# *Evaluation for The Implementation of New Presidential-Regulation on Solid Waste Management In Jakarta, Indonesia*

Final Version

29 August 2019

**Pradhita Audi**

**(S2135760)**

Project Supervisors:

Dr. V.I Daskalova

Dr. Laura Franco – Garcia

**MASTER OF ENVIRONMENTAL AND ENERGY MANAGEMENT PROGRAM**

**UNIVERSITY OF TWENTE**

**ACADEMIC YEAR 2018/2019**

## Acknowledgement

I praise and thankful for God to give me a chance and opportunity of a lifetime to pursue a study in The Netherlands and finish the master thesis.

I want to express thanks to my supervisor, Dr Victoria Daskalova, for the patience, dedication, and excellent assistance throughout the duration of the research thesis. I was able to expand my knowledge of various aspects of law, circular economy, and sustainability. Also, through her, I could build my skills, especially for writing, that I will benefit significantly as a result. I want to express a lot of thanks as well to Dr Laura Franco-Garcia for her constructive feedback and help for the thesis period. Additional thanks for Rinske and Marjan, the course coordinators of the Master of Environmental and Energy (MEEM) Programme, for their hospitality and kindness during the one year study period in the Netherlands. Without their countless assists in the study program, I will be lost and confused about some issues. The experience and depth of work through this research, I will forever cherish and one of which sure to be great assistance of life and career path.

I would extend my thanks to people that agreed to have an interview with me. A huge thanks to my parents for their endless support, sacrifice, and love of which without, I would never leave Indonesia and study in The Netherlands. My brother for the continuous cheer during my study period. Also my Indonesian best friends (Afi, Amoy, and Acha) for their endless supports in the thesis period, MEEM friends, (Shraddha, Sarah, Zhao, Veronica, Sharette, Tilla, Avadhoot and all classmates), and the Indonesian family in Leeuwarden (Saniar, Gendis, Ferdinan,Sasa,Nisa Mbak Silvi, Mas Andra and Mas Hengky) who gave me help and support during the study period and thesis.

**Pradhita Audi**


(Front page image credited to Elisabeth Zavoli and retrieved from https://www.sierraclub.org/sierra/2019-4-july-august/photo/what-its-living-landfill)

## ABSTRACT

The background for this research is the ineffective solid waste management in Jakarta, Indonesia. Their solid waste management (SWM) relies heavily on the Bantar Gebang Landfill as the final disposal. Finally, Indonesia developed a regulatory plan (Presidential Regulation No. 97/2017) in 2017 to shift the current waste management to become more circular by deploying the Circular Economy (CE) principles. These principles are applied to metropolitan and small cities in Indonesia. However, Jakarta is not seen making significant progress in its reduction for solid waste. Hence, this research aims to make recommendations on improving the implementation of the presidential regulation by evaluating from the regulatory perspective. The data collection of this study consists of two types: primary and secondary data.

The primary data of this research was derived from field research, e.g., several interviews with stakeholders related to the implementation of presidential regulation. The secondary data was used to support the primary data obtained from the preliminary regulatory research, the theory of circular economy principles and related framework, the theory of regulatory effectiveness of SWM situation in Jakarta, and any media sources. This study applies the evaluative research approach by carrying an evaluation of the implementation of the presidential regulation with benchmarks developed on the basis of the literature review. Afterwards, recommendations are made based on the evaluations.



Keywords: Circular Economy, Environmental Policy, Policy Implementation, Regulatory Evaluation, Solid Waste Management

# Table of Contents

## List of Figures



## List of Tables

## List of Abbreviations

| | |
|---|---|
| 3R | : Reduce, Reuse, and Recycle |
| CE | : Circular Economy |
| CIT | : Contextual Interaction Theory |
| CSR | : Corporate Social Responsibility |
| EPR | : Extended Producers Responsibility |
| EU | : European Union |
| GDPR | : General Data Protection Regulation |
| IdDKP | : Indonesia Diet Kantong Plastic |
| ISWM | : Integrated Sustainable Waste Management |
| JAKSTRADA | : Regional Policy and Strategy |
| JAKSTRANAS | : National Policy and Strategy |
| MoE | : Ministry of Environment |
| NGO | : Non-Governmental Organizations |
| OECD | : Organisation for Economic Co-operation and Development |
| SWM | : Solid Waste Management |
| SSWM | : Sustainable Solid Waste Management |
| TJSL | : Tanggung Jawab Sosial dan Lingkungan |

WTE : Waste to Energy

## List of Appendix

# Chapter 1: Introduction

This chapter provides an overview of the thesis project, what kind of information in each chapter, and the purpose behind this research.

## 1.1 Background of the study

Solid waste management (SWM) is a major environmental issue in the metropolitan cities of developing and developed countries worldwide. Indonesia itself has faced many complex issues with SWM during the past decades, where the appropriate system to process the waste is lacking in particular within metropolitan cities, including Jakarta. Jakarta produces more than 190,000 tons of organic waste per day, which presents the most significant fraction in urban waste composition (Mann, 2019).

Despite the ample number of regulations and management systems, SWM issues in Indonesia has not been solved (Bahraini, 2018). From the total waste generated in Indonesia, 69% is disposed to landfills, and 10% is buried. Other wastes are treated via incineration, or recycled, or else unmanaged[1] (Ekawati, 2016). In other words, 120,750 tons of waste accumulates every day in Jakarta[2], and only 13,125 tons have been processed and recycled (Bahraini, 2018). Households were identified in the metropolitan cities of Indonesia who contribute the most as producing between 50-60% of the waste (Damanhuri, Handoko, & Padmi, 2014).

Waste management has been challenging in Jakarta such as the increase in urbanization, bringing a substantial amount of garbage (The World Bank, 2016) and inadequate landfills due to a shortage of vacant land (Putra, Nedi, Dipa, Arya, Kahfi, 2019). In 2017, Indonesia finally came up with another regulation plan namely Presidential Regulation No. 97/2017 for the National Policy and Strategy of SWM with

[1] Unmanaged waste is the waste that gets improper treatment, which ends up mostly landfilled in an insanitary way (Kalyani & Pandey, 2014).

[2] Meanwhile, Jakarta has an approximated population of 10,638,689 people in 2019 (World Population Review, 2019).

an adaptation of the 3R strategy, which aims to shift the current waste reduction into the Circular Economy (CE) principles. This regulation is part of the action plan toward the 2025 Clean-From-Waste-Indonesia with the main objectives: reducing waste in Indonesia by 30%, having the least 70% of the waste processed and managed to avoid landfilling. These goals are expected to meet their target in 2025 (Bahraini, 2018).

Although Presidential Regulation No. 97/2017 and 2025 Clean-From-Waste-Indonesia has enacted in Jakarta, it has not seen significant progress in reducing the solid waste in Jakarta. The lack of a cohesive policy that unifies and organizes all stakeholders together in all governmental levels reported as one of the main factors for the failure factors (Kharishar Kahfi, Dipa, Arya, Putra AW, Nedi, 2019).

## 1.2 Problem Statement

With the acceleration in the rate of urbanization, various types of pollution occurred in Indonesia, including Jakarta, thus requiring the governmental bodies from all levels to tackle environmental issues since early 1970 (Dethier, 2017). Like any other management in large cities in developing countries, SWM in Jakarta is far from an adequate system (Meidiana & Gamse, 2010). Several important factors are responsible for the inadequate system, such as insufficient financial resources, awareness, and public coordination (Pasang, Moore, & Sitorus, 2007; Purningsih, 2018).

Consequently, the Government of Indonesia comes up with a new regulation (Presidential Regulation No. 97/2017). This regulation attempts to re-design the waste management strategies by shifting the existing application into the CE principles-based implementation. The combination of the existing strategies with the possible implementation of CE to eliminate waste through various sectors in Jakarta might be a suitable plan to mitigate the problem (Purningsih, 2018). For this reason, an investigation and assessment from the new regulation are needed to find feasible alternatives, so that it will be integrated with the existing SWM in Jakarta and address its challenges.

## 1.3 Research Objective

This study aims to formulate possible recommendations to the government about the ways to improve the implementation of Presidential Regulation No. 97/2017 in Jakarta, so that it may be congruent with the CE principles. Even further, the study evaluates the new presidential regulation practices in order to answer the research question:

**"To what extent is the implementation of Presidential Regulation No. 97/2017, enabling the SWM system in Jakarta to integrate the CE principles?"**

Moreover, to evaluate and answer the main research question, the following sub-questions were used to build the knowledge needed to answer the main research question:

1. What are the CE principles required in the case of SWM?
2. What are the current challenges of SWM for Jakarta to not align with the CE principles?
3. To what extent does the new regulation address the challenges?
4. Does the presidential regulation offer alternatives which circumvent the challenges?

This study relies on primary data, such as interviews to answer the sub research questions described in Chapter 3. Also, the study uses secondary data collection to identify relevant data and information from scientific literature, official reports, and any media resources.

Firstly, Chapter 1 describes an introduction to this research, such as the current situation of SWM in Jakarta with the background study, the problem of the thesis unit, and the objective of the research. Secondly, Chapter 2 presents a literature review of the research context. This chapter identifies the fundamental concepts of thesis projects, such as solid waste management, circular economy integration into solid waste management, the regulation of solid waste management in Jakarta, and the regulatory effectiveness of solid waste management.

Thirdly, Chapter 3 presents the research framework, the boundary of the thesis, the methodology to carry on this project, the types of data and information used in this research order to answer the sub-questions. After that, the following two sections present the findings, trying to provide answers to the research sub-questions. Chapter 4 is dedicated to discussing the sub-question 1 and 2, while Chapter 5 provides the depth analysis to the sub-question 3. Finally, Chapter 6 highlights some of the analyses used in order to elaborate on the recommendations for SWM in Jakarta.

# Chapter 2: Literature Review

It is first necessary to analyze the current context and theories related. For that reason, section 2.1 introduces the system of SWM. Following that, section 2.2 presents the Circular Economy (CE) integration in Solid Waste Management (SWM). Firstly, it was useful to know what is the meaning of CE. Starting with an overview of the SWM, then it continues with the CE integration with the waste management system with ISWM (Integrated Sustainable Waste Management) framework. This conceptual framework is crucial to identify how the concept works within its integration for SWM. Therefore, this research could evaluate how far the regulation can achieve the CE objectives during its implementation.

After that, section 2.3 introduces the regulation of SWM in Jakarta and the strategy from Presidential Regulation No. 97/2017 (this is called JAKSTRANAS for the national plan and JAKSTRADA for the regional plan). Lastly, section 2.4 discusses the theory of regulatory effectiveness as a background theory to be applied in answering sub-question 3.

## 2.1 Solid Waste Management

This section describes SWM, the challenges posed in the developing countries, and afterwards, the theory of sustainable SWM (SSWM).

In general, waste management deals better through a flexible system approach (Europe, 1991). Incorporating a viable system of SWM into a societal context involves an integrated strategy for the waste management hierarchical structure (McDougall, White, Franke, & Hindle, 2001).

Solid waste itself is defined as any non-liquid or gaseous waste material. It consists of agricultural and industrial waste, hazardous waste, waste from the area of institutional, residential, and commercial as well as municipal waste (Goel, 2017). In the case of a metropolitan city (such as Jakarta), solid waste usually comes from household and hazardous wastages. SWM is essential due to the concern for the direct effect of the improper management of public health and environmental pollution (Goel, 2017).

### 2.1.1 The Challenges of Solid Waste Management in the Developing Countries

In developing countries, SWM is particularly a challenge for the majority of governmental bodies in developing countries (Guerrero, Maas, & Hogland, 2013). Many factors affecting the various stages of waste management demands the connection of many actors to enable the whole system to work effectively (Lohri, Camenzind, & Zurbrügg, 2014).

Financial sustainability in SWM remains critical in the metropolitan cities of developing countries (Lohri et al., 2014). The challenges are notably credited to the increasing waste generation, which leads to a burden on the financial budget for the municipality (Lohri et al., 2014). Additionally, municipalities often face imbalances between income and expenditure. These financial imbalances include the exorbitant price for waste processing facilities, the increasing price for the transportation, disposal choices, and value of land close to the city center that causes a growing distance to disposal sites (Van De Klundert & Anschütz, 2001). Wilson et al. (2013) noted that financial sustainability is essential to the formal system and strategies to remain affordable and have an effective cost for SWM (Wilson, Velis, & Rodic, 2013).

Additional factors from the managerial aspect also count, i.e., the lack of organizational capacity and complexity of problems to handle their SWM system (Permana, Towolioe, Aziz, & Ho, 2015). Furthermore, from the technical aspects, factors like inadequate technologies and infrastructure, insufficient roads and vehicles, and poor existing data, affect SWM in developing countries and lead to poor management of the whole system (Guerrero et al., 2013).

The municipality is also unlikely to have good cooperation with the citizens, with the negative behaviours (e.g., illegal dumping, misuse of waste containers, and resistance against waste service charges) happen (Van De Klundert & Anschütz, 2001). They are also likely to have issues with private enterprises and often get bribed by those corporations. Many formal sectors are also unprepared with the monitoring system to monitor the activities daily (Van De Klundert & Anschütz, 2001).

Another challenge is also coming from situations of the citizens for SWM. Konteh (2009) stated the relation of several issues, such as increasing urbanization, leads to socio-economic disparities. The disparity causes other problems such as the inadequate provision of sanitary and environmental amenities, social exclusion, and inequalities to existing SWM. Consequently, it affects the motivations of the citizens toward the development of SWM (Konteh, 2009). Moreover, the rapid growth of residences in some cities causes extreme commercial and residential land planning. This problem results in a challenge of infrastructures and inefficient SWM services due to insufficient institutional structures (Konteh, 2009).

The local cultural and social context also shapes the behaviour pattern of citizens and attitudes for SWM in developing countries. Public awareness and attitude impact the whole success or failure indicator of an SWM system from storage in a household and the waste separation system to the interest to reduce the generation of waste (Shekdar, 2009). For instance, in West Asia or Latin America, opportunities to strengthen waste regulations may be limited due to the culture in these respective areas as having SWM jobs is not respectable in their society (Marshall & Farahbakhsh, 2013). The cultural context affects the willingness to pay for SWM service, the demand for collection services, and recycling. The crucial issue about SWM is that the system could not perform to its maximum capacity or be adequately maintained without public cooperation (Shekdar, 2009).

In short, standard SWM practices in developing countries is insufficient based on the said challenges and complexity. The inadequateness also possibly applies to Indonesia and its metropolitan cities. Hence, transitioning the system into the sustainable and circular one will be difficult and require a good strategy.

### 2.1.2 Sustainable Solid Waste Management

The observations for the challenge of SWM in developing countries signify the necessity to have a sustainable SWM. Sustainable solid waste management (SSWM) should not only be highly prioritized, but also beyond the technical aspects of SWM and integrate several critical factors for sustainability (Zurbrügg, Gfrerer, Ashadi, Brenner, & Küper, 2012).

SSWM is focused on the optimum usage from some products that are resulting in a minimum of waste generation (C40 Climate Leadership, 2015). Two preferred practices in SSWM and the waste hierarchy (Figure 1: based on Lansink model (1979)) are the waste reduction and waste separation (Permana et al., 2015). These two elements influence the result of the overall process of SWM. It is also emphasizing the necessity of society to shift the way they produce and consume in order to reutilize materials post-consumption that can become the waste. As a result, the elements introduce to the disposal system and disposal of the material, are the least management options (C40 Climate Leadership, 2015).

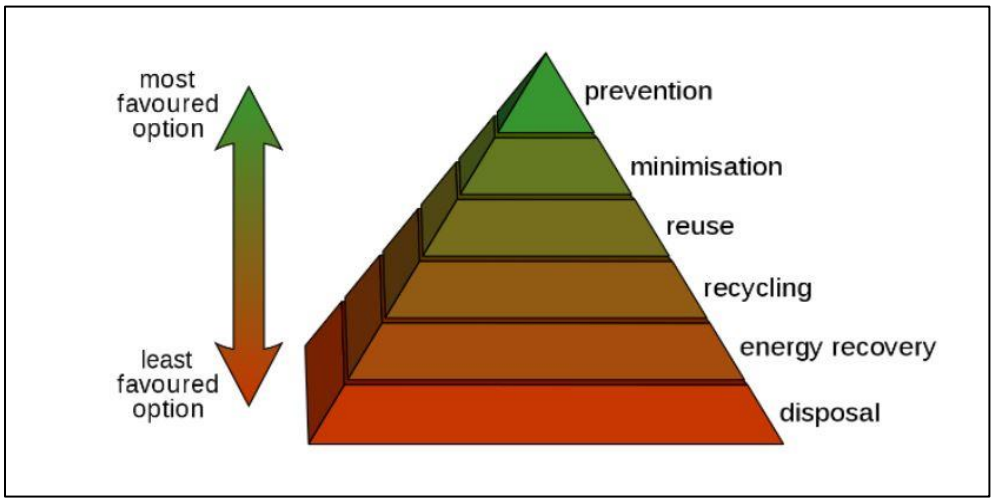


**FIGURE 1. THE WASTE HIERARCHY** (C40 Climate Leadership, 2015; Lansink, 1979)

SSWM-practices involve strategic, tactical and operational decision-making, with selection of waste treatment sites and landfills (G. Wang, Qin, Li, & Chen, 2009), capacity expansion strategies for allocating transformation facilities and landfills (He, Huang, Zeng, & Lu, 2009), zoning of service (Mourão, Nunes, & Prins, 2009), and the need for days of collection in each zone (Mourão et al., 2009).

SSWM also affects the social and economic sectors. The cities can account for advantages from the excellent management of SSWM. For instance, citizens can reap benefits from increasing public health conditions (with easier access to clean water and air quality) and reducing poverty (C40 Climate Leadership, 2015). Despite the

outstanding advantages, it is highly challenging for cities to achieve SSWM, as they require to have sufficient qualified staff to manage waste. Hence they need to invest in worker capacity building and involve many partners from different levels (C40 Climate Leadership, 2015).

In conclusion, with the challenges and complexities of waste management in a developing country, SWM needs to achieve the SSWM targets, not only environmental but also social and economic criteria. CE might offer the conceptual framework to achieve that SSWM. Hence, section 2.2 presented the CE integration in SWM through a concept of ISWM.

## 2.2 Circular Economy Integration into Solid Waste Management

The concept of CE defined as an industrial system designed to be either restorative or regenerative. A primary objective of CE is targeted to keep any materials or products at their best value (Ellen MacArthur Foundation, 2013), divided into two-cycle, the technical and biological (see Figure 2):

a. The technical cycle describes the stock management of finite material by recovering or substituting them for consumption. This cycle recovers and restores the technical components in the life cycle of products (Ellen MacArthur Foundation, 2013).
b. The biological cycle includes ways to close the flow for renewable materials flows through the organic material flows. That loop shows how organic nutrients can be recovered and regenerated (Ellen MacArthur Foundation, 2013).

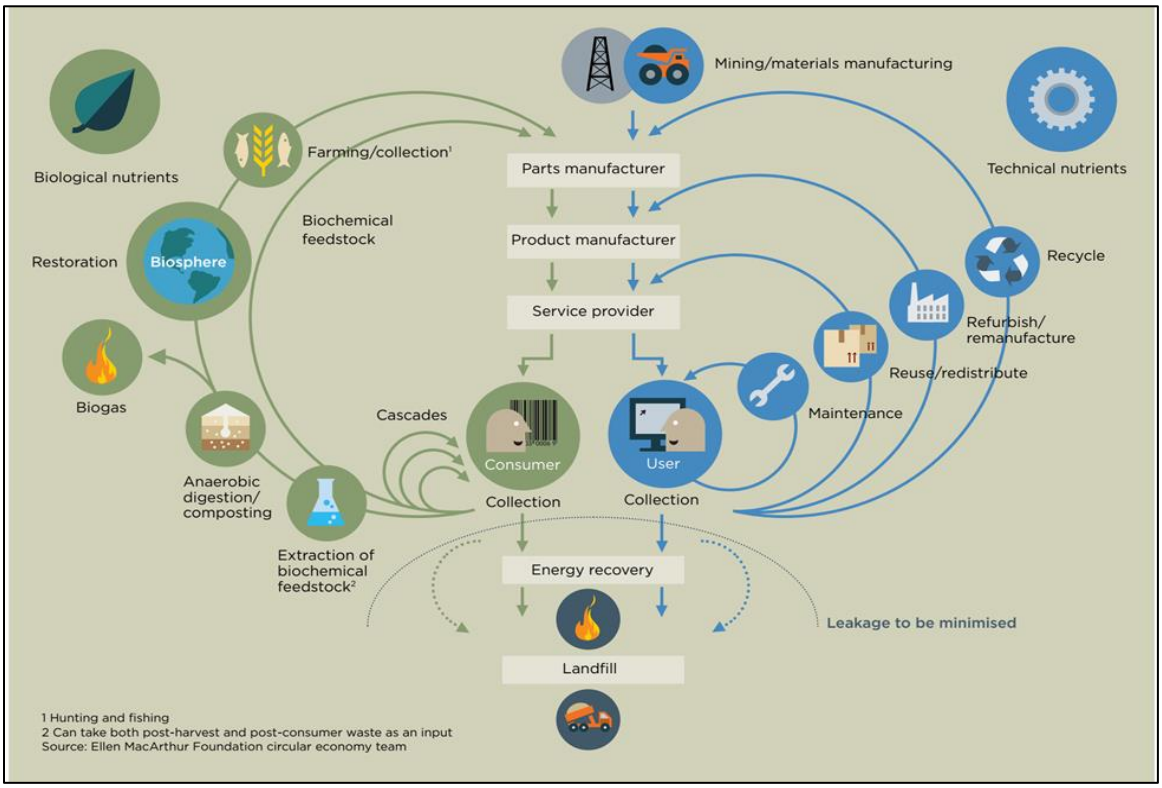


**FIGURE 2. OUTLINE OF CIRCULAR ECONOMY** (Ellen MacArthur Foundation, 2013)

In order to primarily incorporate CE and 3R initiatives in SWM, it needs an advanced approach to SWM in developing countries, allowing the concept to integrate within the system (McDougall & White, 2001; Pasang et al., 2007). Henceforth, to have an excellent sustainable system that aligns with CE principles and suitable for developing countries, the concept of ISWM is introduced by Van De Klundert & Anschütz (2001).

The concept of ISWM is a developed framework suitable for developing countries. It aims to address the issue of SWM in lower-income locations and see waste as the opportunity for revenue creation, which differs from conventional waste-management perception (Van De Klundert & Anschütz, 2001). This concept highlights the problem of waste management, from the perception, attitude, and behaviour of society towards waste. Also, from the institutional framework, socio-cultural context, managerial (in)capacities and the environment itself, rather than from insufficient available funds or adoption of technologies, which are apparent issues to the waste management development (Van De Klundert & Anschütz, 2001).

The ISWM concept implies finding suitable solutions for the Global South that are economically reasonable, technologically applicable, and socially acceptable to waste management, without degrading the environment (Van De Klundert & Anschütz, 2001). The ISWM concept includes four fundamental principles to its framework:

1. Equity: every citizen is accountable for the proper management of waste that benefits their health and environment.
2. Effectiveness: the implemented waste management system results in the safe removal of all waste.
3. Efficiency: waste management works by maximizing the use of resources and benefits while minimizing the expenditures, taking equity, effectiveness, and sustainability into account.
4. Sustainability: a waste management system is suitable for local conditions and applicable in environmental, technical, social, economic, and institutional sectors, and can preserve itself over time without exhausting resources (Van De Klundert & Anschütz, 2001).

Based on the concept of ISWM there are three dimensions for waste management (Figure 3): (1) stakeholders; (2) waste management system elements; (3) sustainability aspects (political-institutional, social, financial, economic, and technical) (Van De Klundert & Anschütz, 2001).

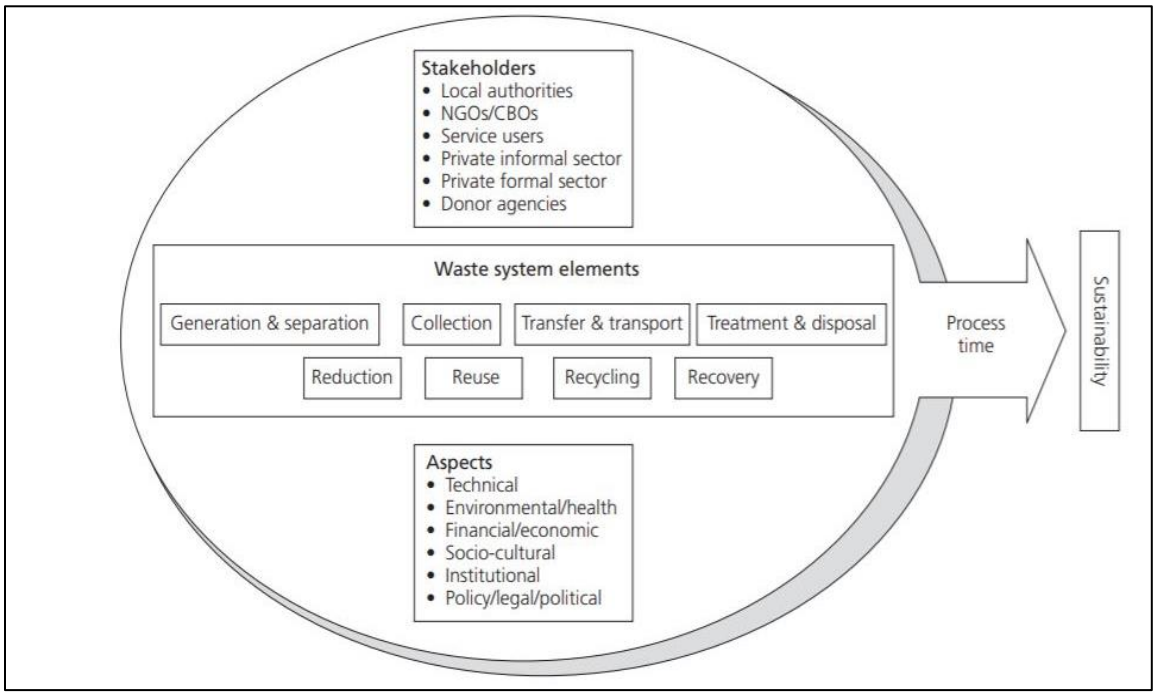


**FIGURE 3. THE ISWM MODEL: ORIGINAL VERSION** (Van De Klundert & Anschütz, 2001)

Stakeholders have various roles, interests, and responsibilities when it comes to waste management. Especially in the Global South like Indonesia, stakeholders outside the municipality participate in activities related to recycling and reuse. These could be people from the informal sector, such as waste pickers and waste buyers (Van De Klundert & Anschütz, 2001):

a. Waste pickers are people who pick waste materials from street and dumpsites.
b. Waste buyers are people who collect and buy discarded items from households, dealers, wholesalers, and recycling enterprises (Van De Klundert & Anschütz, 2001).

Formal stakeholders are the most important actor in SWM as they set the rules, policies, and provisions for an SWM system from a particular area (Guerrero et al., 2013). However, public participation is crucial to the process of recycling because this step can only really deploy its potential when citizens actively participate in the

campaigns, are aware of the issues, and have adequate information and knowledge about solid-waste recycling (Guerrero et al., 2013).

Secondly, ISWM defines waste system elements as the flows of materials from processing to the final disposal and divides the stages as 'collection,' 'transfers', 'disposal or treatment,' while it gives equal importance to reduce waste, recycling, and reuse (Van De Klundert & Anschütz, 2001). The 3R principles remain to be critical priorities for proper solid waste management with the addition of CE-based initiatives, such as closing the loop, recycling of new products and nutrients, by avoiding waste and striving for high reuse rates, and organic recovery (Wilson et al., 2013).

There are a few factors that influence waste system elements. As shown by Guerrero et al. (2013), factors like limited knowledge of waste management technologies and practices hinder the development of waste separation. Additionally, a lack of equipment for collecting sorted materials and sound decision making in environmental issues also lower the efficiency of waste separation (Guerrero et al., 2013). While for the collection and transportation, things like road planning, time, and schedule for waste bin collection, infrastructure, and organization for informal sectors influence the whole process. Treatment is mostly affected by knowledge of treatment systems, appropriate infrastructure, and the availability of local knowledge to address waste management issues (Guerrero et al., 2013).

Lastly, ISWM defines sustainability aspects. These aspects evaluate the existing waste management system, balance priorities, and create measures to give solutions to tackle the issues faced by the aspects. For instance, institutional aspects examine the political and social structures that control and implement waste management from the distribution of roles, tasks and organizational structures. Also, environmental aspects focus on public health, pollution control, and effect from waste management (Van De Klundert & Anschütz, 2001). As seen from Table 1, there are ISWM aspects and their respective investigation areas (Van De Klundert & Anschütz, 2001).

To summarize, this section provided a brief introduction to the CE theories and ISWM concepts and principles, to integrate CE to SWM. This research look at the regulation system of SWM in Jakarta in the next section.

**TABLE 1. ISWM ASPECTS & MEASURES TO EVALUATE**[3] (Van De Klundert & Anschütz, 2001)

| ISWM aspect | Areas to investigate |
|---|---|
| Technical | 1. Waste quantities, waste composition, density<br>2. Capacity of collection or treatment technology (how much waste can be collected, how many people can be served, which areas can be served with it)<br>3. Physical infrastructure (condition of roads, traffic)<br>4. Sturdiness of equipment/technology<br>5. Local availability of spare parts |
| Environmental | 6. Effects of technology on the environment<br>7. Effects of technology on opportunities for reuse and recycling<br>8. Working conditions and environmental health of waste workers |
| Financial-economic | 9. Capital and labour cost<br>10. Operation and maintenance costs compared with waste management budget<br>11. Feasibility of covering depreciation (cost of replacement) |
| Socio-cultural | 12. Average level of awareness among population<br>13. Willingness and ability to pay<br>14. Cultural attitudes towards waste and implications for waste handling, separation at source, recycling<br>15. Gender and sex roles relating to management of waste within the household |
| Institutional | 16. Skill level waste management staff<br>17. Procurement methods for imported spare parts |
| Policy/legal/political | 18. Political priorities (e.g. increase employment, reduce imports, improve environment)<br>19. Policy and regulations regarding technologies and equipment<br>20. Contracting rules; biases in contracting procedures |

## 2.3 The Regulations of Solid Waste Management in Jakarta

In order to analyze the implementation of the regulation, this study identifies the waste management regulations of Jakarta.

[3] Measures to evaluate or Areas to investigate (in the original document) are criterion in each aspects that people could use to evaluate the existing management system (Van De Klundert & Anschütz, 2001). This research uses the sustainability aspects to analyze Chapter 4 and the area of aspects as a base criterion to evaluate the regulation in Jakarta (Chapter 5).

The Indonesian government acknowledged the importance of a better environment and quality of life with adequate management of solid waste. Therefore, they enacted Act No. 18/2008 on Waste Management in 2008 (Suherman, Franco-García, Abdoellah, Kurniadie, & Hidayati, 2019). Other laws, such as Presidential Decree No. 61/1993 (Ratification of Basel Convention), Regulation No. 32/2009 (Environmental Protection and Management), and Government Regulation No. 81/2012 on Municipal Solid Waste (Bahraini, 2018), are also supported Act No. 18/2008 (Bahraini, 2018). The current laws issued to improve the SWM system are described below.

1. Act No. 18/2008 on Waste Management

This Act mandated Indonesia to have integral and comprehensive management for waste. There are three main activities in the implementation of waste reduction in this Act, based on the CE initiative and 3R principles: the reduction of waste generation, reusing, and disposal of recycling products. As mentioned in Article 4, waste management by local authorities is done through the segregation, collection, transportation, processing, and final disposing of waste (Aprilia, Tezuka, & Spaargaren, 2013).

With the implementation of Act No. 18/2008 on Waste Management, the previous policies on waste management that relied on landfill were revised into a more focused approach. The new approaches, such as reducing at source, limiting extraction of virgin materials, and recycling the resources via an application of the 3R principles (reduce, reuse, and recycle) are preferable than to landfill. Moreover, according to Act No.18/2008, all wastes generated are the responsibility of the producer who causes the waste (Lokahita, n.d.).

2. Act No 32/2009 on Environmental Protection and Management

Act No. 32/2009 regulates the management for industrial and hazardous waste (3R Regional Forum, 2016). These types of waste are managed through the same system (with 3R principles). However, to dispose of the substantial amount of hazardous waste, it needs a special permit. This mechanism controls citizens, who disregard their waste to the environment, via specific requirements, such as complying with

the standard quality for the environment and securing a license from the Minister or similar authorities (Ministry of Environment and Forestry, 2009).

3. Government Regulation No. 81/2012 on Municipal Solid Waste

This regulation was written to protect public health and environmental quality, reduce the occurrence of accidents, disasters associated with household waste and other similar waste management, and support sustainable economic development. Government Regulation No. 81/2012 is also used as a reference when formulating local regulations and plans (Lokahita, n.d.).

### 2.3.1 JAKSTRANAS and JAKSTRADA Waste as the Action Plan of Presidential Regulation No. 97/2017

As the first step of the implementation of Presidential Regulation No. 97/2017, governmental bodies on a national scale planned strategy called *Kebijakan & Strategi Nasional* or National Policy and Strategy (JAKSTRANAS), for household and other solid-waste types (MoE (Ministry of Environmental) Indonesia, 2017). The waste type that covers in this regulation is household wastages (organic and inorganic waste, not include specific wastages such as specific chemical and hazardous waste) from the commercial district and industrial sector (MoE (Ministry of Environmental) Indonesia, 2017; The Environmental Agency Banten, 2017). There are 32 institutions involved with their own assigned tasks and functions. Overall the objectives are:

- To reduce the waste volume by limiting recycling and reusing back the solid wastages with 30% in 2025 from the total volume.
- To maximize the handling of the waste treatment process (sorting, collecting, transporting, treating, and final disposal) with the target to manage at least 70% of the total existing wastages (MoE (Ministry of Environmental) Indonesia, 2017; The Environmental Agency Banten, 2017).

As an advanced plan and strategy of JAKSTRANAS, so that these targets could be reached, each city formulates *Kebijakan & Strategi Nasional* or National Policy and Strategy (JAKSTRADA), for household and other solid-waste types, from the

provinces across Indonesia. Formulating this strategy is done by the institutional side, which controls and monitors the environmental affairs and coordination between the governmental bodies in the provinces level. The cities plan differently for JAKSTRADA because each city has a different environment and situation (The Environmental Agency Banten, 2017).

There are several tasks assigned for the institutional sector, such as:

- Preparing the procedures and criteria in the reduction of solid waste
- Strengthening the coordination in the central and regional government
- Strengthening the capacity building as well as the commitment of executive and legislative institution
- Budget provisioning
- Creating a solid information system
- Strengthening public participation through the transfer knowledge (The Environmental Agency Banten, 2017)

The overall programs that should be implemented daily are described in Table 2. These plans are based on the other province (Banten) as Jakarta has not released its JAKSTRADA. This table consists of the 3R programs, the facilities to support plans that should be provided, and the stakeholders who should do the tasks (The Environmental Agency Banten, 2017).

**TABLE 2. JAKSTRADA 3R PROGRAMS (THE ENVIRONMENTAL AGENCY BANTEN, 2017)**

| 3R Principle | Program | Facilities and Infrastructure | Assigned to |
|---|---|---|---|
| Reduce | Redesigning old products and packages to minimize waste | Facilities for research and development | Producers and manufacturers of the product |
| | Reducing the usage of single-use plastic bags | | Retailers |
| | Reducing the usage of single-use plastic food cutlery and plastic cup | | Producers; food and beverages seller |
| | Eco-office (environmentally friendly office system) | | Management of corporations to reduce the use of packages for products, single-use containers, plastic bags, and food cutleries |
| | Action plan to raise awareness and become more environmentally friendly for the education center and school | | School in Jakarta to reduce the use of packages for products, single-use containers, plastic bags, and food cutleries |

| | | | |
|---|---|---|---|
| Recycle | Composting on the individual scale, communal scale and district scale | The facilities are provided by individuals or helped by the governmental agency staffs or other agency staff; communal composter (on a communal scale); composter-facility for the district scale called "Rumah Kompos/ TPS3R") | Public (communities, residences, and each district in Jakarta) |
| | Biodigesting on a communal scale | Biodigester on a medium scale for communities | Public communities independently have done (led by the district manager; facilities could be provided by governmental bodies or voluntarily by the district |
| | Waste Bank Unit | Shelter unit, tools, and machines | Management is done by district area near the unit and entirely a volunteer-based act; facilities could be provided by governmental bodies or voluntarily by the district |
| | Recycling on a district scale | | Management is done by district area near the unit and entirely a volunteer-based act; |
| | Collecting waste to be recycled | | Management is done by individuals entirely a volunteer-based act; |

| | | | |
|---|---|---|---|
| | Collecting waste by informal sectors | | Management is done by informal sectors near the unit and entirely a volunteer-based act; |
| Re-use | Reusing products by individuals and communities | | Volunteer-based acts from Jakarta citizens. |

## 2.4 The Regulatory Effectiveness of Solid Waste Management

A successful SWM (practice and regulatory framework) requires not only having a detailed regulatory framework, but also a stricter legal system to prosecute the law, and sufficient requirements from other sectors (OECD, 2014). After all, good outcomes from the regulatory implementation depend more than the rules written inside the regulation. Administering and enforcing some regulations require efficient and capable regulators, as well as good governance practices and regulatory management (OECD, 2014). Therefore, it is essential to know what is regulatory effectiveness, especially for a complex system as SWM.

Policy implementation is a process that involves turning a more or less focused strategy as an input, with a systematic characteristic in its process, into several different applications as an output (Bressers, 2004). Achieving the objectives from economic, environmental, and even social policies require regulation as an analytical instrument that cannot be addressed by voluntary dispositions (OECD, 2014). Therefore, regulations should support some principles, such as serving clear goals and useful for achieving its objectives, being a sound legal framework and having an empirical basis, and being practical and straightforward for a user to have excellent performance. Moreover, it is essential for the regulation to congruous with other policies and laws (OECD, 2014).

There is a secure connection between the overall principles of proper regulations and governance as functional structures will encourage the regulators to improve the

implementation outcomes for the communities. This secure connection can lead to the efficiency of regulatory activities and boost compliance by making the administration and implementation to be more consistent and predictable (OECD, 2014).

Results from the policy implementation are not only depending on the instrument characteristics but also the actors involved in the policy processes. Mainly, the processes are related to their motivation, information, and power towards the regulation. Government and the targeted actors frequently exerted their power over each other before the implementation takes place (Bressers, 2004).

As Contextual Interaction Theory (CIT) explained, policy implementation is measured by the motivation, information, and power of the actors. Motivation works if the policy instruments contribute to the motives of the implementers and interests of the targeted actors, to what degree the applications satisfy these two. Information, because the amount and quality of available information to the member of the target groups will increase the success rate of policy implementation. The distribution of power that derives from the sources is also essential to see how far this power for the result (Bressers, 2004).

As noted by Organisation for Economic Co-operation and Development (OECD) (2014), governments especially have a broad scope for its regulatory powers, showing the complex and diverse in the needs of the economy, communities, and citizens (OECD, 2014). Two aspects of the implementation differ as to whether there is any implementation and is the process adequate for the individual policy action (Bressers, 2004).

The effectiveness of regulation mainly is not because of the mandatory rules written in it, yet it is due to the influence of the result by balancing benefits and incentives. Furthermore, a regulation also becomes operative, if there is a communication given in the implementation because it often leads to some agreement (such as covenants or voluntary agreement) and compromises being made. It is vital to pursue a more

fundamental context of the effectiveness of law instruments while also searching for new approaches for the implementation of the regulation (Bressers, 2004).

Enforcement is also crucial to ensure compliance from actors within regulation and obtain benefits from the public that are provided by the regulation. At the same time, enforcement operations may result in significant sanctions affecting corporations and NGOs (Non-Governmental Organizations), such as reputable damage to an extreme situation of company closure or loss of human livelihood (OECD, 2014).

To sum it all, to know what extent a specific regulation implements effectively to particular target groups, the effectiveness of regulation consists of two critical parts: the framework and enforcement. The frameworks need to express certain principles such as clarity in goals and effectively reach all those targets and having a sound and empirical legal basis. While in the enforcement, it needs the key characteristics influencing the process (power, motivation, and information from the related stakeholders, to implement some regulation successfully. This framework and enforcement are also what SWM regulation of Jakarta to have for the management to achieve their objectives. Besides that, it requires to not only exert the rules to the target groups but balancing it with benefits, incentives, and communication to them.

# Chapter 3: Research Design

The research design of a project describes an overall research strategy, the foundation of the methods to gather and analyze the information to answer possible research questions. This chapter discusses the activities attempted to find the answer to the research question of this project and give recommendations in the final analysis of the SWM sector within the municipality of Jakarta.

## 3.1 Research Framework

Research framework, a key component to establish the theoretical background, is a schematic representation of the research objective. The framework consists of seven steps of approaches to achieve the research objective, according to Verschuren & Dooreward (2010).

i. **Step 1: Brief Characterization of the objective of the research project**

   This research has the main objective to assess the implementation of the new presidential regulation and its SWM practices against evaluation criteria (sustainability aspects) developed in Table 1. After that, this research forms several recommendations to the government (SWM authority) in Jakarta with the regards to the improvement of this specific regulation practices.

ii. **Step 2: Declaration of the research object**

   The research object in this thesis is the implementation of the presidential regulation in the SWM of Jakarta.

iii. **Step 3: Explanation of the nature of the research perspective**

   This research involves the practice-oriented research, observing the implementation of the presidential regulation and the involved actors through all levels from the regulatory perspective to address the evaluate SWM operation in Jakarta. Therefore, to formulate several recommendations for SWM in Jakarta, this research uses an evaluative research approach. The study identifies the answers of research sub-questions (principles, challenges, and to what extent the

new regulation addresses the challenges) and evaluates the new regulation to answer the main research question.

### iv. Step 4: Description of the sources of the research perspective

This research project studies scientific literature to build a conceptual model. Theories to be used in this research are shown in the following table.

**TABLE 3.SOURCES OF THE RESEARCH PERSPECTIVE**

| Key Concepts | Theories |
|---|---|
| Integration of CE Principles in SWM | Theories on CE, ISWM |
| SSWM | Theories on SWM, SSWM |
| The effectiveness of Regulation | Theories on Regulatory Effectiveness |

### v. Step 5: Formulation a schematic interpretation of the research framework

The research framework is presented in Figure 4.

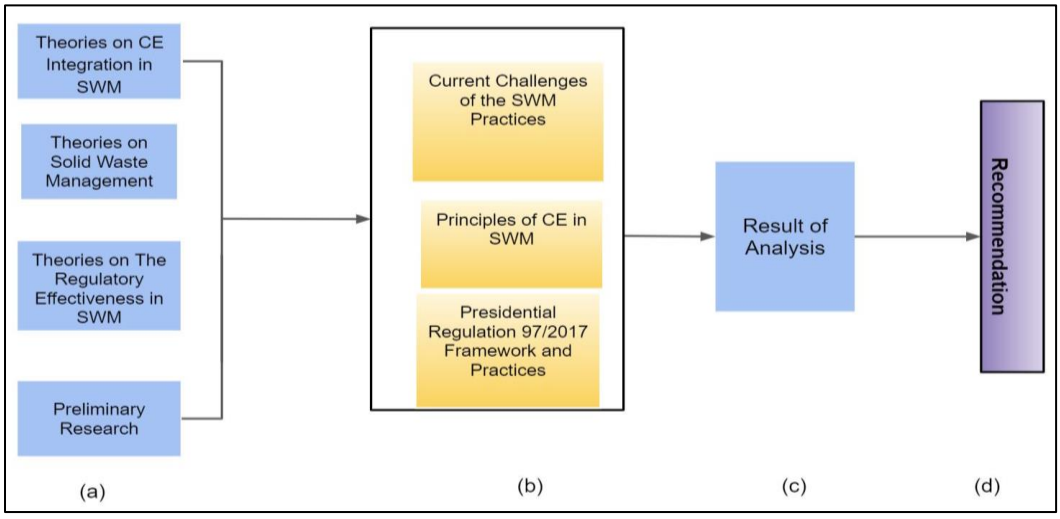


**FIGURE 4.THE SCHEMATIC REPRESENTATION OF THE RESEARCH FRAMEWORK**

**vi. Step 6: Segmentation of the research framework**

a. Firstly, the theories and information from works of literature and other sources related to SWM, CE, Regulatory Effectiveness of SWM, and Preliminary Research were studied.
b. Based on step a, the finding for the principles of CE, challenges of SWM in Jakarta, and the implementation of the new presidential regulation on SWM (based on the benchmark from sections 2.1 and 2.2), were analyzed.
c. In this step, the results were evaluated as a basis to propose several recommendations.
d. Lastly, several recommendations were suggested to improve the presidential regulation practices of SWM in Jakarta.

**vii. Step 7: Review of the developed model for any possible changes.**

## 3.2 Research Questions

- The main research question:

  **To what extent is the implementation of Presidential Regulation No. 97/2017, enabling the SWM system in Jakarta to integrate the CE principles?**

- Sub-research questions:
  1. What CE principles that require in the case of SWM?
  2. What are the current issues on the SWM for Jakarta to not align with the CE principles?
  3. To what extent does the new regulation address the challenges?
  4. Does the presidential regulation offer alternatives which circumvent the challenges?

## 3.3 Research Concepts

This chapter highlights certain concepts used for this research project.

i. Circular Economy: the concept is to have an economic system that is restorative by its design where waste does not exist in the life cycle of products. The main target is to promote the use of renewable energy, minimize waste generation and inefficiency processes, building resilience within the closed-loop cycle through all the societal sectors (Ellen MacArthur Foundation, 2013).

ii. Solid Waste: the waste that contains non-liquid material that is disposed of, as a result of products for human activities regularly. Solid Waste usually contains organic waste (i.e., food), combustibles materials like paper and wood, hazardous waste like a battery, waste from construction sites such as rubble and concrete (European Comission, 1994).

iii. Solid Waste Management: a system consists of the waste generation, storage, collection, transportation, processing, and final disposal (European Comission, 1994).

iv. Sustainable Solid Waste Management: a system in which the disposal is the least desirable option that must be avoided (C40 Climate Leadership, 2015).

v. Integrated Sustainable Waste Management: the concept developed out of the experience and suitable for developing countries, as means to assert visions of waste management that would pay attention to the sustainability, effectiveness of cost, recovering materials that could be recovered and socially acceptable while not degrading the environment (Van De Klundert & Anschütz, 2001).

vi. Regulatory effectiveness: Regulatory process has not only an excellent framework but also satisfactory outcomes from the enforcement, which relies on the relationship of regulators, good governances, and regulatory management.

vii. Contextual Interaction Theory: Theory that explains the dynamics of the interface between actors (Spratt, 2009) and identifies the cognition, power, and motivation of actors as crucial variables that influence the policy implementation (Salaj, 2018).

## 3.4 Research Strategy

The research strategy is the method for the researcher to collect and analyze relevant materials in order to get specific answers to the research question. This research uses a single-embedded case study approach (Jakarta municipality), which analyzes the implementation of Presidential Regulation No. 97/2017 in SWM of Jakarta with the evaluation method.

### 3.4.1 Research Unit

The research unit in this research was SWM of Jakarta, with the observation unit of the implementation of Presidential Regulation No. 97/2017 in Jakarta. While Jakarta functions as the case study of this research.

### 3.4.2 Research Boundary

The research boundaries are set in order to attain research within a limited period. The following boundaries that can occur during this research:

- This study only evaluated the SWM regulatory practice from the perspective of the implementation from the legal framework, the operations, and public participation. The regulatory practices were also included in the waste types stated in the regulation, (e.g., household and commercial wastes). The design for the SWM or technologies solutions were also not included either in this analysis.
- As the data on SWM and its management in the case is minimal and seldom update, this study could only utilize the data that was accessible during the research period. In this case, this research used the updated news, website articles about SWM in Jakarta, and the information derived from the interviews.

- The interviews and the information. This research only reported the information that could be gathered from the interviewed stakeholders and had to meet the objective of the research questions. While this research could conduct more interviews to have a more significant sample and precise answer for the sub-questions, only eight people were available for an interview due to the time frame and the arrangement of the meeting schedule (the people listed in section 3.5).

## 3.5 Research Material and Accessing Method

This research relies on the primary data and secondary data as a key to evaluate and answer the main and the sub-questions. Primary data obtained from the interviews conducted to the eight related stakeholders (the governmental bodies, NGOs and several citizens) in Jakarta, who understand the waste management practice and the enactment of the presidential regulation in Jakarta. The interviews followed the research ethic criteria from the University of Twente.

The interviewees are protected by the European Union (EU) General Data Protection Regulation (GDPR), The Code of Conduct for personal data used in Scientific Research. This research project firstly reviewed and approved by to Behavioural, Management and Social (BMS) Ethics Committee, as well as the supervisors of the project to conduct the interviews. The interviews were carried out in the location with one person (one informant from Waste4Change) via email. These people do not want their name to be disclaimed. With their consents, therefore, this research did not expose their name.

The following describes the interviewees, which information to be analyzed, in Chapter 4:

1. Three people from 3R Environmental Officers in Kramat Pela district from the South Jakarta Environmental Agency in the waste management division interviewed on 28.05.2019. The reason for the conduct of this interview was because their task is to execute and monitor waste management regularly. They are knowledgeable of the current situation.

2. One informant from NGO/enterprise Waste4Change, one of the well-known NGOs in the waste management for Jakarta, carried out on 01.07.2019.
3. One informant from NGO Iddkp (Indonesian Diet Kantong Plastik – *Plastic Bags Diet Indonesian,* one of NGOs in the environmental field in Jakarta that currently focuses on having the plastic ban to be regulated in every metropolitan city of Indonesia*)*, interviewed on 13.06.2019.

As for Chapter 5, the description is here as follows:

1. A citizen who has followed the zero-waste living interviewed on 16.06.2019, knowledgeable about SWM situations and practices in Jakarta, and aware of the SWM issues.
2. Three people from 3R Environmental Officers in Kramat Pela district from the South Jakarta Environmental Agency in the waste management division interviewed on 28.05.2019. The reason for the conduct of this interview was because their task is to execute and monitor waste management regularly. They are knowledgeable of the current situation.
3. Staff in the Ministry of Environment and Forestry (Department of Goods and Packaging) and knows the regulatory system of SWM in general, carried out on 21.06.2019. This interview is based on a recommendation from the informant of NGO Iddkp because he knows about the implementation of the regulation and the process.
4. One informant from NGO/enterprise Waste4Change one of the well- known NGOs in the waste management for Jakarta, carried out on 01.07.2019.
5. One informant from NGO Iddkp (Indonesian Diet Kantong Plastik – *Plastic Bags Diet Indonesian,* one of NGOs in the environmental field in Jakarta that currently focuses on having the plastic ban to be regulated in every metropolitan city of Indonesia*)*, carried out on 13.06. 2019.
6. One Waste Bank Officer (Owned by Pertukangan Community), carried out on 28.06.2019. One of the waste banks with an excellent structural and practical system in Jakarta.

The secondary data is collected from various academic literature, previously conducted study documents, newspaper articles, journals, and government reports available online related to the waste management sector of Jakarta, as support to justify the analysis of the collected data.

A brief overview of the materials and the data analysis method are described in Table 4.

**TABLE 4. OVERVIEW OF RESEARCH MATERIAL AND ACCESSING METHOD**

| Research Questions | Information Required | Research Material | Assessing Method and Outcome |
|---|---|---|---|
| What does the CE Principles that required in the case of Jakarta for them to have a better SWM? | The detail information CE principles that are suitable for the development of Municipal SWM in Jakarta | Secondary Data: Information from the scientific literature | Qualitative analysis: Information about the principle does SWM needed |
| What are the current issues on the SWM for Jakarta to not align with the CE principles? | The detailed information, regarding the challenges or issues, hindered the SWM system, and practices | Primary Data: Results of interviews (the interviewees listed above) Secondary Data: Information from scientific Newspaper and Website articles | Qualitative Analysis: Analyzing the aspects concerning the challenges of SWM, the current system, and impact from the management, to the theories from Solid Waste Management |
| To what extent the new regulation addresses the challenges? | Updated information on the current practices of the regulatory framework in the SWM sector according to the waste/performance elements | Primary Data: Results of interviews (the interviewees listed above) Secondary Data: Information from Scientific Literatures, Newspaper and Website articles | Qualitative Analysis: Reporting the evaluation for the new regulation to what extent the effectiveness of the policy and its implementation to the theories of regulatory effectiveness and the ISWM framework in section 2.2 |
| Does it offer alternatives that circumvent the challenges? | Any possible mitigation strategies to manage the challenges and current point that insufficient in the regulatory system | Primary Data: Results from the analyses Secondary Data: Information from Scientific Literatures, | Qualitative Analysis: Reporting recommendations based on the evaluation of new regulations and challenges |

## 3.6 Research Ethics

This study involves people explicitly, so the ethical sensitivities are entirely relevant to gather and analyze information. Ethical considerations with the concern to the purpose of the study and what it targets to accomplish, are relevant, as this research may affect stakeholders or inspected institutions. Since the research goal to contribute to the development of the SWM sector, all aspects of research, such as data collection, analysis, and reporting, respects and obeys the ethical research principles. The principle of ethical research includes respect for autonomy, beneficence, justice, fidelity, and non-malice (Beauchamp & Childress, 1979).

# Chapter 4: The Principles Required and Challenges of SWM in Jakarta

This chapter provides the findings and discussion of the first and second sub-questions: 'what are the required CE principles for the case of Jakarta?' & 'what are the current issues on the SWM for Jakarta to not align with the CE principles?'.

Firstly, the first sub-question is answered in the first subsection 4.1 and to answer this question, secondary data from various scientific literature and journal articles are used in the section.

## 4.1 CE Principles that Required to Reach SSWM

The CE itself is an industrial system will replace the linear consumption or concept for end-of-life and move towards renewable-energy usage or seek to eliminate waste through the higher design of products, materials, system and business model (Ellen MacArthur Foundation, 2013). This concept requires the system to follow the three fundamental principles:

- Conserve and increase natural capital by controlling end stocks and balancing the flows of renewable resources by reducing product use. Hence, the circular system will select particular resources wisely, along with the processes and technologies, when they are needed. This system also prioritizes the usage of resources that have better performance or renewable (Ellen MacArthur Foundation, 2015).
- Optimize resource yields at all times in technical and biological cycles by circulating products, components, and materials. This optimizing process means redesigning, refurbishing, and remanufacturing must be done to let the components from technical aspects and materials remain circular and contribute to the economy loop (Ellen MacArthur Foundation, 2015).
- Enhance system efficiency by identifying and designing negative externalities. The activity includes the damage reduction for the system and areas like shelter, home, health, and management for air, water, and noise pollution (Ellen MacArthur Foundation, 2015).

CE also has been considered to be a method based on the 3R principles as resource management (Ghisellini, Cialani, & Ulgiati, 2016). The principle of 3R is transverse in the CE models, as stated by Yuan et al. (2008), and applicable to all production, consumption and return cycles of resources (Yuan, Jiang, Liu, & Bi, 2008). Just like the fundamental principles of CE, these principles call for the optimization resources by increasing the recycling activity for the materials or components to be reused by redesigning and reduction of resources and energy consumption in general (Ellen MacArthur Foundation, 2015). Wang et al. (2014) even specifically emphasize the principles of CE as 3R with its characteristic is low consumption, low emission and higher in efficiency (P. Wang, Che, Fan, & Gu, 2014).

These principles could not be successful and efficient without the segregation of waste at the source (Ellen MacArthur Foundation, 2015). Without waste separation, it is impossible to know the composition of waste in a particular city, and thus, it is challenging to plan and design the right strategy for the implementation of the SWM system (Ellen MacArthur Foundation, 2015). In order to primarily enable CE and 3R initiatives in solid waste management, it needs an integrated approach to SWM is required in developing countries.

Based on the above, CE principles that are required in SWM Jakarta are resource management, closing the loop of materials by reducing the product use, redesigning, and recycling materials to circulate the product with 3R principles. However, not only these 3R principles that need to be developed and implemented well, but also public health is needed to be considered to enhance the system efficiency, by reducing the environmental impacts resulted from the waste management as well the general issues from the air, water, and noise pollution.

Furthermore, in occurrence with what has been stated in section 2.2, to enable CE principles in SWM, based on the ISWM Framework, the system needs an integrated approach to close the loop to avoid waste at any cost such as: (i) resource management; (ii) collaboration among key stakeholders at waste management processes (collecting, transport, treatment and final disposal); (iii) the governance

system (stakeholders system, financial sustainability and sound institutions & proactive policies) (Van De Klundert & Anschütz, 2001).

Now, this research explores the next question of challenge (sub-question 2). This sub-question answered in section 4.2.

## 4.2 The Challenges of Solid Waste Management

This section discusses the barriers for SWM which are not in alignment with CE principles. The challenges affecting the waste management system may be divided into various aspects from financial, societal, environmental, institutional & policy, and technical conditions, in regards to the sustainability aspects in section 2.2 (Figure 3).

Moreover, the information from several interviewees (the details in section 3.5) was used as findings in this section. Furthermore, the secondary data from the reputable sources (previous researches related to the waste management sector of Jakarta, newspaper articles available online) were used to support the conducted research to justify the discussion of the obtained data in the following subsections.

### 4.2.1 Financial Challenges

Adequate financial resources (section 2.1.1) are essential for government activities, and often, its provision becomes a challenge for developing countries (Lohri et al., 2014). The lack of financial support and urgency to directly improve the current operation of SWM resonates as the factor for the stagnant development of SWM in this city. Financial sustainability is essential to integrate the CE principles as it remains prudently budgetary affordable and cost-effective (Wilson et al., 2013). When financial budget and provision become a challenge, it will hinder the development of SWM.

Firstly, found from Pasang et al. (2007), the financial budget is restricted because the income from the waste fee is too low to cover the cost of waste management service, due to no precise mechanism of the revenue collection in the last years (Pasang et al., 2007). Moreover, it was found SWM is mostly done through a recycling market that involves informal sectors and in the end, paying those who are in charge

of the waste transfer (Pasang et al., 2007) and the government does not charge any fee for these waste services (Aprilia, Tezuka, & Spaargaren, 2012).

Secondly, it was found that the informal sector gets the lowest wages and least concern with regards to health-related aspects (Pasang et al., 2007), while this community has the most significant contribution over the solid-waste regulation in Jakarta (Sidiq, 2019b). This sector probably gets a salary of about USD 3.50 daily if they are lucky enough to find lots of valuable materials in a day (Sidiq, 2019b). The informal sector has not been studied seriously, and there is little appreciation from the waste management authority (Pasang et al., 2007). Based on these findings, their task has a high risk of disease, and thus, they should be paid more to compensate for such hard work and exposure to the health consequence. These findings could mean that the health-related aspects are not considered in SWM.

Thirdly, based on Pasang et al. (2007) Jakarta does not have the mechanisms that relate to the producer's responsibility, e.g., the policy of the polluter should pay for waste management (*polluter pay principle*) (Pasang et al., 2007). On the other hand, the *polluter pay principle* is indeed already implemented in the majority of the corporation. For example, they already compensated for the environmental pollution that impacted the natural resources and reported it through CSR (Corporate Social Responsibility). This activity is under a governmental program called "*Tanggung Jawab Sosial dan Lingkungan*" (TJSL) (Priyanta, 2016).

However, within the implementation of TJSL, often the corporations compensate for the pollution they caused through the social activities or non-related events, rather than directly pay off to the damaged environmental. Besides, if the scale of the impact is small, there is no sanction given to the corporations (Priyanta, 2016). The latter means that the *polluter pay principle* for the business activities and the cost related to the environmental and health damage are not accounted for most of the time. The governmental agency should know that regardless of the scale environmental impact, it is still polluting. As a result, corporations should be given any penalties directly to mitigate environmental effects (Priyanta, 2016).

Lastly, there is less private sector participation in Jakarta for waste management processes (Interview with Environmental Officers in Kramat Pela District, carried out 28.05.2019). Currently, there are not many enterprises focused on this due to the public perception of little profitability of this sector (Dethier, 2017). The reason is mostly they only handle the materials that are valued, and those are not as high as when they come from natural sources. When, in fact, the reality is the opposite, as it brings many financial profits. For instance, based on the interview with the environmental officer, it has brought an income for an individually owned waste bank in Kramat Pela (Interview with Environmental Officers in Kramat Pela District, carried out 28.05.2019). Because of this situation, no other sector could relieve the burden on the formal sector to handle the waste in the recycling practices.

Based on the above, in order to transform SWM and align with CE principles, Jakarta needs the government to handle their budget provision better and give full financial support. Financial sustainability is essential as the core of developing a better SWM. They need to strategize the financial plan better and prioritize the facility budget because having a new infrastructure and technology does improve the system. Aside from that, they need to supervise the informal sectors, including the health and safety aspects of this community.

### 4.2.2 Socio-Cultural Challenges

Noted from Muthmainnah (2007), societal barriers exist in the SWM of Jakarta, such as inadequate participation, low public awareness to participate in the SWM system, and mass consumption products (Muthmainnah, 2007).

Firstly, information from an interview found that the majority of citizens might be aware of the importance of waste management and the environmental impact caused by waste, but a majority do not take it seriously. Consequently, they do not show commitment to preventing the environmental effect, in particular with changing the life habits (Interview with a representative from NGO Iddkp, carried out on 13.06. 2019). This behaviour of citizens was also shown in the survey from the research of Aprilia et al. (2012) for public participation in the waste management system. People did strongly agree that citizens share the same responsibility as the government to

handle the wastes by 47% of the total respondents, and 73% of respondents willing to consider waste sorting at their home. However, 44% of respondents were reluctant that they had to pay the government a waste fee and a majority (81%) indicates that they usually do not sort their waste at home (Aprilia et al., 2012). Even further from Pasang et al. (2007) reported the low involvement of the community, that was due to a weak relationship between the community and the local government. This low involvement makes it challenging to create a suitable waste management scheme for the community (Pasang et al., 2007).

Public participation is crucial, as said from section 2.2, especially to enable the recycling process in the SWM, without some action towards campaign or programs, there will be no progress to the development of the SWM system. SWM will deploy better when citizens are: (i) active in the campaigns; (ii) aware of its importance, and (iii) have sufficient knowledge about the procedures of solid-waste recycling (Guerrero et al., 2013).

Additionally, the consumption habit is portrayed with the current citizen habit to use single-use products, especially plastic bags (Interview with a representative NGO Iddkp, carried out on 13.06.2019). Some of the locals think plastic bags are more convenient and affordable. Even further, markets in Jakarta use 400 bags regularly for half of the day, and these have to be restocked for the night time shopping activity if it is occasionally running out. In 2016, consumers at stores, markets, and malls generated up to 9.8 million plastic bags (Mongabay-Indonesia, 2018).

Based on the information provided in section 2.1.1, the citizen situation influences their level of participation through the whole SWM system. With the increase of urbanization in Indonesia (explained in section 1.1), it is not a surprise that a lack of awareness for SWM issues in an intense urban growth population leads to greater poverty or socioeconomic disparities. It becomes evident that governments become unable to provide equal sanitation and public health to its citizens (Dethier, 2017; National Geographic, n.d.). As a result, it affects motivation towards the development of SWM. In that case, it will be hard for people to comply with the regulation and

change their habitual patterns. Therefore, local cultural and social context shape the behaviour of people towards the SWM system (Shekdar, 2009).

In conclusion, without a significant change in citizen situation, low awareness among citizens and participation from them will be challenging to change. Governments need to campaign profusely and to change the situation in Jakarta, by means such as reducing urbanization and provide better sanitation. The population needs to shift its regular habits and cultures. Without the change from citizens for their regular habit of using single-use products, there is no guarantee that with the better SWM system, the environmental impact will be lessened.

### 4.2.3 Environmental Challenges

When it comes to SWM, it will also impact the environmental surroundings (which would be harmful to the quality of the environment). In the case of SWM in Jakarta, the environmental challenges exist mostly concerning the irresponsible behaviour from citizen when they illegally dump their waste.

The current concern for the environment is the ongoing illegal dumping to the rivers in Jakarta (Apip, AH, & Pingping, 2015). Some of the thrown wastes contribute to pollute the rivers and worsen the flood that regularly happens during the rainy seasons, due to an increase in water volume caused by the stacked-up waste (Sidiq, 2019a). Also, it was found that the waste, especially plastic, from Jakarta polluted the coastal areas and damaged the marine ecosystem nearby the city, sea of Thousand Island (Sidiq, 2019a). Some scattered plastic material, such as straws, were found under the sea, which tended to be eaten by sea creatures (Iffah Nur Afifah, 2018).

These dumping acts can contribute to a more significant effect (e.g., river pollution). Water plays a crucial role in human activities. Thus when it is contaminated, the other side effects could occur, such as health implications (Maschal Tarekegn, 2018). For example, polluted water causes different diseases, such as diarrhea, respiratory, and cardiovascular disease (Haseena & MF, 2017; Ullah, Javed, Shafique, & Khan, 2014).

Another environmental challenge is the activity of open incineration in Jakarta (Pasang et al., 2007). Burning waste, mainly plastic, are some everyday habits in Jakarta as a quick solution to reduce the garbage. While it seems an effective method to reduce the volume of wastes, the dioxins and furans are emitted, can instantly cause dizziness, coughing, and short breath in the short-term. The longer-term effect from open incineration is even more dangerous as it is associated with lung cancer to the inhaler. At a macro scale, the gas emission will damage the ozone layer and also burning the waste increases the greenhouse effect (The Jakarta Post, 2018b).

Although from this approach, a substantial amount of waste is reduced, the method is considered dangerous for health and the environment. Burning the waste causes air pollution, as it increases the gas emission (IPCC, 2006). The air pollution will cause a more severe effect on the environment, such as global warming. Although the gas emission from open burning of waste is not the primary cause, greenhouse gasses due to open waste burning are significant to cause global warming (Cogut, 2016). Other than the effect of a series of health implications that mentioned previously, open incineration may cause the lost opportunity for reuse and recycling the burned waste.

The poor collection rates, inadequate funding, lack of awareness of the environmental impact, and poor waste disposal methods are reasons for people to do the open burning of waste (Cogut, 2016). As a result, due to such reasons, the only thing the residences know to reduce waste quickly is through the open incineration, without thinking about the harmful effect in the longer term. It proves the importance of the availability of local knowledge to address waste-management issues to the treatment process (see section 2.2) (Guerrero et al., 2013), which is lacking in the SWM of Jakarta.

In addition, from the research of Pasang et al. (2007), the problem was found from the health and safety aspects of the waste workers, such as scavengers or waste-pickers, in SWM (Pasang et al., 2007). Activities performed by informal sectors in SWM generally executed without consideration for the safety of workers (Damanhuri & Padmi, 2012b). Whereas, these waste workers play an essential part and crucial to

enable the recycling activity in Jakarta (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019).

Although in the case of more significant industries, the workers usually get proper treatment, due to the corporations have to maintain their company image, and thus, they comply with the appropriate regulations (Damanhuri & Padmi, 2012a). Policymakers need to think about social protection for these employees as they operate in unsafe settings, exposing them to many health and other issues in the future (The Jakarta Post, 2014).

In conclusion, environmental issues are directly linked to the human health impact when the environment is polluted. Environmental problems also cause the SWM not to be aligned and circular as the activity (e.g., illegal dumping) and methods or technologies (i.e., open incineration) have made the waste lose its value to be reused and recycled. The lack of awareness of human health is also shown in the health and safety of waste workers, where they do not become a primary concern in the bodies of the SWM system when these workers are vital to the recycling activity. The lack of awareness on the effects on human health, the environment, as well as control over the waste management activities, might be the root of the challenges in the environmental aspect.

### 4.2.4 Institutional and Legal/ Policy Challenges[4]

The institutional and policy aspects of SWM in Jakarta are not as created as one would prefer them to be. Several factors are complicating the system.

[4] Intitutional and legal/ policy challenges are obstacles related to the structures which control and implement waste management and boundary condition of the existed waste management system. Intitutional aspects explore the issue from distribution of function, available institutional capacities and actors involved. Whereas legal/policy aspects investigate the condition such as the organizational structures, the existing or planned regulatory framework and the decision-making processes (Van De Klundert & Anschütz, 2001). The challenges measure from the organizational structure and distribution of function; regulatory framework and available institutional capacities; actor and their decision-making process.

Firstly, Meidiana & Gamse (2010) stated that despite the available policies and institutions who manage the tasks, the enforcement is still low. The main reason for the insufficient enforcement of SWM laws is due to the weak enforcement of the regulations and solid-waste laws at the local level. The reason for the weak implementation is mainly because of too many institutions involved and leads to overlapping responsibilities in SWM (Meidiana & Gamse, 2010).

Based on section 2.4 (CIT section), the success rate of law implementation depends on sufficient power, motivation, and information in the SWM (Bressers, 2007). Previously from the study of Pasang et al. (2007), restrictions in the SWM law implementation from institutional aspects are the lack of a robust legal system to prosecute law and coordination among relevant agencies (Pasang et al., 2007). The application clearly shows the lack of power to execute the plan. Also, clearly with the lacking legal system proves that the knowledge in the implementation of regulations is insufficient, and so does the motivation from the stakeholders. Lack of coordination among relevant agencies means that there is a different motivation among stakeholders to the implementation of the laws. With the power of stakeholders and the legal system, as well as sufficient knowledge and the same level of motivations among agencies, the implementation would reach the regulation objectives effectively.

Secondly, Pasang et al. (2007) in Menteng[5] identified two of the three missing crucial factors from the SWM in Jakarta for its governance, which are the strategic and the long term planning for the institutional section (Pasang et al., 2007). As supporting information, although there are many regulations publicized, local governments could not push efforts immediately to waste practices as required by the existing law (B.V, 2012). The reason is due to ample derivatives from the law were not publicized. The primary regulations that were urgently required are the procedure for waste management, the method for incentives and disincentives, manufacturer obligations,

[5] One of the districts in Jakarta (Pasang et al., 2007).

the funding system, as well as the negative consequences and compensation for those effects (B.V, 2012).

Furthermore, the cooperation from the regional level for the regulation is also not supported by the force of taxation policies in Indonesia (B.V, 2012). Consequently, local government and the related stakeholders could not implement a set-out mechanism that is precise, practical, transparent, fair and gives mutual benefits in the SWM system (B.V, 2012). Furthermore, taxation policies particularly have not yet been an incentive for the growth of cooperation with the other sectors in the waste management procurement of landfill sites (B.V, 2012).

Based on the above sentences, the lack of guidelines may result in a highly irregular and uncoordinated manner at the waste collection. If there is no uniformity in the waste collection of the different areas, it might cause an unpredictable performance in the waste management system. Such a practice will be an obstacle for SWM to be a sustainable system.

Thirdly, the institutional and policy aspect of SWM faces a problem in their actor and decision-making process. Some agencies, who primarily handles the environmental regulations, have both regulatory and operational roles (Pasang et al., 2007). For instance, the policy-making of environmental law is usually made mostly by experts on ecological engineering when the team supposedly makes the regulation from legal experts. The minimal participation from the law scholars only at near the end of the policy-making process for the translation from engineering terms to the law terms (Interview with a representative of NGO Iddkp, carried on 13.06.2019). From this information, it could be assumed because the legal experts did not make the regulation from its origin. Thus, it might be not straightforward and practical.

Furthermore, in their decision-making process, citizens seldom join in government decision-making (Pasang et al., 2007). Consequently, public participation in the decision-making process causes no transparency in the political processes (Pasang et al., 2007). As stated in section 2.2, public participation is vital as citizens are the service users and sector that influenced the process of recycling (Guerrero et al.,

2013). Also, with citizen participation, communication could occur between two parties. Thus, formulated policies might reach a compromise between two parties and a commitment to comply with the regulation (section 2.4) (Bressers, 2004). The governmental bodies could persuade citizens, then building trust to give benefits for compliance and strategic alliances (Irvin & Stansbury, 2004).

Besides, a few staff, based on expertise and experience, made an arbitrary decision without sufficient data and information (Pasang et al., 2007). Based on the theory of CIT explained in section 2.4, information is essential for the successful implementation. With adequate background information, it might increase the success rate of implementation of the regulation (Bressers, 2004). Thus, information like environmental to the public condition is needed to formulate a suitable regulatory framework and increase the success rate of the implementation.

In conclusion, inadequate legal frameworks and derivatives influence the whole enforcement process. For that reason, SWM needs to publish missing legal framework and have sufficient procedures for its practices that come with adequate background information. The participation from all actors involved is also essential to have successful policy-making and enforcement. Stakeholder participation might show how much the motivation from them to have a better SWM system. These barriers can be considered that the governmental bodies are not fully committed to rectifying the current SWM and could worsen the overall SWM situation in the future.

### 4.2.5 Technical Challenges

Development for infrastructure and technology is always a significant concern generally for Indonesia, and particularly for Jakarta due to the complex issues related to the environment, public health, traffic congestion which should be addressed with a limited budgetary for the general development. Technologies are required as one of the tools to improve the eco-efficiency of the processes and production system (Clini, Musu, & Gullino, 2008).

For technical aspects, there were numerous inefficiencies in the SWM process. Firstly, as derived from the Pasang et al. (2007), Jakarta has a transport, and collection SWM

system that is poorly maintained (Pasang et al., 2007). Furthermore, the location of the final disposal is far from the center of Jakarta, which is 40 km away, and morning transporting schedule overlaps with traffic congestion (Coconuts Media, 2018). All of this hinders the transportation system and lowering the efficiency in waste management. Waste vehicles faced difficulties transferring a substantial amount of waste when Jakarta has massive neighbourhoods, households, office buildings and public parks (*Indonesia Jakarta Solid Waste Management System Improvement Project*, 2003).

Secondly, Jakarta also lacks trained staff to handle waste from all levels with the actors have less experience in SWM (Pasang et al., 2007). With few trained staff, SWM is also impacted by limited knowledge, experience, and skill to handle the technical issues of SWM (Pasang et al., 2007). Moreover, uncontrolled scavenging is still part of the SWM in Jakarta (Pasang et al., 2007). Although this sector helps to collect the waste and enable the recycling activity in Jakarta (Damanhuri & Padmi, 2012a), it adds to the uncertainty of the waste separation to happen wholly in SWM because it is not integrated with the formal system. As a result, the system is hard to supervise and monitor (Pasang et al., 2007). Therefore, it might be challenging to evaluate how much their contribution to waste reduction in Jakarta.

As for the infrastructure, Jakarta has an inadequate treatment facility to recover the waste from the daily generation or the landfill site and the poorly maintained old facilities. Moreover, Jakarta only has a few treatment facilities and usually a small-scale, when the city needs a bigger scale to have significant progress to waste reduction (Wijaya, 2016). Because of the insufficient facility, there are no Waste-to-Energy (WtE) facilities, composting, and zero-waste programs (Permana et al., 2015). As a result of the massive inefficiencies, such as those mentioned above, could make more renewable and non-renewable resources go to landfill.

These are the following reasons why achieving SSWM through ISWM framework is difficult in Jakarta. Inefficiencies in the technical aspects, as well as institutional, socio-cultural (from the habits of residence), and financial challenges hinder the development of SWM in Jakarta. Furthermore, those mentioned obstacles also delay

the process for the management from becoming circular and following CE principles. These challenges show that sound institutions and pro-active policies might be required in the cases, such as a prohibition for the open incineration to protect the environment from pollution and informal sector protection.

# Chapter 5: The Effectiveness of Applying the Regulation in SWM Activities

Chapter 5 collects the findings, from the interviews conducted (the list in section 3.5), literature, newspaper, and web articles, for the third sub-question. The findings found from the interviews came from questions based on the programs listed in Table 2. As mentioned in section 2.3, at present, Jakarta has not publicized its regional policy and strategy for SWM. Therefore the basic programs used in this research comes from Banten. Although it is not the original strategy in Jakarta, the nearby region usually has the 3R programs. Thus, the questions were created to investigate the waste management system elements based on presidential regulation.

The purpose of the third sub-question is to investigate how the regulation addresses SWM challenges and its effectiveness scores against the sustainability criteria of the ISWM model (Table 1) concerning the theoretical framework which is based on the theories from sections 2.1, 2.2, and 2.4.

Section 5.1 involves reporting the performance of the regulation in section 2.3 (Table 2) of the SWM of Jakarta, that includes reuse, reduce, recycling, collection and transportation, treatment, and disposal elements. All of these elements were evaluated in section 5.2, through the financial, environmental, socio-cultural, institutional, technical, political aspects of ISWM framework (Table 1).

## 5.1 The Presidential Regulation Performance of SWM Jakarta

This section reports the findings of Presidential Regulation No. 97/2017 performance using the waste system elements, based on the ISWM Model illustrated in Figure 3. The waste management system elements are used here to categorize the flows of SWM practices regulated by Presidential Regulation No. 97/2017.

**Waste Generation and Separation**

The generation of waste in Jakarta originates from the six municipalities (North, South, East, West, Central Jakarta and Thousand Islands), 44 sub-districts and 267 villages (Jakarta Central Bureau of Statistics, 2016; Putri, Fujimori, & Takaoka, 2018).

Household waste has the most significant portions out of solid waste (52.97%) and the commercial sector (27.35%). The rest are industrial sectors (8.96%), schools (5.32%), traditional markets (4%), and others (1.4%). As could be seen from the waste composition as well (Figure 5), kitchen waste has the most significant portion with a total of 52%. The rests were less significant in comparison, each accounting for below 15% (Aprilia, 2016). It was found from the interview that there is no tool to measure and monitor the SW and hard to measure quantitatively such as the waste compounds, and how many percentages the reduction rate (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). What they have done so far is to measure it manually with the data input (Interview with Environmental Officers in Kramat Pela District, carried out 28.05.2019).

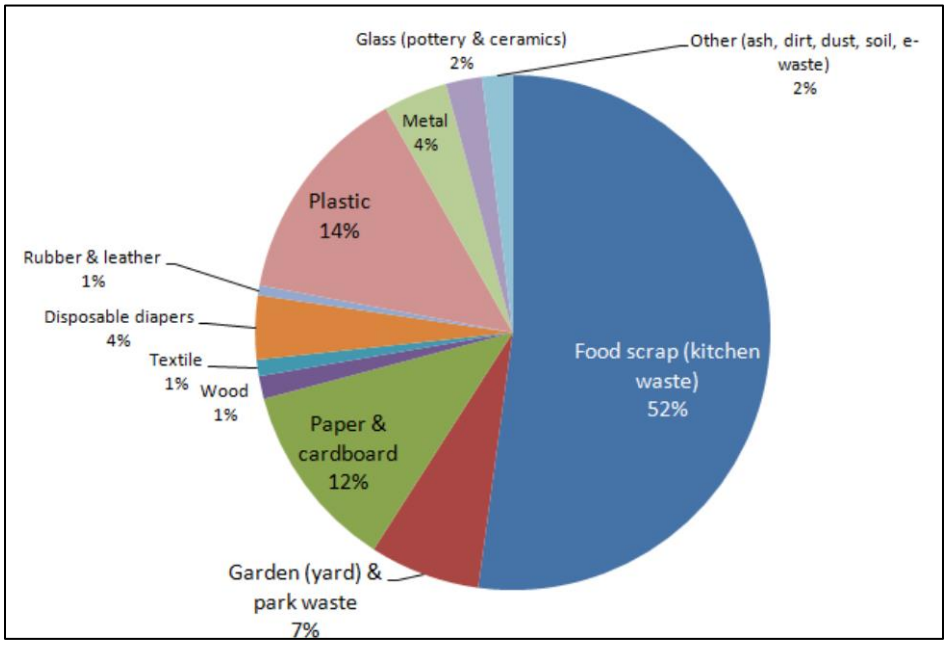


**FIGURE 5. WASTE COMPOSITION PER YEAR** (Aprilia, 2016)

Waste separation has to be sorted out from the source (i.e., households). The target groups (public/communities) have to separate the trash according to the type, the leaves and other organic compounds, inorganic products such as plastic bottles, metal materials and scrap (e.g., paper) (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019).

The waste segregation which is the crucial process for a specific city to have an ISWM and a functional CE integration (based on the sections 2.1.2 and 2.2) is not found to be effective in some areas of Jakarta. While some did it better, others are still unsorted and make the following process of waste treatment is not as effective as it supposed to be (Interview with a citizen of Jakarta (Zero-Waste Follower), carried on 16.06.2019). Moreover, the formal waste segregation is still mixed and relies heavily on the landfill(Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). Residents of few areas of Jakarta already adapted the source-separation for composting and recycling. However, most of the residents do not deploy this practice (Aprilia et al., 2012). Jakarta needs a big-scale composting infrastructure with a daily operator who runs the facility as most citizens in Jakarta are busy, so not all people could comply with the composting program in the regulation (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019).

**Solid Waste Collection and Transport System**

The collection and transportation system is a vital component of the SWM system. In Jakarta, there are few means of collection. Firstly, the community-based waste management collects the trashes and transports the waste into the temporary transfer point or waste bank. Secondly, multiple neighbourhoods assign a waste collector crew from the informal sector (such as scavengers) a district and send to the transfer point by truck or waste cart. Thirdly, it is done through the street sweeping from the road or garbage bins across the street (Damanhuri & Padmi, 2012a). Often scavengers also collect valuable waste at these locations and then sell these wastes to the intermediates[6] for further sorting and cleaning (Putri et al., 2018; Trisyanti, 2004).

[6] Intermediates are a party that usually trades money to the scavengers via credit sales for some used products (Damanhuri & Padmi, 2012b).


**FIGURE 6. ONE OF THE TRANSPORTATION SYSTEM - WASTE CART (PICTURE FROM DATA COLLECTION)**

As parts of the efforts done to help the collection process, the Jakarta Environmental Agency has increased the number of garbage bins that are placed in the city compared in the past years. They also provided several waste-collection trucks to provide waste collection to more regions (Interview with a citizen of Jakarta (Zero-Waste Follower), carried on 16.06.2019; Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). Most of the municipality vehicles are only a standard pickup truck, cart with a motorbike and waste cart to collect and transport waste (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019.

For the collection process, the environmental agency received help from private environmental enterprise, such as Waste4Change, to collect waste via a drop-box (Figure 6). This type of collaboration had the purpose of getting the sorting to be more precise and separate the waste according to its type. From the study carried out by World Bank in 2018, 8765.5 tons of daily waste generation were registered from which approximately 6484.7 tons of waste were successfully daily collected (Jayasiri, 2017).


**FIGURE 7. WASTE4CHANGE DROPBOX** (Lestari, 2018)

Transportation system is also another crucial component in the waste management system. At present, all of the waste collected is transported into the temporary storage sites (Aprilia, 2016), by using a waste cart, handcart, and hand-picked up truck (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019).

**Transfer Station, Treatment and Final Disposal Management**

Temporary storage sites are established to lower the transportation cost by reducing the hauling distances for the collection truck. These sites are categorized as depots and located as a place to station the handcarts, waste carts, or trucks. Currently, there are 958 temporary storage sites available in Jakarta (Putri et al., 2018). The Jakarta Environmental Agency keeps increasing the number of the waste-collection truck to collect more trash efficiently in all Jakarta districts (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). In recent years, the Jakarta Environmental Agency has added 971 units of trucks for the transportation system (Putri et al., 2018).

Waste is transferred to waste trucks by manual labour from municipal officers or shovel loader. Currently, there is no treatment facility in the technical process, and the waste is be directly transported to the composting center or the waste bank subsequently and to a landfill (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019; Aprilia, 2016).

The treatment processes are usually done in the waste bank units or TPS 3R (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). Waste banks, as the initiative from The Ministry of Environment, are informal community-based facilities (with subsequent supervision of the governments) and they were established to sort the inorganic waste that has economic value (Jayasiri, 2017).

The waste bank is like a community bank where the sorted waste is collected and exchanged with money by the bank. Customers bring all the inorganic waste to the bank, trade it with money. The transactions are written in the bank book that the customer holds or kept by the bank (Jayasiri, 2017).

The waste bank has contributed the most with the sorting process SW reduction in Indonesia until approximately 1.7% of total waste on a national scale (MoE (Ministry of Environmental) Indonesia, 2019). Henceforth, the government encourage more communities and individual to open more waste bank in Jakarta (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). The sorted wastes in the community (Waste Bank) could be seen in Figure 8.

**FIGURE 8. THE SORTED WASTES (PICTURE FROM DATA COLLECTION)**


**FIGURE 9. THE SORTED CARTBOXES (PICTURE FROM DATA COLLECTION)**

For the household management, the waste bank unit collects the waste from people who come from the households and then sorts once again the unsorted wastages. In the waste bank usually plays a role as the transfer station. Afterwards, the staffs sort

the organic and turn it to compost with capable microorganism (EM) diluter. Inorganic wastes are transported to the waste bank central (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019).

Besides, the owner of the waste bank could sell the materials directly to the dealers[7], and then these people sell the wastes to recycling facilities (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019). Dealers also get the valuable materials collected by scavengers, such as plastics, metal, or papers, from the intermediates. Regardless of which place they trade, these inorganic waste are taken and sold, such as:

- All plastics (mostly the plastic bottles) to the product factories that use it as packaging (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019). Plastic dealers often conduct further processing with the materials obtained from scavengers, such as pressing the plastic bottles or grinding the plastic waste (Putri et al., 2018; Trisyanti, 2004).
- All paper to be recycled in the seller (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019). Cardboards or papers are generally not further processed. After these products get collected and tied, they are supplied directly to the processing plants (Damanhuri & Padmi, 2012b).
- E-wastes[8] are sent directly to the Jakarta Environment Agency in collaboration with the e-waste treatment company, namely PT. Prasadha Pamunah Limbah Industri (PPLI) to process electronic gadgets and PT. Mukti Mandiri Lestari for other types of e-wastes (The Jakarta Post, 2018a).

[7] A party involved in the further processing of waste, e.g., turning waste into raw materials, such as grinding plastic trash (Damanhuri & Padmi, 2012b).

[8] E-waste is a combination of obsolete, used and unwanted electronic products that exceed their life cycle. For instance cell phone, spare parts of computer, batteries that containing hazardous and toxic substance and requiring special treatment (Vats & Singh, 2014).

- Irons and other metals, acquired from the intermediates by dealers, will be delivered to automotive factories (Damanhuri & Padmi, 2012b).

Because of the massive waste generated daily, the environmental agency collaborates with Waste4Change for the recycling process of inorganic products, with dropboxes for collection and sorting. Currently, 170 dropboxes could be found in Jakarta, and there is approximately 3471 kg of waste recycled by this enterprise[9].

One of the schemes from the treatment process could be seen from Figure below.

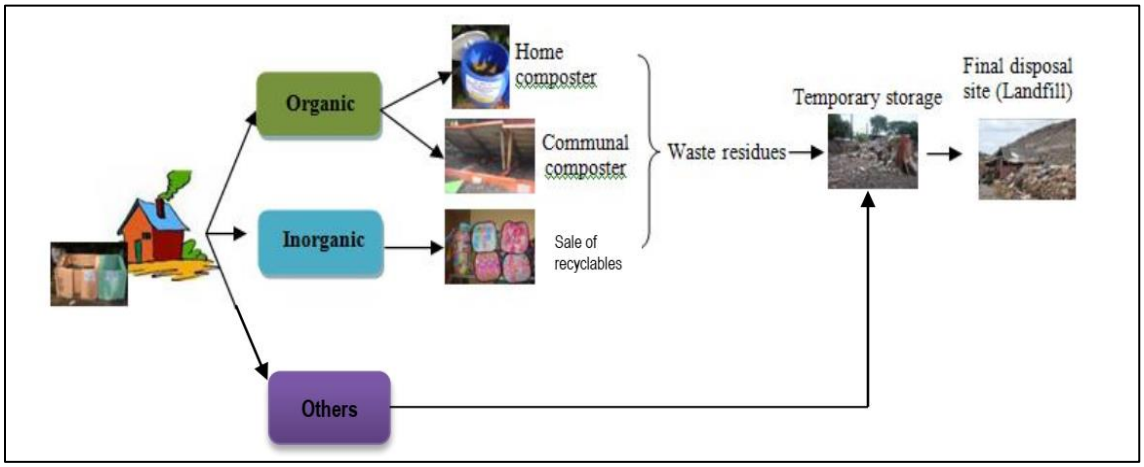


**FIGURE 10. HOUSEHOLD WASTE MANAGEMENT FLOW** (Aprilia, 2016)

Unfortunately, this research could not find the specific information on commercial sites or the business sector, but from an interview with a representative from Iddkp, he stated that the commercial sites most likely to hire a private agency to handle their waste. As a result, it was not found whether this agency has done the waste separation and treatment by themselves (Interview with a representative of NGO Iddkp, carried on 13.06.2019).

[9] This information is taken directly from the Waste4change webpage in their dropbox service section (Waste4Change, n.d.).

From Table 2, it could be seen there is a composting program included in the regulation. It was found that composting is usually practised in a community facility such as TPS3R[10] and waste bank. However, in Jakarta composting practice is found to be done at the limited quantity (not found at every level, even not every household has done this program). At TPS3R, the standard methodology to compost is an open windrow composting, while at the waste bank they usually compost in a drum. It is worth to note that as the primary purpose of waste banks is the recovery of inorganic waste, it is very few of them who conduct composting processes. Usually, the waste bank that conducts composting is coordinated by Jakarta Cleansing Agency. On the contrary, TPS3R is focused on the recovery of organic waste. One example of the existing TPS 3R is TPS 3R Rawasari in Central Jakarta (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019.

In the final disposal process, usually, wastes were thrown directly to the landfill site (Aprilia, 2016). However, the site is more controlled now (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019. In recent years, there are more facilities for workers in the landfill site, such as toilet, bathroom, temporary restroom near the final disposal site. It is due to the waste processing in the landfill site is usually more complicated. Therefore, as regulated by Presidential Regulation No. 97/2017, the government gives more equipment to the workers and construct more infrastructures near the landfill site (MoE (Ministry of Environmental) Indonesia, 2017).

The Government of Indonesia also has constructed a WtE in Bantar Gebang Landfill called PLTSA Merah Putih. This plant is also the solution for landfilled waste in Bantar Gebang as it turns those wastages (100 tons per day) into electricity with the capacity of 700 kW (Aqil, 2019). There was a biogas plant, but it has not been developed for those dumped trashes, because it was ineffective to reduce the wastages (Interview

[10] TPS 3R is a temporary station for waste that regularly follow the 3R principles: reduce, reuse, recycle). It is similar to the waste bank (Research and Development Institution of Minister For Public Works and Human Settlements, n.d.).

with a citizen of Jakarta (Zero-Waste Follower), carried on 23.07.2019). This facility is regulated by Presidential Regulation No. 97/2017, and it finally began to operate in March 2019 (Purningsih, 2019b).

Another one that is yet to be operated but still has to be constructed is the intermediate facility (ITF) in Sunter. It is expected to process between 2,000 to 5,000 tons every day in order to relieve the burden of the final disposal site with the WtE technology like the PLTsA Merah Putih (Surapati, 2018). The treatment facility (Waste to Energy plants) started to be considered and built in the city (Wijaya, 2016) just because the landfill site is congested and could only operate until 2021 (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019).

**Reduction, Reutilization, and Recycling Process**

The principles of 3R are transverse in the regulation with the 3R programs in Table 2, and the processes are explained previously. However, except for the formal processes, people still have a low awareness regarding reducing activities. Under those circumstances, the government has done many awareness campaigns and education programs to the communities through schools and some districts on how to reduce waste. They also learn the current impacts of waste in the environment when people do not reduce their consumption habits and generate more. They also just started Jakarta Less Waste Initiative to encourage offices, cafes, and restaurants to be innovative in their waste management (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019.

Eventually, education is not enough through all societal levels (Interview with Environmental Officers in Kramat Pela District, carried out 28.05.2019). A citizen of Jakarta indicated that public education to learn how to separate organic and inorganic waste is almost not existing. She also said that it is such a shame when the waste bins are upgraded, from one into two-types compartments (organic and inorganic), but people are still throwing trash incorrectly (Interview with a citizen of Jakarta (Zero-Waste Follower), carried on 16.06.2019).

With the current highlighted issue in reducing the single-use products, the regulation is found to not addressing aspects related to the culture, particularly on the ongoing usage of single-use plastics. The low awareness clearly shows in the cultural attitudes of citizens that keep buying the single-use products because it tends to be cheaper than when they buy stuff in bulk size or the better quality of products (Interview with a citizen of Jakarta (Zero-Waste Follower), carried on 16.06.2019). A similar situation happens with single-use plastics, even when people knew and became aware of the effect of waste on public health and the environment, they keep using it (Interview with a representative of NGO Iddkp, carried on 13.06.2019).

In section 4.2.2, it was said that Indonesia is considered as the top plastic polluter in the world, but reducing the single-use products is not yet stipulated. One way to explain this can be is how Article [3] of Presidential Regulation No. 97/2017 said to reduce plastics use, but it does not mention direct prohibition (The Jakarta Post, 2018c). In order to comply with waste management to reduce waste to reach the target of this regulation, the ministry of environment recommended using degradable plastic instead. Since then, it was implemented to the 35,000 retailers in Jakarta. However, this type of plastic has still contributed to the waste generation in Jakarta (The Jakarta Post, 2018c).

There is a follow-up law to forbid the usage of single-use plastics bags for retailers. However, the law to ban plastic has not been implemented, and it is still on the policy-making process. There are several reasons for the postponed ban to be regulated in Jakarta. Firstly, governmental bodies need to educate retailers, schools, traditional markets, and other markets to forbid the usage of plastic bags. Other reasons are the mixed reaction of the public to the ban of plastic, so they need to amend the regulation (Gokkon, 2018). Currently, the plastic prohibition is still on progress as confirmed by the NGO Iddkp. The governmental bodies collaborate with NGO Iddkp for this prohibition, as the technical advisor (e.g., in giving advice and suggestion to the prohibition). This NGO also helps in connecting citizens and governments, by gathering information from communities and public opinion (Interview with a representative of NGO Iddkp, carried on 13.06.2019).

For the reusing, Jakarta has reduced the plastic-straw usage among the citizen, and instead, they use the reusable material for the straw. Based on the interview with a representative from NGO/enterprise from Waste4Change, he said it was quite tricky for the regulation to enforce citizen for reusing stuff. However, there is another act outside the regulation scope but contributes to the regulation objective called "No Straw Movement", carried by environmentalists, in order to reach the 30% waste-reduction target. What makes this aligned with the reuse principle is how people try to reduce single-use straws and substitute it with reusable straws (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). This act has engaged business sellers on social media, who also concern about plastic waste, such as they made an awareness campaign from the plastic straw impact. Also, they started to sell those reusable straws while educating their followers about the environmental effect (Iffah Nur Afifah, 2018).

Recycling in Jakarta still relies heavily on informal sectors. So far, the activities of the informal sector have not well-organized (Damanhuri & Padmi, 2012b). However, the regulation does take part in recycling efforts by community and government through the waste bank (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). It was found that finance as the sole motivation for citizens to do waste segregation as financial incentives when they exchange their recyclable materials (plastic bottles and glass) to the waste bank (Purningsih, 2019a).

As the waste bank keeps to be beneficial for the public, it also increases the public's awareness, knowledge of waste and its environmental impacts. In the same manner, the waste bank has managed to reduce the significant value of total waste in Bantar Gebang Landfill up to 3,788 tons (Purningsih, 2019a). Despite ample efforts to recycle in Jakarta, there is a lack of cooperation between the operations of recyclers in the formal (government and community, i.e. waste banks) and informal sectors (Sembiring & Nitivattananon, 2010).

## 5.2. The Aspects of Current SWM Practice in Jakarta

This section assesses the findings presented in section 5.1 through the perspective of financial, environmental, socio-cultural, institutional, technical, institutional/

political aspects which are several principal considerations from the ISWM model (Figure 3) with the criteria of the area to investigate (Table 1) and challenges in section 4.2.

**Technical Aspect**

Based on section 5.1, the technical process has somewhat well-functioning in the city. From the efficiency of the collection mentioned above, the rate is 26% (Jayasiri, 2017). The waste composition itself could be detected displayed in Figure 5.

However, from section 5.1, it was found that there is no tool to measure and monitor the SW and hard to measure quantitatively. Therefore, for measuring and evaluating, they do it manually. There are many disadvantages to manual data entry. For instance, the method leads to error due to mistakes, and thus, it takes a longer time to enter the data (Brickler, 2017).

Furthermore, based on the findings, the collection still relies on the informal sector, their operation is not regulated under the SWM regulation, and few of the treatment technology is not operated yet (e.g., the intermediate treatment facility). Moreover, the absence of waste separation by the municipality is another limitation. Although nowadays there is a waste bank, there is no assurance that source-segregated waste is to stay separated in the waste chain and often in some districts get mixed in the landfill site.

For the conditions of physical infrastructure, based on section 4.2.5, many of the technologies for collection and transport systems are poorly maintained and with the traffic congestion daily in Jakarta, leading to the poor management of SWM and lower the efficiency level of the technical aspect. However, the government has increased many transportation means, based on the findings in section 5.1 and install many new facilities such as Merah Putih PLTSA and the impending Sunter ITF. Based on these findings, it means there are a few efforts in the regulation to maintain the transportation system and develop the technology for SWM.

**Environmental Aspect**

Based on the findings in environmental problems, it could be said that the regulation has not succeeded yet to mitigate the issues from the environment. Furthermore, the finding did not found the impact of the regulation on the challenges mentioned. Also, from the programs in Table 2, this regulation does not regulate the issues caused to the environment.

Despite the missing effort to the challenges mentioned, based on the findings, the waste bank has significantly helped with the treatment and sorting process in Jakarta. Many processes are still credited to the few public participation in waste bank and the waste workers from the informal sector that operates the waste management practice, just as mentioned in section 5.1. The waste bank enables more recycling activities happening in Jakarta, and so does affecting to the waste reduction.

Furthermore, the facilities, such as Merah Putih PLTSA, installed in Jakarta have helped the city to reduce and treat their waste better in the landfill site. Moreover, the technology effect would affect take significantly for the environment after the Intermediate Treatment Facility operates in Jakarta.

The health of workers in the SWM system that becomes one of the challenges in the waste management (section 4.2.3) is currently not the main target to be achieved from the regulation (as could be seen from information in Table 1). However, the findings indicate that there are more constructed facilities and equipment for workers. Thus, it could be said that there are a few considerations from the regulation towards the health and safety aspects of SWM workers.

**Financial Aspects**

In regards to the financial aspect, it is unclear that this regulation solves the economic challenges. Jakarta had a sufficient budget compared to other cities in Indonesia, and that was why it is not a particular focus for the Ministry of Environment to give additional financial aid to this city (Interview with a staff of Goods and Packaging Department, Ministry of Environment and Forestry Indonesia, carried out on

21.06.2019). However, this research found several obstacles related to the financial aspect.

Firstly, according to the interviewees, the allocated budget for SWM in Jakarta is inadequate to handle all the waste problems (Interview with Environmental Officers in Kramat Pela District, carried out 28.05.2019). For example, within the composting program, a well-built financial system is required to ensure the composting facility runs sustainably (Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019).

However, with the data presented in Table 5, it could be concluded that Jakarta has the highest cost for the SWM, due to the transportation and landfill operations. The exorbitant pricing of the waste management fee causes the imbalance of expenses and the limitations of the budget for waste management. The low revenue for waste management hinders the investment of technology development, and the regulation has not done adequately to solve this issue without any program plan existing.

**TABLE 5. SOLID-WASTE SERVICE COST SUMMARY** (RAHIM, NAKAYAMA, & SHIMAOKA, 2013)

| City | Solid waste service cost (US$) | Unit cost | | | | |
|---|---|---|---|---|---|---|
| | | Collection US$/ton (%) | Transfers US$/ton (%) | Transpor-tation US$/ton (%) | Landfill US$/ton (%) | Total US$/ton (%) |
| DKI Jakarta | 20,754,854 | 0.73<br>7.9% | 0.84<br>9.1% | 6.07<br>65.5% | 1.62<br>17.5% | 9.26<br>100% |
| Palembang | 1,814,600 | 1.0<br>17.0% | 0.1<br>1.2% | 3.5<br>60.4% | 1.3<br>21.4% | 5.8<br>100% |
| Medan | 3,216,876 | 0.59<br>9.0% | 0.02<br>0.3% | 4.85<br>73.6% | 1.13<br>17.1% | 6.59<br>100% |
| Bandung | 2,801,359 | 0.47<br>9.7% | 0.01<br>0.2% | 2.33<br>47.8% | 2.06<br>42.3% | 4.87<br>100% |
| Bekasi | 1,348,813 | 0.39<br>20.0% | 0.01<br>0.5% | 1.02<br>52.6% | 0.52<br>26.8% | 1.94<br>100% |
| Makassar | 1,614,278 | 0.46<br>9.6% | 0.06<br>1.3% | 3.28<br>68.3% | 1.00<br>20.8% | 4.81<br>100% |
| Surabaya | 4,713,820 | 0.96<br>15.7% | 0.04<br>0.7% | 3.99<br>64.9% | 1.16<br>18.8% | 6.15<br>100% |
| Semarang | 2,257,199 | 0.75<br>19.6% | 0.06<br>1.6% | 2.41<br>63.3% | 0.59<br>15.5% | 3.81<br>100% |
| Depok | 1,209,453 | 0.65<br>20.6% | 0.24<br>7.7% | 1.12<br>35.5% | 1.14<br>36.2% | 3.16<br>100% |

**Socio-Cultural Aspects**

The awareness level among the population is still low from the implementation, looking through the waste segregation practice in the household and commercial on section 5.1 when it supposed to be the most critical aspect of the waste management based on the Lansink model (Lansink, 1979). It shows through the implementation of the regulation, the majority of people are still reluctant to pay for the waste management fee (Aprilia et al., 2012). Regardless, citizens of Jakarta do agree that both roles should be responsible for waste sorting in the household (Aprilia et al., 2012).

Furthermore, taking into account the area of investigations for the socio-cultural aspect, which how the attitudes of citizens towards waste and implication for waste handling, separation, and recycling (see Table 2), the findings indicate a lack of commitment from citizens to handle their waste. Firstly, it is proven with how seldom individuals or communities with reusing products. Secondly, not every citizen does the separation at source (see section 5.1: waste generation and separation) when from the regulation program (Table 2), every individual should do this process.

Finally, it is difficult to see the performance of recycling activities in Jakarta, even though some citizens recover their wastes through waste banks in recent years (see section 5.1: recycling). Most of the recycling activities still happen in Jakarta due to the contribution of the informal sectors (see section 5.1: recycling) (Damanhuri & Padmi, 2012a; Interview with a representative from NGO/enterprise Waste4Change, carried on 01.07.2019). Although the recycling activities are conducted in the city, there are more significant proportions of wastes (i.e. plastics) in Jakarta (Putri et al., 2018). It shows that the regulation does not enforce enough waste prevention and reduction through the public.

However, seeing the plastic pollution through illegal dumping in the coastal area (section 4.2.3) issue has gained public awareness through the activities, such as "No straw movement", since last year, this means an increase in awareness of the environmental issue in Jakarta.

**Institutional and Policy Aspects**

There are a few critical missing points of the regulation affecting the implementation. Firstly in the category of the skill level of management staff for institutional aspects, it lacks the experts and trained operational staffs (Interview with Environmental Officers in Kramat Pela District, carried out 28.05.2019), and it adds the inefficiency to execute the regulatory operations. As supporting evidence, the informal sectors is one of the elements to the waste management system (section 5.1), yet based on the several researchers (Aprilia, 2016; Damanhuri & Padmi, 2012b), this sector lacks a proper training with their recycling activities, such as they do not know use the safety measures to do the management activities (Aprilia, 2016). Based on section 2.2, the limited knowledge of SWM would hinder the development of practice and decision making in for the institution. Similarly, information is what needed as a critical factor for the success rate in regulatory enforcement (section 2.4).

Secondly, in the current policy implementation, the main target of the law for the national scale is there, yet for the regional level, the step-by-step planning has not enacted (Interview with a staff of Goods and Packaging Department, Ministry of Environmental and Forestry Indonesia, carried on 21.06.2019). The municipality has not established the plan or strategy to guide of waste management practice to achieve the SWM reduction target (Interview with a staff of Goods and Packaging Department, Ministry of Environmental and Forestry Indonesia, carried on 21.06.2019. This finding is what also stated in section 4.2.4 for past regulations. At present, the regulation is also missing these derivatives. Moreover, such as the plastic ban has not been enacted yet, and it is currently on processed (section 5.1: recycling). This lack of directive is proven by the sporadic manner of waste separation at source (see section 5.1) (Aprilia et al., 2012), resulting in the mixed waste in the transfer station and adds to inefficiency in the treatment system as the staff has to segregate the waste before they transfer it to the waste bank.

As a result, the local governments, found from the interview, have not been able to push waste management efforts immediately by the provisions of the law, and there is no uniformity in the SWM system (Interview with Environmental Officers in Kramat Pela District, carried out 28.05.2019). The programs of the waste bank, for example, are independent so their performances to collect the waste differ in each district of Jakarta (Interview with a waste bank officer (Owned by Pertukangan Community), carried out on 28.06.2019). The absence of a legal provision indicates the governmental bodies to have difficulty taking legal action against a household that is not following the waste segregation practices.

Thirdly, the regulation has a weak legal procedure for contracting with enterprises. The Ministry of Environment usually persuades the business sector to implement the EPR[11] (Extended Producer Responsibility) for their wastes (Interview with a staff of Goods and Packaging Department, Ministry of Environment and Forestry Indonesia, carried out on 21.06.2019). The information above indicates no enforcement to implement EPR for enterprises. The inefficiency in waste management practices and procedures can be a clear representation of ineffective enforcement and institutional system.

Nevertheless, the regulation does have their political priorities, which to improve the environment through the means of programs to improve the SWM and its aspects (see section 2.3) and the improvement for the flow of management systems. The amelioration for the management system could be seen from the installation of the new facilities for waste management (section 5.1), increasing vehicles and waste bank in Jakarta (Interview with a representative from NGO/enterprise Waste4Change,

[11]EPR is a regulatory approach toward sustainable development that can minimize environmental effects, particularly to the life cycle of a product. OECD described that with the implementation of this policy, producers would consider the entire life cycle of products they design to mitigate its environmental impact. Consequently, producers responsible for the environmental cost of waste disposal and treatment (OECD, 2001).

carried on 01.07.2019). There are many improvements for SWM in Jakarta to mitigate the infrastructure, such as the treatment facility for landfills (Chapter 5.1). A few coordination also happens in the governance that brings positive initiatives, such as with Waste4Change through the dropboxes and cooperation on the upcoming plastic prohibition with NGO Iddkp.

Unfortunately, this research could not found data regarding the procurement methods of the spare parts for the tools. Therefore, a situation such as a shortage for the parts, the difficulties in procedures to arrange customs clearance and obtain foreign exchange is unknown to this research.

In conclusion, the regulation already tries to reach its main objectives and improve the system of SWM seen in the waste management systems and the sustainability aspects mentioned above. For instance, in the technical aspects with the development of facilities and improving the relationship with other sectors (i.e., collaboration with private enterprise). Although there are several contributions to the regulation to achieve its objective, it has a limited capacity to focus on all existing issues and mitigate the problems. Therefore, it has not succeeded yet to congruent with the CE principles and addressed SWM challenges.

For instance, the government could engage and integrate the informal sector into the formal settings, but they currently do not prioritize this sector. Furthermore, the most vital issue is that the regulation does have not publicized a set out of mechanisms and procedures for the enforcement, which can increase the efficiency of the daily practices and cooperation with other stakeholders. Regardless, there a room for improvement to the implementation of regulation for the more significant goods and reach the objective successfully before 2025.

# Chapter 6: Conclusions and Recommendation

## 6.1 Conclusions

In this section, the questions addressed by undertaking this research are answered. First, this section analyzes the sub-questions, from the principles of CE, challenges, and the effectiveness of regulation. After that, the research focus was to evaluate the main research question.

For circular SWM to develop in Jakarta, CE principles needed from the concept are crucial. SWM in Jakarta requires to have resource management based on the 3R principles (reduce, reuse, and recycle) to close the loop of the waste cycle and optimize existing resources. Besides resource management, SWM in Jakarta also needs to eliminate the negative impact of factors such as public health and the environment. It is also explained in section 2.4, to integrate CE in the SWM through the concept of ISWM requires three components: public health, environmental protection, and 3R management. It is clear as to why SWM needs the principle of 3R, but other than that, it is essential to embed them into the regulatory structure, and for their enforcement by taking into account the sustainability aspects from human health and environmental impacts (from air and water pollutions).

A transformation of the current SWM practice into a sustainable and circular waste value chain is urgently required. However, various challenges complicate the matter, identified from financial, societal, environmental, and governance. The financial challenges highlighted no financial sustainability in the SWM system. The current system does not have a budget to cover all the waste management fee for maintenance and new facility. Also, the revenue from SWM is too low, and there is no take-back mechanism in the business sector. As noted in section 2.1.1, financial sustainability is one of the elements needed in SWM, so that it aligns with the CE concept and towards sustainable development, such as giving more freedom to be cost-effective, opening new facilities and encouraging more enterprises to the SWM system.

The societal challenges were particularly accentuated in the ongoing culture of consumption, the inadequate awareness level of citizens to about the SWM issues, and low public participation towards the regulation program and campaign from the government. Public participation is crucial to give feedback to the SWM sector and also to the recycling process. Knowledgeable citizens and aware of SWM issues will establish a better practice for recycling at least at the source-separation phase.

In the same way, the environmental challenges emphasized the unlawful waste practice, e.g., illegal dumping and inappropriate treatment technique, e.g., open incineration, due to factors such as inadequate awareness of the individual to the environmental problems and knowledge to the proper waste treatment. This factor proves that the availability of information for locals to address waste management issues influences the treatment process in the SWM Jakarta such as the open incineration. Additionally, the health of the workers has been not prioritized in the waste management system of Jakarta, when these workers play a vital role in enabling most of the recycling activities in the city. Policymakers need to consider the safety and health aspects of these employees as they are vulnerable and exposed to ample harmful substances and create a prohibition for open incineration to protect the environment from pollution.

The weak enforcement from the regulatory bodies, the absence of a long-term strategic plan for SWM in an integrated manner and established policies or directives from the government as a guide for appropriate waste practice are other concerns from the institutional and policy aspects. In the same manner, limited support from the force of taxation policy, and the missing public participation in the decision making hinder the integration of CE into SWM. Furthermore, the random decision by staff to the problems of SWM hinders the decision-making from having an excellent solution to SWM problems and also shows the importance of having adequate information in SWM.

Concerning the technical mechanism, there are several inefficiencies in the daily mechanisms, such as poorly maintained existing technology, lack of trained staff and experts, and unregulated scavenging activities. In the same manner, SWM also has

the inadequate infrastructure, such as nonexistent big scale treatment facilities. These inefficiencies need to be overcome in order for SWM in Jakarta if this sector wishes to function more sustainably and effectively.

These challenges prove that it is challenging to achieve ISWM framework and to be aligned with CE principles. That is why the implementation of Presidential Regulation No. 97/2017 is needed, so that SWM will reduce waste significantly and achieve its targets. Therefore, this research evaluated the regulation performance to what extent this regulation has performed to reach its objectives and mitigate the challenges, with the sustainability aspects of ISWM. After having investigated the current practices and situations concerning the current management practices in Jakarta, it was understood that the regulation performance has not succeeded to address the challenges mentioned previously and needed an urgent amendment.

From the technical aspects, the system is somewhat functioning in the city. On the one hand, there are few inefficiencies, such as no tool to evaluate and measure waste generation, and thus this process needs to be done manually, the collection still relies on the informal sector, and these sectors are not regulated by the law. Moreover, there is no waste separation at source exists in the municipality. On the other hand, there are few improvements from the regulation, such as opening more waste bank to treat the wastes, increasing the means of transportations and opening new facility (i.e., Sunter ITF). Based on this evaluation, it is apparent that the regulation gives a few impacts on the improvement of SWM from the technical aspects.

As for the environmental aspects, currently, the regulation enforcements help somewhat to mitigate the environmental impact in the SWM of Jakarta through its technology to the treatment for the waste, e.g., waste bank. The existence of waste banks helps to lessen the burden of waste management in Jakarta through the sorting and treatment stages. Also, it helps to enable more recycling activities happening in the communities. Furthermore, with the new facilities, such as Merah Putih PLTSA, helped to reduce the waste in the landfill site. There are more considerations towards the health and safety aspects of the workers as well with the constructions of few facilities and new tools for the waste workers in the landfill site. Even though the

effects on the significant issues for environmental, such as pollutions and illegal dumping, are still occurring and not minimized with the regulation.

The current regulation is seen struggling within its financial aspects such as the provisional budget of SWM could not balance the revenue and expenditure from waste management. From the socio-cultural aspects, there is a rise in public awareness and participation through the environmental issue such as plastic pollution to the coastal areas. Many citizens, currently, fight the issues through the "No Straw Movement," substituting straw from plastic to more reusable materials such as bamboo or stainless steel. Despite the awareness of the plastic issue, public awareness is still low, looking through the waste-separation practices and how seldom individuals to reuse their products. Moreover, citizens are still reluctant to spend their money on waste management services, such as paying a higher waste management fee and reuse everyday items.

Through the institutional and policy aspects, the regulation is slightly mitigating the problems of SWM. Inevitably, within the implementation, the government increases more collaboration with other stakeholders, such as environmental enterprise and NGO, opening more communication to the others in SWM. The regulation also manages to focus on improving the environment with the development of facilities. Despite the amelioration, there are many missing points from the regulation, such as the detailed directive and structure from the expert and trained staff that are resulting in delayed decision making, weak communication between people and local authorities. For sure, Jakarta needs to keep improving its implementation on SWM to create an integrated waste management system that will manage all of the principles (especially reduce and recycle better).

In conclusion, the regulatory framework did follow the CE principles with 3R programs as its resource management for SWM. However, the regulatory practices and enforcement, somewhat far from achieving the CE principles based on the answers of the three sub-questions. There are a few improvements for the SWM system for the 3R principles in resource management. For instance, from the technical aspects with new facilities and treatment system, environmental aspects through the effects

of the improvement of technologies and considerations toward workers, and increase in public awareness or participation through socio-cultural aspects. However, the enforcement has not successful enough to deliver a solution to all challenges in order to achieve the CE principles and ISWM framework. There are many missing opportunities from the regulation, such as the integration of the informal sector to the formal sector.

Their many internal aspects need to be ameliorated like the stricter enforcement and stringent institutional strategy to deter all actors for complying with the regulation. Also, it requires assistance not only from other formal sectors but from informal sectors and public. For instance, through communication with citizens to promote public participation and to comply with the regulation as well as make more initiatives with business sectors.

The details of possible alternatives the government could have done to improve the implementation could be seen in the following section.

## 6.2 Recommendations

This section discusses what kind of alternatives which circumvent the challenges of SWM in Jakarta. After evaluating and emphasizing the current inefficiencies across the waste management sector in the previous section, this section outlines measures concerning the municipality, private enterprises, and related non-governmental bodies in waste management activities and the residences of Jakarta for more circular SWM system.

**Alternatives of SWM Framework for Jakarta**

Based on the operations discussed in the previous sections, the formal sectors which hold the full authorities towards SWM, have to take significant steps in revamping the current system.

The regulatory plan and the strategy for the regulation can be realized sooner for better policy implementation and evaluation. The Environmental Agency of Jakarta should make a clear strategic direction with specific goals, guiding directives, and

how to achieve the goals with the specific measure with a real timeline: monthly targets and yearly. Regular monitoring and tracking of waste management activities not only from the data of waste reduction or the total waste but also for the performance of transportation and treatment system operations. It is also could be better if the regulation plan is consisted of the upcoming plastic prohibition, from the monitoring measure and activity guidelines.

Also, the informal waste sector, (e.g., the scavengers and waste pickers) can be formally recognized and integrated into the official recycling department with performance supervision regularly. Additionally, adopting the appropriate and stricter health and safety measures in the collection and handling process would also be beneficial for waste workers.

Authorities could design a legal framework on the incentive and disincentive system in the upcoming structure, such as incentives to give better equipment and tools to the district of Jakarta, such as to the excellent waste bank practice and disincentives to reduce the financial budget for which waste bank that could not meet the standards. The government also could create the indicator and standards, in the forms and procedures (B.V, 2012), for waste-management system elements (such as a waste bank) to get the incentives and disincentives. Under the circumstances, the judgment would be more objective, and the waste bank would be motivated to pass the indicators. Thereupon, it will create more unchanging practices in waste activities such as waste banks, while this could be more competitive with the reward system.

Another alternative for the financial system is taxation for waste management. One of the challenges in the institutional system is the revenue for the waste is too low to do research and adopting new technology. If the authorities design a legal framework for the taxation system, this might allow them to compel the households for paying the waste management services. The taxation system would implant the need to obligate the right waste collection and separation by the residences.

A stricter polluter pay system must be enforced because such a system is missing from the regulatory enforcement in which people are held responsible for the damage

done to the environment by paying penalties. As an example from Nagoya Japan, the consumers must comply with a complicated waste separation procedure (a 31 pages booklet). One of the systems in the booklet demands consumers to deliver some recyclables to specific collection stations weekly and others to retail stores (Ebner et al., 2007; Lease, 2002). Also, willingness is needed from the public to accept and pay a suitable service charge, in exchange with a guarantee of a circular and sustainable SWM system that targets for mitigating any potential health and environmental risks from the continual SWM system. Thus, improving the living conditions for citizens in Jakarta.

Also, the polluter pay principle needs to cover for business activities. As mentioned in section 4.2.1, the current polluter system for business is that the polluter gets punished only when the activity starts to cause more harmful effects on the public. Factories often cause pollution to the ground due to the damaged parts, metal fillings, and scraps. These wastes may be transported to the landfill or buried in the local dump. As time goes by, rats, flies, mosquitoes breed in the dump and could spread diseases to the nearby area (Hesperian, 2015). Moreover, it is not obligated from the regulation to implement this principle. Consequently, implementing the take-back principal for the business activities of private sectors daily could be better for the SWM system so that this sector could become responsible for the wastes. Also, this principal could control and deter them from responsible for materials, such as scraps and metal fillings, by reusing them to their new products.

Product factories (i.e., beverage, food, cosmetic.) need to be responsible for the end of the packaging. The government needs to enforce the recycling process for the packages, bottles, and wrapping of their products, taking back these, recycling and reusing it for their new product. Similar approaches are also employed in Korea with their deposit-refund system, disposable goods restrictions, and eco-labelling. The first method, the deposit-refund system, forces producers to pay deposits on their products. Then, 'Special Account for Environmental Improvement' receives all deposits and uses this money to support the recycling business. Based on the recovery rate attained, producers also get a refund for their deposits (Ebner et al., 2007; Lease, 2002). With this system implemented in the business sector, the

manufacturing companies will be most likely to shift their materials to more environmentally-friendly and recyclable, as the principal requires them to take back, reuse and recycle the package.

Current environmentally harmful practices must be stopped, such as illegal dumping and open incineration, and negligence towards environmental protection. There should be an obligatory, in regards to the cooperation from the public and commitment to obey a regular and systematic segregated waste collection system, to ensure the continual success of the sector. More campaign on the river and sea cleanliness need to be done regularly and not on some rare event such as earth day, mainly targeting the residents who live nearby the river or coastal to advertise and involve them, so they could know how severe and affected these areas by polluting with the wastages.

**Recommendation For Further Research**

While this study focuses on the importance of the implementation from the regulation of SWM in Jakarta to congruent with the concept of CE, there are scope and requirement for further research and exploration to figure a more circular and sustainable for further waste management system. Other practices that were not investigated in the present study should be researched in the future. All of the possibilities must be examined to gain new benefits and opportunities in the legal arrangement.

This research could only suggest environmental opportunities from better CE integration to SWM through the chance in the regulation and operational system. Therefore, further study needs to research other environmental opportunities that CE Integration can solve in the regards of SWM in Jakarta. The research will require extensive data collection and analysis from all the related stakeholders to realize the full potential and effect of CE in Jakarta where data concerning SWM is updated infrequently and hard to access which was the limitation of this study. For example, public participation towards SWM by surveying a representative sample of the population to investigate the perspective of citizens towards the SWM practices. Also,

the evaluation of the monetary budget of waste management and provide a well and ad hoc efficiency metrics for its financial scheme.

## References

3R Regional Forum. (2016). *Country Analysis*. Hanoi. Retrieved from http://www.uncrd.or.jp/content/documents/Country Analysis Paper_Indonesia.pdf

Apip, AH, S. S., & Pingping, L. (2015). *Water and Urban Initiative Water and Urban Initiative Working Paper Series*. Retrieved from http://collections.unu.edu/eserv/UNU:2872/WUI_WP4.pdf

Aprilia, A. (2016). *HOUSEHOLD SOLID WASTE MANAGEMENT IN JAKARTA, INDONESIA: EVALUATION ON HUMAN BEHAVIOUR, ECONOMY, AND GHG EMISSIONS*. Kyoto University. https://doi.org/https://doi.org/10.14989/doctor.k19904

Aprilia, A., Tezuka, T., & Spaargaren, G. (2012). Household Solid Waste Management in Jakarta , Indonesia : A Socio-Economic Evaluation.

Aprilia, A., Tezuka, T., & Spaargaren, G. (2013). Inorganic and Hazardous Solid Waste Management: Current Status and Challenges for Indonesia. *Procedia Environmental Sciences*, *17*, 640–647. https://doi.org/https://doi.org/10.1016/j.proenv.2013.02.080

Aqil, A. M. I. (2019). Waste-to-energy plant to produce 700 kw - Thu, March 28 2019 - The Jakarta Post. Retrieved July 1, 2019, from https://www.thejakartapost.com/news/2019/03/28/waste-energy-plant-produce-700-kw.html

B.V, D. (2012). *Scoping Study for Solid Waste Management in*. Jakarta.

Bahraini, A. (2018). Everything You Need to Know About 2025 Clean-from-Waste Indonesia – Waste4Change. Retrieved April 15, 2019, from https://waste4change.com/everything-you-need-to-know-about-clean-from-waste-indonesia-2025/

Beauchamp, T. L., & Childress, J. F. (1979). *Principles of biomedical ethics*. New York: Oxford University Press.

Bressers, H. (2004). Implementing Sustainable Development: How to Know What Works, Where, When and How. In *Governance for Sustainable DevelopmentThe Challenge of Adapting Form to Function*. Cheltenham, UK.

Bressers, H. (2007). Contextual Interaction Theory and the issue of boundary definition: Governance and the motivation, cognitions and resources of actors. *External Report ISBP EU-Project*.

Brickler, S. (2017). The Disadvantages of Manual Data Entry - CADTalk. Retrieved August 28, 2019, from https://www.cadtalk.com/2017/05/15/the-disadvantages-of-manual-data-entry/

C40 Climate Leadership. (2015). *Sustainable Solid Waste Systems*. Retrieved from www.c40.org

Clini, C., Musu, I., & Gullino, M. (2008). *Sustainable Development and Environmental Management: Experiences and Case Studies*. https://doi.org/10.1007/978-1-4020-6598-9

Coconuts Media. (2018). Jakarta's traffic ranked 12th worst in the world according to new survey | Coconuts Jakarta. *Cocounuts Jakarta*. Retrieved from https://coconuts.co/jakarta/news/jakartas-traffic-ranked-12th-worst-world-according-new-survey/

Cogut, A. (2016). *OPEN BURNING OF WASTE: A GLOBAL HEALTH DISASTER*. Retrieved from https://regions20.org/wp-content/uploads/2016/08/OPEN-BURNING-OF-WASTE-A-GLOBAL-HEALTH-DISASTER_R20-Research-Paper_Final_29.05.2017.pdf

Damanhuri, E., Handoko, W., & Padmi, T. (2014). Municipal Solid Waste Management in Indonesia. In A. Pariatamby & M. Tanaka (Eds.), *Municipal Solid Waste Management in Asia and the Pacific Islands: Challenges and Strategic Solutions* (pp. 139–155). Singapore: Springer Singapore. https://doi.org/10.1007/978-981-4451-73-4_8

Damanhuri, E., & Padmi, T. (2012a). The Role of Informal Collectors of Recyclable Waste and Used Goods in Indonesia. In E. Damanhuri (Ed.), *Post-Consumer Waste Recycling and Optimal Production*. Rijeka: IntechOpen. https://doi.org/10.5772/33760

Damanhuri, E., & Padmi, T. (2012b). *The Role of Informal Collectors of Recyclable Waste and Used Goods in Indonesia*. Retrieved from www.intechopen.com

Dethier, J.-J. (2017). Trash, Cities, and Politics: Urban Environmental Problems in Indonesia. *Indonesia*, (103), 73–90. https://doi.org/10.5728/indonesia.103.0073

Ebner, T., Ladouceur, M., Rosso, N., Fung Tsoi, T., F Lau, E. C., Director Hahn Chu, A., & Affairs Manager Michelle Au, E. (2007). *Beverage Producer Responsibility and Recycling*. Retrieved from https://web.wpi.edu/Pubs/E-project/Available/E-project-022807-211023/unrestricted/ProducerResponsibilityHKC07.pdf

Ekawati, S. (2016). Mengkritisi Kebijakan Penanganan Kantong Plastik di Indonesia, 1–4.

Ellen MacArthur Foundation. (2013). Towards the Circular Economy: Economyc and business rationale for accelerated transition. *Journal of Industrial Ecology*. https://doi.org/10.1162/108819806775545321

Ellen MacArthur Foundation. (2015). Towards a Circular Economy: Business Rationale for an Accelerated Transition. *Greener Management International*, 20. https://doi.org/2012-04-03

Europe, U. N. E. C. for. (1991). *Draft regional strategy for integrated waste management as quoted. In: McDougall, F., White, P., Franke, M., Hindle, P. (2001), Integrated Solid Waste Management: a Life Cycle Inventory* (Second). Oxford, United Kingdom: Blackwell Science.

European Comission. (1994). *Chapter 7 : Solid Waste Management*. Retrieved from http://ec.europa.eu/echo/files/evaluation/watsan2005/annex_files/WEDC/es/ES07CD.pdf

Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, *114*, 11–32. https://doi.org/https://doi.org/10.1016/j.jclepro.2015.09.007

Goel, S. (2017). *Advances in solid and hazardous waste management*. *Advances in Solid and Hazardous Waste Management*. https://doi.org/10.1007/978-3-319-57076-1

Gokkon, B. (2018, July 23). As planned excise flops, Indonesia ponders how to give up plastic bags. *Mongobay* . Retrieved from https://news.mongabay.com/2018/07/as-planned-excise-flops-indonesia-ponders-how-to-give-up-plastic-bags/

Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste Management*, *33*(1), 220–232. https://doi.org/https://doi.org/10.1016/j.wasman.2012.09.008

Haseena, M., & MF, M. (2017). Water pollution and human health. *Environmental Risk Assessment and Remediation*, *1*(3), 16–19. Retrieved from http://www.alliedacademies.org/environmental-risk-assessment-and-remediation/

He, L., Huang, G.-H., Zeng, G.-M., & Lu, H.-W. (2009). Identifying optimal regional solid waste management strategies through an inexact integer programming model containing infinite objectives and constraints. *Waste Management*, *29*(1), 21–31. https://doi.org/10.1016/J.WASMAN.2008.02.003

Hesperian. (2015). *Pollution from factories*. Retrieved from https://hesperian.org/wp-content/uploads/pdf/en_wgthas_2015/en_wgthas_2015_33.pdf

Iffah Nur Afifah. (2018). Gerakan Anti Sedotan Plastik Yang Kian Gencar di Indonesia (Intense Act of No Straw Movement in indonesia). *ABC News*. Retrieved from www.abc.net.au/indonesian/2018-09-19/gerakan-anti-sedotan-plastik-di-indonesia/10280154

*Indonesia Jakarta Solid Waste Management System Improvement Project*. (2003). Retrieved from https://www.jica.go.jp/english/our_work/evaluation/oda_loan/post/2003/pdf/2-14_full.pdf

IPCC. (2006). *INCINERATION AND OPEN BURNING OF WASTE*. Retrieved from https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/5_Volume5/V5_5_Ch5_IOB.pdf

Irvin, R., & Stansbury, J. (2004). Citizen Participation in Decision Making: Is It Worth the Effort? *Public Administration Review*, *64*, 55–65. https://doi.org/10.1111/j.1540-6210.2004.00346.x

Jakarta Central Bureau of Statistics. (2016). *Jakarta in Figs. 2016 (in Bahasa Indonesia)*. Jakarta. Retrieved from https://jakarta.bps.go.id/backend/pdf_publikasi/Jakarta-Dalam-Angka-2016.pdf

Jayasiri, H. B. (2017). Marine debris. *Marine Pollution and Climate Change*, (April), 136–162. https://doi.org/10.1201/9781315119243-6

Kalyani, K. A., & Pandey, K. K. (2014). Waste to energy status in India: A short review. *Renewable and Sustainable Energy Reviews*, *31*, 113–120. https://doi.org/10.1016/J.RSER.2013.11.020

Kharishar Kahfi, Dipa, Arya, Putra AW, Nedi, G. A. (2019, March 6). Regions lag behind in waste management planning. *The Jakarta Post*, p. 1. Retrieved from https://www.thejakartapost.com/news/2019/03/06/regions-lag-behind-waste-management-planning.html

Konteh, F. H. (2009). Urban sanitation and health in the developing world: Reminiscing the nineteenth century industrial nations. *Health & Place*, *15*(1), 69–78. https://doi.org/https://doi.org/10.1016/j.healthplace.2008.02.003

Lansink, A. (1979). Lansink's Ladder.

Lease, K. (2002). *Asian Countries Jump on the EPR Bandwagon (41st ed.)*. Washington, D.C.

Lestari, A. P. (2018). WASTE SORTING – PRAISE DROPPING BOX – ASTRI PUJI LESTARI. Retrieved July 29, 2019, from https://astripujilestari.com/2018/08/20/waste-sorting-praise-dropping-box/

Lohri, C. R., Camenzind, E. J., & Zurbrügg, C. (2014). Financial sustainability in municipal solid waste management – Costs and revenues in Bahir Dar, Ethiopia. *Waste Management*, *34*(2), 542–552. https://doi.org/10.1016/J.WASMAN.2013.10.014

Lokahita, B. (n.d.). *INDONESIA municipal solid waste Regulations and Common Practice*. Tokyo. Retrieved from https://www.academia.edu/23109258/INDONESIA_municipal_solid_waste_Regulations_and_Common_Practice

Mann, A. (2019, March 1). The waste challenge: Is Indonesia at a tipping point? *Jakarta Post*, p. 1. Retrieved from https://www.thejakartapost.com/academia/2019/03/01/the-waste-challenge-is-indonesia-at-a-tipping-point-1551431355.html

Marshall, R. E., & Farahbakhsh, K. (2013). Systems approaches to integrated solid waste management in developing countries. *Waste Management*, *33*(4), 988–1003. https://doi.org/10.1016/j.wasman.2012.12.023

Maschal Tarekegn, M. (2018). Causes and impacts of shankila river water pollution in Addis Ababa, Ethiopia. *Environmental Risk Assessment and Remediation*, *2*(4), 21–30. Retrieved from http://www.alliedacademies.org/environmental-risk-assessment-and-remediation/

McDougall, F. R., & White, P. (Peter). (2001). *Integrated solid waste management : a life cycle inventory*. Blackwell Science.

McDougall, F. R., White, P. R., Franke, M., & Hindle, P. (Eds.). (2001). *Integrated*

*Solid Waste Management*. Oxford, UK: Blackwell Publishing Company. https://doi.org/10.1002/9780470999677

Meidiana, C., & Gamse, T. (2010). *Development of Waste Management Practices in Indonesia*. *European Journal of Scientific Research* (Vol. 40).

Ministry of Environment and Forestry. (2009). *ENVIROMENTAL PROTECTION AND MANAGEMENT*. Jakarta. Retrieved from http://extwprlegs1.fao.org/docs/pdf/ins97643.pdf

MoE (Ministry of Environmental) Indonesia. Peraturan Presiden Republik Indonesia Nomor 97 Tahun 2017 tentang Kebijakan dan Strategi Nasional Pengelolaan Sampah Rumah Tangga dan Sampah Sejenis Sampah Rumah Tangga, 1 § (2017). Indonesia. Retrieved from http://dlh.magelangkab.go.id/download/file/PEDOMAN JAKSTRADA HA - 2 APRIL 2018 lamp pdf.pdf

MoE (Ministry of Environmental) Indonesia. (2019). *KEBIJAKAN DAN STRATEGI PENGELOLAAN SAMPAH (Plan and Strategy of Waste Management)*. Retrieved from http://dlh.sumbarprov.go.id/images/2019/03/file/Presentasi_SUMATERA_BARAT_2019.pdf

Mongabay-Indonesia. (2018, September 4). Indonesia, a top plastic polluter, mobilizes 20,000 citizens to clean up the mess. *Mongabay*. Retrieved from https://news.mongabay.com/2018/09/indonesia-a-top-plastic-polluter-mobilizes-20000-citizens-to-clean-it-up/

Mourão, M. C., Nunes, A. C., & Prins, C. (2009). Heuristic methods for the sectoring arc routing problem. *European Journal of Operational Research*, *196*(3), 856–868. https://doi.org/https://doi.org/10.1016/j.ejor.2008.04.025

Muthmainnah, L. (2007). Menggugah Partisipasi & Membangun Sinergi: Upaya Bergerak dari Stagnasi Ekologis Pengelolaan Sampah. *Jurnal Ilmu Sosial Dan Ilmu Politik*, *11*(2), 267–286.

National Geographic. (n.d.). Urbanization Causes and Impacts. Retrieved July 22,

2019, from https://www.nationalgeographic.com/environment/habitats/urban-threats/

OECD. (2001). *Extended Producer Responsibility : a Guidance Manual for Governments.* OECD Publishing.

OECD. (2014). *The Governance of Regulators*. OECD. https://doi.org/10.1787/9789264209015-en

Pasang, H., Moore, G. A., & Sitorus, G. (2007). Neighbourhood-based waste management: A solution for solid waste problems in Jakarta, Indonesia. *Waste Management*, *27*(12), 1924–1938. https://doi.org/https://doi.org/10.1016/j.wasman.2006.09.010

Permana, A. S., Towolioe, S., Aziz, N. A., & Ho, C. S. (2015). Sustainable solid waste management practices and perceived cleanliness in a low income city. *Habitat International*, *49*, 197–205. https://doi.org/10.1016/J.HABITATINT.2015.05.028

Priyanta, M. (2016). THE POSITION OF STATE RESPONSIBILITY FOR ENVIRONMENTAL POLLUTION BY CORPORATE : The Legal Studies of Implementation Paradigm Polluter Pay Principle in Environmental Law Enforcement in Indonesia. *Tadulako Law Review*, *1*(2), 119–138. https://doi.org/10.22487/j25272985.2016.v1.i2.7130

Purningsih, D. (2018, March 12). Lack of Attention on Circular Economy for Waste Management. *Greeners.Co*. Retrieved from https://www.greeners.co/english/lack-of-attention-on-circular-economy-for-waste-management/

Purningsih, D. (2019a, February 28). Waste Bank in West Jakarta Hit Billions Rupiah of Profit - Greeners.Co. *Greeners.Co*. Retrieved from https://www.greeners.co/english/waste-bank-in-west-jakarta-hit-billions-rupiah-of-profit/

Purningsih, D. (2019b, March 26). Bantar Gebang Waste-To-Energy Plant is Ready to Operate - Greeners.Co. *Greeners.Co*. Retrieved from

https://www.greeners.co/english/bantar-gebang-waste-to-energy-plant-is-ready-to-operate/

Putra, Nedi, Dipa, Arya, Kahfi, K. (2019, March 3). Inadequate landfills worsen Indonesia's waste problems - National. *The Jakarta Post*, p. 1. Retrieved from https://www.thejakartapost.com/news/2019/03/03/inadequate-landfills-worsen-indonesias-waste-problems.html

Putri, A. R., Fujimori, T., & Takaoka, M. (2018). Plastic waste management in Jakarta, Indonesia: evaluation of material flow and recycling scheme. *Journal of Material Cycles and Waste Management*, *20*(4), 2140–2149. https://doi.org/10.1007/s10163-018-0753-2

RAHIM, I. R., NAKAYAMA, H., & SHIMAOKA, T. (2013). Cost Analysis of Municipal Solid Waste Management in Major Indonesian Cities. *Journal of Japan Society of Civil Engineers, Ser. G (Environmental Research)*, *68*(6), II_79-II_88. https://doi.org/10.2208/jscejer.68.ii_79

Research and Development Institution of Minister For Public Works and Human Settlements. (n.d.). Tempat Pengolahan Sampah - Reduce Reuse Recycle (TPS3R) - TeknoPU. Retrieved August 29, 2019, from http://elearning.litbang.pu.go.id/teknologi/TPS3R

Salaj, I. (2018). Education Policy Implementation from the Perspective of Pupils and Students with Disabilities / Provedba obrazovne politike iz perspektive učenika s teškoćama u razvoju i studenata s invaliditetom. *Croatian Journal of Education - Hrvatski Časopis Za Odgoj i Obrazovanje; Vol 19 (2017): Sp.Ed.3*. Retrieved from http://cje2.ufzg.hr/ojs/index.php/CJOE/article/view/2696 %3C/div%3E

Sembiring, E., & Nitivattananon, V. (2010). Sustainable solid waste management toward an inclusive society: Integration of the informal sector. *Resources, Conservation and Recycling*, *54*(11), 802–809. https://doi.org/https://doi.org/10.1016/j.resconrec.2009.12.010

Shekdar, A. V. (2009). Sustainable solid waste management: An integrated approach

for Asian countries. *Waste Management*, *29*(4), 1438–1448. https://doi.org/10.1016/j.wasman.2008.08.025

Sidiq, F. (2019a, January 9). Jakarta delays ban on single-use plastic bags - Wed, January 9 2019 - The Jakarta Post. *The Jakarta Post*. Retrieved from https://www.thejakartapost.com/news/2019/01/09/jakarta-delays-ban-single-use-plastic-bags.html

Sidiq, F. (2019b, February 27). Scavengers work under radar to help reduce city's waste - Wed, February 27 2019 - The Jakarta Post. *The Jakarta Post*. Retrieved from https://www.thejakartapost.com/news/2019/02/27/scavengers-work-under-radar-help-reduce-city-s-waste.html

Spratt, K. (2009). *POLICY IMPLEMENTATION BARRIERS ANALYSIS: CONCEPTUAL FRAMEWORK AND PILOT TEST IN THREE COUNTRIES*. Retrieved from http://www.healthpolicyinitiative.com/Publications/Documents/998_1_PIBA_FINAL_12_07_09_acc.pdf

Suherman, V. S., Franco-García, M.-L., Abdoellah, O. S., Kurniadie, D., & Hidayati, Y. A. (2019). Circularity of Wastes: Stakeholders Identity and Salience for Household Solid Waste Management in Cimahi City, West Java Province, Indonesia. In M.-L. Franco-García, J. C. Carpio-Aguilar, & H. Bressers (Eds.), *Towards Zero Waste: Circular Economy Boost, Waste to Resources* (pp. 81–104). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-92931-6_5

Surapati, F. B. (2018, July 5). Sunter ITF Construction Plan Continues to Be Prepared - Beritajakarta.id. *Berita Jakarta*. Retrieved from http://www.beritajakarta.id/en/read/22068/sunter_itf_construction_plan_continues_to_be_prepared#.XRpxougzY2w

The Environmental Agency Banten. Kebijakan-dan-Strategi-Nasional-Pengelolaan-Sampah-Tahun-2017 (2017). Indonesia. Retrieved from https://dlhk.bantenprov.go.id/upload/dokumen/JAKSTRADA.pdf

The Jakarta Post. (2014, January 17). Govt needs to pay more attention to informal

sector - National - The Jakarta Post. *The Jakarta Post*. Retrieved from https://www.thejakartapost.com/news/2014/01/17/govt-needs-pay-more-attention-informal-sector.html

The Jakarta Post. (2018a). Jakarta to collect more e-waste in 2018 - City - The Jakarta Post. Retrieved July 1, 2019, from https://www.thejakartapost.com/news/2018/01/12/jakarta-to-collect-more-e-waste-in-2018.html

The Jakarta Post. (2018b, April 1). Burning plastic waste harmful to health - Health - The Jakarta Post. *The Jakarta Post*. Retrieved from https://www.thejakartapost.com/life/2018/03/31/burning-plastic-waste-harmful-to-health.html

The Jakarta Post. (2018c, December 19). Plan to ban plastic bags in Jakarta met with mixed response - City - The Jakarta Post. *The Jakarta Post*. Retrieved from https://www.thejakartapost.com/news/2018/12/19/plan-to-ban-plastic-bags-in-jakarta-met-with-mixed-response.html

The World Bank. (2016). *Indonesia's Urban Story exhibit — City Form Lab*. Massachusetts. Retrieved from http://cityform.gsd.harvard.edu/projects/indonesia-s-urban-story-exhibit#05solidwastemanagement

Trisyanti, D. (2004). *Solid waste management of Jakarta: Indonesia an environmental systems perspective*.

Ullah, S., Javed, M. W., Shafique, M., & Khan, S. F. (2014). *An integrated approach for quality assessment of drinking water using GIS: A case study of Lower Dir*. *Journal of Himalayan Earth Sciences* (Vol. 47). Retrieved from http://nceg.uop.edu.pk/GeologicalBulletin/Vol-47(2)-2014/Vol-47(2)-2014-Paper12.pdf

Van De Klundert, A., & Anschütz, J. (2001). *Integrated Sustainable Waste Management-the Concept*. Gouda, The Netherlands: WASTE. Retrieved from https://www.ircwash.org/sites/default/files/Klundert-2001-Integrated.pdf

Vats, M., & Singh, S. (2014). E-Waste characteristic and its disposal. *International Journal of Ecological Science and Environmental Engineering*, *1*, 49–61.

Wang, G., Qin, L., Li, G., & Chen, L. (2009). Landfill site selection using spatial information technologies and AHP: A case study in Beijing, China. *Journal of Environmental Management*, *90*(8), 2414–2421. https://doi.org/10.1016/J.JENVMAN.2008.12.008

Wang, P., Che, F., Fan, S., & Gu, C. (2014). Ownership governance, institutional pressures and circular economy accounting information disclosure: An institutional theory and corporate governance theory perspective. *Chinese Management Studies*, *8*(3), 487–501. https://doi.org/10.1108/CMS-10-2013-0192

Waste4Change. (n.d.). Waste4Change. Retrieved July 29, 2019, from https://waste4change.com/dropbox/

Wijaya, C. A. (2016, May 20). Jakarta set to develop waste-to-energy plants - City - The Jakarta Post. *The Jakarta Post*. Retrieved from https://www.thejakartapost.com/news/2016/05/20/jakarta-set-to-develop-waste-to-energy-plants.html

Wilson, D. C., Velis, C. A., & Rodic, L. (2013). Integrated sustainable waste management in developing countries. *Proceedings of the Institution of Civil Engineers - Waste and Resource Management*, *166*(2), 52–68. https://doi.org/10.1680/warm.12.00005

World Population Review. (2019). Jakarta Population 2019 (Demographics, Maps, Graphs). Retrieved August 24, 2019, from http://worldpopulationreview.com/world-cities/jakarta-population/

Yuan, Z., Jiang, W., Liu, B., & Bi, J. (2008). Where will China go? A viewpoint based on an analysis of the challenges of resource supply and pollution. *Environmental Progress*, *27*(4), 503–514. https://doi.org/10.1002/ep.10300

Zurbrügg, C., Gfrerer, M., Ashadi, H., Brenner, W., & Küper, D. (2012). Determinants

of sustainability in solid waste management – The Gianyar Waste Recovery Project in Indonesia. *Waste Management*, *32*(11), 2126–2133. https://doi.org/https://doi.org/10.1016/j.wasman.2012.01.011

# Appendix

## APPENDIX 1. INFORMED CONSENT BOOKLET FOR RECORDING

**INFORMED CONSENT** [12]

**Project Title**

Evaluation for The Enactment of New Presidential-Regulation on Waste Management In Jakarta, Indonesia

**Purpose of the Study**

This research is being conducted Pradhita Audi di Jakarta, Indonesia to evaluate the implementation of the presidential regulation. Therefore, I invite you to participate in the interview of the thesis project. This primary purpose of this research is to make recommendations on improving the implementation of the effectiveness of the presidential regulation.

**Procedures**

This interview lasts for 30 minutes. You will be asked questions about the implementation of the presidential regulation to solid waste management in Jakarta. Sample questions include: "What kind of challenges that hinder the improvement for solid waste management Jakarta?".

Your age must be at least 16 years old with no cognitive impairments or under institutional care (e.g., hospitals, nursing homes, prisons) to complete this form.

**Potential Risks and Discomforts**

There are no apparent physical, legal or financial risks connected with this research,

[12] The original template downloaded from https://www.utwente.nl/en/bms/research/ethics/informed-consent-procedure/

or some discomfort due mainly to the sensitive issues. You do not have to reply to any questions that you do not wish to answer. You are free to discontinue as your participation is voluntary at any time.

**Potential Benefits**

Participation in this research does not ensure any beneficial results for you. As an outcome of your participation, you may understand the broader target of this study, which improves the implementation of the presidential regulation and gives new recommendations or alternatives for solid waste management of Jakarta.

**Confidentiality**

Your privacy shall be protected to the highest extent allowed by law. No personal information will be reported in any of the research products. In addition, only qualified research staff will have access to your answers. Within these restrictions, the results of this study will be made available to you upon request.

As stated above, this study project includes making audio recordings of interviews with you. Transcribed sections of audio recordings may be used in published forms (e.g. newspaper articles and book chapters). Pseudonyms will be used in the event of publishing. Audio recordings, forms, and other documents created or collected as part of this study will be stored in a secure location on the researcher's password-protected computers and will be destroyed if the audio transcript is completed.

The researcher will obtain the audio or video recording to ensure any critical answer will be not missed from the interview. The audio or video data will be stored in a hard disk and will be encrypted with a password. The research files will be destroyed right away after the data from the audio has been entirely transcribed to the document.

**Consent Statement**

Your signature has to indicate that you are at least 16 years old; you have read or read this consent form; your questions have been responded to your satisfaction,

and that you are willing to participate in this research study. You will obtain a copy of the signed consent form.

I agree to join in this research project led by Pradhita Audi. The primary purpose of this consent booklet is to set the terms for my participation in the project by being interviewed.

I have received adequate information about this research. The aim of my involvement as a participant in this project has been clarified and is transparent to me. My participation as an interviewee in this project is voluntary. My involvement as an interviewee is voluntary. There is no coercion, explicitly and implicitly, to be part of this interview.

Participation involves being interviewed by (a) related researcher(s) the Interview will last approximately 30 minutes. I permit the researcher(s) to take notes during the or recording with audio/videotape during the interview. I am at any point of time entitled to withdraw from participation, in case I do not want the Interview to be recorded.

I have the right not to answer any of the questions when, in any manner, the questions become too unpleasant during the interview session. I have the right to stop participating in the interview.

I have been provided specific guarantees that the investigator will not identify me by name or function in any of the reports using the data acquired from this interview if I do not wish to be included. Furthermore, my confidentiality as a participant in this study will remain secure.

I have been told and guaranteed by the researcher (s) that this research project has been reviewed and approved by the Supervisor of this project, Daskalova V.I and by the BMS Ethics Committee, Jansen G. For research problems or any other question regarding the research project, the Secretary of the Ethics Commission of the faculty Behavioural, Management and Social Sciences at University Twente may be contacted through ethicscommittee-bms@utwente.nl.

I have understood the statements and points in this form. I have had all my questions responded to my satisfaction, and I willingly agree to take part in this research.

## APPENDIX 2. QUESTIONNAIRE ANSWERS

### 2.1. Interview with a representative from Waste4Change

1. In further details for JAKSTRADA, there is a program for composting. To what extent the program works in the community? How is the practice that usually happens in the community? What is the key to the successful/unsuccessful composting in the community?

   Composting is usually practised in a community facility such as TPS 3R and waste bank – however, in Jakarta, composting practice is still in a minimal quantity. At TPS 3R the standard methodology to compost is open windrow composting, while at the waste bank they usually compost in a drum. It is worth to note that as waste bank's primary purpose is the recovery of inorganic waste, it is very few of them who conduct composting. Usually, the waste bank that conducts composting is coordinated by Jakarta Cleansing Agency – for example, Waste Bank Centre in West Jakarta Environmental Agency office which creates "Bank Kompos Induk Satu Hati" and has four waste bank units which supply waste to them. On the contrary, TPS 3R is focused on the recovery of organic waste – one example of the existing TPS 3R is TPS 3R Rawasari in Central Jakarta.

   As most of Jakarta citizens are busy, for a composting to be successful in the community, the first basic need is a composting infrastructure with a daily operator who runs the facility. Second, there is a need for a reliable financing system to ensure the composting facility will run continuously – lessons learned from several existing practices, relying only on the revenue from selling the compost is not enough.

2. To what extent the recycling program works in most districts of Jakarta? Could you give some examples of how the program works/does not work? If you had to

give the program a score of 1-10 in terms of effectiveness, what score would you give? Why did you choose this score?

Recycling in Jakarta mostly still relies on the role of informal sectors. The recycling effort by the community and the government is usually conducted through the waste bank, where the community sort their waste and submit it in return for money in their 'account.' Nowadays in each branch of Jakarta Environmental Agency, there is a waste bank – not all of them are running well though. Jakarta Environmental Agency also provides an inorganic waste truck to help waste bank units deliver their waste to a waste bank center.

Some of the waste bank units use this facility, while some others work directly with their trader in delivering their waste. For current practice, I would give 5 scores – because recycling is happening, but the formal system still relies heavily on the landfill as the waste collection is still mixed. According to the Ministry of Environment and Forestry, the waste bank is predicted only reduce about 2% of waste generated – on a national scale. We still need improvement to create an integrated waste management system that will manage to recycle better.

3. To what extent reusing stuff in household communities of Jakarta contributes to the solid-waste reduction in Jakarta? What kind of actions these communities usually do for this? If you had to give the program a score of 1-10 in terms of effectiveness, what score would you give? Why did you choose this score?

   I would say measuring the rate of people reusing stuff is quite tricky. Most of the movement that happening is focused on reducing the use of the single-use item, for example, Gerakan Indonesia Diet Kantong Plastik that focuses on reducing the use of the plastic bag. However, there is a trend in Jakarta – and in some big cities in Indonesia in general – for people to use a reusable straw (stainless, bamboo, etc.). I believe social media has a significant influence on spreading this behaviour.

4. What are the facilities and infrastructures that have been established in the SWM of Jakarta?

   Collection: waste cart, a cart with a motorbike, pickup truck

   Temporary storage: Tempat Penampungan Semnetara (TPS) / Temporary Storage, Stasiun Pengolahan Antara (SPA) / Intermediate Treatment Facility (ITF)

Recovery and recycling: TPS 3R, waste bank (units & central)

Transportation: dump truck, arm roll truck, trailer truck, compactor truck, inorganic truck

Final treatment: TPST Bantar Gebang (controlled landfill)

5. To what extent the reduction of solid waste in Jakarta from the first enforcement of JAKASTRADA Solid Waste? Do you think the policy/program JAKSTRADA is effective (in your opinion)? Do you think others think the same/would agree with you?

   Currently, there are no tools to measure and monitor the implementation of JAKSTRADA in Jakarta. Thus, we cannot answer how effective the reduction of waste is quantitative. On another hand, based on Waste4change's experience on the ground, we can say that Jakarta's waste management system is improving - it can be seen from upstream to downstream. Upstream in the waste collection process, Jakarta increases the number of waste bank, creating an environment for the society to sort their waste. They also have just started Jakarta Less Waste Initiative to encourage offices, cafes, and restaurants to be innovative in their waste management.

   In the transportation sector, the Jakarta Environmental Agency increases the number of waste collection trucks to provide waste collection to more regions. At downstream, we can see that the management of TPST Bantar Gebang is getting better now after the government took over the management of the facility from the previous private sector. Even though we have not seen any radical change, I believe they were continuously making improvements to handle waste management better, and I think others will think the same.

## 2.2. Interview with a representative from Iddkp

1. What do you know about Jakstrada?

   After Jakstrada the legal needs to plan the road map; the implementation is not that structural, depending on the region; there is no standard measure of how

the implementation successful/not. The current SWM itself has gotten an integration with the private enterprise such as 'Waste4Change' to aid them in handling waste management.

Waste Bank: needed to think to what extent they did the socialization/campaign and their strategy for the implementation of Jakstrada because NGO and public did not participate in the making of the regulation.

Composting = it is stated in the regulation but unknown to its existence inside the system.

The recycling program is not entirely effective cause firstly waste banks in each district work independently (except the waste bank center). The informal sector, which is usually done the recycling program collected the wastages from nearby neighbourhoods and Bantar Gebang. It is unsure as the waste is not only belonging to the citizens of Jakarta but also the area near the city if the waste collected from Bantar Gebang. Household and commercial sites differ in their waste management due to the later might use a specific private agency for their waste. Currently focused on plastic bags, Styrofoam, and a plastic straw.

2. What is your role in the SWM of Jakarta or in the plastic reduction?

   As a bridge of the public to government for the plastic ban through campaign etc.; and be a technical advisor to the government in example to the policy-making of the plastic prohibition

3. What is the plastic ban? How is the current status of the law-making currently?

   The regulation plan is still on process and not signed yet. If it is done, the regulation will be applied to the traditional markets, mall, modern stores could not use and sold single-use plastic at all. These are the ones with the selling permits from the government. While the ones without it will be an obstacle of the ban in the future, as the government could not supervise these people and enforce them with a sanction as they do not regulate under the formal sector. Another obstacle is after it is enacted, the regulation could not be applied directly as this

law needs to be socialized to the public and make them used to it. The effect might take for 6-12 months after the enforcement and could be evaluated then as to whether it is valid or not.

Also, it depends on how much the average rate of plastic reduction, and this ban contributes to the Jakstrada. Nowadays, most likely the waste reduction could only be calculated from composting and recycling program (not from the plastic ban) such as from the e-waste dropping box for electronic wastages (how much it is recycled and supported to the reduction of 70%).

4. How are the reactions and actions from the public knowing the plastic reduction issue and the plastic ban itself?

   The truth is that most of the citizens know and aware of the harmful effect of plastic bags. However, it is still unsure as to what extent they act towards the plastic bags and reduces it, because the quantitative data such as a percentage rate comparison of the past year and this year of plastic bags usage is still missing (e.g., from the data of retails who get fined because of selling single-use plastic bags). Inadequate quantitative data is also caused by insufficient periodical monitoring. The current Presidential Regulation No. 97/2017 regulates the paid single-used plastic. However, it is not implemented evenly. Therefore Jakarta must have the plastic ban, and our organization will keep pushing the government to implement this regulation. Later if the regulation gets enacted, the retail stores are prohibited from selling any single-used plastic bags.

5. If later the ban gets implemented, how about the small scale store?

   For the authorized seller, their stores will be easy to regulate as they will be supervised directly by the governmental bodies. For instance, for a massive market area, the market manager will get taxation and fined by law if they get caught selling single-use plastic bags.

   There is one drawback in Jakstrada. When the regulation got implemented, it is not directly enforced into the public right away or taken into effect. After it is got enacted, governments would announce it firstly by informing and educating

towards the public on how this regulation works, etc. Then usually there is none detailed plans or strategy published right away and only the main targets. Few initiatives are taken annually. At the end of the policy implementation, few of the targets would be achieved, and the rests got ignored. So if it is calculated a based score from 1 to 5, then the implementation only gets 1 in the score. Another weakness is in the environmental sector which mostly handles the regulatory role, and the executive role is the same staffs from engineering that actively participate in the policymaking process, and there is a little participation from the law person. Usually only to translate the engineering terms to law terms in the regulation, at the near end policy-making process.

## 2.3 Interview with a citizen that follows zero-waste practice and has sufficient knowledge of solid waste in Jakarta

1. What are the challenges for infrastructure in Jakarta? What else has been done for Jakarta to mitigate the infrastructure challenge?

   Lack of specialized truck for the waste management, big-scale facilities for treating the waste not only the regular waste on a daily basis but also the existing waste in the landfill ; WtE plant (methane to electric) near the Bantar Gebang Landfill site but it is ineffective to reduce the waste in the landfill as the plant could only hold the waste on a small scale and the waste is already building up like a mountain.

2. What is the societal challenge when it comes to reducing the waste in Jakarta that you know?

   Reduce the plastics in around the community market or traditional market. Usually, this kind of market relies heavily on plastics or Styrofoam, such as for packaging. These packages make the food last longer, and thus, they could sell it not only in Jakarta but shipping it to the other provinces. They need it as a container for snacks they sell etc. This could be a severe issue if the plastic ban regulates in Jakarta as they will oppose the ban, on the other hand, this kind of plastic is a single-used plastic thus it will be hard to be recycled.

Another is the awareness of the citizens to the issues regarding the health aspects of SWM in Jakarta. They need to be aware and concern thus they could push the formal sector to change and create the regulation to have a valid target and cover all stakeholders in SWM such as not only from the communities but to the industrial sector as well.

3. To what extent reusing stuff in household communities of Jakarta contributes to the solid-waste reduction in Jakarta? What kind of actions these communities usually do for this? If you had to give the program a score of 1-10 in terms of effectiveness, what score would you give? Why did you choose this score?

   I believe, the implementation of the regulation regarding the programs related to the reusing principle is not well progressed. For the evidence, citizens of Jakarta still stuck to their habit of using a single-used product, in the example in a party or special occasion or in office life. Reusing stuff works well in the fashion retail sector, for instance, with the second-hand store. There are lots of youngsters who love the second-hand stuff, even building a community or platform such as Tinkerlust. Regardless, the efforts of citizens are only to that extent, and there is not enough realization in people to reuse products they used previously. Overall, I will give 5 for the score due to the argument made prior.

4. To what extent the recycling program works in most districts of Jakarta? Could you give some examples of how the program works/does not work? If you had to give the program a score of 1-10 in terms of effectiveness, what score would you give? Why did you choose this score?

   The recycling program from the regulation could not be implemented maximally in Jakarta. It is limited to the private communities or organizations who love and concern about environmental and not based on the enforcement or controlled by the government. There is one good enterprise that provides its company as a place for citizens to send their trashes for inorganic waste to be collected and recycled in their firm freely. Citizens could send it directly to their office, but this organization also provides a dropbox in a particular location point where people

could throw the waste in there. Even though the location points are not many, but this helps to relieve the government burden for processing the waste ( to add that they also collaborate with the governmental bodies in the SWM system). In recent years, I have read much news because this enterprise is a trustworthy one. Eventually, many companies have trusted their aids to process their waste to this company. The overall score that I could give is 6 because not many sectors have contributed yet to make the most of the program work.

5. The effectiveness of the regulation from the scale 1-10?
   I think reliably could give 5 on the processes. From collecting the waste it is already done better than before, the garbage bins are sufficient in recent years rather than in the past. However, the waste segregation is still not effectively done in the management process, thus making the final disposal process to be ineffective as well.

## 2.4. Interview with environmental officers

1. To what extent governmental bodies have monitored the implementation process of JAKSTRADA for waste (the plan in accordance with the presidential regulation)? What are the ways in which you monitor? What kind of strategy you do to make the action plan effectively progress for solid-waste reduction? What kind of monitor you usually do to get the information for the implementation?

   For citizens: Guidance on waste banks, facilities (garbage trucks, collections, other support equipment and services to waste banks is carried out because the waste bank itself is a system of site systems held near the residents. Therefore many residents are still reluctant to dispose of garbage into stalls.

   The monitoring is done through service per waste bank units. Because from the, not all of the waste put in one station instead spread through units (there are units and one center of the waste bank) then through these branches they will sort and send it to the center waste bank in Menteng. As a result, they are monitoring and educating through the waste bank units by the organizational staff in the unit to the school and nearby, such as environmental education that is

periodically done. The monitoring is also done to the data of waste processed and handled daily

2. How is the operational management for the waste bank, usually in the districts of Jakarta? What are institutional bodies usually do to maintain the operating system? Are there instances in which it has gone wrong, or you have received complaints? Could you tell me a bit more about these instances? To what extent the effectiveness of waste banks in the district areas of Jakarta? Who helps to collect the trash? Are there any government agencies involved? Which ones? And after being collected to the waste bank where the waste will be transferred?

   It is effectively implemented, albeit not giving any significant change to the SWM of Jakarta. The waste bank works as a bridge between the government and citizens. On the one hand, governmental bodies want the waste to be sorted and treated correctly, on the other hand, majority of the residences still not want to collect and sort their waste thus with a site system of this bank it helps residences to be a place to collect all citizens waste and sort the unsorted ones. It was under the ministry of environment and forestry of Indonesia and supervised under this institution. All of the waste from the waste bank on the district level will be collected and sent to the waste bank center that works directly under the ministry itself, and they will send the ones that could be recycled to the firm which want the material such as plastic bottles or papers.

3. To what extent the governmental bodies of Jakarta have identified the potential of the waste volume and collecting the waste data?

   They have not maximally identified the potential of waste volume because not all of the wastages are sorted and not every residence send their wastes to the waste bank (more to the informal sector).

4. Based on the evaluation, are there any obstacles in regards to the enforcement? What kinds of challenges are there?

Mostly it is to the monitoring and evaluation processes. The informal sectors that are not integrated with the waste bank. Even so, the governments have tried to persuade and refer this sector to gather all the collected waste to the waste bank. However, this sector still works independently (from collecting to sell recyclable products to the firm), lack of skilled and experienced human resources to help for research and development of the environmental and SWM system of Jakarta. Moreover, lack of education and awareness about SWM in the formal education resulting in a lack of awareness for Jakarta citizens.

The educational campaign is there but does not resulting in a significant impact because it is not done through all levels. Besides, the regulation currently is an effective strategy to make less-problematic enforcement for the executor. As the culture of the citizens that needs any a permit before making the campaigns and programs in some areas for the executors to spread and educate people. That is why Jakarta needs a legal provision that could penetrate, not only the macro levels but also the middle and lower levels of communities. With this provision, the executor could encourage more recycling activities (for example) or educate the local residences.

Furthermore, at present, Jakarta lacks the environmental agencies to work in the waste management field, since they know this sector is not favourable as they handle "waste". As a matter of fact, it makes profit too for the owner of a waste bank as or example, the one in Kebayoran. This waste bank produces up until 30.000.000 monthly.

## 2.5. Interview with staff from Goods and Packaging Department, Ministry of Environment, and Forestry Indonesia

1. To what extent the reduction of solid waste in Jakarta from the first enforcement of JAKASTRADA Solid Waste? Do you think policy/program JAKSTRADA is useful (in your opinion)? Do you think others think the same/would agree with you? Is there any chance of process in the waste treatment, from collecting to final disposal?

In Jakarta, as far as I know, they have not finished the strategy for JAKSTRADA. For another city in Indonesia, most of them completed the regulation. So if one day being asked about the data for Jakarta, I cannot answer the exact statistic for SWM as the strategy is not there yet.

To tell the effectiveness, they must be sufficient to reach the target of 30%. Because this is such an obligation, The Environmental Agency needs to, but because of the nonexistent strategy, I cannot be sure of the effectiveness. However, from some of the programs in Jakarta, I think they have progressed well. However, on the national scale itself, the target of 30% is still far away.

There are changes and improvements in SWM in the enforcement, from the reduction side. For instance, few policies enforced for the plastic ban in other provinces such as Bali. Jakarta has not enforced yet, but hopefully sooner, it will be enacted. We government would keep pushing the waste banks in Jakarta to keep contributing to the waste reduction and educating the communities to spread the awareness towards the better management of solid waste in Jakarta.

We also will enforce the business sectors, producers who produce the packaging and goods so they will also responsible for the waste (packaging and product waste) as a polluter. We will keep spreading the awareness to the public to reduce and treat their waste such as to encourage composting activities, from the technology, planning to install WtE facility. It supposedly to operate this year but due to some circumstances, it is postponed to the next year.

2. To what extent governmental bodies have monitored the implementation process of JAKSTRADA for waste (the plan by the presidential regulation)? What are how you monitor? What kind of strategy, do to make the action plan effectively progress for solid-waste reduction? What kind of monitor you usually do to get the information for the implementation?

The priority now is to push the Environmental Agency of Jakarta to establish the JAKSTRADA plan, calculate the new reduction target, and evaluate the initial implementation process from capacity and the percentage of target achieved.

As for the daily monitoring, few of the activities executed such as evaluation for the plastic prohibition, the ministry department go to the few points in Jakarta to evaluate the background aspects; Monitoring waste bank to every districts and investigating whether the facilities are used well or not; We have the reward called ADIPURA that conducted twice in a year to see from the regional scale whether a particular city has reached the right cleanliness level based to our standard and we will reward them; enacting SWM plan completely, we go for field research and enforce with the incentives or disincentives scheme with reward and new facilities, we don't give people sanction we will give a warning, so they don't do it again.

3. To what extent the governmental bodies of Jakarta have identified the potential of the waste volume and collecting the waste data?

   Same as answer number 1 part 1

4. What are the facilities and infrastructures that have been established in the SWM of Jakarta ?

   The central government facilitates the local landfills government. PUPR builds new or landfill rehabilitation. Also, things, such as the means of transporting garbage trucks, recycling centers, TPS3R trash cans with the 3R principle, the local government also help with the form of buildings, tools, machines, transportation equipment, etc. Then biogas facilities to process organic waste into gas in several regions. (Jakarta does not have it, now on the Bantar Gebang Plant only have methane gas to electricity). Jakarta does not get much help because Jakarta is the capital city so usually has the highest capital budget assistance from the ministry is usually in the form of policy evaluation, constitution, design of activities and regulations.

5. Based on the evaluation, is there any obstacle in regards to the enforcement? What kinds of challenges are there, internally or externally?

   There are many examples from challenges such as few of the regions do not have the regulation guidelines, and even if some already had the JAKSTRADA guide,

they have not calculated the detailed steps they should take to reach the target. So we have to keep pushing the regional governments to evaluate their JAKSTRADA and make the next step for their enforcement. There is no commitment from several regions to establish JAKSTRADA.

After the establishment of JAKSTRADA, there are also some problems such as local government capacity management such as budget, then technical such as experts, then from business people to invite them to be responsible for the waste that they produce (producer responsibility) because from their mindset they think that garbage is a government matter.

## 2.6. Interview with a waste bank officer from Pertukangan

1. In further details for JAKSTRADA, there is a program for composting. To what extent the program works in the community? How is the practice that usually happens in the community?

   The composting in community works in two ways: they could collect the organic waste and bring these to the waste bank, and it will be treated in the communal composting, or they could buy a composting bag and do the process in their own home.

2. To what extent the recycling program works in most districts of Jakarta? Could you give some examples of how the program works/does not work?

   The recycling program works with the waste bank regularly. The treatment processes are:

   Organic waste treatment: with composting as from organic waste to compost. It works and dilutes with EM diluter.

   Inorganic waste treatment: There are a few types of inorganic waste such as plastics, papers, and hazardous wastages and e-waste. However, it is rare the residences to bring their hazardous/ waste to the waste bank as they usually sell it and make a profit out of those wastages.

3. How is the operational management for the waste bank, usually in the districts of Jakarta? What are institutional bodies usually do to maintain the operating system? Are there instances in which it has gone wrong, or you have received complaints? Could you tell me a bit more about these instances?

   The waste bank works like a bank, generally. Residences who live near the sites bring and sort their waste. Then in the waste bank, we will weigh the waste of how many kgs and we will trade it for money according to the price/kgs (there is a price list in here that differ to individual price list and group, such as family or community from school, price list).

   There are two kinds of waste bank: owned by an individual or community. Some people could open the waste bank right away. The motivation of people to open the waste bank varies from solely for their own benefits (money and profits) or to mitigate the waste problem in Jakarta.

   They also educate people and encourage them to sort their wastages and treat these in the waste bank near their house. However, some might not have educated well to the residences near the site.

   The waste bank is usually managed by society, such as the district community (RT or RW). It works like a social enterprise that gets supported and supervised by the governmental bodies (The Environmental Agency of Jakarta). Only the waste bank central that works and controlled directly under The Environmental Agency of Jakarta.

   There are things gone wrong, particularly in educating with waste management. Some communities firstly do not permit or let the waste bank staff do the educating program. Also, they usually think waste bank only has a motive to branch money when it has two in fact: to make a profit and the objective of environmental protection in waste management. The waste bank needs to sort the misconception of motivation while also gather new customers who will treat their waste to waste bank, so it is difficult. It takes several means, and the staff needs to be clever towards this. Sometimes the

residences just disagree with the ways we enforce, but we have to be stricter and more clever than them. For instance, the residences only want the waste bank staff to come and collect their waste in their house, and it is not supposed to be that way, so we tried to be a reputable and strict institution, and the residences could not underestimate and comply with the rules.

4. To what extent the effectiveness of waste banks in the district areas of Jakarta? Who helps to collect the trash? If you had to give the program (Recycle, Reduce or Reuse) a score of 1-10 in terms of effectiveness, what score would you give? Why did you choose this score?

   A waste bank is supposedly done all the recycling activities, when in fact, the staff is not fully expert on those activities. Thus, we rely on a lot of other experts. For this, I will give a score of 7.5 because the effectiveness of waste bank requires public participation. It needs residences to collect and bring the waste as well.