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Performance of Community-Based Solid Waste Management for Integrated and Sustainable Solid Waste Management. The Case of Bogor City, Indonesia

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Performance of Community-Based Solid Waste Management for Integrated and Sustainable Solid Waste Management. The Case of Bogor City, Indonesia

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Abstract

Nowadays, solid waste become a global issue which must be managed in a comprehensive and integrated way. Solid waste generation continue to increase as population growth but otherwise the unbalance amount of infrastructure, the limitation of land for final disposal sites and the high cost of waste collection and transportation became challenges in solid waste management itself. So that needs efforts to handle and process the waste since the waste source to reduce the burden of final disposal sites (landfills). One of the strategy is by developing the 3R approach (reduce, reuse, recycle) at community level. This issue is also faced by the Indonesian Government now. In addition to those challenges, the central government set target for universal access (100% access) to sanitation by the end of 2019. Through community-based solid waste management (CBSWM), the government hopes waste reduction target can be achieved.

This study focuses on community-based solid waste management (CBSWM) practice through TPS3R program in Bogor City, Indonesia. The main research question of this study is “What factors influence the performance of community-based solid waste management (CBSWM) in Bogor City so that it can contribute to integrated and sustainable solid waste management?” This research is based on qualitative approach including literature review, interview with stakeholders and field observation of case study. The field observations and interviews with managers and users of TPS3R are conducted in 4 different locations in Bogor City. The CBSWM practice in these areas described based on five waste system aspects, those are legal aspect, technical and environmental aspect, institutional aspect, financial aspect and participation and social aspect.

The research found that waste services level of Bogor City at the end of 2015 has reached 72% while the TPS3R existing only able to process 3.17% of total waste generation. So that there is still a big gap to achieve the 100% access target. Moreover, the income of TPS3R has not been able to cover the operational and maintenance costs so that TPS3R facilities still rely on financial support from the local government. From the field observation, the author conclude that many factors affect the performance of community-based solid waste management through TPS3R programs in Bogor City. It was vary for each location depend on the challenges and capacity they have. But generally the active participation and good collaboration from all related stakeholder, like from the central government, local government, community groups or TPS3R managers, team leader, society or users, the informal sectors, local officials and private sectors are needed to achieve Integrated and Sustainable Solid Waste Management. The crucial issues in keeping the sustainability of TPS3R are the cost recovery of TPS3R, the characters of the leaders and managers, markets availability for TPS3R products, and waste sorting process since the waste sources (homes).

Keywords: *community-based solid waste management, stakeholder, participation, TPS3R program, sustainability, performance, Bogor City, Indonesia*

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Abbreviations

| | |
|-------|---|
| 3R | Reduce, Reuse, Recycle |
| CBO | Community Based Organization |
| CBSWM | Community Based Solid Waste Management |
| CSR | Corporate Social Responsibility |
| DoCL | Department of Cleanliness and Landscaping |
| GDP | Gross Domestic Product |
| ISWM | Integrated and Sustainable Waste Management |
| MoEF | Ministry of Environment and Forestry |
| MoH | Ministry of Health |
| MPWH | Ministry of Public Works and Housing |
| MSW | Municipal Solid Waste |
| NGO | Non-Governmental Organization |
| SDG | Sustainable Development Goals |
| SWM | Solid Waste Management |
| TPS3R | Temporary Waste Processing Site / 3R Centre |

List of Symbols

CHAPTER 1

Introduction

This chapter will provide a general overview of this research, consist of background information on the problem, problem statement, research objective, research questions and the relevance of the research.

1.1. Background

Solid waste has become a global issue which must be managed in a comprehensive and integrated way from upstream to downstream in order to provide economic benefits, community's health, safe for the environment, and change people's behaviour. Many factors that accelerate the municipal solid waste generation are increasing of population growth, economic development, and rapid urbanization (Minghua et al., 2009). Recent years every country make an effort to reorient sustainable Solid Waste Management (SWM) systems. To achieve this goal, it requires integrated approach so that solid waste management can be proportionate, effective, and efficient. An integrated approach of SWM should include diverse collection and treatment options, participation from all stakeholders and interaction among waste system (Visvanathan et al., 2004).

A lot of measures were taken to reduce the number of waste generation at local, national and international level. But the increasing of solid waste generation is not balanced with the improvement of infrastructure of solid waste management and also limitations of land for the final disposal sites especially in big cities. It is very difficult to find sufficient land for final disposal sites near the city and moreover cost of transportation and environmental impacts became challenges to construct landfills at a distant location (Memon MA, 2010). So that needs efforts for waste reduction from the source to reduce the burden of final disposal sites.

Indonesia's population growth is about 1.3% per year, from 241 million in 2010 to 257 million in 2015, with over half of the population (53.4%) lives in urban areas as a consequence of a high urbanization rate (Worldometers, 2016). The Municipal Solid Waste (MSW) in Indonesia estimates increase 2-4% per year and every Indonesian generates 0.76 kg/day solid waste (MoEF, 2015). With 257 million people, a staggering 195,000 tons of waste is produced each day. Thus, the total MSW produced in 2015 was over 71 million tons. The current service coverages of solid waste in Indonesia is approximately reaching 79.8% (MoH, 2013), while the government set target "waste-free" in 2020. So there is still a big gap to achieve this goal.

Under the Indonesian regulation on solid waste management, Act No. 18 of 2008, the central government and local government shall finance the implementation of solid waste management. The local government has authority and responsibility in the management, and for the implementation and operation may involve the community groups and NGOs or in partnership with private sector who engaged in the field of solid waste management. The initiatives from the community in solid waste management were more effective in reducing solid waste generation. Community-based solid waste management (CBSWM) is one of the strategies of solid waste policy that stated in the regulation of Ministry of Public Works and Housing No. 21 of 2006 to increase the active role of the public and private sectors as a managing partner. CBSWM plays an important role in waste handling in Indonesia since it is low cost and involve high participation from the people. The society already proved capable of effectively implementing various programs and even with a very high success level, especially when their participation involved since the beginning of the program. Community-based solid waste management can be undertaken to improve solid waste management in residential neighbourhoods through the empowerment of local communities, which can then be replicated in other places.

One of the cities in Indonesia that successfully applied community-based approach and involve their society participation in a waste reduction from the source is Bogor City. Two flagship programs that promote by the central government related to community-based solid waste management are waste bank program and TPS3R program. At the end of 2015 there were 56 units of Waste Bank and 24 units of TPS3R collection sites develop by the local government and can reduce about 82 cubic meters, or about 13% of municipal solid waste from the source every day (Donni, 2016). The existence and success stories of both programs have also been able to increase the value of Bogor City as a clean city for Adipura Award program.

1.2. Problem Statement

Community-based programs put the responsibility of operation and maintenance at the hands of the society in accordance with the agreement between the community and the local authority, so the main actor here who leads the role in solid waste management is the community (Mungkasa, 2009). But it must be understood that the community-based does not mean that all is done by the community. The government and other agencies also have roles and responsibilities, such as take part as motivators and facilitators (Colon and Fawcett, 2006). The function of the facilitators is facilitating the community to achieve the goal of sustainable activities. If the community is not ready and has weaknesses to prepare or operate, the government or other institutions should assist and guide them. The assistance may include financial, technical assistance, and institutional supports. But must be careful not to make the community depends on the support from the government and other agencies because the main purpose of community-based programs is to create an independent community who is able to overcome the problems in their environment (Mungkasa, 2009).

The challenges that faced now in solid waste management in Indonesia are the roles and division of responsibilities of the operator and regulator is not clear (Damanhuri et

al., 2014). And from financial aspects, the investment is limited, the retribution from the society is not calculated on the basis of the cost recovery and inadequate funding for operation and maintenance. Another obstacle is low awareness and commitment from local government and related actors, which can be seen from low enforcement of solid waste policy and regulation and the availability of local regulation and institution who is responsible for municipal solid waste management.

Community-based solid waste management will not be sustainable without the existence of a strong partnership between the community groups and the local government (Krisna, 2003). The local government should create a joint framework that can provide opportunities for cooperation among the stakeholders. Needed a partnership between different actors in order to build synergy in the implementation of solid waste management, especially through community-based programs. The willingness of all actors to share and support each other will help in achieving the goals.

1.3. Research Objective and Research Questions

The general objective of this research is to explore and understand the situation and performance of Community-Based Solid Waste Management (CBSWM) in Bogor City. This research begins with main research question: What factors influence the performance of community-based solid waste management (CBSWM) in Bogor City so that it can contribute to integrated and sustainable solid waste management?

To achieve the general objective, several sub-questions are conducted as below:

1. What are the challenges faced in the implementation of community-based solid waste management (CBSWM) in Bogor City?
2. Which stakeholders influence the community-based solid waste management (CBSWM) practice in Bogor City and what are their roles?
3. What strategies do local government and CBOs use to support the performance of the community-based solid waste management (CBSWM) practice in Bogor City?
4. What lessons learned and recommendation can be drawn from the research to improve the performance of solid waste management in Bogor City?

1.4. Relevance of the Research

Indonesia has a potential to develop Integrated Solid Waste Management strategy through community-based programs. Community-Based Solid Waste Management (CBSWM) is promoted to be effective to achieve global and national targets because it can reduce the amount of waste generated and disposed to the final disposal sites since the source of waste. Global commitments such as SDGs and national target to become waste-free in 2020 is thought to be difficult to achieve in the absence of synergy between the governments and without participation of society. The involvement of various actors is one of the important keys to making the program successful. By involving the public into the process, the government has implemented a bottom-up approach where the community's thought will be a key input in policy

formulation and decision-making process. This bottom-up approach is needed to ensure that the development reaches the community level. Decentralization is not just about reduce the authority of the central government, but also improving public services and creating efficiency and effectiveness of governance and development. The spirit of decentralization also encourages the growth of local democracy and community empowerment.

Many research has been conducted before studied on the function of the Community Based Organizations (CBOs) in handling municipal solid waste (MSW) and the factors that affect the sustainability of the organization. But not many scholars discuss the important role of local authority in the process towards the success and independence of CBSWM. According to Pasang (2007), his research shows that the obstacle in the implementation of MSW management in Jakarta not so much linked with financial and technical aspects, but rather to institutional aspect as vision, commitment and policy initiatives.

The results of the evaluation conducted by the Directorate of Environmental Sanitation Development, Ministry of Public Works and Housing in Indonesia shows that Bogor City Municipality has more commitment when compared to other cities in Indonesia related to environmental management and waste handling. Many CBSWM which have been built by the central and local government are growing, and eventually be able to survive and become independent without the help of the local government. The ability of this city to achieve and maintain Adipura Award also become other evidence that the leaders and the municipality set priority on the cleanliness of the environment. The success stories of CBSWM in Bogor City manage their municipal solid waste can be used as learning example and motivate other cities. Not only the passion and involvement of the community but also the role of the municipality in supporting their community-based organizations (CBOs) become independent can be replicated in other areas.

CHAPTER 2

Literature Review

This chapter will discuss and review the relevant literature from different authors that contribute to this research. The first subchapter discusses the solid waste management and their challenges in developing countries, the next subchapter gives a general overview of the implementation of solid waste management in Indonesia. The third subchapter gives the concept and practice of decentralization and shifting responsibilities to the community in solid waste management. In the fourth subchapter, the concept of community-based solid waste management will be introduced and in the fifth subchapter will examine the local government performance in supporting the CBOs. The last subchapter is the short summary of chapter 2.

2.1. Solid Waste Management in Developing Countries

Based on Agenda 21 chapter 21.3, the definition of municipal solid waste (MSW) is all domestic and non-hazardous solid wastes includes commercial and institutional wastes, waste from street sweepings and construction wastes. Many obstacles faced by the municipalities on solid waste management, especially in developing countries, mainly due to the increasing of waste generation, the limited municipal budget, and the lack of understanding from the government officials about factors that influence the solid waste management at a different level (Guerrero et al., 2013). So that an integrated approach is needed to tackle the solid waste problem through the proper collection, treatment, and disposal.

Integrated and Sustainable Waste Management (ISWM) approach consist of several waste system elements such as solid waste generation, collection, transfer, transport, disposal and recycling which affected by the participation of all stakeholder and consider the enabling environment. An enabling environment is the conditions that support the effective change and sustainable (Eawag/WSSCC, 2005). The project can be said being successful if it is adaptable and fully operational in different social, economic and environmental conditions that likely to change over the time. Integrated and sustainable solid waste management approach is more than about technical and environmental aspects (UNEP and Cal Recovery, 2005). The conceptual framework that represents the integrated and sustainable solid waste management approach is shown in Figure 2.1 below. Based on Zurbrügg et al. (2012), drivers that determine the success or failure of solid waste management project are related to:

- Social acceptance
- Institutional elements like a stakeholder, legal and management functions
- Financial requirements and cost recovery mechanisms

The integrated and sustainable solid waste management diagram is corresponding with other scholar's opinion that achieving sustainability in solid waste management requires an integrated approach (Visvanathan et al., 2004) including various collection and treatment methods, stakeholder participation, and interactions between waste system elements and the environment. Joseph (2006) also affirm that participation from all stakeholder in solid waste management such as the waste generators, waste processors, government agencies, NGOs, private sectors, and society is an important factor for the sustainability of solid waste management.

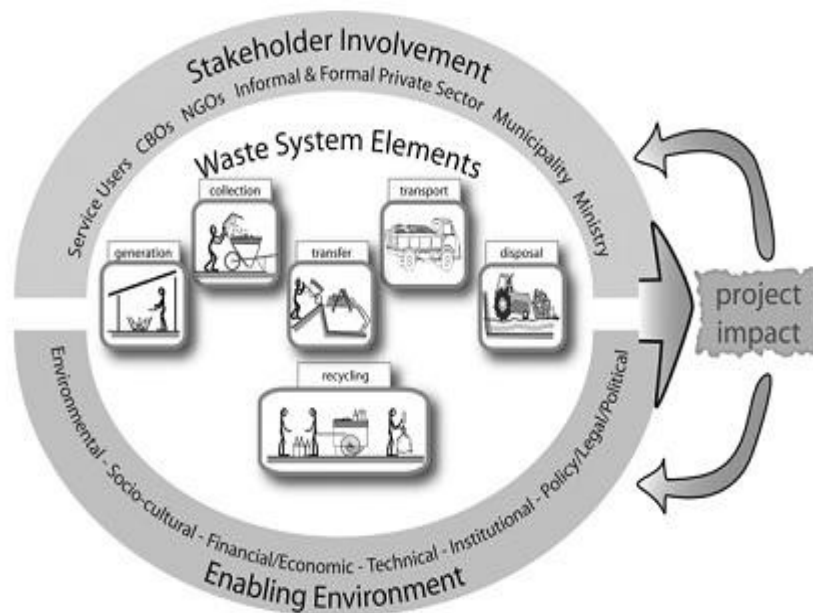


Figure 2-1 Integrated and Sustainable Solid Waste Management Approach (Van de Klundert and Anschutz, 2001)

From that diagram, we can conclude that integrated solid waste management (ISWM) also requires consideration of environmental, socio-cultural, financial, technical, institutional and legal aspects. In order to organize and make sure all stakeholder participate in solid waste management service, policies, laws or even punishment are required. Another tool to guide people is a national action system plan in solid waste management, which is formulated based on all related waste system elements.

Memon (2010) state that the 3R approach (reduce, reuse, and recycle) aims to optimize the management of solid waste from all waste producers (municipal, construction, industry, agriculture, and health facilities) and involve all stakeholders (waste producers, service providers, regulators, government, and society). The waste management becomes more effective, the risk to the environment and impact to the public health will be minimized because 3R help to reduce the amount of waste dumped from source to final disposal. This approach emerges because the current garbage collection in many developing countries is constrained due to cost issues. It is hard to find sufficient land near the town to be used as the landfill site, with consideration of the transport costs and environmental impact when building a landfill in a location away from the city. So the solution is to reduce the amount of waste early

on. Decreasing the amount of waste will reduce the burden on the service of collecting, processing and disposal facilities.

World Bank estimating in developing countries that the municipalities spend average 20%-50% of their budget for SWM, but still only about 30%-60% of total municipal solid waste or less than 50% of the population underserved (Memon, 2010). In developed countries, people have to participate in order to reduce the cost of collecting and facilitate recycling of waste. The primary concern was the majority of the funds are used for garbage collection process and very difficult for many countries to provide proper treatment and disposal without the help of funding from external parties (Memon, 2010). This public awareness complements the 3R concept to reduce the waste generation and to shift some of the waste for reuse and recovery. An ISWM based on 3R approach can be designed and implemented optimally at the municipal level if the local authorities can carry out their roles to provide waste collection services and management. Based on Pasang et al. (2007) typical characteristics of solid waste in developing countries are:

- (i) High density,
- (ii) High moisture contents,
- (iii) Most are organic wastes with portions of vegetables/rot ingredients,
- (iv) Dust and street trash as sweeping results become part of the municipal waste collection system, and
- (v) Small particle size.

Waste composition is influenced by economic conditions of a city or country. The proportion of waste that can be recycled such as paper, plastic, etc. is quite high in developed countries, while in countries with low GDP is dominated by high-degradable organic waste. The low proportion of recyclable waste in developing countries can also be linked to the market value of recycling.

Based on the United States Environmental Protection Agency (USEPA), recycling is defined as the process of collecting and processing waste so that it can produce a new product that can be used again by the community and save the environment (Tiew et al., 2015). Waste recycling program could be one of the environmentally friendly solutions to reduce the burden on landfills. Waste recycling approach was first introduced in developed countries to reduce, reuse and recycle solid waste, thereby reducing the final volume of solid waste that goes to landfill. It is estimated that the recycling activity can reduce the amount of solid waste that goes into landfills by 15-20% (Pappu et al., 2007). The success of waste recycling programs in developed countries is also supported by the participation, awareness, and cooperation of the community (Shekdar, 2009). By contrast, in developing countries, recycling is done because it can support the economy of the community by the sales profit of recycling activities.

Local resources such as financial capability and affordability of the community are two factors to be considered in determining the waste management solutions. This can be seen in the high-income countries that 3R program initiatives which require costs continue to be sustainable due to high revenues from the public (Shekdar, 2009). The

central government and local governments also have a responsibility to provide financial and institutional support. Sometimes not all stakeholders have a shared understanding of the term "sustainable development". Based on the experience in Malaysia, there are many factors that affect the sustainability of waste recycling program. It includes continuous publicity, maintenance and operational costs (5-10% of the sale of recycling), public awareness, continuous training, and the enthusiasm of the leaders of the program on environmental protection (Tiew et al., 2015).

2.2. Solid Waste Management in Indonesia

Indonesian Law on Solid Waste Management Act No. 18/2008 defines solid waste as the residue of human activities and/or residues from natural processes in the environment as a solid form. In Indonesia, the municipal solid waste management being the responsibility of the local government. There is a special department that handles issues of cleanliness and solid waste in each district/city. But most cities still give less attention and priority for the waste management. It can be seen from their annual budgets that they put low allocation of funds used for the operational, maintenance and investment (Damanhuri et al., 2014). At the national level, the management of solid waste is handled by the Ministry of Public Works and Housing (MPWH) for the planning and implementation of projects on nationwide. Although the main responsibility of the central government is to provide guidance and oversight, they still allocate funds for the initial investment and technical assistance. At local government level, the provincial government is responsible for coordinating related to regional final disposal sites among the cities/districts. The provincial government may also contribute by providing 'participative' budget for the centralized facility investment.

The common method used in municipal solid waste management in Indonesia is a collect-transport-dispose method. Most of the local governments do the practice of open dumping or semi sanitary landfill at the final disposal sites and create a worrying condition for the surrounding environment. In addition, the district/city has its limitations in the provision and presentation of data related to waste management in their territory (Damanhuri et al., 2014). The data that currently exist need to be updated regularly such as the amount of waste generated, composition and characteristics of the waste. The composition of municipal solid waste in Indonesia is dominated by organic waste (more than 55% by weight) derived from food scraps and vegetables or fruits. The composition of inorganic waste is about 40% (by weight), and the remaining approximately 5% (by weight) are classified as inorganic components that can be recycled (Damanhuri et al., 2014). Plastic, glass, paper and metals are collected by the informal sector or municipality, and these materials will then be recycled.

The Ministry of Environment and Forestry and the Ministry of Public Works and Housing seeks to reduce waste from the source through the 3R program, particularly after the enactment of Solid Waste Management Act No. 18/2008. This is undertaken by increasing community participation and develop similar programs in cities in Indonesia every year. This empowerment program involving NGOs and local communities. The main challenge felt today is how to maintain the spirit of the community to involve in this program and keep this pattern continues. The aims of this

approach are to develop the potential and the participation of citizens in dealing with their own waste in a way to empower them and provide environmental knowledge, particularly related to the waste management.

A waste recovery mechanism that has been developed in Indonesia is a garbage-savings-selling mechanism, better known as "waste bank", which is managed by the citizens in the form of cooperatives. The organizations formed will receive the valuable dry inorganic waste collected by the citizens, and it will be sold to the garbage collectors who come to the cooperatives. Money from the sale of the waste will be deposited in the accounts of people who deposit their garbage in the cooperative. Most of the profits from this transaction will be earnings for the neighbourhood.

As was mentioned earlier that the handling of municipal solid waste is the responsibility of each local government. It is estimated that only about 10% of final disposal sites operated with a better system such as using a controlled landfill (Damanhuri et al., 2014). Another treatment is using incineration which is undertaken in several cities in Indonesia. For organic waste management, the waste composting process also known simply as part of the solid waste management at the community level. In principle, the composting system consists of centralized sorting and shredding system, and after that composted organic materials with simple composting methods.

Many districts/cities that are motivated to look up hygiene and sanitation conditions of their city, among others because of the program Adipura Award which is given to district/city that can manages to maintain the cleanliness of their environment. There has been a fundamental change in the political and governance, such as decentralization system and local autonomy which influence the division of tasks in government level (Damanhuri, 2008). In accordance with the implementation of the decentralization policy, the municipality takes over the authority and responsibility for waste management from the central and provincial governments. Local government has to adjust many policies and considering to the conditions in their respective areas, especially in the institutional aspects.

The Ministerial Regulation No. 21 of 2006 issued by the Ministry of Public Works and Housing has mentioned national policies and strategies in managing municipal solid waste. This regulation is also derived from the Solid Waste Management Act No. 18/ of 2008 which stipulates that waste reduction through the 3R (reduce, reuse, recycle) as a first priority and waste handling become the next priority. This concept being a new paradigm to substitute the old concept of collect-transport-dispose, which was widely adopted by most cities in Indonesia. The involvement and active participation of the community and other waste producers by reducing the volume of waste are the key success of solid waste management.

One of the central government programs that support the municipal waste management through the Ministry of Environment and Forestry is Adipura Award, which revived since June 2002. This program has main objective to motivate local governments to implement the principles of good environmental management of the

urban environment so that a clean and green city can be realized (Ministry of Environment, 2004).

2.3. Decentralization and Shifting Responsibilities to Community

In carrying out their responsibilities to manage the municipal waste, municipalities faced the challenge of providing an effective and efficient system for the public. And often the solutions offered beyond their ability and capacity (Sujauddin et al., 2008), due to lack capacity of the organization, limited financial resources, complexity and multi-dimensional system (Burntley, 2007). Other scholars mentioned another factor like recycling projects and infrastructures (Nissim et al., 2005), the availability of recycling companies (Henry et al., 2006), drop-off and buy-back centres (Matete and Trois, 2008) and support from the informal sector (Sharholy et al., 2008) also become the obstacles.

Zotos et al. (2009) mentions that often the administration at the local level are not sufficient to manage and implement policies from the central government. This deficiency is partly due to the process of decentralization to local governments without regard for budgetary support and sufficient capacity. This resulted in confusion at the local government level and they cannot follow the national policies and strategy, so it raises a significant gap between planning and implementation and delays to solve the problems and inefficiencies in the utilization of the available funds (Zotos et al., 2009).

For example, a case of waste management in India is the responsibility of the local authorities. Civilian agencies like the Municipal Corporation, municipalities, and panchayat obliged to provide services relating to the cleanliness of their city. However, due to low priority, the service becomes inefficient. The situation is aggravated by the greater costs involved, lack of funds, lack of institutional capacity, lack of trained personnel, indiscipline among the workforce and political pressures (Asnani, 1996). To overcome this situation the local authorities started looking for a new approach to creating a partnership with the society, small and medium enterprises, industries and large private entrepreneurs and other interested parties to share responsibility in these areas. The local and central government can attract private sector participation in solid waste management services by providing incentives (Haan et al., 1998).

Smoke (2003) mentions participatory mechanisms and Community Based Organizations (CBOs) have an important role in creating an effective decentralized system, but he regretted that the collaboration aspects was not getting much attention. Characters of the leader as driving force becomes a key factor to consider when planning a replication widely, but it also could be a major obstacle that must be taken to ensure the project's sustainability (Zurbrügg et al., 2012). While the availability of sustainable funding (including investment, depreciation, operation, maintenance, and replacement costs) are also keys of strong and reliable operation and maintenance.

Based on Krishna (2003), parties that support CBOs raised evidence that the local government in certain circumstances gives more attention to the interests of the upward levels, such as the central government. On the other hand, those who support the local government shows evidence on how the CBOs also prone to malfunctions, they are less equipped with the skills and technology and often focus on the interests of the parties who gives funding (to donors) rather than downwards (to their constituents) in determine the direction and goals of the organization.

Some success stories of CBOs show that the community is also willing and able to invest and manage their local services. In order to provide effective services to the public, social intermediation such as increasing awareness of the public, user groups, and non-governmental organizations (NGOs), the use of microfinance services, education and health promotion are very important and necessary (Muller and Hoffman 2001). In this case, the CBOs can be an important partner for local governments in the municipal solid waste management and activities related to the environment, health, education or community service and more if the local community has a recognized and respected leader (Joseph, 2006).

Another example of a participatory approach that has been practiced in developing countries is watershed development efforts in India, which is shown decentralization project planning, implementation, and management of local communities at the village level is still not successful (Bouma et al., 2007). From the observations and research that has been done there, showed that investment in community organizations have not been able to guarantee the commitment of the local community to do the maintenance in the long term. Without consideration of cost recovery for investments in soil and water conservation, and not equipped with a capable local institution to coordinate investment in the long term, the sustainability of watershed management through a participatory approach will be seriously threatened. In the early period, most of the implementation process is done with a top-down approach. However, this approach was not very successful and eventually then combined with bottom-up approach initiated by non-governmental organizations (NGOs), so as to give a little change and restore the initial focus of the projects (Kerr et al., 2002). Currently, in India, most of the watershed development programs have evolved towards a participatory approach, involving local people in the planning, implementation, and management of soil and water conservation. From the results of research conducted by Bouma et al. (2007) concluded that a bottom-up or participatory approach which is involving the community become more effective in achieving the objectives than the top-down approach that is practiced at the beginning of the project, especially in terms of flexibility of time and resources. From the results of some qualitative research projects, Sanket et al. (2002) also concluded that the failure to manage resources sustainably is also due to the weakness of the institution that responsible for performing maintenance on soil and water conservation.

2.4. Community-Based Solid Waste Management

As described in the previous sub-chapter, Tiew et al. (2015) asserts that the stakeholder involvement, the management elements, and technical management

requirements are the factors that affecting the sustainability of waste recycling program. Realistically, the society can play a role in solid waste management in their areas and it is strongly influenced by the local context. This system requires significant local resources, political and technical support, which would be difficult to obtain in the absence of strong local leaders (Colon and Fawcett, 2006). Another model as a form solution in addressing the problems of technical and commercial aspects that are considered difficult by the community is by triangle contract between the local government, residents and small businesses.

Community-Based Solid Waste Management (CBSWM), is one type of community-based organizations (CBOs) that have an important role in the solid waste management and hygiene, especially in locations that do not get official waste services. However, the role of this CBSWM has not fully developed yet because of several factors, including (Pasang et al, 2007): (a) the waste management at neighborhood level is considered as the voluntary activities of the citizens without any support from the government; (b) the function of the community in the municipal solid waste (MSW) management has not developed significantly; (c) lack of appreciation for the services performed by the public from the authority of waste services; and (d) the reduction of waste through separation at source or other means is not considered as an alternative to ease the burden on the city in dealing with waste.

Based on the theory of Sharp and Luckin (2006), the community will contribute to the sector that is not served by the state or private sectors. Murray (1999) estimates that there are three possible roles for the community in the future of the waste sector, as a pioneer, a sub-contractor, or it may take part as an important actor in the long term. The strong environmental community will provide an opportunity for people to take control of waste management aspects so that they can create a real improvement to their lives in economic, environmental and social sectors. This community has understood the main objective of waste management is to ensure the health and safety of humans, as well as environmentally effective, economically affordable and socially acceptable. Sustainability of municipal solid waste management can be interpreted that it is able to sustain itself over time without spend all existing resources.

CBOs are not a formal part of the local government structure. CBOs generally appear in the marginal areas of low income that generally do not get service in the case of electricity, drinking water, sanitation, public transport, drainage and waste disposal. Their quality of life will be improved depend on self-help efforts and initiatives of the community. So the role of dedicated people, who have live in the area, who want to work and share their knowledge and expertise to the local community is one of the keys to the success of CBOs. However, local governments are usually less keen to see the potential and benefits of waste collection scheme which has been organized locally that can give benefit and ease their own burden (Van Beukering and Gupta, 2000).

In developing community-based organizations, there is no need to build a new organizational structure because the organization that has stood in the community for a long time can produce a stronger sense of ownership. Community-Based Solid

Waste Management (CBSWM) systems can reduce the burden of the local government for primary collection and transportation. Activities undertaken by CBSWM will reduce the amount of waste, especially all the materials that can be recycled or composted. This will extend the lifetime of the landfill, reduce negative impacts on the environment and increase people's income from the sale of recyclable and compostable materials (raw materials and products). CBSWM activities will allow larger economies in the waste management sector, with improving the quality of the environment as the consequences. Another important thing that should also be considered for supporting the role of CBSWM is a market for recycling services. The market mechanism should be framed in such a way so that community-based organizations can continue to compete with other small and medium enterprises. The question now is whether the central and local governments should create a mechanisms to support the community organizations? And to what extent the government should support the existence of this community-based organization? (Sharp and Luckin, 2006).

In the process of waste reduction at the source, strong community involvement is very important. Among CBSWM activities, such as garbage collection, a collection of costs, recycling, composting, and micro-enterprises will be the driver of the solid waste management to create better services that available for all levels of the household. Revenues obtained from the recycling and compost can be used to contribute to the waste collection cost and other community activities, including providing incentives to communities in the form of the provision of waste containers and additional safety measures. Potential incentives and benefits to the government of the existence of CBSWM are as follows (Pasang et al, 2007):

- (i) Reducing the burden of the municipality for the waste collection and transportation the Sanitation Department allow to focus only on commercial, industrial and hazardous waste, as well as transportation and disposal facilities, can be managed more efficiently;
- (ii) Reducing the amount of waste generated, collected, transported and disposed of to landfill and in turn, reduce the impact on the environment; and
- (iii) Increase revenue from the waste sector.

Pasang et al. (2007) also argued that a number of community-based organizations (CBOs) and non-governmental organizations (NGOs) introduce the reduce-reuse-recycle (3R) activities in Indonesia, especially under the project-based scheme. But generally many of these projects have stopped operating. It is caused by a lack of public awareness, the lack of commitment from the implementing agencies to address issues arising from the project (such as trucks deficiency that allocated to collecting the garbage that has been separated at the household level), and bad coordination with other urban systems. The absence of economic incentives and low enforcement systems become another obstacle in the development of 3R programs in Indonesia. Poor performance is also caused by a lack of strategic development for composting.

In their paper, Colon and Fawcett (2006) found that each household is eager to support any system as long as it provides benefits and incentives to them. One new approach that aims to increase revenue from the trash at the community level is through micro-

enterprises. This will encourage waste management so as to provide better services at the community level. If micro-enterprises managed by the representatives of the community, it is necessary for the committee to run a transparent management under the community-based organizations. Considering the process and targets to be achieved, systems, policies, regulations and the enforcement of pre-existing need to be modified or developed so making it possible to be implemented in the new structure.

2.5. Local Government Performance in Supporting CBOs

In promoting the change towards sustainable development, the division of roles and synergies between the provincial government, municipalities and communities are very important (Zotos et al., 2009). Limited financial resources to provide sufficient waste infrastructure and weak institutional capacity to deterring bad behaviour are also being part of the problem (Agamuthu, 2003). Municipality as the closest level of government to the community have an important influence and can contribute greatly to carrying out the principles of sustainable development at the local level. Local government can formulate and implement new policies or make a breakthrough towards sustainable environmental management, either by reducing their own waste production or by promoting policies that give the opportunity to citizens to actively participate. In addition, local governments also need to make consulting and training activities of sustainable solid waste management to local communities and specific target groups as priority activities. To develop the program to a much larger level, it needs a significant investment in capital and human resources. Local authorities should be able to explore the potential financing sources through the competitive external project (Zotos et al., 2009). But in general, sometimes local governments are not able to assess how good or bad their performance and at which point they should set their targets (Zotos et al., 2009).

The partnership between the local government and community-based organizations can improve the performance and utility of each institution (Brinkerhoff and Brinkerhoff, 2002). In this partnership, both local governments and community organizations have different roles to be arranged in a variety forms of partnership arrangements (Krisna, 2003). The institutional performance will depend heavily on public opinion and approval. Institutional design at the local level needs to be developed through consideration of local needs (Rodrik, 2001). The involvement of community organizations can significantly improve the performance of the government agencies. This is in accordance with the opinion of Grootaert (1998) and Krishna (2002) which states that the institutional performance will be more effective by involving social capital through the involvement of community associations in the planning and implementation of government programs at the local level. Instead, profits are not only met by the local governments but also can flow in the reverse direction from the local government to community organizations.

Examples of successful cases often being subject to evaluation and learning for decision makers who will be interpreted and applied it in their local context. One example is in Chennai, South India, the municipality acts as a facilitator by providing land and infrastructure for composting. One option scheme is financial support from

the local government to invest in small-scale composting. It is intended for people who have been ready to take on a contract with micro enterprises engaged in the sale of compost. Related to their roles, local governments can also offer technical support and provide a market for compostable products that can be used in public parks and land reclamation projects (Colon and Fawcett, 2006). They have to develop a good management structure, seeking technical and institutional support, and cooperate with the private sector in processing waste resources or in the form of financing and support for collection schemes to become successful. However, Colon and Fawcett (2006) also found that place municipal waste management entirely in the hands of community could potentially create a fundamental issue for government functions. If this idealist model is made possible then citizens will no longer need local governments to provide their basic needs.

Minghua et al. (2009) stated that the government should encourage the market and improve the professionalism of recycling company in order to increase the rates of recycling in their area. Low priority of policy makers to the waste sector can result in a lack of trained and skilled personnel in the region. While the factors capable of supporting the improvement of the system according to Guerrero et al. (2013) is the availability of a strategic plan for the municipal solid waste management that enables annually monitoring and evaluation of the system.

2.6. Summary of the Chapter

This chapter has described that many obstacles faced by the municipalities on solid waste management, especially in developing countries, mainly due to the increasing of waste generation, the limited municipal budget, low enforcement and lack of understanding and awareness from the related stakeholders. An integrated solid waste management (ISWM) requires consideration of environmental, socio-cultural, financial, technical, institutional and legal aspects. To optimize the solid waste management and to reduce the amount of waste dumped to final disposal sites, 3R approach is developed in many countries. Community-Based Solid Waste Management (CBSWM) is one type of community-based organizations (CBOs) that applied 3R concept, especially in areas that do not get official waste services. According to Pasang et al. (2007), a number of CBOs and non-governmental organizations (NGOs) introduce the reduce-reuse-recycle (3R) activities in Indonesia, especially under the project-based scheme. To develop the program to a much larger level, it needs a significant investment in capital and human resources. Moreover, the partnership between the local government and community-based organizations can improve the performance of CBSWM.

CHAPTER 6

Conclusion, Recommendation and Reflection

This chapter contains three subchapters, conclusion, recommendation and reflection of the research. The conclusion part will answer explicitly the research objective and research questions. While the recommendation part will give some advice offered by the author based on the lessons learned on waste management practice in Bogor City. The last part will contain the reflection on the methodology and the fieldwork process of this research.

6.1. Conclusion

Nationally Indonesian Government has a target of 100% decent access to sanitation sector by the end of 2019. However, according to Central Bureau of Statistics, the proportion of households with sustainable access in the waste sector just reached 86.73% (2014), so there is still gaps and needs efforts to meet the target. Furthermore, the central government is also targeting 20% of waste reduction at the waste source. It aims to reduce the load of waste processing in landfills. To achieve these targets 3R approach has been implemented in Bogor City at the community level and TPS3R and Waste Bank infrastructure were built by using the Central Government and Local Government funds.

Waste handling management at the waste source is in accordance with the mandate of Act No. 18 of 2008 on Waste Management, Government Regulation No. 81 of 2012 and Regulation of the Minister of Public Works No. 3 of 2013. Not only at the central government level, the changes of paradigm to manage waste from the source also being a focus of attention of the local government, like Bogor City Government. This is evidenced by the inclusion of elements of waste handling by using the 3R approach in the Local Regulation of Bogor City.

The 3R concept emphasizes the active participation of the community that is integrated with all elements and aspects of the sustainable waste management system. To better understand the concept of 3R through community-based solid waste management, the author conducted research on community-based solid waste management activities of TPS3R in the city of Bogor. This research was aimed to explore and understand the situation and performance of community-based solid waste management (CBSWM) in implementing an integrated and sustainable solid waste management in Bogor City. Furthermore, this research was expected to identify factors influence the performance of community-based solid waste management (CBSWM) in Bogor City so that it can

contribute to integrated and sustainable solid waste management. The results of this research are based on qualitative approach including literature review, interview with stakeholders and field observation of case study on solid waste management practice in Bogor City.

By looking at the implementation of the 3R concept through composting and recycling of inorganic waste practices currently in Bogor City, it can be concluded that the actual mechanism of the 3R in Bogor City has been run. A lot of potentials that can be developed, as well some of the obstacles that must be anticipated, so the implementation of the 3R is appointed as a strategy at the city level, not just being an unplanned or unintegrated process to the system of municipal solid waste management.

As illustrated in Figure 3.1, the performance of TPS3R as part of CBSWM influence and contribute to the performance of solid waste management in Bogor City. The smaller the residual volume of waste dumped from TPS3R to landfills, the more optimal the performance and waste management service of Cleanliness and Landscaping Department. This shows that the community has a major contribution to ease the burden on the government and to support the achievement of universal access target in solid waste sector.

From the fieldwork found that many factors affect the successful of community-based solid waste management through TPS3R programs. This is known after analyzing the five aspects on the waste management system (legal aspect, technical aspect, financial aspect, institutional aspect, and participation aspect). Those factors are:

- The availability of clear regulations that support the implementation of community-based waste management
- Active participation of the community to pay monthly fees and doing waste sorting at home
- The financial support from the local government to finance the operations and maintenance activities of TPS3R
- The characters of TPS3R leaders and managers and their innovation in addressing the challenges in the operational of TPS3R
- The availability of markets for products resulting from the waste processing in TPS3R (compost, liquid fertilizer, recycled inorganic waste)
- The selection of waste processing technology should match the capacities and desires of the community
- The involvement of local officials in the socialization process, education and the collection of monthly fees of citizens
- Community preparation and institution management formation at the planning stage or pre-construction stage, etc.

These various factors are influencing each other and determining the performance of solid waste management. The author create a causal diagram to illustrate the relationships among factors as shown in Figure 6.1 below.

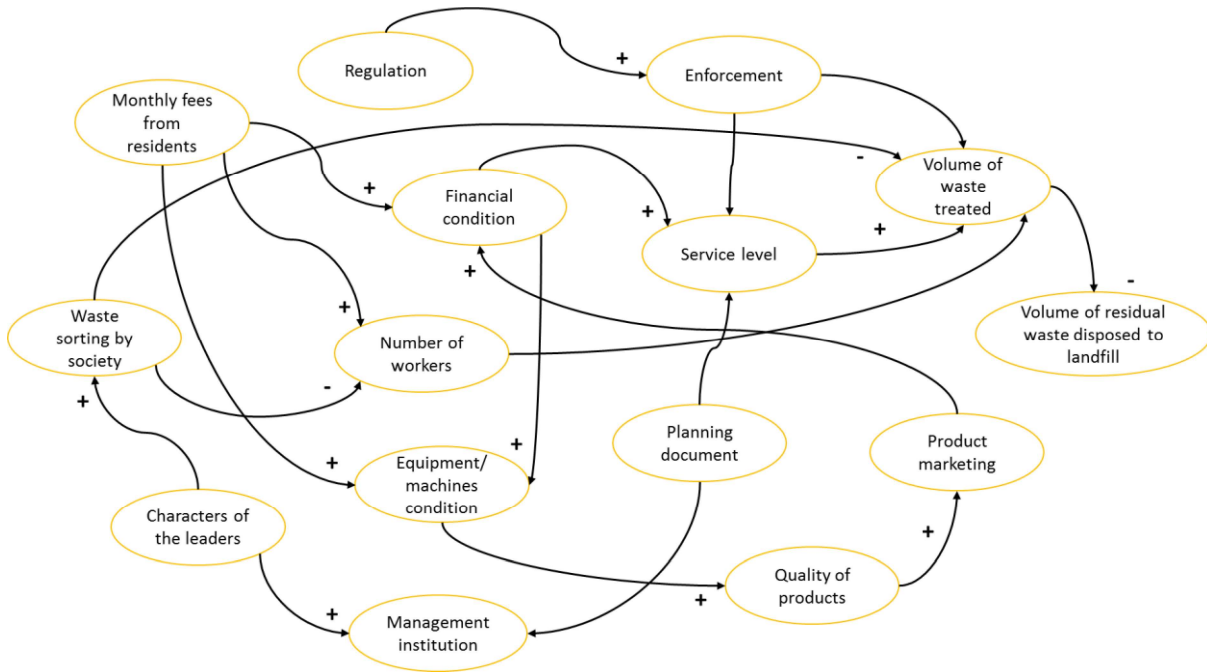


Figure 6-1 Causal Diagram of Contributing Factors in Solid Waste Management System

Based on observations in the implementation of the 3R in waste management system of Bogor City, common issues and challenges identified as follows:

- a. Waste sorting at source has not run optimally so that the collection system and the transport system were not operates as the guideline of waste management techniques with 3R principles. That will reduce the efficiency of waste handling in TPS3R.
- b. In accordance with the minimum service standards for waste management sector, the waste reduction target of Cleanliness and Landscaping Department of Bogor City is 20% of municipal waste generation. While based on the evaluation results by the end of 2015, it is known that from 12 locations of TPS3R existing only able to handle 3.17% of total waste generation. So that there is still a big gap to achieve the target.
- c. The TPS3R income has not been able to cover the operational and maintenance costs so that TPS3R facilities still rely on financial support from the local government.
- d. The marketing of waste processing products from TPS3R still limited.
- e. The limitations of waste conveyance/transportation that is hindering the increase of service coverage.
- f. The handover process of assets/infrastructure from the central government to local government was not finished yet.
- g. Many of TPS3R managers have other duties outside of TPS3R so that might be neglecting of their duties in the management, etc.

From the fieldwork can be identified the main stakeholders who has an important role in community-based solid waste management practices in the Bogor City, they are

central government, local government, community group or managers of TPS3R, local society or users, informal sector and local officials. The role of each stakeholder are:

- a. **Central government**, which in this case is the Directorate of Environment Sanitation Development at the Ministry of Public Works and Housing has the role of establish policies and regulations related to waste management, provide guidance on the implementation of waste management, provide an initial investment in the construction of the landfill and TPS3R facility, provide capacity building for local government, etc.
- b. **Local government**, the agency who has a responsibility in waste management sector at Bogor City is the Department of Cleanliness and Landscaping. The main task of this institution develops the waste management system and waste processing in Bogor City, provide local regulations to support the implementation of waste management, provide land, accompaniment of institution management, operational and maintenance costs. In addition, local government was also responsible for building, develop and replicate waste processing facilities, monitoring, and evaluation of the implementation of waste management, assist and provide training for waste managers, and improve community awareness through socialization and public campaign.
- c. **Community groups/CBOs/TPS3R management group**, has a role in the implementation of solid waste management at the community level, transmit 3R lifestyle to the society and raise their awareness, and become the initiator, leader, a motivator in the implementation of waste management at community level. The leader or manager of TPS3R has a crucial role in the continuity of TPS3R. Their passion and fighting spirit strongly influence the process and the people around them. It can be concluded that they are the milestones in community-based solid waste management.
- d. **Society or users** contributed to reducing waste in their daily activities, implements the 3R concept and actively participate in waste management by waste separating at home, paying trash fees, etc.
- e. **The informal sector**, such as waste vendors, waste collectors, and shanties. They are supporting the development of waste management by being a partner in the waste business development and provide a market for the products resulting from the TPS3R.
- f. **Local officials**, which supports the local government and TPS3R managers in the implementation of community-based waste management by collect the resident's fees and raise the society awareness and enforcement of waste management at local level.

After seeing the challenges and constraints as well as the stakeholders involved in the community-based solid waste management (CBSWM) of Bogor City, there are some strategies that have been applied by the TPS3R managers to overcome the challenges and maintain the sustainability of TPS3R. The strategy that has been taken by the managers of TPS3R vary for each location because the capacity and the challenges

they face are also different. Based on subchapter 4.3 we can see some of the strategies such as:

- a. Using local officials to collect monthly fees
- b. Dividing the schedule of waste collection into some areas because of the limited of waste transportation
- c. Using cross-subsidy system so that the weak economic residents could still served
- d. Providing rewards for residents who do the waste sorting at their home
- e. Proceeds from organic waste sales gives directly to the workers as their extra income

In general, if we look at the waste management practice in Bogor City, several things are conducted by the related stakeholders to improve the performance of CBSWM so that contribute to integrated and sustainable solid waste management system such as:

- a. Performing the integration of TPS3R with Waste Bank to increase the waste service level and improve the TPS3R performance.
- b. Utilization of Corporate Social Responsibility programs for private companies to address the financial constraints in solid waste management practice.
- c. Improve the community participation and empowerment to raise their awareness through socialization, public campaign, education, etc.
- d. Strengthening the institutional capacity of local government and the TPS3R manager.
- e. Undertake the monitoring and evaluation regularly by the central and local government.
- f. Replication of best practice of TPS3R through local budget or other funding sources.

6.2. Recommendation

From the above findings, the author offered some recommendations in order to improve the performance of community-based solid waste management. They are divided according to waste system aspects: legal, technical, institutional, financial and social aspect. Some of them are already applied in Bogor City waste management system but not optimally yet.

1. Legal aspect:
 - Socialize the regulations and penalties related waste management to the public and other actors.
 - Strengthen the law enforcement.
 - Updating and improving the quality of planning documents.
2. Technical aspect:
 - The choice of TPS3R location should be done strictly namely in prone to sanitation locations in urban areas. Before the construction of TPS3R infrastructure should also be ensured of community readiness and the availability of the TPS3R managers.
 - To support the waste sorting from the source, the local government should increase the amount of disaggregated garbage container and also followed by

the provision of waste conveyance/transportation that accommodate it, such as disaggregated trash cart/trash motor/garbage truck.

- Developing the service area and optimizing the performance of waste processing in each location of TPS3R. This can be done by optimizing the process of organic waste composting and compacting or recycling of inorganic waste.
 - Maximizing organic waste processing technology that has been implemented, namely windrow composting and anaerobic digester. In addition, it should also be developed variations or other alternatives of composting methods, such as rotary kiln composting, aerated static pile system, and vessel system. But of course, this should still consider the capabilities and conditions of the TPS3R.
3. Institutional aspect
- Increased the institutional capacity through training, comparative study, and positioning a person according to their expertise (put the right person in the right place).
 - Other cities/districts can learn from Bogor City in implementing community-based solid waste management, especially in terms of funding support from local governments and collaborate with various actors, both from internal and external parties.
 - Create TPS3R learning communities, where TPS3R managers can share their experiences and learn from best practices, not only sub-district to sub-district learning but also city to city.
4. Financial aspect
- To expand the marketing of products resulting from inorganic waste processing, local authorities can facilitate cooperation with recycling companies and companies which produce household waste such as food products, electronics, and other household needs. They can be drawn to buy the waste from their products as a form of corporate responsibility.
 - Increase the proportion of annual local budgets for the waste sector.
 - Cooperation between Government, Private and Public.
5. Participation and social aspect
- The local government should assist in the establishment of the management group of TPS3R and provide initial operational funds. Furthermore, requires early participation of local society and the CBOs.
 - The public campaigns in line with provision of adequate facilities to increase the awareness on the importance of waste separation at home.
 - Promote composting and recycling activities at the household level so that the society are trained to be more concerned with the waste they generate and also it will increase their active participation in reducing waste that processed in TPS3R and landfill.
 - Imposing reward and punishment in solid waste management practice to improve the performance of related actors.

Moreover, several innovations which is conducted by Bogor City Government can be learned and followed by other districts/cities in Indonesia in order to develop community-based solid waste management and optimize the performance of TPS3R. They are:

- Establish the Association of TPS3R / 3R centres as a forum gathering for the leaders of TPS3R.
- Establish central cooperative of solid waste to support the marketing of TPS3R products such as compost and inorganic waste.
- Use social media to communicate and promote the waste management activities and important issues
- Look for and educate cadres who has a fighting spirit and champion spirit to potentially be candidates for a TPS3R manager in their region.

6.3. Reflection of the Research

The primary data sources of this research are interviews and field observations were conducted in four locations of TPS3R in Bogor City. From a number of interviewees planned, the author has not been able to meet directly with the informal sector such as waste collector or shanties were also involved in the sale of inorganic waste products. But then the author tried to interview members of central cooperative of solid waste in Bogor City. This organization was founded to help the managers of TPS3R selling their products resulting from the waste processing. So the author still get an overview of the process and challenges in the process of recycling inorganic waste. In addition, because of time constraints, the author is only able to visit four locations of TPS3R from a total of 24 locations of community-based TPS3R operating in late 2016. To get more detailed picture the roles of TPS3R in reducing residual waste that will be processed in landfills, will be better if the number of locations that are observed increase so that the data obtained will be more representative.

In addition, in analysing the results of the study, the author find that the initial framework and list of contributing factors are still not able to dig deeper the level of functioning and success of TPS3R. Because a lot of factors that are not really technical things and cannot be measured with numbers but greatly affect the potential of the sustainability of TPS3R. In addition, it is also due to the absence of the same standard or uniform criteria among the respective stakeholders related to the level of success of a community-based program. But by using 5 waste system aspects and indicators designed, the author has been able to explain the condition of community-based waste management in the city of Bogor and the challenges. Finally still needs further research which more comprehensive and detailed, such as cost benefit analysis and life cycle assessment of the implementation and sustainability of the TPS3R program. This also aims to find out how effective the role of TPS3R reducing waste to landfill.

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Appendices

Appendix A Semi-structured Interview Questions

Interview questions:

1. For Ministry of Public Works and Housing
 - a. Name of organisation and department
 - b. Position and role in the organisation
 - c. What are the roles and responsibilities of your department?
 - d. What do you think about solid waste management condition in Indonesia nowadays?
 - e. What problems and challenges faced in solid waste management in Indonesia?
 - f. What are the current policies and regulations to address the issues of solid waste management in Indonesia?
 - g. Are those policies and regulations sufficient or effective enough?
 - h. What strategies do central government use to solve the problems and challenges faced in solid waste management in Indonesia?
 - i. What do you think about involving community-based organisation in solid waste management?
 - j. How do you determine or categorize a community-based organisation success or not in solid waste management?
 - k. What factors that determine the successful of community-based organisation in solid waste management?
 - l. Do you think it is important to enhance CBOs activities in solid waste management in Indonesia? If yes, why and how can it be improved? If no, why?
 - m. What do you think about solid waste management condition in Bogor City at recent years?
2. For Bogor Municipality
 - a. Name of organisation and department
 - b. Position and role in the organisation
 - c. What are the roles and responsibilities of your department?
 - d. What do you think about solid waste management condition in Bogor City nowadays? (the service coverage percentage and areas)
 - e. What problems and challenges faced in solid waste management in Bogor City?
 - f. Is there any local regulations to address the issues of solid waste management in Bogor City?
 - g. Are those regulations sufficient or effective enough?

- h. Can you explain how the solid waste management system In Bogor City is being organised? (the waste collection and disposal methods, location, distance and who is responsible for the process/ who does what)
 - i. Do you have enough resources in managing solid waste in Bogor City? (personnel, fund, legal aspect, infrastructure, equipment)
 - j. What do you think about involving community-based organisation in solid waste management?
 - k. How do you determine or categorize a community-based organisation success or not in solid waste management?
 - l. What factors determine the successful of community-based organisation in solid waste management?
 - m. What strategies and resources do local government use to support the community-based solid waste management (CBSWM) in Bogor City?
 - n. Did you made agreements with the community-based organisation and other related actors and mentioning the responsibilities of each actors on that agreement?
 - o. Did you found any challenges working with communities in managing solid waste in Bogor City?
 - p. Whether there are other important actors that play an important role in solid waste management in Bogor City, especially related to the community-based organisation?
 - q. Do you think it is important to enhance CBOs activities in solid waste management in Bogor City? If yes, why and how can it be improved? If no, why?
 - r. Did you have monitoring plan and system to ensure the enforcement of solid waste management in Bogor City? How do you do that? And how is the result so far?
 - s. What is your expectations related to the future solid waste management in Bogor City?
3. For Community-Based Solid Waste Management (TPS3R leader and members)
- a. Name of organisation
 - b. Position and role in the organisation
 - c. How this organization formed and started? How is the organizational structure?
 - d. What do you think about solid waste management condition in Bogor City nowadays?
 - e. Can you explain how your organisation manage and reduce the solid waste in your neighbourhood?
 - f. How many clients do you serve? How much the user charges? How are they decided?
 - g. Can you describe an overview of expenses incurred in your waste management services? What are the major expenses?

- h. Where the source of the organization's operational funding is obtained? Did the community take part and pay for the operational and maintenance?
 - i. Did the local government gives subsidies every month?
 - j. Do you work together with other actors? Who are they? Do you know what are their roles and responsibilities?
 - k. How is the relationship with other actors? What kind of support do they offer? (municipality, community, private sector)
 - l. What problems and challenges that faced by your organisation?
 - m. How do you determine whether your community-based organisation success or not in solid waste management?
 - n. Do you think the local government already provides sufficient resources to support the CBO? If not, what should be done by the local government?
 - o. What is your level of dependence on the other actors in terms of resources? Will you still depend on their resources forever?
 - p. Do you think it is important to enhance CBOs activities in solid waste management in Bogor City? If yes, why and how can it be improved? If no, why?
 - q. What is your expectations related to the future solid waste management in Bogor City?
 - r. Is there anything that you feel I have missed that you consider important towards the topic?
4. For Private sector or informal sector
- a. Name of your company and your roles?
 - b. Can you explain how your company take part in solid waste management in Bogor City?
 - c. What is your business model?
 - d. Who are your customers?
 - e. Do you know any policy or regulation for solid waste management?
 - f. Do you think those current policy or regulations are favourable to you?
 - g. Can you explain the relationship between you and the community and the municipality?
 - h. Did you face any problems or challenges during your daily activities?
 - i. Do you think the presence of CBOs can support your business?
 - j. What is your expectations related to the future solid waste management in Bogor City?
 - k. Is there anything that you feel I have missed that you consider important towards the topic?
5. For Society or Users
- a. Who is the main service provider for solid waste management in this area?
 - b. Who does your solid waste collection?
 - c. What is the quality of solid waste management services in this area?
 - d. Are you satisfied with the services offered to you currently? Why?

- e. How much do you pay for solid waste services?
- f. Has the municipality ever participated/consulted you in relation to waste management? How?
- g. What do you think about involving community-based organisation in solid waste management?
- h. Did you are involved or participated by the CBO in managing solid waste in your neighbourhood? How?
- i. Do you recommend or prefer CBOs manage the solid waste in your neighbourhood? Why?
- j. Do you think it is important to enhance CBOs activities in solid waste management in Bogor City? If yes, why and how can it be improved? If no, why?
- k. What is your expectations related to the future solid waste management in Bogor City?
- l. Is there anything that you feel I have missed that you consider important towards the topic?

Appendix B List of Interviewees

| Categories | Identified Stakeholders | Number of Interviewees |
|------------------------------------|--|------------------------|
| Central Government | Ministry of Public Works and Housing (Directorate of Environmental Sanitation Development) | 3 |
| Local Government | Department of Sanitation of Bogor City Municipality | 2 |
| Community Based Organisations | Waste Bank & TPS 3R Ranggamekar, Sub-district of South Bogor | 4 |
| | TPS 3R & Waste Bank Cipaku, Sub-district of South Bogor | 3 |
| | TPS 3R Griya Katulampa, Sub-district of East Bogor | 3 |
| | TPS 3R & Waste Bank Kencana, Sub-district of Tanah Sareal | 3 |
| Local Society | Serve by Waste Bank & TPS 3R Ranggamekar, Sub-district of South Bogor | 2 |
| | Serve by TPS 3R & Waste Bank Cipaku, Sub-district of South Bogor | 2 |
| | Serve by TPS 3R Griya Katulampa, Sub-district of East Bogor | 2 |
| | Serve by TPS 3R & Waste Bank Kencana, Sub-district of Tanah Sareal | 2 |
| Central cooperative of solid waste | Members of solid waste central cooperative of Bogor City | 1 |
| TPS3R association | Members of TPS3R association of Bogor City | 1 |
| Total | | 28 |

Appendix C Documentations

TPS3R facilities and infrastructure



Separated inorganic waste



Classification of inorganic waste



Compacted plastic waste



Residual waste



Trash motor



Liquid fertilizer products



Waste bank roved around the village



Waste education to students in TPS3R



Socialization process to society

