003). Besides carcinogenic materials, the accumulation and build-up of explosive gases such as methane can have significant negative impacts on surrounding environments (Damanhuri et al., 2009; Lavigne et al., 2014). In 2005, a methane gas explosion occurred at the dumping site managed by the Bandung and Cimahi municipalities² (Lavigne et al., 2014). As a consequence, millions of kilogrammes of municipal waste were abandoned for months, constituting a direct threat to the health of local populations (Lavigne et al., 2014). These populations contracted gastrointestinal tract infections and typhoid caused by germs from the garbage (Hilda, 2014). When effluent was washed into drainage channels, it clogged the drainage flow (Surakusumah, 2008).

¹ Household waste Average 1,048.96 Ton/year (Appendix 2)

² Leuwigajah landfill site, located in Cimahi City Suburban Area (Appendix 1)

Besides transporting waste into landfill sites, people in Indonesia dispose of their domestic waste by dumping it into rivers, burning or burying it (Ministry of Environment, 2008b). These habits not only harm river biodiversity, but they also affect hydrogeological conditions of surface water, especially during floods³ (Ginkel, 2015).

1.2. Current responses

The authorities acknowledged that the current waste issues are one of the causes of annual floods, especially during the rainy season (Bandung Environmental Management Agency, 2013). To minimise the threat from floods, the Bandung Environmental Management Agency (BEMA) launched a movement called “A million bio-pores” in 2013 (Bandung Environmental Management Agency, 2013; Budi, 2013). The project encouraged people to dig bio-pores⁴ on their residences to expand rain precipitation areas. Besides the bio-pore agenda, the municipality also provided small bio-digester⁵ sets to several districts (Bandung Environmental Management Agency, 2017). Both bio-pores and bio-digesters were expected to gradually reduce volumes of organic domestic waste in the city (Bandung Environmental Management Agency, 2013, 2017). These projects came under the Act 23/1997 and were managed by the mayor of Bandung. They were executed at local levels by hamlet and neighbour association leaders⁶ (Ministry of Environment, 2009).

At the community level, local non-governmental organisations (NGOs) in Bandung established a waste bank programme in 2013. The programme raised awareness of domestic waste management at a household level, by increasing the economic value of waste (Indrianti, 2016). This was achieved by buying waste from local populations and selling it to recycling companies and waste buyers (Indrianti, 2016). The programme also trained citizens to sort their waste (Indrianti, 2016). Waste banks were not only expected to reduce transported waste to landfill sites (Wijayanti & Suryani, 2015), but they were also expected to increase waste recycling rates (Chaerul, Fahrurroji, & Fujiwara, 2014). However, the success of municipal waste management programmes, as managed by authorities, was strongly dependent on public cooperation (Bulkeley, Watson, Hudson, & Weaver, 2005; Guerrero et al., 2013).

³ The further explanation about hydrogeological disturbance by flood will be explained at chapter 2

⁴ A Bio-pore is a 10cm diameter hole with 100cm depth that can be filled with organic waste inside and absorb more water to the ground (Budi, 2013).

⁵ Bio-digester is a tool to produce biogas from anaerobic microbial activity (Hessami et al., 1996)

⁶ For further information about the Indonesian authority structure from national to neighborhood level, see Appendix 3

1.3. Project Aims and Research Questions

The issues mentioned above illustrate how mismanagement of municipal waste can negatively impact on the environment, e.g. ecological disturbances and sanitation issues. Furthermore, the success of municipal waste management projects is very much dependent on community responses. Therefore, the aim of this project was to investigate a waste bank project in Bandung. This initiative was predicted to meet public needs in navigating environmental disturbances caused by unmanageable municipality waste practices.

The following research questions were generated:

RQ1: How do key actors incentivise Bandung city residents to understand the urgency of domestic waste management?

RQ2: What barriers inhibit the progress of domestic waste management?

RQ3: How does the sustainability perspective reflect upon the identified barriers?

In addressing these questions, this thesis will initially explore current Indonesian waste management landfill systems (Chapter One) And assess its impact on local ecology (Chapter Two). In this same chapter, the emergence of waste banks and domestic waste flow systems will be explained.

Adaptive co-management will be employed as the analytical framework of the thesis and will be described in Chapter Three.

Chapters Four and Five cover methodologies and results respectively.

Chapter Six is divided into three sections. The first discusses the struggles to incentivise local populations in adopting waste bank programmes. The second section addresses institutional barriers that inhibit project development. Finally, the third section reflects on barriers and project relationships that could hinder waste bank development goals.

2. Waste Management in Bandung, Indonesia

This following chapter presents the mainstream municipal solid waste management system in Indonesia, specifically in the city of Bandung, West Java. Besides examining current waste management schemes, the environmental impact of mainstream MSW is also investigated. Additionally, the emergence of waste banks as the community's response to these issues are explored.

2.1. Mainstream Indonesian waste dumping systems and their environmental impact

2.1.1. Indonesian conventional domestic waste flow

Households are the biggest waste producers in Indonesia (Midiana & Gamse, 2010). In 2006, approximately 16.7 million tonnes of waste were produced by the Indonesian household sector, and these numbers are projected to escalate (Ministry of Environment, 2008a). Furthermore in 2015, Bandung Statistic Centre (2015) recorded that Bandung municipality produced approximately 1,048.96 tonnes of household waste (Appendix 2). Most domestic waste is handled by sanitation companies owned by local municipalities (Local Sanitation Company Bandung City, 2016; Meidiana & Gamse, 2010).

Based on data from the Ministry of Environment, 69% of total waste generated by households can be managed by sanitation companies. The waste is managed by relocation to landfill sites. The remaining 32% is treated by households in conventional ways, e.g. burning, burying and dumping into rivers. Data shows that the majority of the population treat domestic waste conventionally (Table 1).

Table 1. Household waste treatment in 2006. Source: Ministry of Environment Indonesia, 2008

| Method | Amount (Million ton/year) | Percentage (% of total) |
|-------------------------|---------------------------|-------------------------|
| Transported to landfill | 11.6 | 69 |
| Buried | 1.6 | 9.6 |
| Burnt | 0.8 | 4.8 |
| Composted | 1.2 | 7.15 |
| Disposed in river | 0.5 | 2.9 |
| Other | 1.1 | 6.55 |
| Total | 16.8 | 100 |

Waste removal from homes to landfill sites in Bandung municipality is organised by Bandung sanitation companies who are funded by governmental distribution budgets (Damanhuri, 2008). Besides high operational and maintenance costs, it takes approximately three to four hours to transport this waste to landfill sites (Bandung Sanitation Company, 2016). The lack of knowledge and willingness to change

waste management behaviours has become the main reason why this practice is sustained in most Indonesian cities (Damanhuri, 2008; Damanhuri et al., 2009; Rahayu, Putri, Hani, & Hasan Basri, 2012). Figure 1. illustrates domestic waste relocation from households to landfill sites.

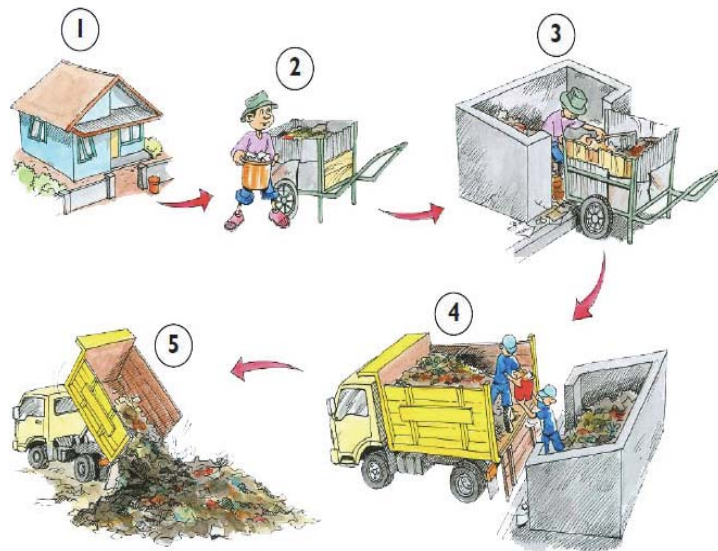


Figure 1. Waste relocation from households to landfill sites. 1) Waste is collected at households. 2-3) Waste is transported to temporary waste disposal containers 4) Waste picked up by local sanitation company. 5) Waste is transported to landfill sites. Source: Yusran, (2010)

In households, both organic and nonorganic waste is collected in the same container, which is then collected by the waste picker, on a daily basis (Rahayu, Putri, Hani, & Hasan Basri, 2012). Most waste pickers are formally organised by sanitation companies but some act as informal waste pickers (Rahayu, Putri, Hani, & Hasan Basri, 2012). Garbage is collected from different hamlets and relocated to temporary waste disposal units (Rahayu, Putri, Hani, & Hasan Basri, 2012). Each district usually has one or two temporary waste disposal units which are located in the street. These are easily accessed by the local sanitation company. After this, the garbage is relocated to Sarimukti⁷ open landfill site. Later, the mixed waste is sorted by informal scavenging⁸ (Rahayu, Putri, Hani, Hasan, et al., 2012; Sasaki & Araki, 2013).

The open landfill in Sarimukti operates like other landfill sites, there are no standardised sorting processes (Damanhuri et al., 2009; Japan International Cooperation Agency, 2012; Meidiana & Gamse, 2010). Some garbage is manually sorted by informal scavengers (Damanhuri et al., 2009). The

⁷ The current landfill managed by Bandung Municipality (See Appendix 2)

⁸ An itinerant waste picker works individually or in an informally organised group (Sasaki & Araki, 2013)

scavengers often sell heavy materials such as iron, metal, aluminium, or plastic containers to waste buyers⁹ (Damanhuri et al., 2009; Sasaki & Araki, 2013). Recycling rates from manual waste sorting can reach a maximum of 7.5% of transported waste (Chaerul et al., 2014; Damanhuri et al., 2009; Sasaki & Araki, 2013).

In 2012, it was predicted that household waste at Sarimukti landfill would be over capacity by 2015 (Japan International Cooperation Agency, 2012). Up until this time, the Sarimukti landfill site was still accepting waste from Bandung municipality and some districts around the city (Bandung Sanitation Company, 2016). The Japan International Cooperation Agency (JICA) noted that besides limited space, these dumping sites would harm the ecology of surrounding agricultural areas and settlements. Similarly, the JICA also noted that water and soil quality were threatened by heavy metals and toxic chemicals that could be washed out, together with untreated leachates¹⁰ (Japan International Cooperation Agency, 2012).

The municipal waste dumping system in Bandung has been observed to be potentially harming the surrounding ecology (Bulkeley et al., 2005; Damanhuri, 2008; Hamer, 2003). An issue of major concern are high methane emissions from these landfill sites (Bandung Environmental Management Agency, 2013). In 2000, total methane emissions from Indonesian landfill sites reached approximately 663×10^3 tonnes. In 2025, emissions are projected to reach $1,581.74 \times 10^3$ tonnes (Meidiana & Gamse, 2010).

This issue became serious in 2005. A methane explosion at Leuwigajah landfill¹¹ killed 147 people and resulted in serious environmental damage for Bandung municipality (Damanhuri, 2008; Lavigne et al., 2014). This accident was one of the main reasons why this research was conducted in Bandung City. Moreover, in a few decades Bandung Municipality will expand into the Bandung metropolitan area to more than twice the size it is today (Tarigan, 2016). Without question, waste management issues will unfold and deteriorate the population's quality of life.

⁹ A small scale business holder on recyclable waste selling and buying activity. The waste buyers are an intermediary agency where the scavenger sells their waste collection to be distributed to the recycling factory (Sasaki & Araki, 2013)

¹⁰ A bad smelling liquid that is produced from garbage piles

¹¹ The technical detail of this incidence be read at Damanhuri (2008) and Lavigne et al., (2014)

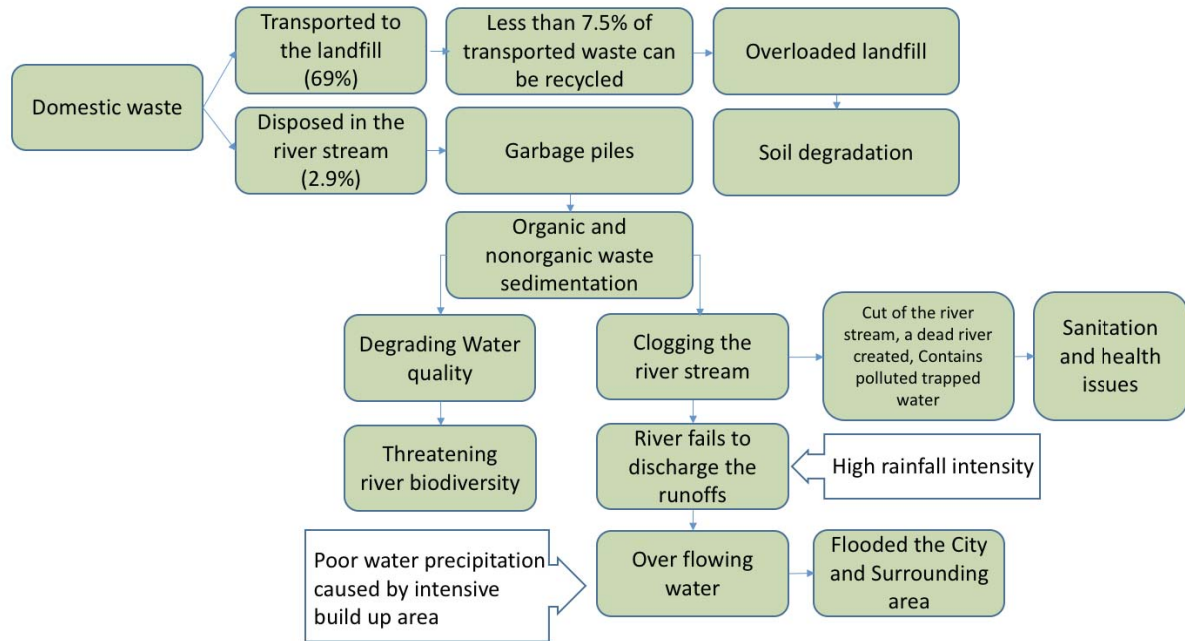


Figure 2. Environmental impact caused by current waste dumping systems in Indonesia. The white box shows the external pressures that contribute to the problem. Re-illustrated from Budi, 2013; Ginkel, 2015; Ministry of Environment, 2008b)

2.1.2. Alarming ecological and hydrogeological systems

Every year, approximately a half million tonnes of waste are dumped into Indonesian river systems (Ministry of Environment, 2008b). In 2014 in Bandung city, more than 92 garbage piles were found along the Cikapundung River,¹² which flows north to south through Bandung (Appendix 4) (ICWRMIP, 2014). The garbage had serious impacts on river water ecology, hydrology and surrounding lands (Ginkel, 2015). Toxic compound contamination perturbs river biodiversity and water availability for people (Ginkel, 2015). Waste piles of trash can lead to ecological damage, particularly during the rainy season,¹³ as these piles clog water streams (Appendix 5). Rivers therefore fail to discharge water runoff (Ginkel, 2015).

Additionally, waste sedimentation on river beds reduces the river's capacity for excessive water flow during the rainy season (Wangsaatmaja, Sabar, & Prasetiati, 2006). It is also exacerbated by poor water precipitation rates caused by intensively built up areas, and deforestation in the northern areas (Budi, 2013; Suhari & Siebenhuner, 1993; Tarigan et al., 2016). The worst flooding damage occurs in the south

¹² One of the water stream that flows from northern Bandung city and passes across the city to the southern part.

¹³ Normally during September-May

of the city and Bandung regency (Ginkel, 2015; Tarigan et al., 2016). Approximately three districts and fifteen regency districts are affected by floods every year (Appendix 6) (National Disaster Mitigation Agency, 2016; Tarigan et al., 2016). Clogging waste piles gradually cut river streams and reshape dead rivers (Rohmat, 2009). These dead rivers usually contain stagnant water full of organic matter and microbes (Rohmat, 2009). The water is not drinkable and contain pathogenic microbes, implicated in human disease (Rohmat, 2009). Figure 2 illustrates how waste management issues can cause environmental problems.

2.2. Waste bank management methods as alternatives for municipal waste management at the household level

2.2.1. The emergence of waste bank projects in Indonesia: The communities' response and its basic operational principles

The waste bank project is a community-based movement in response to environmental challenges caused by poor municipal solid waste management at the household level (Wijayanti & Suryani, 2015). Waste bank programmes aim to reduce the negative impact of mishandling municipal waste. Appointed waste bank project officers train householders to sort their domestic waste. At the same time, waste bank organisations manages the distribution of the sorted waste from householder to recycling companies/waste buyers ((Hijau Lestari, 2016; Indrianti, 2016; Wijayanti & Suryani, 2015). Several non-governmental organisations manage waste bank projects in Indonesia (Indrianti, 2016; Wijayanti & Suryani, 2015).

Waste banks allows registered householders to exchange their sorted waste for local currency¹⁴, saving these sums to accounts, similar to high street banks (Indrianti, 2016). The system functions as a conventional waste bank, where sorted non-organic waste is valued per kilogramme and the monetary value saved to the beneficiaries' account (Indrianti, 2016). Therefore, this method conserves the economic value of domestic waste, a factor usually underrated by Indonesian cultures (Kristina, 2014). Additionally, with more integrated non-organic waste management schemes, the recycling rates of domestic waste can be increased (Chaerul et al., 2014).

The active involvement of householders in managing their waste is key. Specifically, with respect to MSW management, a public willingness to act and contribute is fundamentally essential (Bulkeley et al., 2005; Folz, 2000; Guerrero et al., 2013). Additionally, with the involvement of local business people

¹⁴ Indonesian Rupiah (Rp)

and local government, citizens can ensure better MSW management outcomes (Bulkeley et al., 2005; Indrianti, 2016; Wijayanti & Suryani, 2015).

Previous studies on Indonesian waste bank management have identified similar developmental issues, e.g. financial security to sustain programmes, employment of local networks to disperse knowledge (traditional community, cultural gatherings, etc.) and local characteristic adjustments (Indrianti, 2016; Wijayanti & Suryani, 2015). In terms of development, a waste bank organisation in Bandung became an environmental project hub, connecting actors and stakeholders to public and private partnerships (Hijau Lestari, 2016; Indrianti, 2016). These organisations can become intermediaries between the government and the citizen, to communicate and organise environmental programmes for local populations (Hijau Lestari, 2016; Indrianti, 2016). 'Actors', represents the waste bank organisation officers, governments, householders and supporting business stakeholders (Wijayanti & Suryani, 2015). As part of MSW management, waste bank programme must involve the three main groups of actors (Appendix 7).

2.2.2. Where does the waste flow in waste bank systems?

The previous section explained how domestic waste flows through conventional dumping systems. For waste bank systems, the waste is sorted based on material, i.e. organic or non-organic. Waste separation starts in the household where non-organic waste is sorted based on a list. The sorted waste is weighed and priced at the waste bank unit (Appendix 8a). Afterwards, the waste is transported to a waste bank centre, where all collected waste is processed (cleaned, chopped and classified based on its content and colour, Appendix 8b) (Hijau Lestari, 2016). Lastly, waste bank officers sell it to waste buyers or recycling factories. The money earned by the waste bank is saved to beneficiary accounts. After several months, the money is redeemed to beneficiaries, based on their transaction history (Wijayanti & Suryani, 2015).

Organic waste is not sent to waste bank centres; instead it is recommended that bio-pores be dug at citizen’s residences (Appendix 8c). Bio-pores can act as fertiliser based solutions for the soil (Budi, 2013). First, bio-pores can help with organic waste management issues (Budi, 2013; Mulyaningsih, Purwanto, & Sasongko, 2014). All chopped up organic waste can be placed into bio-pore holes to be broken down by natural soil fungi and fauna (Mulyaningsih et al., 2014). Digestion products from the composting process can be used as organic fertilisers, thereby helping with land fertility issues. The open hole also seeps rain which increases water precipitation level. Therefore, not only maintaining the water ground debit but also reducing the flood occurrence during rainy season (Budi, 2013).

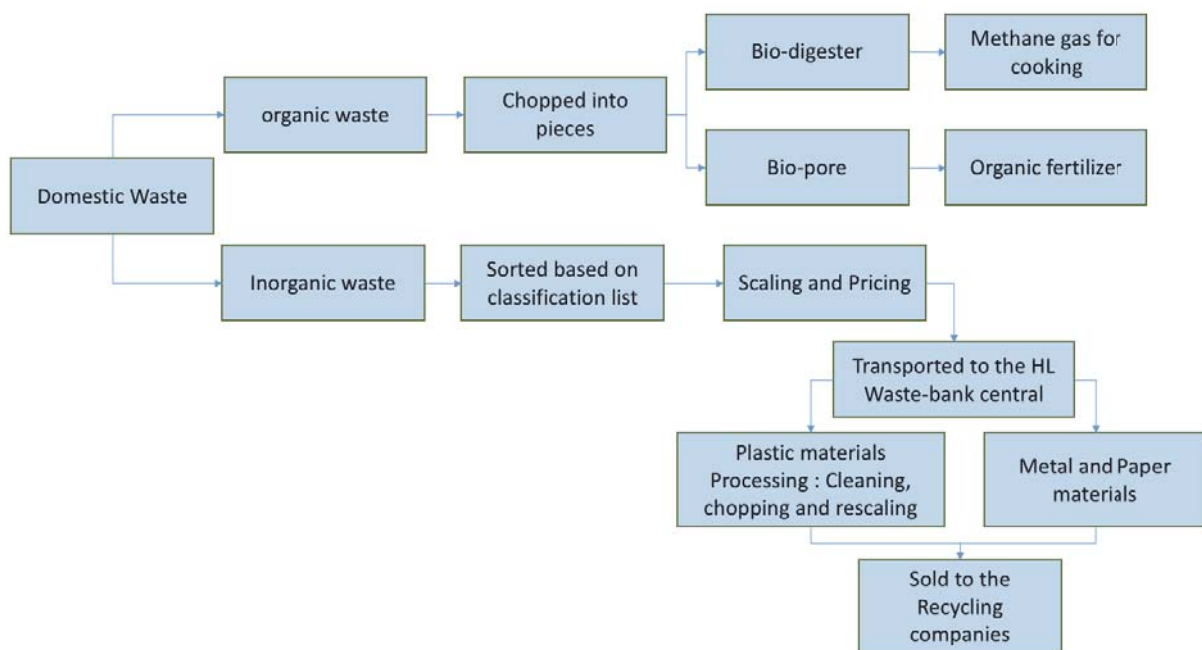


Figure 3. Waste flow scheme using waste bank systems. Source: re-illustrated from Hijau Lestari (2016)

Another option for handling domestic organic waste is to use bio-digesters (Appendix 8d) (Hijau Lestari, 2016). Bio-digesters are instrument that produce biogas from anaerobic microbial activity (Hessami, Christensen, & Gani, 1996). They are considered sustainable solutions to minimise organic waste, whilst simultaneously harnessing energy from this waste (Hessami et al., 1996; Hilkiyah Igoni, Ayotamuno, Eze, Ogaji, & Probert, 2008). The gas produced contains high volumes of methane, which is flammable and suitable for domestic scale energy sources (Hessami et al., 1996)

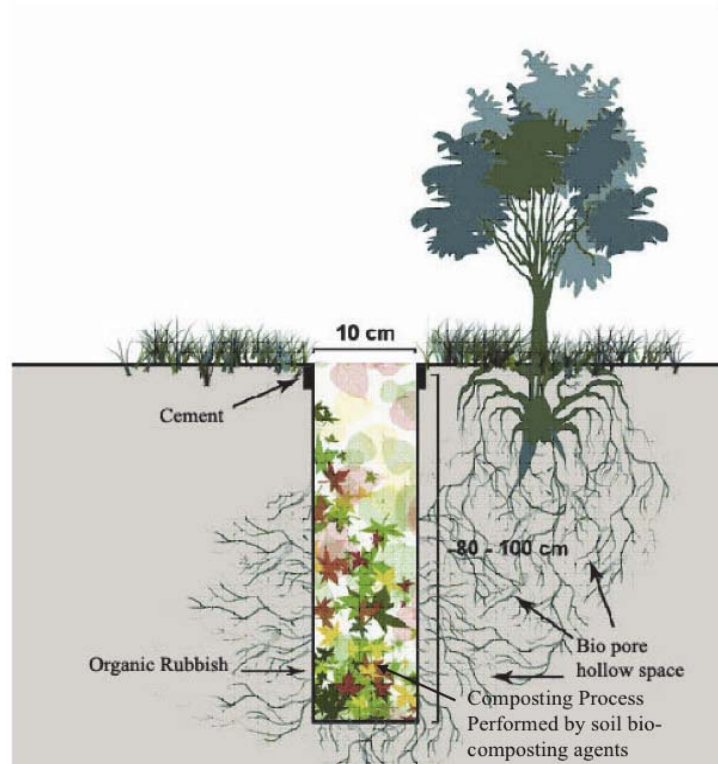


Figure 3. Bio-pore. Source: Emmaus International (2010)

3. Analytical framework

To meet research objectives, a framework was required to understand meanings, processes and purposes of social responses in overcoming municipal solid waste issues in Bandung City. The theoretical background of this research needed to focus on environmental management strategies for local contexts. A adaptive co-management concept was chosen as the theoretical background for this work.

3.1. Adaptive co-management

Environmental issues caused by poor domestic waste management are inseparable from social aspects of urbanisation, e.g. lack of awareness, unsupportive policies, lack of incentives and irregular ecological conditions e.g. high rain intensities and minimum precipitation areas etc. (Tarigan et al., 2016). To overcome the non-linear challenges of socio-ecological dynamics, a group of sustainability scientists developed adaptive co-management.

The concept emerged from the need to build adaptive capacity to strengthen a system's resilience, from the bottom up (D. R. Armitage et al., 2009; Hasselman, 2016; Trimble et al., 2015). In the context of socio-ecological dynamics, specifically in urban spaces, adaptive capacity refers to the ability of citizens/institutions to cope with social and environmental changes (Folke et al., 2002; Hasselman, 2016; Smit & Wandel, 2006). Additionally, within the context of urban systems, resilience refers to the ability of the citizen to "withstand, cope and overcome" ecological disturbances (Wamsler & Wamsler, 2014, p. 10).

Adaptive co-management is a visionary concept within environmental management situations; it optimises available resources and local stakeholder participation to procure solutions for the medium and long term (Hasselman, 2016). The concept helps scientists, institutions, societies and companies to deal with complex interactive systems (D. Armitage, Berkes, & Doubleday, 2010).

The reviewed literature shared terms such as "iterative social learning process" and "multiple level collaboration" (D. R. Armitage et al., 2009; Plummer, Armitage, de, & C., 2013; Trimble et al., 2015). These concepts incorporate wider perspectives and various contributions from multi-level actors (Hasselman, 2016). As shown in Figure 6, Fabricius and Currie, 2015 drew on the main features of adaptive co-management concepts. Besides the main features, there are four essential elements that should be maintained in representing adaptive co-management concepts.

| | |
|----------------------------|---|
| Adaptive Co- Management | Concept : Joint management through learning by doing collaboratively |
| | Purpose : Enhance resilience and manage complex systems beyond boundaries of multiple levels and scales |
| | Emphasis on : Joint management and learning by doing; integration of local and scientific knowledge, sharing rights, responsibilities and power by relevant stakeholders at multiple scales |
| | Linkages : Horizontal and vertical for joint learning by doing |
| | Temporal Scale : Medium to long term, multiple cycles of learning and adapting |
| | Organisational level: Multilevel with self-organised networks |
| | Capacity building focus: All stakeholders |

Figure 5. Main features of adaptive co-management. Source: (Fabricius & Currie, 2015)

The essential elements of adaptive co-management concepts are;

1. An enabling environment (provided by an institution such as supportive policies, norms, motivating leaders, etc).
2. Transformative learning.
3. Collaboration of multi-level actors
4. A cyclical iterative process that leads to capacity development (D. Armitage, Marschke, & Plummer, 2008).

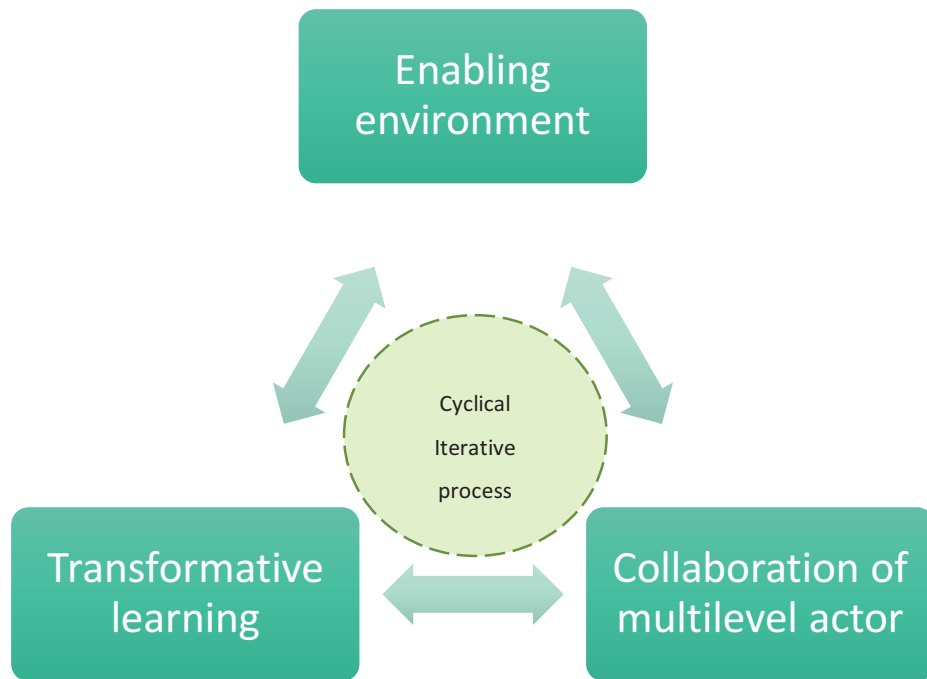


Figure 6. Essential elements of adaptive co-management concepts. Re-illustrated from: (Fabricius & Currie, 2015)

The actors within an adaptive co-management process have to acknowledge that the system is not linear, it is unpredictable and it may cause persistent societal problems (Scoones et al., 2007). When a population perceives a shared risk, they collaboratively look for different perspectives to overcome the risk (D. R. Armitage et al., 2009; Trimble et al., 2015). In the context of adaptive co-management, shared learning processes are iterative process that ensure experiential learning for the actors (Plummer et al., 2013)

At the first stage of the learning process, the actors become involved in idea conception that stems from socio-ecological dynamics (Plummer et al., 2013). Secondly, the participants become imposed to the failure and success during the learning process (Plummer et al., 2013). Afterwards, they reflect on what they have obtained and conduct corrections and improvements towards supportive factors, such as policy improvement or value creations (D. R. Armitage et al., 2009; Trimble et al., 2015). The reflective phase, also called the monitoring phase, broadens the understanding of how to navigate the human interventions on ecological niche and facilitates actor support of management processes in better, productive ways (Plummer et al., 2013).

The desirable outcome of this shared learning process is an altered collective consciousness, thereby eliciting change (Plummer et al., 2013). Diverse actors with different characteristics and different motivations are potentially imposed to uncertainties and changes (Alberti, 2008). Therefore, the promotion of social engagements or collaborations is intensive on adaptive co-management processes

(D. R. Armitage et al., 2009; Trimble et al., 2015). Collaboration between practitioner and scientist, for instance, would lead to better understandings and innovations whilst still developing a process (Plummer et al., 2013). Proponents of adaptive co-management count on its flexibility, because the concept enables a hybridisation between idealised forms of the social system (e.g. state, market and community) and its differentiation (e.g. co-management, public-private partnership) (Plummer et al., 2013).

The partnership between public and private sectors, especially at local scale, can reinforce grassroots organisations. They can voluntarily build or strengthen their social capacity and cooperate with authority institutions or the private sector (McQuaid, 2000). Dhillon's study (2009) reported that partnerships could be complex and their continuity was dependent on social capital existence. Lin (1999) defined social capital as "(an) investment in social relations by individuals through which they gain access to embedded resources to enhance expected returns of instrumental or expressive actions" (Lin, 1999, p. 39). Furthermore, social capital can not only support social cohesion, but it can also provide financial capital when needed (Dhillon, 2009). Therefore, social capital is seen as a connecting factor between capacity and the possibility of development action (Dhillon, 2009; Pihkala, Harmaakorpi, & Pekkarinen, 2007).

3.2. Limitations of adaptive co-management processes

Fabricius & Currie (2015) outlined the barriers that should be overcome, to successfully initiate the co-adaptive management process. Actors or institutions involved should be aware of and manage internal obstacles. Other barriers include unsupportive legislation, lack of leadership, institutional incapability, inadequate communication between actors and insufficient incentives (Fabricius & Currie, 2015). Some barriers may require long term approaches, e.g. open-mindedness and institutional inertia (Fabricius & Currie, 2015; Scoones et al., 2007).

Institutional inertia was a condition when the institutional elements gained their stability and reliability stage; they tend to be stagnant and less responsive to the external dynamics inertia (Pihkala et al., 2007). In this case, the greatest inertia possibly comes from governmental sectors. Based on previous research, discrepancies between departments in Indonesian governmental context used to be the major inhibitors of sustainable waste management (Meidiana 2010).

3.3. Justification for using the adaptive co-management concept

This research is based on a sustainability science structure, "which attempts to bridge the natural and social sciences in seeking creative solutions for sustainability challenges" (Jerneck et al., 2011, p.2).

Additionally, Clark (2007) emphasised the contribution of sustainability science in understanding the system dynamics of human and natural interactions. The first rationalisation for employing adaptive co-management concepts was based on Guerrero et al., 2013. These authors argued that environmental management was not merely defined by technical systems, but was related to mindfulness, attitudes and people's behaviour, enabling systems to work continuously. As quoted from Alberti (2008, p. 14) "City evolve as the outcome between the individual choices and actions of many human agents", suggesting that individual choices and actions are key to maintaining urban-ecological dynamics.

The second justification for this research says explicitly that to direct an urban dynamic, we have to empower existing local structures (both formal and informal) to cope with environmental perturbations (Chowdhury et al., 2011).

Lastly, adaptive co-management was employed as a concept as it could motivate society and capacitate stakeholders in environmental management and it could adopt local characteristics yet ensure transformative learning processes (Fabricius & Currie, 2015). With task-oriented problem solving, local actors could be empowered to bring about changes at the local scale (Trimble et al., 2015).

4. Methodology: Case Study Research

4.1. Research design: case study

In conducting a sustainability study, it was important to adopt a compatible method in rethinking, reconceptualising and reframing the empirical phenomenon (Jerneck et al., 2011). Therefore, a comprehensive study design that would catch the social empirical phenomenon related to the theoretical background, was employed (Yin, 2013). In terms of household waste management, empirical evidence of adaptive co-management processes were collected. This would explain how communities in Bandung city are associated with key features of the adaptive co-management concept. Multiple evidence should be collected to minimise misinterpretation of social processes based on triangulation rationale (Yin, 2013).

The case study of Bandung waste bank was conducted using qualitative research methods, using semi-structured interviews, direct observations and archival record interpretation.

The study focused on domestic waste management at a household level, steered by a local environmental organisation called Hijau Lestari (HL). Hijau Lestari means 'green conservation' and is commonly known as HL in Bandung City. It was started in 2012 from an urban farming initiative. A year later, a steering committee member joined a waste bank management training session and became interested in starting a similar project in Bandung City. In the early stages, the waste bank unit was only available at each members' neighbourhood, but then it spread to other hamlets. Currently, there are 134 waste bank units in 13 Bandung City districts (Appendix 9).

Thirteen districts in Bandung municipality are voluntarily engaged in the waste bank project. The largest number of units (43) are to be found in Coblong district, the third densest district in the city. Each is located in a different hamlet which have different waste collection days.

The specific study area was Hamlet 14, the Sekeloa sub-district. This hamlet was chosen as residents have participated in the programme for over a year. Hamlet 14 consisted of 400 houses, including the house of the hamlet leader. Some key actors involved in the waste bank project are identified and illustrated (Figure 9).

4.2. Data Collection and Analysis

4.2.1. Secondary data collection

Literature and public document review

A literature review was conducted before collecting primary data (interviews and direct observations). A literature review was needed to understand ecological disturbances caused by poor management of household waste. It included information addressing the issues and the actors involved, which was later useful for case study objectives.

Secondly, it was important to ascertain a suitable theoretical background to frame social processes in navigating environmental management. Literature review sources came from the digital library of Lund University (LUB search) and the Google Scholars database. Besides published research, public documents were also examined to validate policy documents, official project reports and data statistics related to MSW management in Bandung city. The reviewed documents were published predominantly by the Ministry of Environment Indonesia, Bandung Environmental Management Agency and the National or Local Statistic Centre.

Waste bank units; data records

Monthly records were analysed to observe participation in waste bank units from August 2015 (1st month) – July 2016 (12th month). The data revealed the numbers of participants who were consistently committed to managing their domestic waste. Because of a fasting month, the waste bank activity at Hijau Lestari was nil, therefore, only 11 months data were recorded.

4.2.2. Primary data collection

Interviews

To gain comprehensive information from different perspectives, semi-structured interviews were conducted with different actors between March 22nd and April 8th 2017. Interviews were conducted with committee representatives of Hijau Lestari waste bank organisation. The objective was to understand the motivations and the struggles of the waste bank project. A second interview took place with the waste bank unit manager. Two interviews were conducted to acquire information on the

technical processes of waste collection and dispersion techniques. Third interviews were conducted with household representatives.

The interviews described the interviewee’s perspective on the waste bank project, how they perceived knowledge and learning from the waste bank organisation, and how they were involved in the learning/sharing processes. An open-ended interview was conducted with a company spokesperson to ascertain their broad mission in supporting the HL waste bank organisation. It also gathered information on how far their involvement was in problem resolution. Interview codes and details are attached (Appendix 10).

Table 2. Interview list and purposes

| No. | Target / Source | Purpose |
|-----|--|--|
| 1. | Hijau Lestari steering Committee representatives (Four persons) | To understand knowledge transfer, struggles and problem resolution processes |
| 2. | Hijau Lestari Unit Managers (Two Persons) | To understand knowledge transfer, struggles and problem resolution processes |
| 3. | A spokesperson of Perusahaan Listrik Negara for West Java Region ¹⁵ | To know the motivation and their contribution in supporting this project |
| 4. | Leader of Hamlet 14 | To know his perception and his involvement in waste bank projects. |
| 5. | Households representatives (10 interviewees) | To understand the participant’s knowledge of waste |

Direct observation

Direct observations were conducted to generate more information such as “unspoken difficulties” during waste bank collection processes. These observations helped me to use the participant’s or actors’ point of view in real conditions. Spontaneous behaviours and interactions and discussions regarding waste management can give more evidence to support other findings (Yin, 2013).

Observations took place on waste collection day, March 24th. A Hijau Lestari introduction seminar occurred on March 25th. An informal discussion occurred among the hamlet leaders on March 26th

¹⁵ The National Electricity Company

and *Kerja Bakti*¹⁶ event as a preparation for *Adipura*¹⁷ grading. The details of direct observation are attached (Appendix 11).

4.2.3. Ethical considerations and limitations

Letters of consent were signed by the interviewees, under acknowledgement from the head of sub-district Sekeloa and the leader of Hamlet 14. Most interviews with household participants were not recorded. Direct observations were conducted informally during and in between interviews. These interviews may run the risk of “over-involvement”. However, there is not a notable risk of that in this study.

However, a major difficulty was encountered in contacting the electrical company spokesperson due to time constraints. Besides this challenge, there were other limitations to this study. In reviewing some of the public data, it was observed that for some governmental reports, study resources were employed. This could introduce some bias because some reports were compiled for different purposes, such as work performance assessments. Another bias could be introduced from secondary data sources, from waste bank units. Waste bank units are not computerised, meaning potential biases through manual data recording and entry.

5. Findings and Analyses

The results from data collections were interpreted based on core elements of the adaptive management framework¹⁸ (Chapter 3).

5.1. Enabling Environment

An enabling environment is the first core element of adaptive management. For this study, the legal premises of domestic waste management were studied. There were some discrepancies between the law and waste conditions;

¹⁶ An Indonesian term for a collective activity when the householders work together to clean or decorate the neighborhood. In larger context, *Kerja Bakti* also has meaning as voluntary work.

¹⁷ *Adipura* is a Government’s Appreciation that is given by Ministry of Environment for clean cities around Indonesia. The studied Hamlet is selected to represent the waste free neighbourhood area. This neighbourhood was graded on 28th March 2017.

¹⁸ Adapted from Fabricius & Currie's (2015), See Figure 7

1. Based on Act 81/2012 article 1 clause 7, every temporary waste disposal unit should apply the 3R principle (reduce, reuse and recycle). This specifically means that waste collections must be segregated, however in reality no temporary waste disposal unit had different bins for different waste materials.
2. Based on Act 18/2008, local authorities had to permanently close dumping landfill sites by 2013. However, Sarimukti Landfill was still operating as of 2016 (Rosadi, 2016).
3. Regarding the strategic planning documents of BEMA (2013), there were 70 waste bank units in Bandung city. However, there was no information on which waste bank was owned or managed by the municipality. Policy frameworks are important to stimulate a conducive MSW management plan (Bulkeley et al., 2005; Folz, 2000; Guerrero et al., 2013). A previous study concluded that the Indonesian constitution for waste management does not specify protocols for integrative municipal waste management (Meidiana & Gamse, 2010). However, Act 18/2008 article 21 clearly stated that local government should incentivise waste reduction.

The role of the local leader in driving management processes was considered an important enabling factor (Fabricius & Currie, 2015). Interview i4a and direct observations D.1; D;3 showed how leaders adapted formal or non-formal waste bank and composting methods as alternative options for domestic waste management. The discussion forum helped local leaders define language and term issues and share experiences and suggestions with each other (D4).

The HL steering committee realised it was important to manage their own accountability (i1a;1b). Even though they are a non-profit organisation, they realised that in directing the project, they should be strongly committed to technical requirements, such as providing continuous funding and ensuring waste schedule punctuality (i1b). Besides technical demands, social demands should also be met; a day off once a week (Sunday) and a break during fasting month¹⁹ (i1b). In directing projects, the steering committee also acknowledges the essential function of unit managers (i1a,i1b). Therefore, financial incentives were given to unit managers. For each kilogram of sorted waste, the managers earned approximately Rp200-Rp5000 (about 0.13 SEK-3.3 SEK), depending on waste classifications (Appendix 12). The committee also encouraged consistency by holding annual meetings with all unit managers to upgrade their knowledge base and strengthen their commitment to the cause (i1a,i1b).

¹⁹ The decision to pick Sunday and fasting month was made based on consensus between Labours in Waste bank central. Fasting month is not always the same every year. Fasting month is called Ramadhan in Islamic Lunar calendar.

5.2. Learning Processes

Knowledge dissemination processes were initiated by the steering committee (D.2; i1c) at the introduction seminar. The seminars encouraged participants to join programmes using constructive dialogue on socio-ecological issues facing Bandung City (D2). The seminars were conducted in formal and informal institutions such as schools, hamlet associations, women's associations, religious groups and *Arisan*²⁰ (i1a,i1b,i3a,i3b).

Thoughts and ideas delivered at seminars were also discussed informally between Hamlet leaders (D2). Moreover, informal dialogue also happened between Hamlet leaders and the heads of sub-district Sekeloa (D2; D4). Together, they were involved in a local environmental organisation called "The Free Waste Zone" (i1c, D3). The association was voluntarily established as a discussion platform to navigate environmental issues, especially municipal waste problems (i1c, D3). During forum discussions, one participant shared his personal experience on the economic benefits of composting organic waste (D2). He also shared his perspectives on improving composting techniques and offered a different approach in persuading more householders to practice a more sustainable domestic waste management agenda (D2).

Meanwhile, at the household level, knowledge dissemination happened in a variety of ways. Involvement of mothers was quite prominent in learning processes (i5a, i5c, i5d, i5e, i5g, i5i, i5j). Findings from interviews showed that housekeeper involvement not only helped the householder, but also helped unit managers in managing domestic waste (i3a, i5c, i5h). However, it was noted that the householder did not always gain knowledge from seminars. Equally, another Hijau Lestari project, urban farming, acted as an "entrance door" for some to start the learning process (i5g).

5.3. Collaboration

The organisation sought local actors' contributions in supporting this initiative (i1a, i1b, i1c). To manage waste projects, HL is continuously seeking financial contributions and technical support from business stakeholder's (i1a, i1b, i1c). Major sponsorship came from Perusahaan listrik Negara (PLN)²¹ and Bank Jabar Banten²² (i1a,i1b,i2a). Contributions from both companies were noteworthy for the

²⁰ A form of Rotating Savings and Credit Association in Indonesian Culture. Arisan is a social gathering that takes place at a fixed interval (Amar & Chaerani, 2010).

²¹ In English: The National Electricity Company

²² Short name for Bank Jawa Barat –Banten. A prominent Bank in West Java Province

development of HL (i1a, i1b). Both contributions were given as part of Corporate Social Responsibility (CSR) funds from each company. The PLN holds regular meetings with West Java Environmental Management Agency to communicate progress on their environmental programme (i2a).

The waste bank project supported the PLN's road map in the expansion of non-fossil fuel energy sources (i2a). Other waste banks, in cities around Java and Lombok Island were also supported by PLN (i2a). From the PLN perspective, waste bank projects are in line with their targets to expand into alternative energy sources (i2a). Seeing the potential of waste-for-energy (WFE) sources, they intend to build this type of power plant in eastern parts of Bandung city (i2a). They acknowledge, that before building commences, they need to ensure adequate waste stock. They also need to promote public awareness of the benefits of harnessing energy from waste (i2a).

The PLN collaboration was not merely for financial support. PLN representatives helped HL committees in future strategic planning and to limit corrupt bureaucracy (i1a, i2a).

The USSI²³ company and HL also entered into partnership (i1a). Through this partnership, HL will improve their services to the online based market (i1a). Online technologically is new to beneficiaries and requires time to interface with current technical systems, especially to users of waste bank units (i1a).

Another collaboration, held with Rumah Zakat, an Indonesian charity, aims to produce a new service brand called 'waste for charity' (i1a). Some beneficiaries from the upper-classes do not ask for trash-selling money, therefore, Rumah Zakat distributes these monies to Charity House (i1a).

A partnership between different waste bank organisations and learning centres helped HL to improve management strategies for better outcomes (i1a, i1b), in terms of study visits or short training sessions.

The organisation endeavours to acquire greater support from local authorities (i1a, i1b). Committee members actively pursue collaborations with governmental departments such as Bandung Environmental Management Agency and the Local Sanitation Company (i1a). According to Act 81/2012, the local authority is the key actor in domestic waste management. The committee acknowledges that waste bank projects provides great help to the authority in enforcing the law (i.e. sustainable waste management) (i1b).

²³ A local technology company

Besides the need for higher investments from government, both the committee and unit managers (i1a, i3a) acknowledge greater education among academics. To this extent, they targeted academia through seminars at a local university and local elementary schools (i1b, i3a). Fabricius & Currie, (2015) state that academia can play important roles in both knowledge transfer and the monitoring of environmental management agendas. In spite of this, scientists were absent from the interviews recorded here (i1c, D3, D4).

5.4. Barriers / Challenges

The adaptive management approach comes with barriers. The major barrier concerns discipline in terms of waste segregation, therefore motivation and incentivising are key goals (i1a, i1a). However, economic incentives are not always successful in motivating the population, particularly in middle and upper-class neighbourhoods (i1a, i1a). One interviewee stated that selling prices were not enough to incentivise her to dedicate their time to the scheme (i5b).

“Some of the residents do not want to be involved in their domestic waste management, mostly those who come from the elite housing area. They think they don’t need the money from waste selling. It is even trickier to motivate the educated class who don’t care about the environment.”

Aji, chief of HL Waste Bank central

Secondary data on waste bank units showed that 51 beneficiaries attended units over 18 months (August 2015-January 2017). To facilitate greater understanding, the data is represented as bar and chart graphs (Appendix 13, 14).

The highest numbers of participants attended in September 2015 and October 2016, when 57% registered beneficiaries attended the waste-collection day. However, when individual participation was studied more closely (Appendix 13), most beneficiaries attended no more than eight times on collection days, suggesting only 12% attended collection days more than 13 times. Thus, it was vital to incentivise individuals.

The committee believes that government support will empower more citizens to participate, enlarging organisational capacity and transitioning towards a more sustainable MSW management programme (i1a). While local authority support is desirable, sometimes the political will is simply not evident. (1a).

While project awareness can be an issue, transport can also be a significant barrier to the project (i1a, i1a). Due to technical and budgetary reasons, HL has often only one truck to carry waste collections

from 134 units in 18 different districts, therefore waste collections cannot be done more often than once a week for each district (i1a, i1a). At each unit, it takes approximately 90 minutes or more to load waste collections into the truck (D1). The loading time varies depending on the residential area, some waste bank units are not accessible by car because of narrow gangways. In these cases, it can take 4 to 5 hours to load waste collections (i.1.b). To combat this, HL approached the local sanitation company for technical support (i1a).

Another operational struggle concerns economic capacity. Insufficient margins from waste selling-buying cannot cover technical costs (wages, transportation, rent) (i1a). The NGO tried to incentivise beneficiaries (from middle and low economic households) by maintaining competitive prices, however, beneficiaries demanded higher selling prices (i1a, i1a). As in all market economies, the market price for waste often fluctuates, therefore it cannot sustain consistent incomes for beneficiaries (i1a).

6. Discussion

The discussion section analyses the findings within the adaptive co-management framework. Other perspectives and observations will also be discussed.

From the literature review, it was noted that domestic waste management, incorporating waste bank systems is more sustainable than current waste dumping systems. Waste banks improve recycling rates of plastic (Chaerul et al., 2004) and they improve behavioural changes in domestic waste sorting, thereby minimising ecological disturbance (Damanhuri, 2008; Ginkel, 2015; Rabl, Spadaro, & Zoughaib, 2008). The continuity of more sustainable waste management solutions for Bandung is also influenced by various factors such as awareness of environment factors, appropriate learning processes and collaborations with key local and governmental bodies (Fabricius & Currie, 2015).

6.1. Incentivise iterative learning processes in waste bank projects.

A desirable outcome of the waste bank project is to change behaviours in trash handling and reduce ecological impacts. Altering perceptions, raising responsibilities and increasing mindfulness are long term and iterative processes (D. Armitage et al., 2008). In this project, everyone can be involved in municipal waste management and seize it as an experiential learning process. The organisation becomes a platform where different parties communicate on the complexities of municipal waste management and defining barriers and opportunities. Hijau Lestari is a platform where different actors motivate each other to create interdependencies, which strengthen commitments between stakeholders (Fabricius & Currie, 2015).

From direct observations, the learning process occurred in a small community²⁴ where the hamlet leader and sub-district leader engaged in semi-constructive dialogue on human and biophysical system feedback. Here, vertical and horizontal networks were established. Formulation of problems and job division for problem resolution may happen on this multilevel learning forum, as expected by D. Armitage et al. (2008). The multilevel learning forum was more effective for knowledge dissemination. Similarly, it was more effective for “knowledge integration or knowledge synthesis” from different sources such as traditional, scientific and experiential (D. R. Armitage et al., 2009; Plummer et al., 2013).

²⁴ “The Free-Waste Zone” community

The forum participants held reflexive dialogue about their knowledge and experiences (Plummer et al., 2013). Multilevel learning forums are necessary because they offer flexibility which allows adjustments of local characteristics (D. R. Armitage et al., 2009). In this case, knowledge sharing within the community was delivered by mixing Indonesian with Sundanese languages (D3). Mixing languages to fix technical problems can help participants articulate, understand and resolve the problem (D. Armitage et al., 2008; Michael, Madon, & Dame, 2017).

From the results, the HL waste bank organisation had limitations in assisting people to manage the MSW at the smaller scale, therefore municipal waste management was supervised by unit managers. They are key individuals to this programme. They function as double agents; they are part of the local community but they are also semi-intermediaries that build connections among participants. The term 'intermediaries' comes from Fabricius & Currie, (2015) and represents a group of actors that "facilitate communication, knowledge building, trust and cooperative behaviour". Unit managers are not full intermediaries as they are part of the 'resource user' group who conduct learning processes and share knowledge. Their contribution to waste bank projects is remarkable because without these key individuals, overseeing Bandung city municipal waste management could not be done.

Under the adaptive co-management framework, it was impossible to perpetuate the process without stimulating factors. The accident of 2005 was the reason why the committee wholeheartedly sustained this programme without financial compensation (i1b). The PLN's support was motivated by their vision to build a waste-to-energy power plant. However, different reasons drive key leaders and beneficiaries in every waste bank unit. More than 263 key leaders from 134 waste bank units have to consistently maintain these projects. Dedication is required to approach potential partners to join the scheme, to remind people to collect waste and to teach people how to sort trash appropriately (i2a, i2b).

Waste management learning processes take time and its continuous success is highly dependent on the incentive scheme (Plummer et al., 2013). The NGO incentivise key leaders and beneficiaries with monetary rewards, however in some cases it worked well, but sometimes the scheme did not appeal to all. This was particularly true for high income householders, who appeared to have insufficient knowledge of schemes and their advantages. Community diversity also affects the way knowledge is perceived and how change is embraced (Keen, Brown, & Dyball, 2005). In these cases, the resistance to change is a conflict of social learning, which challenged project leaders (either unit manager or committee member). They had to encourage more "resistant" communities to join the learning processes.

From the interview process, it was recognised that many approaches were used to encourage more people to participate (e.g. local wisdom and religious values), however the organisation was limited in financially incentivising householders. However, inertia can be dealt with using informal and formal rules (Keen et al., 2005). This argument suggests that informal norms such as neighbourhood norms can shape the lifestyles of others (Chowdhury et al., 2011). Based on interviews with the hamlet leader, there were no resident demands for covenants in applying waste bank methods. The residents perception was that waste segregation treatment was a recommendation and not an instruction.

It is a misunderstanding to suggest that segregating waste at the household level is an authorised instruction, not a recommendation, therefore suggesting the incentive deficiency is part of the government's weakness in law enforcement.

6.2. Institutional barriers

Fabricius & Currie (2015) defined "weak government" as a hurdle that inhibits collaboration and learning processes. From this case study, it was obvious that collaboration between Hijau Lestari and PLN overcame bureaucratic complexity. However, these collaborations could not fix barriers within political institutions.

The lack of political will in policy enforcement is a profound problem in achieving more sustainable household waste management systems. Reflecting on the current MSW management in Bandung city, the municipality is entirely responsible for all MSW management. Based on Act 81/2012, local government should be open to partnerships in managing household waste, and boosting innovative solutions. Furthermore, public contributions to MSW management improvements are enshrined by law (Act 81 article 35). However, institutional inertia may inhibit the integration of innovative ideas into existing working schemes (Bulkeley et al., 2005). Therefore, the law not only imposes the citizen to manage their domestic waste, but it allows institutions to facilitate grassroots initiatives to improve outcomes. In reforming institutional barriers to open partnerships, this will ensure greater responsibility and sharing. It will allow the authority to focus on more strategic planning, instead of technical or operational issues (Fabricius & Currie, 2015; Milosavljevic & Benkovic, 2009; Trimble et al., 2015). Examples of this include enhancing social responsibility, environmental sustainability and facilitating partnerships with shared values (e.g. balancing profits with social prosperity) (Milosavljevic & Benkovic, 2009).

Citing the Environmental Management Law 18/2002 Article 21, the government incentivises waste reduction. Furthermore, if government consistently implement the law, it will help stakeholders, especially NGOs to increase capacity and performance (Olsson, Folke, & Hahn, 2004).

The findings presented here reveal that Hijau Lestari were limited in maintaining operational costs (i1a, i1b). They can only accommodate a maximum of 1 tonne of sorted waste per day (i1a, i1b). This is miniscule when compared to the daily waste generated in Bandung municipality, approximately 1,590-tonnes unorganised waste. The MSW management sector has a reputation of high costs and economic unprofitability (Guerrero et al., 2013). Therefore, to sustain financial support of MSW management, the authority needs to invest more in innovative ideas and long term social and environmental benefits (Ostrom, 2009). However, it is often difficult for the municipality to define institutional limitations and find more effective and efficient ways of fixing problems, without third party interference (Guerrero et al., 2013).

It is important for the municipality to invest in more sustainable waste management systems and invite more outside parties to deal with these complex issues. It is also important to strengthen policy enforcement, especially in changing householder behaviour in managing domestic waste. Eventually, these more desirable outcomes will help minimise ecological deterioration caused by irresponsible waste treatment.

6.3 Waste bank programme and sustainability challenges

Cities are heterotrophic ecosystems, where “people share a social characteristic and ecological pressure” (Alberti, 2008, p. 9). As cities grow, urban and human activities increase and affect ecological feedback. The ecological problems experienced in Bandung city severely impacts on city finances in terms of damaged infrastructure, economic activity disruption and health issues (Rianawati & Sagala, 2014). In addressing these challenges and finding options to cope with these problems, it is important to understand the interactions between ecological and social systems that shape the urban ecology (Ostrom, 2005, 2009; Ramalho & Hobbs, 2012).

The existence of waste bank programmes in Bandung not only offers alternative solutions for better trash management and intensifying recycling rates, but it also provides greater opportunities for related stakeholder to participate in mutual learning processes. By understanding these socio-ecological interactions, the project gradually shapes adaptive individuals. During seminars and forum discussions, each participant could discuss the latest floods in Southern Bandung and reflect on their experiences (D2). From the abstraction and reflexion process in deliberative forum dialogues, a more

responsive and adaptive society can be formed towards environmental change (D. Armitage et al., 2008). Therefore, these programmes can improve responsibilities of business stakeholders and communities. A robust understanding of urban system dynamics will shape social values and bridge social mobility in transitioning towards sustainable lifestyles (Chowdhury et al., 2011).

In terms of development processes, lack of incentive and institutional barriers are the most obvious challenges to overcome. Specifically, insufficient funding is important as it inhibits moves towards sustainability (Porter & Kramer, 2011; Saungweme, 2014)). Difficulties in implementing solutions are necessary to be taken into our consideration since currently, the progress of the problem-solving movement is not as fast as the growth of the problem

Referring to sustainable development goals (United Nations, 2016), promoting partnerships is key in directing sustainability goals. Collaboration can fix fiscal insufficiency (Porter & Kramer, 2011). However, in reality, it is challenging to invite business stakeholders to invest in creating shared value (Porter & Kramer, 2011). Shared value creation is defined as expanding economic progress without neglecting social and economic performances (Porter & Kramer, 2011). Sharing profits from business with shared values, can support the financial security of NGOs working for environmental rehabilitation (Porter & Kramer, 2011). A potential barrier to shared profit creation means there could be a trade-off between economic benefits and socio-ecological performance (Porter & Kramer, 2011). Porter and Kramer (2011) argued it was important to change the actors' perception about trade-offs because investing some profit in environmental conservation is profitable.

To create a supportive environment for shared values, a policy setting is required to enable social network coordination in supporting partnership establishment (D. Armitage et al., 2010; Porter & Kramer, 2011). Furthermore, political support should establish institutional arrangements and organisational structures to develop stakeholder capacity, integrity and performance in environmental project development (D. Armitage et al., 2010; Olsson et al., 2004).

The findings show that when various stakeholders are involved in waste projects, considerable contributions are made in addressing sustainability challenges. However, it is impossible to assess the impact of a project without good marketing strategies and capital support (Jerneck et al., 2011; Porter & Kramer, 2011). Increased waste bank marketing will not only invite more innovation partners, but it also helps the organisation to self-sustain the project.

Besides improving healthier livelihoods, safer rivers, less soil degradation, fewer floods, there are two others notable implications of project improvement. First, these programmes can increase the funds circulating in the garbage recycling chain. Second, if these projects can be scaled up, they will earn

more money. This should improve performances, pay more workers to organise waste distribution, increase jobs and reduce waste scavenger numbers.

6.4 Envisioning the future of waste banks as permanent public-private partnerships

Waste banks have the potential to improve some environmental and social problems. In 2013, the organisation was sustained with various private donations and funding. Similarly, the business does well when it is continuously supplied with good quality plastic trash (Appendix 8b) which it forwards onto recycling companies (i1a). These factors suggest that the Indonesian waste sector is profitable.

A way to cement this situation is by merging the Bandung waste bank organisation to a private company. Public-private partnerships are characterised by legal commitments between at least two different but mutual stakeholders from private and public sectors (Milosavljevic & Benkovic, 2009). The participants share resources which help them allocate expenditure more efficiently. Equally, they share risks to minimise losses (Milosavljevic & Benkovic, 2009). Public-private partnerships can help Bandung municipality and Bandung waste bank organisations conduct municipal waste management, to improve social and economic conditions. The public-private partnership is possible because different actors can focus on different business aspects, thereby complementing work practices to achieve the same goals (Milosavljevic & Benkovic, 2009). For example, in municipal solid waste management, private sectors can build facilities and infrastructures, while governments focus on adding value and reshaping behaviours. Furthermore, strong public-private partnerships will attract scientists and societies to act voluntarily as marketing agents for future sustainability.

7. Conclusion

This thesis started by recognising the alarming impact of poor management of municipal solid waste in Bandung city. This led to several ecological disturbances such as annual flooding and land degradation around landfill sites (Damanhuri et al., 2009; Lavigne et al., 2014; Surakusumah, 2008).

Municipal waste management issues in Bandung have not been tackled appropriately by the municipality. Responding to this situation, Hijau Lestari, a local environmental NGO, facilitated and trained the population to manage their household waste more sustainably. The results of this study show that hamlet leaders and waste bank unit managers are key figures in encouraging participants to sustainably manage their waste. However, there was a lack of enabling factors in supporting project goals, therefore these need to be improved.

1. It was important to acknowledge that lack of incentives (of any kind) creates resistance/inertia among householders in managing their domestic waste appropriately.
2. There was a lack of political will to integrate waste bank initiatives into the current scheme.
3. It was important to highlight that policy enforcement is very important for waste management. Policy enforcement will increase householder awareness and responsibility to minimise ecological disturbances caused by trash mishandling.

By following Indonesian environmental laws, the authority has to incentivise waste management initiatives, such as waste bank projects. These incentives will strengthen the organisation's capacity to manage greater participation and uptake of the schemes. In a *quid pro quo*, they can accommodate more domestic waste, increase recycling rates, and minimise the waste transported to landfill sites. Furthermore, enforcing environmental laws may generate greater opportunities for public-private partnerships. These deals could help develop skills and expertise by exploiting local and expert technical knowledge.

Establishing collaboration between different stakeholders in waste bank programmes can sustain waste management practices, improve river rehabilitation, minimise soil degradation and reduce flooding. Additionally, continuous reflexive learning processes among actors will increase adaptability in responding to climate perturbations and drive Bandung a step closer to a sustainable, environmentally friendly city.

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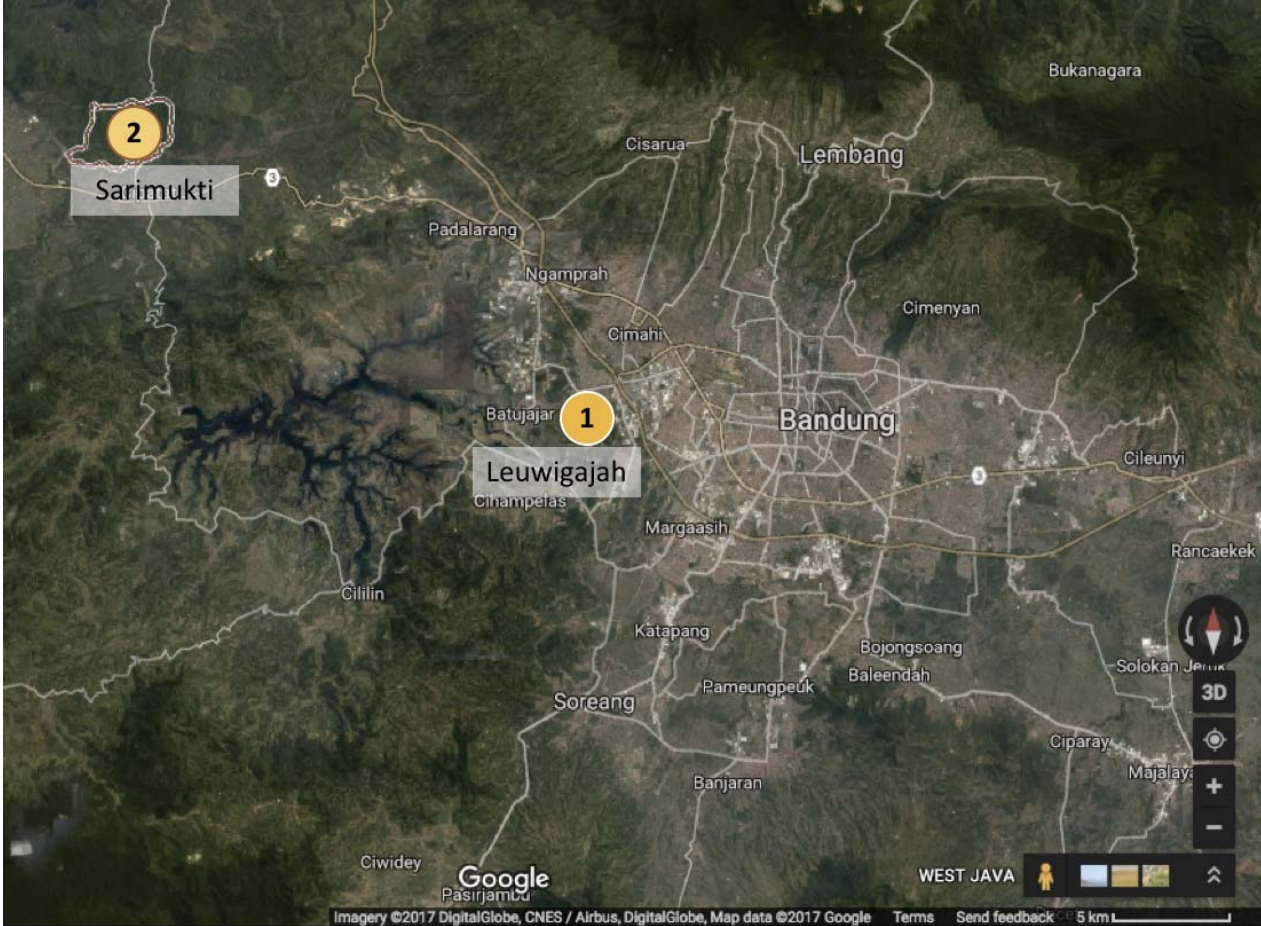
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Appendices

Appendix 1. Landfills Location.

Appendix 1. The previous landfill is marked with number 1 and current marked with number 2.



Appendix 2. Average of Waste generation in Bandung City

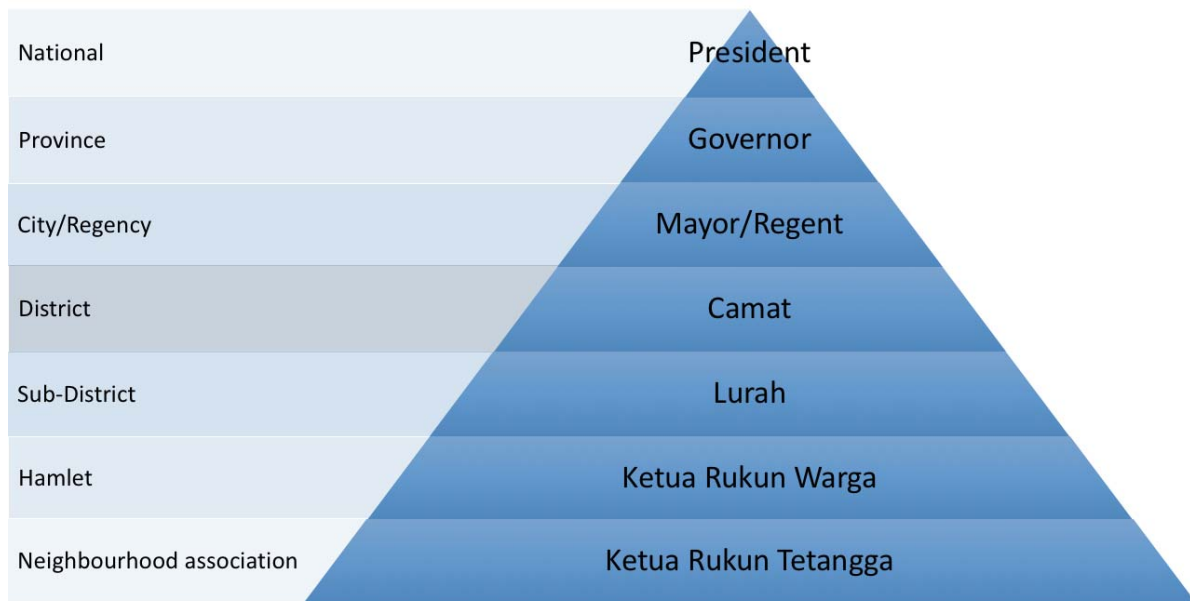
The data was taken at year 2014

| # | Source | Waste generated (ton) |
|---|-----------------|-----------------------|
| 1 | Households | 1,048.96 |
| 2 | Market | 300.32 |
| 3 | Road | 88.32 |
| 4 | Commercial area | 95.84 |
| 5 | Industrial area | 44.96 |

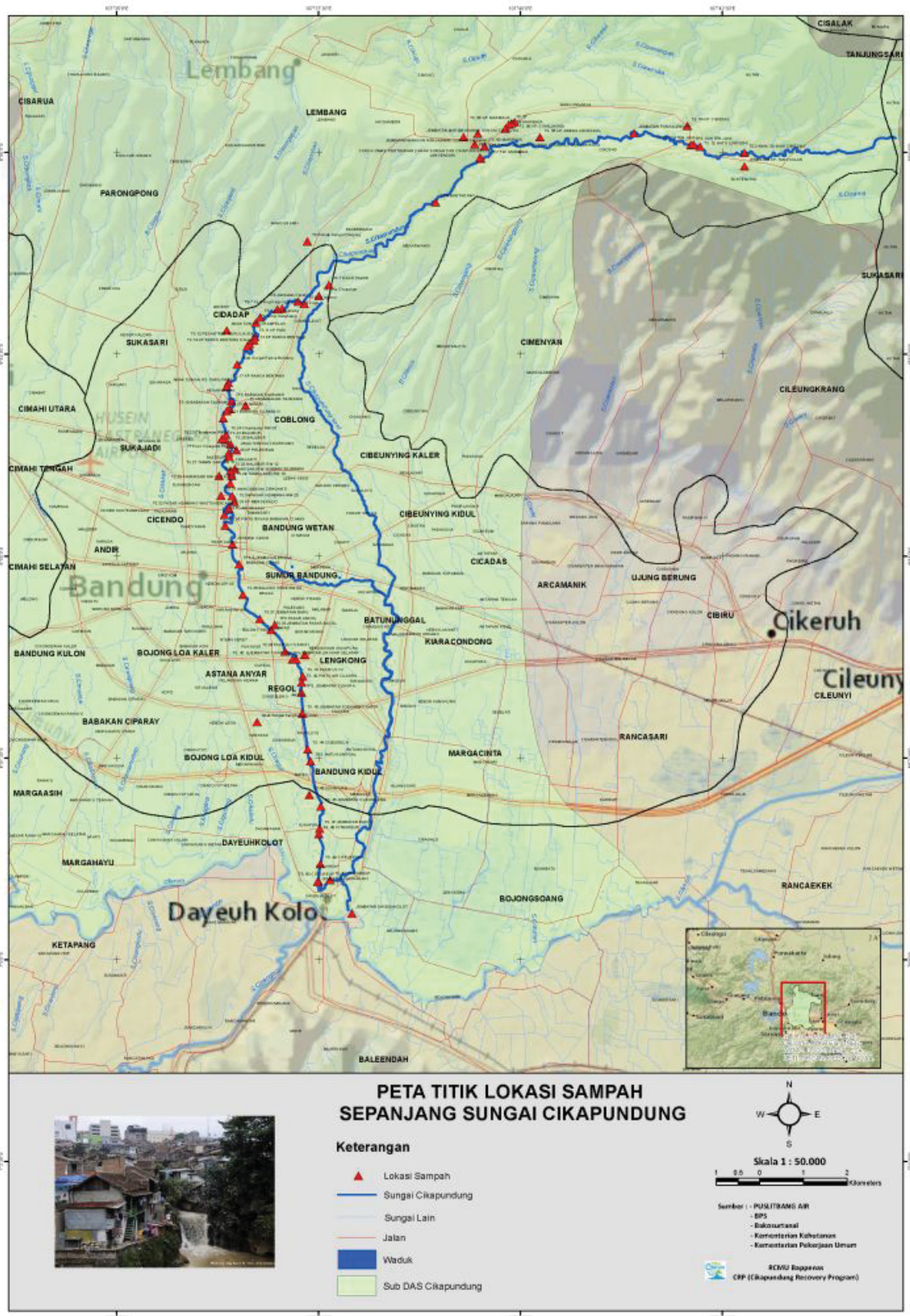
| | | |
|---|-------------|------|
| 6 | Institution | 21.6 |
|---|-------------|------|

Source: Bandung Statistics Centre 2015

Appendix 3. Authority structure in Indonesia



Appendix 4. Garbage piles location along the Cikapundung River.



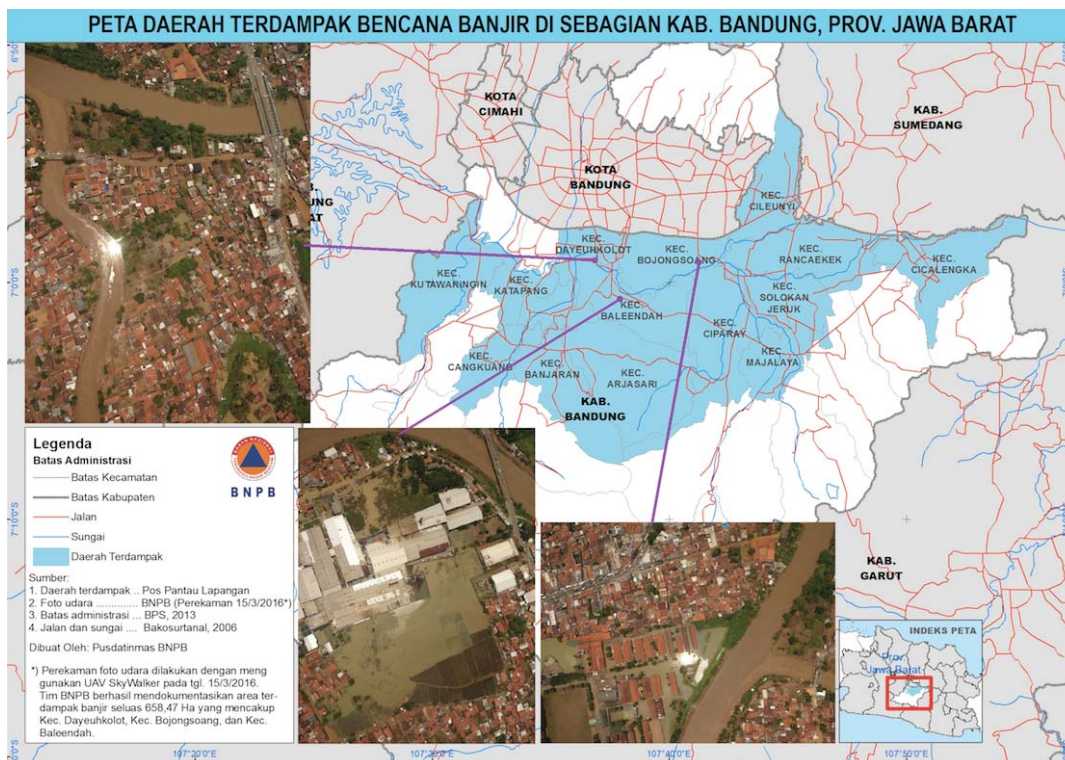
Source : (ICWRMIP, 2014)

Appendix 5. Garbage pile in Cikapundung River.



Source: Communication Department of Bandung Municipality, 2006

Appendix 6. Flooded area in Bandung Regency

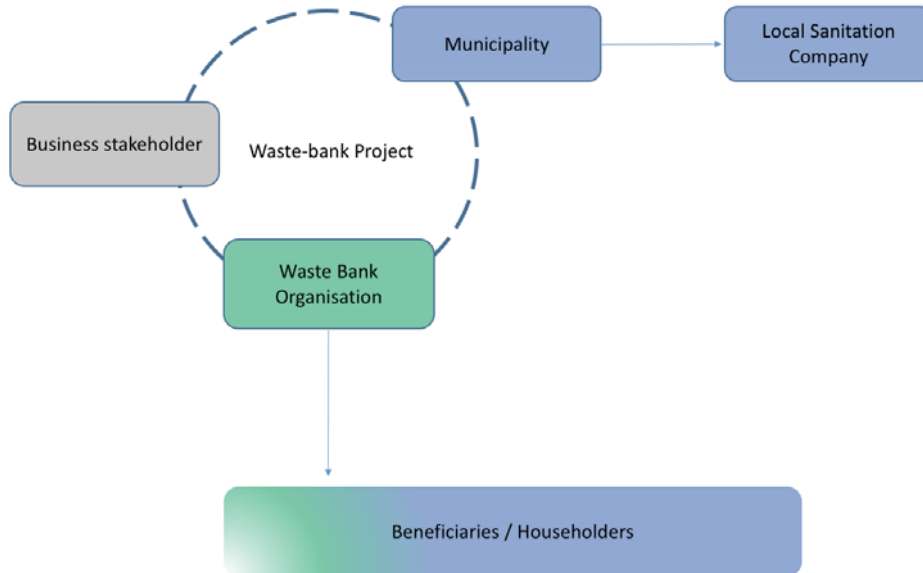


Legend:
 Flooded area

Source: (National Disaster Mitigation Agency, 2016)

Appendix 7. Actors involved in common waste bank project.

Source: (Indrianti, 2016; Wijayanti & Suryani, 2015)



Appendix 8. Documentation of Waste Bank Activity



8a. Waste collection from household to waste bank unit



8b. Plastic waste after further process

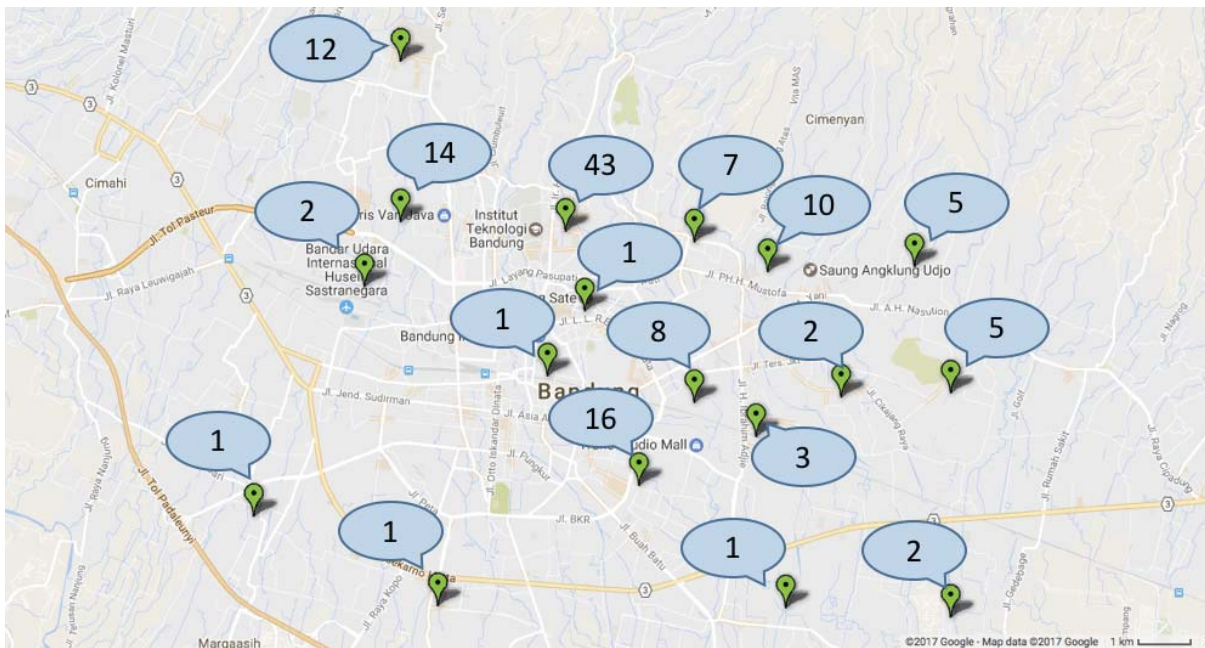


8c. Organic waste composting inside bio-pore



8d. Bio-digester unit

Appendix 9. Waste-bank unit locations and total units each district



Notes: Total Districts in Bandung Municipality is 30, which 18 of them join the waste-bank project voluntarily

Appendix 10. Interview Details

| Target: Hijau Lestari NGO Committee representatives Contact : info@hijaulestari.org Call number : +62 896-3083-1909 | | | | |
|--|---|------|-------------------------|----------|
| No. | Interviewee | Code | Date / Length (min) | Recorded |
| 1 | Aji – Head HL waste-bank central office | i1a | 23-March-2017 / 60 min | Yes |
| 2 | Enung – Division of public guidance and advocate | i1b | 23-March-2017 / 60 min | Yes |
| 3 | Ahmad – Training facilitator | i1c | 25-March-2017 / 60 min | Yes |
| Target: National Electricity Company Spokesperson Address: Jl. Asia Afrika No.63, Braga, Sumur Bandung, Kota Bandung, Jawa Barat 40111, Indonesia | | | | |
| No. | Interviewee | Code | Date | Recorded |
| 1 | Iwan – representative of Corporate Social Responsibility Department | i2a | 22-March-2017 / 30 min | Yes |
| Target : Waste-bank Unit Manager | | | | |
| No. | Interviewee | Code | Date | Recorded |
| 1 | Betty | i3a | 22-March-2017 / 25 min | Yes |
| 2 | Erma | i3b | 24-March-2017 / 120 min | Yes |
| Target: Household leader at Hamlet 14 th | | | | |
| No. | Interviewee | Code | Date | Recorded |
| 1 | Beti | i4a | 26-March-2017 / 70 min | Yes |
| Target: Household member at Hamlet 14 th | | | | |
| No. | Interviewee | Code | Date | Recorded |
| 1 | Ning – housewife | i5a | 26-March-2017 / 90 min | No |
| 2 | Oma – teacher | i5b | 27-March-2017 / 60 min | No |
| 3 | Jihan – housewife | i5c | 27-March-2017 / 25 min | No |
| 4 | Hermin – housewife | i5d | 28-March-2017 / 25 min | No |
| 5 | Kus – Pension social worker | i5e | 29-March-2017 / 20 min | No |
| 6 | Ema - housewife | i5f | 30-March-2017 / 30 min | No |
| 7 | Ijah – housewife | i5g | 2-April -2017 / 20 min | No |
| 8 | Reni- Freelancer | i5h | 2-April-2017 / 20 min | No |
| 9 | Deti – housewife | i5i | 4-April-2017 / 30 min | No |
| 10 | Dani - Student | i5j | 8-April-2017 / 20 min | No |

Appendix 10 Continue. Interview Guidelines

Questions for Hijau Lestari steering committee member

Learning process section

1. How was the first initiation of waste-bank project?
2. What is the main goal of this programme?
3. How is the mechanism of Waste-bank programme?
4. What kind of learning platform that is used?
5. Who is the facilitator of the learning process?
6. What is the main difficulties in knowledge dissemination process?
7. Do you have some assistances from academia to deal with the difficulties or manage a better strategy?
8. How do you measure the outcome of this project?
9. What do you do to improve the project outcome?

Partnership section

10. What is the current difficulties in sustaining this programme?
11. How was the first initiation of partnership with NEC?
12. What contribution that NEC can provide to support this project?
13. Are there any difficulties in conducting partnership with NEC?
14. Do you have any partner beside NEC?
15. Is there any contribution from government for project improvement?

Questions for NEC

1. How was the first initiation of HL and NEC partnership?
2. What is the desirable outcome of NEC in holding this partnership?
3. How far NEC involved in problem resolution process?
4. What is the output of NEC and HL partnership?

Questions for waste-bank unit manager

1. What kind of environmental activity that you are involve actively?
2. What is your first impression?
3. What do you think when you decided to participate to this programme?
4. How do you encourage more people to join?
5. Do you find any difficulties in managing this project?
6. How do you solve it?

Questions for the hamlet leader

1. How far do you know about waste-bank Programme?
2. How do you think about the householder participation in your neighbourhood?
3. What is your motivation in supporting this programme?
4. Is there any support or incentive from sub-district authority?
5. Are you involved in any environmental association or project beside waste bank?
6. How many householders in this hamlet that join the waste-bank programme?
7. Do you see any problem that makes only a few of the whole householder who join the waste-bank programme?
8. How do you encourage them to participate the waste-bank?

Questions for the householder (Household member)

1. What kind of environmental activity that you are involve actively?
2. Do you Join the waste bank Project?
If no: Why?

If yes: next to the third question
3. What is your first impression to the household waste management from Hijau Lestari?
4. What do you think now about this programme?
5. What kind of difficulties in participating this project?
6. How do you solve them/it?
7. How do you encourage the others to join this programme?

Appendix 11. Direct Observation notes

| | | |
|----------------------------|---|--|
| Code | : | D1 |
| Activity | : | Waste Bank Collection |
| Date / Time | : | 24 March 2017 / 13.00 – 15.30 |
| Topic/Agenda | : | Waste Collecting and Waste Picking |
| Location | : | Jalan Dago Timur Kota Bandung, Jawa Barat, Indonesia |
| Participants / Discussants | : | <ul style="list-style-type: none"> • Waste-bank unit manager • Waste-bank beneficiaries |
| Notes from observation | : | <ol style="list-style-type: none"> 1. It took about an hour for the unit managers in managing the sorted waste. 2. Some beneficiaries did not segregate the waste properly therefore the unit managers show them how to do it well. 3. There are only two employees who pick the waste and transported to the waste-bank Central. Over work hour labour. 4. There is only one pick-up car (small size) to pick all sorted waste from all 134 units 5. The collection day is usually dismissed because of weather issue, especially heavy rain |

| | | |
|----------------|---|-----------------------------------|
| Code | : | D2 |
| Activity | : | Introduction Seminar |
| Date / Time | : | 25 March 2017 / 09.00-12.30 |
| Topic / Agenda | : | Waste-bank programme introduction |

| | | |
|----------------------------|---|---|
| Location | : | Jalan Jenderal Ahmad Yani No 752 RT 04 RW 05 Kelurahan Cicaheum Kecamatan Kiara Condong Kota Bandung |
| Participants / Discussants | : | <ul style="list-style-type: none"> • Hijau Lestari Steering committee • Women Association²⁵ of Hamlet 5th • The leader of Hamlet 5th Cicaheum Sub-district • Youth Association²⁶ Cibiru District |
| Notes from observation | : | <ol style="list-style-type: none"> 1. Language used: Indonesian 2. Introduction is delivered by HL steering committee. <ul style="list-style-type: none"> - Addressing the ecological issue cause by unmanageable trash - Communicating the motivation of Waste bank - Explaining and demonstrating the technical work of waste-bank 3. Discussion with participant about responding this issue 4. Hamlet 5th leader clarified the previous problem regarding technical issue of the consent letter that was proposed by HL 5. Head steering committee communicated, difficulties and struggle that should be tackled by the the committee. She clarified the misconception about waste-bank. 6. Previously there was an approach to introduce the programme in an Islamic school nearby |

| | | |
|------|---|----|
| Code | : | D3 |
|------|---|----|

²⁵ In Indonesian women association is called “Pembina Kesejahteraan Keluarga” (PKK)

²⁶ Indonesian name for Youth Association is “Karang Taruna”

| | | |
|----------------------------|---|---|
| Activity | : | Hamlet leaders' Forum Discussion |
| Date/Time | : | 26 March 2017/11.00-13.00 WIB |
| Topic / Agenda | : | <ul style="list-style-type: none"> - Benefits from an organic waste clustering and composting organic waste - Mural as an artistic media to boost residences' awareness of waste management |
| Location | : | <p>Jalan Sadang Tengah Hamlet 14th</p> <p>Sekeloa, Coblong, Sekeloa, Coblong,</p> <p>Kota Bandung, Jawa Barat 40133, Indonesia</p> |
| Participants / Discussants | : | <ul style="list-style-type: none"> • Leader of Hamlet 14th Sekeloa Sub-district • Leader of Hamlet Ujung Berung Sub-district • HL learning facilitator • Head of Sekeloa Sub-district |
| Notes from observation | : | <ol style="list-style-type: none"> 1. The discussants formulating the problem and some potential methods to solve it. 2. The Discussants discussed about the benefits of organic waste composting as solutions for the issue 3. A discussant shared his personal experience in gaining economic benefits from composting their household waste 4. The discussants discussed that art can be used to boost the awareness to keep their environment clean |

| | | |
|----------------------------|---|---|
| Code | : | D4 |
| Activity | : | Kerja Bakti as Preparation for Adipura grading |
| Date / Time | : | 27 March 2017 / 12.00 – 15.30 |
| Topic/Agenda | : | Cleaning the neighbourhood area |
| Location | : | <p>Jalan Sadang Tengah, Hamlet 14th</p> <p>Sekeloa, Coblong, Sekeloa, Coblong,</p> <p>Kota Bandung, Jawa Barat 40133, Indonesia</p> |
| Participants / Discussants | : | <ul style="list-style-type: none"> • Waste-bank beneficiaries • Householder non waste-bank beneficiaries • Hamlet leader • Neighbourhood association leader |

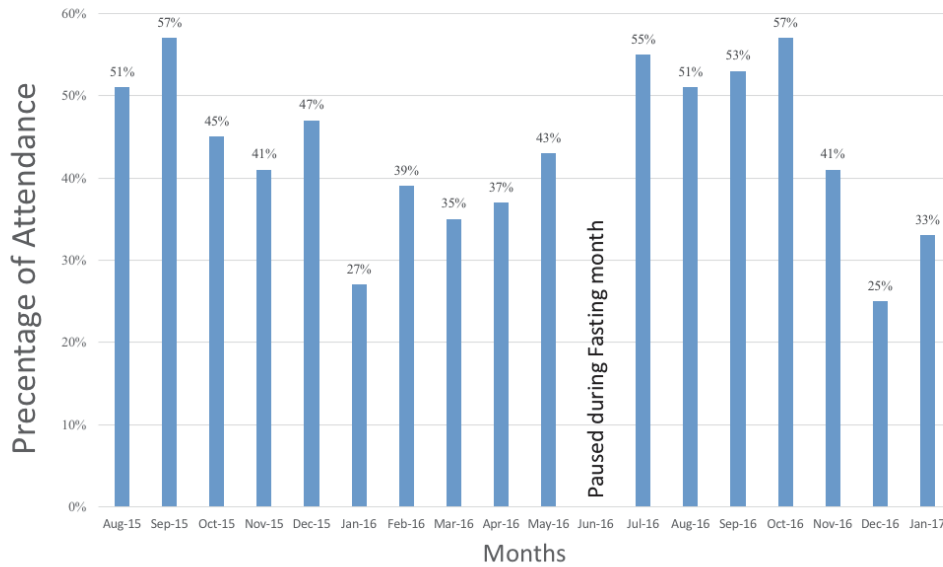
- Notes from observation :
1. Cleaning day is conducted as a preparation for environmental grading by Ministry of Environment
 2. The studied hamlet consists of middle income citizens
 3. The hamlet leader and head sub-district Sekeloa are actively encouraging the householder to actively participate on this programme
 4. However, some individuals thrown the plastic trash on the public garden.

Appendix 12. Waste Classification and selling price list

| DAFTAR HARGA BANK SAMPAH HIJAU LESTARI | | | |
|--|-----------------------------|------------------|------------------|
| NO | JENIS BARANG | HARGA | |
| | | WARGA | UNIT |
| 1 | ARSIP | Rp 1.000 | Rp 1.400 |
| 2 | ARSIP WARNA | Rp 300 | Rp 500 |
| 3 | DUS/BOX | Rp 1.000 | Rp 1.400 |
| 4 | CD/KERTAS BURAM | Rp 800 | Rp 1.000 |
| 5 | DUPLEKS/DUS TIPIS | Rp 300 | Rp 500 |
| 6 | MAJALAH | Rp 600 | Rp 800 |
| 7 | KORAN | Rp 1.000 | Rp 1.400 |
| 8 | KARUNG SEMEN | Rp 1.000 | Rp 1.400 |
| 9 | CUP A/ GELAS PLASTIK BERSIH | Rp 4.000 | Rp 4.500 |
| 10 | CUP B/ GELAS PLASTIK KOTOR | Rp.2.000 | Rp.2.700 |
| 11 | EMBER HITAM | Rp 800 | Rp 1.000 |
| 12 | EMBERAN | Rp 1.500 | Rp 2.000 |
| 13 | GALON/PCS | Rp 2.000 | Rp 3.000 |
| 14 | KELER | Rp 1.500 | Rp 2.000 |
| 15 | KERASAN | Rp 200 | Rp 400 |
| 16 | TEH GELAS/MONTEA | Rp. 1.800 | Rp. 2.500 |
| 17 | LD/ TUTUP GALON | Rp 2.000 | Rp 3.000 |
| 18 | MAINAN | Rp. 1.700 | Rp.2.200 |
| 19 | MIZONE/ BOTOL PLASTIK WARNA | Rp 600 | Rp 800 |
| 20 | PE | Rp. 800 | Rp.1.000 |
| 21 | PET A/ BOTOL PLASTIK BERSIH | Rp 2.000 | Rp 2.500 |
| 22 | PET B/ BOTOL PLASTIK KOTOR | Rp 1.500 | Rp 2.000 |
| 23 | ALPAN / ALUMUNIUM PANCI | Rp 5.500 | Rp 7.000 |
| 24 | ARO/ ALUMUNIUM | Rp 5.000 | Rp 6.000 |
| 25 | BESI AE | Rp 800 | Rp 1.000 |
| 26 | BESI AS | Rp 800 | Rp 1.000 |
| 27 | BESI SUPER | Rp 800 | Rp 1.000 |
| 28 | KALENG | Rp 200 | Rp 300 |
| 29 | SENG | Rp 200 | Rp 300 |
| 30 | STAINLESS | Rp 800 | Rp 1.000 |
| 31 | BOTOL BELING | Rp 100 | Rp 200 |
| 32 | DATU | | |
| 33 | NILEZ | | |
| 34 | CPU/ PCS | Rp 10.000 | Rp 15.000 |
| 35 | MESIN CUCI/ PCS | Rp 20.000 | Rp 25.000 |
| 36 | MONITOR/ PCS | Rp 10.000 | Rp 15.000 |
| 37 | PRINTER/ PCS | Rp.200 | Rp.400 |
| 38 | RADIO/ PCS | Rp.200 | Rp.400 |
| 39 | | Rp | Rp |
| 40 | | Rp | Rp |
| 41 | KULKAS/ PCS | Rp 20.000 | Rp 25.000 |

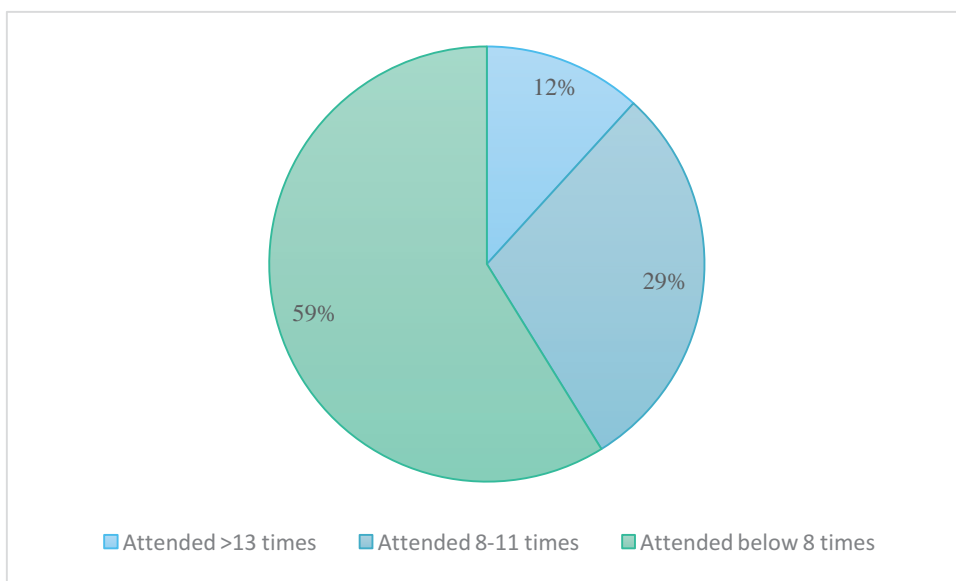
Appendix 13. Participation Data Record form August 2015 to January 2017

Source: (Hijau lestari, 2017)



Appendix 14. Individual Attendance percentage from August 2015 to January 2017

Source: (Hijau lestari, 2017)



Appendix 15. Letter of Consent



LUND UNIVERSITY

Surat Permintaan Izin

Sebuah penelitian mengenai program pengelolaan sampah rumah tangga secara mandiri di Kota Bandung, Jawa Barat

Peneliti:

Marietta Zahra, MSc, Student, Environmental and Sustainability Science,
Lund University, Sweden.

zahrazahramarietta@gmail.com, +4672 836 79 14

Tujuan Studi dan Latar Belakang

Tujuan dilaksanakannya studi ini adalah untuk mengetahui strategi pengelolaan sampah secara mandiri yang dikelola oleh kelompok swadaya masyarakat; mengetahui proses penyebaran ilmu, proses aplikasi dan partisipasi masyarakat dalam pengelolaan sampah secara mandiri melalui metode bank sampah.

Apa yang dilakukan selama penelitian?

Pada tahap pengambilan data penelitian ini menggunakan metode wawancara kepada pihak terkait kegiatan Bank-sampah yang diselenggarakan oleh yayasan Hijau Lestari.

Selain wawancara, peneliti juga melakukan pengamatan secara langsung terhadap kegiatan sehari-hari bank-sampah Hijau Lestari.

Narasumber akan ditanyakan perihal seputar kegiatan bank-sampah, proses kegiatan, manfaat yang dirasakan, kendala yang dihadapi, dan sebagainya.

Potensi manfaat yang diharapkan:

Hasil daripada penelitian ini diharapkan menjadi rekomendasi bagi para pembuat kebijakan publik dalam hal menyempurnakan kebijakan terkait pengelolaan sampah dan mendukung penuh kegiatan bank-sampah di kota Bandung.

Partisipasi dan pembatalan partisipasi:

Partisipasi Ibu/Bapak dalam penelitian ini bersifat sukarela. Ibu/Bapak memiliki hak penuh untuk membatalkan partisipasi ini dalam penelitian saya tanpa batas waktu. Ketika Ibu/Bapak menyatakan mengundurkan diri sebagai narasumber, segala data baik catatan penelitian yang berkaitan dengan keterangan yang telah diberikan dan rekaman suara akan dimusnahkan.

Hasil penelitian:

Hasil penelitian saya akan dapat di akses secara virtual pada website Lund University pada tautan: <http://www.lumes.lu.se/alumni/lumes-alumni-and-theses> setelah penyusunan

Postadress Box 170, 221 00 Lund *Besöksadress* Biskopsgatan 5, 223 62 Lund

Telefon dir 04692220470, *växel* 0469222 00 00

E-post zahrazahramarietta@gmail.com *website* <http://www.luces.lu.se>

master tesis ini selesai. Bila Ibu/Bapak menghendaki file tesis saya, saya akan mengirimkannya melalui surat elektronik pribadi Ibu/Bapak.

Pertanyaan lebih lanjut:

Bila Ibu/Bapak memiliki pertanyaan lebih jauh mengenai penelitian ini atau mengenai hak sebagai narasumber pada penelitian ini, dimohon untuk tidak ragu menghubungi saya pada email yang tertera pada lembar permohonan izin ini. Ibu/Bapak juga dipersilakan untuk menghubungi Thesis supervisor saya Maryam Nastar pada alamat surat elektronik maryam.nastar@lucsus.lu.se atau kepada Study Director, Torsten Krause torsten.krause@lucsus.lu.se

Pemberian Izin:

- Saya telah membaca surat permintaan izin atas penelitian yang dilakukan oleh Marietta Zahra
- Saya memiliki kesempatan tanpa batas waktu mengenai keterlibatan saya sebagai narasumber dalam penelitian ini
- Saya mengetahui bahwa ketersediaan saya menjadi narasumber bersifat sukarela dan saya memiliki kesempatan untuk mengundurkan diri kapan pun
- Saya setuju untuk berpartisipasi dalam studi ini
- Saya mengizinkan Marietta Zahra untuk mengadakan observasi langsung dalam kegiatan Bank sampah

Nama Partisipan:

Tanggal :

1. Saya setuju bila wawancara ini direkam dengan perekam suara
Ya
Tidak
2. Saya menyadari bila informasi dan kutipan yang saya berikan dalam wawancara melibatkan diri saya, Institusi, dan/atau organisasi dimana saya terlibat
Ya
Tidak

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