


# Ecobrick: Innovative Method of Circular Economy in Public-Private Partnership

**(A Case Study of Plastic Waste Recycling in Semarang, Indonesia)**

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## PREFACE

I am proud to present my thesis, Ecobrick: An Innovative Method of Circular Economy in Public Private Partnerships, (A case study of plastic waste recycling in Semarang, Indonesia).

While many people continue to believe that trash is an object with no inherent worth, this is not the case in my family. I was familiar with even playing with waste from a youthful children. For my family, waste is similar to a diamond or gold that, if sold, would provide for my family's essential goods. I was born and grew up on the earnings of my father, a collector of waste in a suburb of Semarang City, Indonesia. After school, I was frequently requested to assist my father in sorting rubbish, which was quite exhausting given that many people lack special skills for waste sorting. As a result, waste-related problems are becoming increasingly impossible to prevent, particularly floods, which are frequently an annual occurrence due to people's still less disciplined behavior.

As I grow older, I recognize that education about waste management is critical and must begin at the local level or within the community. As a result, I am extremely interested in the development of the circular economy (CE) idea in Indonesia with the goal of improving waste management, particularly in the management of plastic waste. Therefore, synergistic cooperation is required to address this issue, involving the government, the community, and business sector actors, which naturally results in a rise in plastic waste production. If everyone has a strong commitment to renovating waste, I believe Indonesia can catch up with countries that have successfully managed waste problems, one of which is the Netherlands.

Throughout the process of writing this thesis, numerous parties helped me in identifying the causes and consequences of waste in the municipality of Semarang. To begin, I would like to express my profound gratitude to my supervisor, Dr Judith van Leeuwen, for her patience in inspiring and providing constructive feedback throughout the thesis process. Second, I would like to thank the DLH Semarang, particulary for Mr. Sapto Adi Sugihartono and Mrs. Yuni, who were really nice and even invited me to be a part of the Ecobrick park's construction. Additionally, I want to express my gratitude to Mr. Ood Lantip Waspodo, who served as the representative of PT Marimas Putera Kencana. Additionally, I would want to express my gratitude to Mrs. Eka, the Ecobrick trainer for Semarang, for opening my eyes and spirit to the possibilities of plastic waste management. Last but not the least , I would like to express my appreciation to the community, associations, and local residents of Semarang City who took the time to discuss and exchange viewpoints during the completion of this thesis. Finally, I would like to thank the LPDP scholarship which has given me the opportunity to study in the Netherlands.

Thank You

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# SUMMARY

Plastics products are becoming more common as technology, industry, human population and continues to increase every year. However, if the problem is left unchecked, it can turn into a big threat. Since Desember 2017, a new recycling technique is gaining popularity in several cities or districts in Indonesia known as Ecobricks. This method uses the remnants of plastic waste that is converted into high-value and useful goods. Ecobrick is derived from the words 'Eco', which means environmentally friendly, and 'Brick,' which means brick. Interestingly, In December 2020, the municipality of Semarang and the private sector decided to form a partnership to create an environmental education park using Ecobrick bottles as raw material. Starting from that, the opportunities for the PPP scheme for the development of a circular economy (CE) began to be analyzed. The findings indicate that the PPP model enhance for the acceleration of a circular economy (CE) in Semarang, Indonesia. This is due to at least 20,000 bottles of Ecobricks equate to a five ton reduction in plastic waste. While, As Ecoton Organization, there are 8 ton Per Year of plastic waste from Central Java Province can not managed properly. Then, both the public and private sectors also get benefit from this partnership such as financial benefit. Interesting to note that, this research also identifies Ecobricks as a model of New Public Management. NPM is a reform of the old bureaucracy toward a more adaptive and responsive bureaucracy capable of resolving problems, especially waste management (Pfiffner., 2004). However, Ecobrick PPP faces obstacles during implementation, like a lack of communication among actors because Covid-19 pandemic and old bureaucratic service model was retained became an impediment to this collaboration. As a result, strategic actions are required to ensure that the PPP Ecobrick scheme can be used to accelerate the CE principles of Reuse, Reduce, and Recycle (3R) in the future. First, the government and the private sector, can collaborate to transform Ecobricks into an economically viable product, particularly in the midst of the Covid-19 pandemic. Second, both actors also should improve communication style to be more open and transparent.

# ABBREVIATION

| | |
|---|---|
| DLH | *Dinas Lingkungan Hidup Kota Semarang* |
| | (Environmental Agency the Municipality of Semarang) |
| TPS | *Tempat Pembuangan Sampah* |
| | (Garbage Disposal) |
| TPST | *Tempat Pembuangan Sampah Sementara* |
| | (Temporary Garbage Disposal) |
| TPA | *Tempat Pembuangan Sampah Akhir* |
| | (Final Disposal Site) |
| PT | *Perseroan Terbatas* |
| | (Limited Company) |
| APBD | *Anggaran Pendapatan dan Belanja Daerah* |
| | (Regional Revenue and Expenditure) |
| BPS | *Badan Pusat Statistik* |
| | (Central Bureau of Statistic) |
| Wegah Nyampah | *Wegah Nyampah* |
| | (No Trash) |

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# CHAPTER 1

# INTRODUCTION

## 1.1 Plastic Waste and Ecobrick Movement

Based on data from Indonesian Aromatic and Plastic Olefin Association (Inaplas) in 2016, Indonesian citizens consumed 17 kilograms of plastic per year in 2015. With a population of 265 million in 2018, Indonesia's plastic use is predicted to reach around 4.5 million tons (Purwoko & Tri., 2018). Plastics products are becoming more common as technology, industry, and the human population increase. This is apparent from using plastics in daily situations as a form of media for packaging food and non-food packaging (Morritt et al., 2014). Consequently, the right method in overcoming plastic waste in Indonesia is needed.

Recycling is one of the strategies used by the Indonesian government to combat plastic waste, this approach includes activities such as composting, waste separation, and micro-business projects (Kristanto et al., 2015). However, some experts believe that plastic recycling is a complex process that requires a precise separation stage in order to be contamination-free (UN., 2019). This is a tough step because contamination is a combination of certain components that are given to the plastic material itself, in either case of chemical residues or contact to other substances whose compositions are distinct from plastic (Sonia & Sunyowati., 2020).

Besides that, there are a lot of industrial sectors in Indonesia complained about the high costs of processing machines for recycling plastic waste (Hidayat et al., 2019). As a result of the lack of separate collection in waste supervision, mismanagement of plastic waste is still a big challenge in developing countries (Ritchie et al., 2018). Even in 2010, Indonesia was one of the four countries in Asia with the worst plastic waste management practices (Jambeck et al., 2015).

To deal with the problem of plastic waste, various initiatives have appeared to create more efficient and appropriate recycling process, one of which is the Ecobrick program. Ecobrick are becoming increasingly popular as a recycling way to decrease plastic waste, as well as in Semarang, Indonesia. Ecobrick is a combination of the words 'eco' (environment) and 'brick' (brick), and it refers to eco-friendly brick. Ecobrick are eco sustainable bricks made from plastic waste that was compacted in a specific container. Ecobrick was founded by Russell Maier and Ani Himawati of the Global Ecobrick Alliance (GEA), the world's innovators of the Ecobrick program (Setyanto & Adiwibawa., 2019).

Moreover, Ecobrick is based on the circular, cradle-to-cradle design philosophy. Ecobrick take advantage of the plastic's resilience to make reusable construction blocks that can be reused again and again. The end of the application and the following life of each Ecobrick are considered while building using Ecobrick (Global Ecobrick Alliance., 2021). Therefore, Ecobricks technique is particularly helpful in understanding that

plastic waste is not just a problem, but a potential resource that has a high selling value if it is managed effectively in accordance with the circular economy (CE) ideas.

## 1.2 The Implementation of Circular Economy (CE) in Indonesia

Circular Economy (CE) models emerge as a new paradigm that can contribute to the solution to plastic waste. CE models preserve products no longer serve their functions so that resources can be reused and generate economic benefit (Bennett., 1991). Thus, nowadays the CE ideas has been defined as an industrial system that is restorative or regenerative by design. It replaces the end-of-life idea in favour of restoration, shifts toward renewable energy, eliminates harmful compounds that hamper reuse, and strives for waste elimination through the superior design of materials, products, systems, and, within these, business models (Ellen MacArthur Foundation., 2013).

To support a CE, the Indonesian government has set a goal of reducing waste by 30 percent by 2025 based on Law No. 23 of 2009 and Law No. 18 of 2008. However, this regulation is meant to reduce general waste, it is not yet targeted to plastics waste (Adi & Wibowo., 2020). Besides that, the implementation of CE in developing countries itself still has some challenges in plastic waste management. To begin, from an environmental standpoint, resource scarcity presents a challenge in developing of the CE. This scarcity can be in the form of many things, such as the scarcity of economic resources, human resources, scarcity of capital, to the scarcity of ideas or thoughts. In addition, the lack of environmental education is also still a barrier to CE. This is because it is difficult to change mindsets, habits, and behaviours in order to protect the environment, as demonstrated by the failure to sort garbage before to disposal (Tura., 2017; Zhang., 2019). Second, the financial resource constraint is another impediment to CE. One of the primary reasons for insufficient plastic waste collection is a lack of tariffs in districts or cities. This might be related to the social nature of pricing, which are not economic but social in nature (llic., 2016).

Another problem, the domination of economic indicators also has proven to be a significant impediment of CE (Tura., 2017). Then, the issue of financial capability also linked to the private sector's barrier to CE implementation. Therefore, Sabatier et al (2017) once stated that adopting sustainable business in developing countries may be complicated by issues such as financial capacity, distribution, innovation, and partnership management (Sousa-Zomer et al., 2018). This is line with Oliveira & Morais (2021) that explained several developing countries appear to be caught in a linear paradigm, but others have attempted to transition to a circular economy (CE) model. This concept emphasizes the gradual transition to renewable resources and the recovery of materials and products at the end of their useful lives.

Aside from that, there are several obstacles such as the lack of disposal sites to recycle obsolete products, the lack of appropriate collection methods, and the relatively weak power of local governments in supervising waste management programs in their respective regions (Kuo et al., 2021). Numerous scholars have already noted a lack of engagement on the part of stakeholders, both public and private sector, in advancing

the adoption of CE. It is due to the lack of awareness among stakeholders of CE and how they differ from traditional approaches to new waste management (Hull et al., 2021). In fact, collaboration between these parties can result in long-term sustainability benefits (Droege et al., 2021; Klein et al., 2020).

Based on the problems, there is a need for collaboration from the government and the private sector to work together to face the challenges in implementing CE and primarily in the Ecobrick recycling program through partnership developing like public-private partnership (PPP) scheme. As stated by Winans et al (2017) CE requires an integrated bottom-up and top-down approach to implementation and evaluation. However, the Ecobrick program has challenges such as a lack of studies on the environmental impact of using plastic waste into brick (Haque & Islam, 2021). Next, lack of massive socialization campaign in support of the Ecobrick initiative (Afriza et al., 2018; Ovalia & Wirasari et al., 2020). And lastly, there is a lack of training on how to promote Ecobrick goods both conventionally and online in order to tackle in such pandemic situation (Yusuf et al., 2020). Thus, a critical component of the CE program is community engagement and coordination using partnerships, so that the group can provide input or guidance on how the CE program should be prioritized (Paberzs et al., 2014).

## 1.3 Public-Private Partnership (PPP)

Strengthening partnership-based models can contribute significantly to resolving the plastic waste problem and development of Circular Economy (Paberzs., et al 2014). However, Jamali (2004) identifies the following reasons for the failure of PPP projects in several countries. To begin, there is a lack of government commitment. Second, ineffective risk management practices. This is because government institutions are unprepared to manage infrastructure that will eventually be transferred to the private sector. Then, the government extended the cooperation contract rather than admitting that the infrastructure was not properly managed. Thirdly, ineffective banking policies and loan availability. This emerges when the private sector is profit-driven, thereby squeezing the budget for project financing. Fourth, a regulatory and legal framework that is poorly drafted. Typically, PPP agreements are reached between the public and private sectors; however, if the agreement's substance is weak, it will also result in less-than-optimal work. Fifth, an insufficient mechanism for attracting foreign investors and private sector participation. Sixthly, there is a dearth of transparency and competition. Moreover, Saadeh & Al-Khatib (2019) also discovered barriers to PPP, particularly in institutions, such as issues with regularity and financial mechanisms that must be overcome in order to encourage and promote partnerships. However, it must be admitted that there is considerable potential for the adoption of PPP in the waste policy sector; this is due to waste is the primary issue that must be addressed immediately to ensure the sustainability for future generations.

In fact, Indonesia is listed as one of the countries that used a PPP to address a variety of issues, including waste management. This is regulated at the central level by Presidential Regulation 67 of 2005 and Law No. 18 of 2008 concerning waste

management as a legal umbrella so that it can be implemented by each district or city in issuing regional regulations (Yandra et al., 2020). One example of a private-public collaboration is also seen in the Ecobrick park program, which began in December 2020 within involves the municipality of Semarang and a variety of private sectors, including PT Marimas Putera Kencana, academics, non-governmental organizations, and the local community.

Indeed, regardless of how promising PPP implementation is in terms of achieving desired environmental goals, certain risks must be recognized. According to Kyriakis (2019), several parameters influence the formulation of PPP, including political decisions, financial situation, economic crises that have affected numerous countries, cultural behaviours, and the immigration crisis, all of which can have a positive or negative effect on the PPP. Meanwhile, a review of previous PPP studies reveals that the research has remained limited to policy content and that there is still a lack of research that discusses in greater detail society participation formulation in waste management (Yandra & Husna., 2020; Saadeh & Al-Khatib., 2019).

Besides that, in the world of bureaucracy, PPP is not a new concept. This paradigm is an extension of the concept of New Public Management (NPM) where its spread increased in recent decades by the public sector (Hood., 1991). NPM is characterized as a recent reform that constitutes a paradigmatic shift from the old model of public administration (Hood., 1991). This idea is defined as a new paradigm of public management that adopts administrative tools from the private sector (Olson et al., 1998). The public-private partnership model can be applied to the provision of public goods and the construction of public infrastructure (Radenovic & Rakic., 2011). This model was adopted in the municipality of Semarang to develop the Ecobrick park.

## 1.4 Problem Statement

Based on the explanation above, this thesis begins with the belief that various CE-related difficulties should be incorporated into the PPP scheme to expedite the adoption of CE principles. CE barriers can be overcome collaboratively through the PPP model, involving both the private and public sectors. This is by taking the example by the PPP model used in the construction of the Ecobrick park in the Municipality of Semarang. One research that supports this viewpoint is Jovanovic and Zivkovic (2019), who state that the PPP contract can implies the harmonization of municipal waste management regulations.

Nevertheless, implementing the PPP scheme is also a challenge, particularly in developing countries. This is generally driven by a combination of factors, including a lack of resources and an internal lack of technical understand to take a task (Krulaj., 2012). Besides that, governments in these countries have less experience with alternative methods of financing their projects (Li & Akintoye., 2005). Then, due to a lack of critical experience and high participation costs, participation in such PPP scheme cause limited to a small number of private sector partners involved (Li & Akintoye., 2005).

Other than that, several regions in Indonesia have implemented PPP schemes for waste management, but these collaborations have not been entirely successful, one of the reasons is because insufficient financial guarantees and uncertainty surrounding tenders (Ferza et al., 2019). Therefore, this study will examine how the public-private partnership (PPP) model might contribute to the development of the circular economy (CE) by managing its waste, using the example of the PPP in the development of the Ecobrick park in Semarang City, which has been operational for a year.

## 1.5 Objective

Based on the statement of the problem presented previous section, this thesis has one major goal:

1. To gain a better understanding of how the PPP scheme as a form of NPM can increase the effectiveness, opportunities, or as a challenge for circular economy (CE) in Indonesia by analysing the functioning of PPP in the development of an Ecobrick park in the municipality of Semarang.

## 1.6 Research Question

This research question is divided into main research question and sub-research questions below.

Main research question:

1. How does the Ecobrick park PPP overcome circular economy (CE) challenges by examining the PPP scheme applied to the provision of public infrastructure from Ecobrick park in Semarang, Indonesia?

Sub research question:

1. How does the interaction formed between the public and private sectors through the PPP scheme help overcome CE barriers in the Ecobrick program?
2. What are the responsibilities of the private sector and the public sector in implementing CE through the Ecobrick program within the PPP scheme?
3. How does the PPP scheme assist in the monitoring of CE implementation through the Ecobrick program?
4. What are the challenges in the Ecobrick program that have a significant impact on the CE implementation through the PPP scheme?
5. To what extent does the new public management model (NPM) approach influence the outcomes of the Ecobrick PPP scheme in Semarang, Indonesia?

# CHAPTER 2

# THEORETICAL FRAMEWORK

The core concept of the circular economic system (CE) is discussed in sub-chapter 2.1 of the theoretical framework. Then, it continued in sub-chapter 2.1. by using discussing how the CE concept developed from a linear economy. Moreover, the researcher also discussed the public-private partnership (PPP) model. In sub-chapter 2.2. the researcher discusses the background of PPP. Then continue with the concept that PPP is a new tool in new public management (NPM) in point 2.2.1. Further, researcher also discuss the improvement of traditional public management concept into NPM, the benefits of NPM, and the rise of multi-stakeholder partnership. Lastly, researcher together knit the concepts that have been described in the conceptual framework in sub-chapter 2.3.

## 2.1 Circular Economy (CE) Concept

Pearce and Turner (1990) introduced the term CE in a study on the interrelationships between environmental and economic activities (Andersen., 2007). However, CE principle as back to Kenneth Boulding (1966), who introduced the concept of a closed system in order to highlight the limited natural resources available for human activities (Nebbia., 2000).

CE is defined as an industrial economy that is designed and intended to be restorative (Macarthur., 2013). According to the circular economy concept of 3R *(reduce, reuse, recycle)*, it is crucial to enhance the use of nature's resources by diminishing the utilisation of nature, environmental degradation, and emission and waste levels by incorporating sustainable concepts (Strielkowski., 2016). Thus, the circular economy model is believed to be preferable to the linear economic model, which relies on the take, make, and disposal concept (Upadhayay & Alqassimi., 2018).

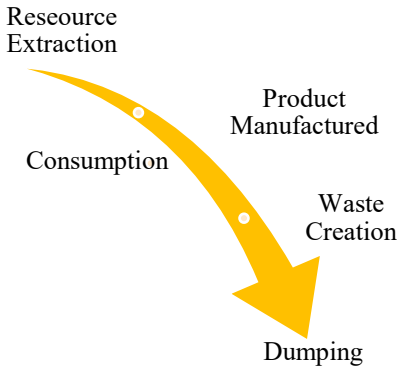


Figure 1. Flow of Resource Linear Economy

On the other hand, in the CE concept, the materials of all endeavours are used in subsequent attempts to produce artefacts that are useful for human use. According to this principle, the process of production/recycling/reuse is repeated indefinitely. It should be noted right away that this virtuous cycle only affects material resources

(Sikdar., 2019). Since then, the CE has been bringing a multi-level transition towards cyclical closed-loop systems by reducing natural resource absorption. This means that the collaboration of various institutions or levels is needed to accelerate CE with a collaborative model Ellen MacArthur Foundation., 2013; Murray et al., 2015).

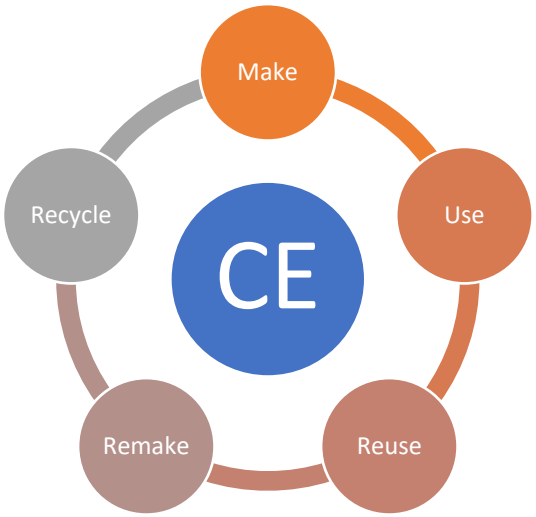


Figure 2. Flow of Resource Circular Economy (CE)

Besides that, there are several ideas of CE that are existing within the literature, along with cradle to cradle (C2C) (Peterson., 2004). A Cradle to Cradle building is defined as one that contains quantifiable elements that add value and celebrate innovation and enjoyment through the following: measurably improving the quality of materials, ecosystems, water, and energy; utilizing current solar income; being deconstructible and recyclable; and performing a variety of practical and life-enhancing functions for its stakeholders (Braungart & Mulhall., 2010). Further, Cradle to Cradle is also defined as a certification program presently controlled by the non-earnings Cradle to Cradle merchandise Innovation Institute for corporations trying to transition to the CE (MBDC LLC., 2013). Within the C2C idea, the main awareness is to limit environmental degradation through generating socially accountable and more sustainable manufacturing procedures, distribution, and disposal practices. In reverse logistics structures, the take-back products are amassed to a disposal factor to minimize the waste in addition to improve the sustainability of the delivery chains (Rezaei., 2015a, b).

Some experts also come up with their definitions of CE concept, including Geissdorfer (2017) that explained the circular economy is a regenerative system in this resource input and waste, emissions, and energy losses are reduced by speed reduction, sealing, and squeezing of material and energy minimized. This can be achieved through permanent design, maintenance, repair, reuse, remanufacturing, restoration and recycling. This is in line with Ghisellini et al. (2016) that defined CE as materials (and raw materials) must remain as much as possible in the economy and waste must be treated as optional raw materials that can be measured and reused. Thus, another author highlighted that CE is also an idea for reducing raw material consumption, re-designing

reusable products (Eco-design), and extending product life through maintenance and repair, according to the company (van Burren et al., 2016).

Additionally, CE can operate at various levels, including the micro (products, companies, consumers), meso (eco-industrial parks), and macro (city, region, nation, and etc), with the goal of achieving sustainable development, thereby simultaneously creating environmental quality, economic prosperity, and social affluence (Saidani et al., 2019). To sum up, Korhonen et al. (2018) believe that CE as a strategy for addressing environmental issues and promoting long-term development has recently gained traction.

However, it is important to note that CE is not just about production but also attempts to build sustainable consumption alongside sustainable production, for example through promoting and using the sharing economy approach (Naustdalslid., 2018; EMAF., 2013). The establishment of a more circular material flow is expected to have significant environmental and socioeconomic benefits. In Europe, for example, it is estimated that by leveraging technological advances, CE can generate resource productivity growth of up to three percent per year. Furthermore, it is based on the gross domestic product (GDP) and has a positive impact on employment (Ellen McArthur Foundation et al., 2015). Then, if properly implemented, this circular economy model has enormous potential for reducing pollution, climate emissions, waste, the use of raw materials, preserved natural systems, will be more competition, develop new markets and the opportunities to create jobs, and finally, there are social benefits (Berg et al., 2018).

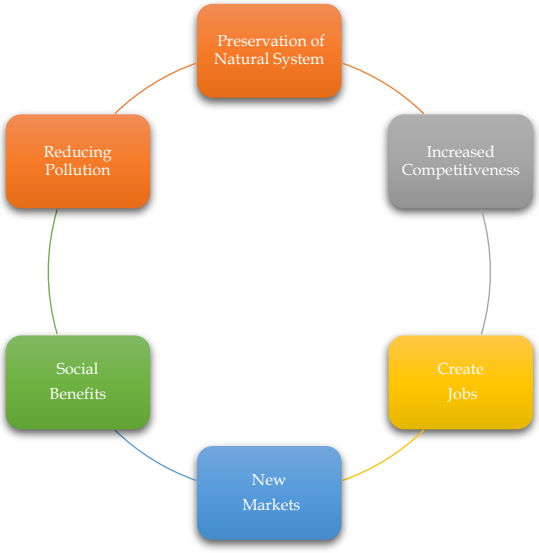


Figure 3. The Benefits of Circular Economy (CE) Adopted from Berg (2018)

## 2.2 Public-Private Partnership

### 2.2.1 Public-Private Partnership (PPP) Background

Transitioning from a resource-based economy to a more innovative way of development necessitates significant investment in order to modernize our

economy. Budget constraints, on the other hand, are frequently a financial issue when it comes to supporting the development of a project. Thus, cooperation, also known as the public-private partnership (PPP) scheme, is required as an objective requirement to support state and private sector (Akhmetshina & Mustafin, 2015). Not only in the field of economic, global support for PPP for infrastructure seems stronger than ever. Discussions at G20 meetings in recent years have focused on the need for a sharp increase in infrastructure investment in developing countries, especially low-income countries (Leigland., 2018).

Historically, PPP has grown in popularity since the early 1990s, primarily to government financial restrictions and administrative reforms such as governments adopting an "enabling" rather than "active" role in the provision of public services (Reim., 2009). Then, according to other authors, the PPP phenomenon has evolved into a new form of governance (Osborne., 2000).

This means existing a shift away from traditional public sector approaches that place new demands on government agencies. They need the ability to design projects with a range of risks and incentives and make them attractive to the private sector. Second, they must also be able to assess costs to taxpayers, which are often more difficult than traditional projects due to the long-term and often uncertain nature of government commitment. And they need advocacy and awareness-raising skills to build consensus on the role of PPP and build a broad agenda across different sectors and levels of government (Dutz et al., 2006).

Further, Farquharson (2011) defines PPP likes a long-term contract where a private market party often approves with a state body to develop and construct, broaden, or improve public amenities such as take large economic, technical, and risk exposures, receive an economic advantage during the contract's life from consumers or the civil service, or a combination of the two.

Nevertheless, Klijn and Teisman (2003) believe that translating a theory or idea into actions is a difficult task. According to other research, many actors are far too pre-occupied with their own practices and internal problems to be effective partners. Besides that, relational risk also has a negative effect on alliance performance because it reveals organizations to hidden costs and possibly unexpected operational risk (Cheng & Fu, 2013; Jia & Rutherford, 2010). Then, Dutz et al., (2006) believed that the best arrangement might be to divide the capacities.

Return to the concept of a new form of governance described above, Scharle (2002) also argues that PPP should not be expected to replace measures or responsibilities that are found elsewhere. In particular, the public sector must continue to set standards and monitor product succession, efficiency, and quality, and must implement systems that provide citizens with adequate access to the products and services they need. In other words, PPP do not imply "less government" but a different role in government. Due to the stronger position of

the private partner, more qualified government involvement is often required. Therefore, to understand the cooperation between the Semarang City Government and the private sector in Ecobrick program, it is also important to understand the new public management approach in PPP.

## 2.3 From Traditional Public Administration to New Public Management

The concept of NPM differs from traditional public administration. On the conventional concept, it heavily relies on a Weberian view of the world. Three institutions are essential in Weber's political thought for dealing with the complexity of modernity and bringing order to the governance model. The following is an overview of the various management paradigms proposed by Kelly and Muers and cited by Stoker (2006).

Table 1. Paradigm Management

Adopted from Kelly and Muers cited by Stoker (2006)

| | **Traditional Public Administration** | **New Public Management** |
|---|---|---|
| *The primary goals* | Political inputs; bureaucratic monitoring of services. | An efficient use of resources and a willingness to respond quickly to customer needs are essential. |
| *Managers' Role* | To guarantee that all laws and regulations are observed and adhered to. | In order to assist in the definition and attainment of agreed upon performance goals. |
| *Public Interest Term Definitions* | By politicians or professionals, with minimal influence from the general population. | Individual preferences gathered by leading politicians or management and backed up by data on client preferences. |
| *Approach to the spirit of public good* | Everyone working for a government agency has a "serving" mentality. | Skeptical of the mentality of the public sector (which he believes leads to inefficiencies and empire building) and in |

| | | |
|---|---|---|
| | | favor of providing excellent customer service. |
| *Service delivery method of choice* | A department or profession with a centralized command structure. | The private sector or a well-defined arms-length state agency. |
| *The democratic process's contribution* | Competition amongst elected officials offers an overall level of responsibility for the government. | Limited to defining goals and monitoring performance, managers are left free to choose the methods. |

From the table above, it can be deduced that the NPM comprises various characteristics that aim to reduce the rigidity of the public sector and pay attention to the satisfaction of the beneficiaries instead of adherence to organizational processes, to decentralize authority and control using flatter rather than hierarchical processes. Organizational structures are promoted, and more profit-oriented strategies are implemented to cover at least the costs of service provision. Flexibility in decision making, performance measurement, and the profit motive are part of what is considered the private sector management of the NPM (Ikeanyibe., 2016).

Moreover, the NPM style is actually very good at giving hope to the public and motivating the government when faced with obstacles, as well as allowing citizens, particularly the poor, to express their preferences (or have their voices heard) and can be used as a tool to hold the public accountable. These include a fair and transparent electoral process (with power-sharing arrangements to protect minority groups) as well as a mechanism for involving civil society and local governments in policymaking (Manning., 2001).

**Benefits for Efficiency, Accountability and Equity**

This is also consistent with what has been stated by Stoker (2006) that each management model we have discussed must be responsive in terms of efficiency, accountability and equity. Essentially, spreading NPM from the West can be used to create new pressures and dynamics for efficiency and effectiveness. Such a change should really have the benefit of boosting efficiency through the adoption of more competitive practices such as entrepreneurship to reduce the burden on government and to break up unresponsive public sector monopolies and respond to the society (Batley, 1999).

Table 2. Management Paradigms and the Challenges of Efficiency, Accountability and Equity Adopted from Stoker (2006)

| **Responses to fundamental problems** | **Efficiency** | **Accountability** | **Equity** |
|---|---|---|---|
| Traditional public administration | Deconstruct difficult jobs and train employees to adhere to established protocols. | Leadership that can be guided and supervised is produced via competitive elections. | By applying the same standard of care to all similarly situated situations. |
| New public management | Set a list of challenging goals for the company to meet. | After setting public objectives and establishing target dates, politicians next hold management accountable. | Making sure that everyone has access to the services they need is a top priority. |

Based on the table 2, it is undeniable that the shift from traditional public management to new public management has many benefits, but this is also due to the involvement of various stakeholders in the resolution. For example, in the case with Semarang's Ecobrick program, which involves both the public and private sectors. Thus, it's also important to comprehend how the concept of multi-stakeholder decision-making came into being.

However, the concept of NPM is still delivery low in developing countries. There are several reasons for this. For starters, public expectations of governments in developing countries differ from those in developed countries. Many citizens believe that their complaints are unimportant, whereas the government makes a greater effort when citizens express dissatisfaction (Manning., 2001). Moreover, the NPM debate sparked fears that some nebulous notions of the "public service ethos" or "civil culture" might unravel over time if compliance management was not maintained. Another reason is the marginal nature of NPM impact in any circumstance in developing countries (Manning., 2001). This is affected by the shift paradigm from traditional public administration to the new public management model.

### 2.3.1 Multi-stakeholder Partnership

Over the past two decades, multi-stakeholder partnerships have flourished. With the failure of intergovernmental organizations to finish a task, right now

international systems have turned to partnerships. Allowing cooperation with private organizations, they are increasingly seen as the governance model of this time (Berman., 2017). Typically, participants from different stakeholder groups are recruited at the formal request of the leaders of the organizations involved (Koch et al., 1998). In other words, multi-stakeholder partnership arises when an issue becomes critical for a very long-time entertainers who accept that they cannot or ought to not move toward it all alone. The criticalness may begin from the issue or from a contention that is associated with the issue (Roloff., 2008).

Furthermore, partnership networks have been marked as another type of worldwide administration with the possibility to connect multilateral standards and nearby activity by drawing on a different number of entertainers in common society, government, and business (Backstrand., 2006). While in terms of sustainability, the development of administration structures dependent on private position, private systems, and a blend of public and private entertainers is especially articulated. Organizations have been outlined as creative types of administration that can adequately address the three 'deficiencies' of worldwide natural legislative issues the administration shortage, execution shortfall, and cooperation shortage (Haas., 2004).

The partnership is also considered a governance and management instrument. Thus, to examine the governance and management perspectives of partnership, it is necessary to understand how partnership relates to new public management (Khanom., 2010). Then, Vassilakou et al. (2012) explained that partnershipalso can be a modern tool of alternative contracting phenomena that support innovation and productivity gains. This is due to recent governance reforms that have recognized the interdependence of the public and private sectors. On the one hand, the public sector is reliant on services provided by the private sector. On the other hand, it is ultimately responsible for whether this sector thrives. State administration reforms blur the distinction between the two by providing models for procuring outsourced services and defining the government's intended outcomes in terms of strengthening private sector potency (Kaul., 1997).

However, there has lately been some criticism that multi-stakeholder partnerships frequently fail to meet the standards of accountability structures and monitoring mechanisms (Backstrand., 2006). This problem arises because of something such as lack of experience and knowledge of effective dialogue practices among multiple committees, moderators, and participants in multi-stakeholder partnerships (Payne & Colton., 2002). These concerns include the difficulties faced like by civitas academic to participate more effectively so that they can better communicate and inform in stakeholder meetings.

Another problem, the potential abuse of those who facilitate or control the process by their client-led stakeholders in unethical engagements, such as unrepresentative stakeholders face. Next, sometimes the participant tries to use

techniques that have been proven in developed countries but are not based on the traditional culture of the local community. Lastly, there is stakeholder fatigue because the planned program may not meet expectations (Payne & Colton., 2002). Therefore, Backstrand (2006) proposes some ideas related to these issues. First, input legitimacy with increasing participatory decision-making (transparency, representation, and accountability). Second, output legitimacy is related to the institution's or rule's problem-solving capabilities, which is more effective.

## 2.4 Conceptual Framework

This sub-chapter discusses the implementation concept for the theoretical framework discussed previously. To begin, the researcher applies the circular economy concept (CE) so that the researcher describes the waste management process in the municipality of Semarang, starting with waste generation, waste management, and plastic recycling, until Ecobrick is introduced as a new method for managing plastic waste. From the background of the CE problem, therefore, the researcher proposes a PPP model that was recently implemented in the Ecobrick program to be analysed in helping to solve the CE challenge in Semarang. However, this is seen from several standpoints, along with how PPP is implemented in the Ecobrick program, the responsibility of local government and the private sector, the type of contract used, the monitoring conducted, transparency and commitment, and identification of PPP challenges in the Ecobrick program. This study aims to determine to what extent the PPP model as NPM form can improve CE performance, especially in terms of public services such as Ecobrick park.

# CHAPTER 3

# METHODOLOGY

## 3.1 Qualitative Methodology

This research uses a case study approach. The case study method is particularly beneficial when an in-depth understanding of an issue, event, or phenomenon of interest is required in its natural actual context (Crowe et al., 2011).

### 3.1.1 Case Studies Research

The Ecobrick program is one of the implementations of the CE and this research employs a case study approach to analyse and describe the notion of CE principle mainly in *reuse and repurpose*, to create goods that are useful, high value, and sustainable. Furthermore, this study focuses on the public-private partnership schema for supporting the Ecobrick program, particularly in Semarang, Indonesia. This is aligned with Robson (2002) definition of a case study as *"a research technique that comprises an empirical investigation of a single contemporary event within its environment using several sources of data."*

Case studies are one of the most common types of research in the field of qualitative methodology, so this is an excellent way to answer a key research questions about how the Ecobrick movement's program recycles plastic waste in low-income areas and creates a few cost-effective PPP in one of the most populous cities in Indonesia. Thus, according to Jarratt (1966), a case study is an in-depth examination of the complexity and uniqueness of an initiative, policy, institution, program, or system in the actual world from numerous perspectives.

### 3.1.2 Profile Municipality of Semarang

Semarang is the capital city and the main port of Central Java Province. In the north of Java, 540 kilometres east of Jakarta. Semarang City Agency for The Environment is currently in charge of solid waste management in the city (DLH). In fact, about 87 percent of the wastes were collected and sent to a landfill, while the remaining 13 percent were burned or dumped into a water body by a citizen (Badan Pusat Statistik Semarang., 2016). The Semarang City plastic waste management network is comprised of city cleaning staff collecting, transporting, and temporarily disposing of waste before it is transported to a final disposal site (TPA) by the sub-district via garbage collectors coordinated by the Semarang Environmental Agency. Scavengers sort through plastic waste at the TPA, which is then sold to waste collectors. However, according to Pertiwi et al. (2018), just 23.59 percent (53.54 tons) of domestic plastic garbage is repurposed for the recycling process through scavenger collection efforts.

The Jatibarang landfill has been in operation in this city since March 1992, when it was first opened. However, in 2009, the volume of waste in this landfill exceeded its storage capacity by 1.6 million cubic meters. The landfill encompasses 45 ha and has a storage capacity of 4.15 million cubic meters of rubbish. As a result, minimizing the amount of waste that is hauled to landfills is a major task for this city (Sekito et al, 2013). Aside from a lack of public knowledge about garbage disposal, the author chose the pilot project owned by the Semarang City administration and the informal sector to collaborate on the construction of an Ecobrick park in the city center.

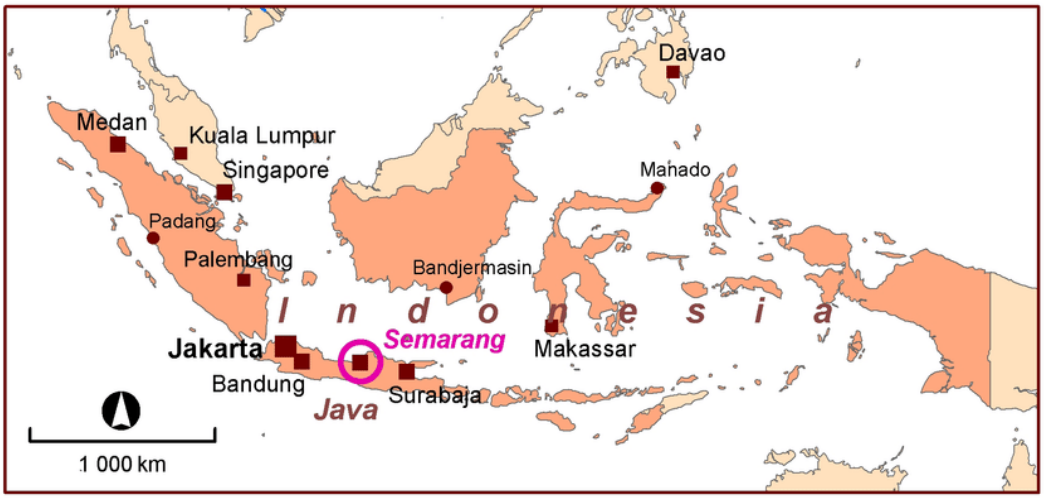


*Figure 4. Maps of Semarang City (Source: Research Gate)*

## 3.2 Data Collection Method

Besides that, Yin (1994) offers six sources of data gathering when conducting research with case studies, including documentation, archives, recordings, interviews, direct observation, participant observation, and physical artefacts, as well as participant observation. Research can be improved by using more than one of these types of evidence, but it also depends on how the researcher chooses to combine them.

### 3.2.1 Interview

The researcher's primary tool for gathering research data is interviews. In November 2021, researchers conducted direct interviews in Semarang, Indonesia. However, given the Covid-19 situation, researchers conducted online interviews with a variety of sources outside of Semarang, such as Ecobrick Indonesia representatives, researchers, and environmental activists.

As for the interviews themselves, they were conducted using a semi-structured interview guide. When it came to data collection, it was chosen based on two key factors. First, they are well adapted to the examination of respondents' thoughts and attitudes on complex and often sensitive matters, and they provide the opportunity to probe for further information and clarification of replies. Another

factor that was considered when assessing the sample's diverse background was the adoption of an interview schedule that was standardized (Louise, 1994).

The researcher will then employ the snowball sampling approach, which is one of the most prominent qualitative research methodologies. Parker and Scott (2019) say that researchers normally start with a small number of initial contacts (seeds), who fulfil the research criteria and are invited to participate in the research. As a result, the willing participants were asked to propose other connections who met the research requirements and who might also be willing participants. These contacts, in turn, recommended more possible participants, etc. This allows researchers to build a network of participants by using their social networks to establish first connections. As soon as the sample size or saturation point is achieved, sampling is over.

Snowball sampling, on the other hand, is usually used in conjunction with purposive sampling, in which participants are selected based on their unique traits or membership in a group (Parker & Scott, 2019). Thus, the sources mentioned below include those who have first-hand expertise in the implementation of circular economy and public-private partnership initiatives. PT Marimas Putra Kencana for example has been pushing the Ecobricks program for a long period since 2017. Furthermore, there are local community from Purwoyoso Ngaliyan, which is an officially registered local community member as well as a member of the climate village in Semarang City, which is actively involved in environmental campaigns. Actors will be interviewed by researchers in the order listed below: actors and their positions are listed in table 3.

Table 3. List Interviewee

| No | Stakeholder | Sample Number | Languange | Obtained Information |
|---|---|---|---|---|
| **1** | Dinas Lingkungan Hidup Kota Semarang (Environmental Agency of Semarang City) | 2 | Indonesia | • Programme Ecobrick Movement<br>• Programme Circular Economy in Semarang<br>• Public-Private Partnership (PPP) in Semarang<br>• Waste Management in Semarang |
| **2** | PT Marimas Putera Kencana (Company) | 1 | Indonesia | • Programme Ecobrick Movement Since 2017<br>• Pilot Project with local government related with Ecobrick Movement |

| | | | | |
|---|---|---|---|---|
| | | | | • Public-Private Partnership in Plastic Waste |
| **3** | Local Communities | 3 | • Indonesia<br>• Java | • Programme Ecobrick Movement in Semarang<br>• Plastic Waste in Semarang |
| **4** | Global Ecobrick Alliance (GEA) Indonesia for Semarang | 1 | Indonesia | • Programme Ecobrick Movement in Indonesia<br>• History of Ecobrick Movement |
| **5** | Yayasan Bina Karta Lestari 'BINTARI' (NGO) | 2 | Indonesia | • Plastic Waste in Indonesia<br>• Response about Ecobrick Program in Indonesia |
| **6.** | Bank Sampah Lestari Magenta (Waste Bank) | 2 | Indonesia | • Waste collection in Semarang<br>• Response about socialization of Ecobrick programme in Indonesia |
| **7.** | Waste Collector | 2 | Indonesia | • Waste collection in Semarang<br>• Plastic Waste in Semarang |

### 3.2.2 Observation

Observation is the second type of data collecting tool utilized by the researcher. As is well known, there are three main collection sites in Semarang City that researchers will visit physically as part of the Ecobrick Movement program. To begin, go to the Dinas Lingkungan Hidup Kota Semarang (Environmental Agency of Semarang City) at Jalan Tapak Raya in Tugu, Semarang to see the Ecobrick park. Second is a company of PT Marimas Kencana Putera Kencana, which is in Block D-21 of the Gatot Subroto Temple Industrial area as a collection of Ecobrick bottles from company. The third is BPI's Purwokeling Climate Village, which is in Ngaliyan Semarang's BPI Housing Block O Number 4 RT 05 RW 10 Purwoyoso as a collection of Ecobrick bottles from community. Observation methods, whether used in associated with Case Study Research or as a standalone method, entail directly observing and recording how research participants act within and relate to their community as it unfolds (Mays & Pope, 1995; Mulhall, 2003).

### 3.2.3 Documentation and Archives

Documentation and archives are two further tools that can were to supplement this investigation. This is mainly gathered through first hand observation and interviews. Old documents or files relating to the implementation of Ecobrick program as innovative method in CE and PPP are two very necessary elements to finish a researcher's thesis, particularly during times of the Covid-19 circumstance

as a back-up. One of them is about the application document for the donation of Ecobrick bottles from Dinas Lingkungan Hidup Kota Semarang.

# CHAPTER 4

# WASTE MANAGEMENT AND ECOBRICK PROGRAMME

Plastic waste is a challenging issue that requires extensive collaboration among diverse stakeholders to resolve. This is owing not just to large amount of plastic waste produced, but also to designed in-material qualities such as durability, low density, and non-degradability (Ragossnig & Agamuthu., 2021). In this chapter, the researcher provides an account of how the community and government collaborate to decrease plastic waste, utilizing circular economy principles such as reuse, recycle, and reduction. Besides this, researchers provide an overview of Semarang City's waste management practices and the obstacles that remain. Lastly, the researcher discusses how Ecobricks are manufactured in order to improve the quality of use of plastic waste remnants.

## 4.1 Waste Generation in The Municipality of Semarang

Semarang is one of the Indonesian regions with a relatively rapid population growth rate. According to Rachmansyah (2017), population growth or economic development has an impact on consumption, resulting in an increase in the volume of waste generated. Based on the results of the 2020 population census, the population of Semarang City was recorded at 1,653,524 people. Population density tends to increase along with the increase in population. In the Semarang City area, the Candisari sub-district was recorded as the most densely populated area (11,538 inhabitants per km2), while the Tugu sub-district was the area with the lowest density (1,033 inhabitants per km2). Administratively, Semarang Municipality comprises 16 sub-districts and 177 villages. The width of Semarang Municipality is 373, 70 Km2. The widest sub-district is Mijen (57,55 km2), followed by Gunungpati with 54, 11 km2, while the smallest sub-district is Semarang Selatan (5,93 km2). Table 4 below illustrates the distribution of population and population growth rates across 16 sub-districts..

Table 4. Population by Subdistrict in the Municipality of Semarang (Source: Kota Semarang dalam Angka, 2021).

| Subdistrict | Population | Annual Population Growth Rate (%) |
|---|---|---|
| **Mijen** | 80.906 | 3,58 |
| **Gunungpati** | 98.023 | 1,00 |
| **Banyumanik** | 142.076 | 0,40 |
| **Gajah Mungkur** | 56.232 | -0.61 |
| **Semarang Selatan** | 62.030 | -1,11 |
| **Candisari** | 75.456 | -0,05 |
| **Tembalang** | 189.680 | 1,67 |
| **Pedurungan** | 193.151 | 0,66 |

| | | |
|---|---|---|
| **Genuk** | 123.310 | 2,84 |
| **Gayamsari** | 70.261 | -0,21 |
| **Semarang Timur** | 66.302 | -1,16 |
| **Semarang Utara** | 117.605 | -0,02 |
| **Semarang Tengah** | 55.064 | -0,88 |
| **Semarang Barat** | 148.879 | -0,38 |
| **Tugu** | 32.822 | 1,06 |
| **Ngaliyan** | 141.727 | 0,96 |
| **Total Population** | 1.653.524 | 0,59 |

Not only in Indonesia, but also in several other developing countries in Asia, similar problems exist (Dhokhikah & Trihadiningrum., 2017). The amount of solid trash generated is substantial, owing to the population and the fact that most of the solid waste is decomposable organic. On the other hand, the most frequently seen issues are a lack of collection coverage and the use of an open-dumping landfill as the final disposal option (Sembiring and Nitivattanon., 2010). To strengthen the argument, the following table 5 is the most recent data on garbage accumulation in Semarang City from 2019 to 2020.

Table 5. Waste Pile in the Municipality of Semarang (Source: SIPSN- Sistem Informasi Pengelolaan Sampah Nasional).

| Year | Province | District | Daily Waste Pile | Annual Waste Pile |
|---|---|---|---|---|
| **2019** | Central Java | Semarang City | 1,251.71 | 456,873.35 |
| **2020** | Central Java | Semarang City | 1,276.74 | 466,010.79 |

According to data, waste generation in Semarang continues to grow each year. As a result, waste management continues to be terribly inadequate. The following table 6 is information relates to the sources and types of waste created often by countries in Southeast Asia. According to this data, plastic waste is still leading cases across a variety of industries, most notably domestic and retail or commercial places.

Table 6. Sources and Types Municipal Waste in Southeast Asia (Sources adapted from UNEP., 2014; Tchobanoglous et al., 1993)

| Sources | Typical Waste | Types of Solid Waste |
|---|---|---|
| **Domestics** | Single-Family residence and apartments | Kitchen waste, paper, corrugated cardboard, plastics, textiles, glass, metals and ashes |

| | | |
|---|---|---|
| **Shopping and Commercial Areas** | Retail, resorts, cafes, supermarkets and offices | Paper, corrugated cardboard, plastics, wood, food scraps, glass, metals. |
| **Institutional** | Health care facilities, prisons, schools, government offices | Paper, corrugated cardboard, plastics, wood, food scraps, glass, metals. |
| **Public Facilities** | Landscaped areas, parks, beaches and recreational places | Landscaping and yard trimmings and general rubbish removal from recreational areas |

Until now, plastic has still a popular material for everyday tasks. One of the reasons for plastics' widespread popularity is the enormous range of qualities they exhibit as a result of their ease of processing (Singh & Sharma., 2016). Thus, proper plastic waste management is needed because it will contribute to increased pollution and degrade the quality of life for current and future generations. Also, plastic trash might influence a country's economy. This can be observed, for example, in the way that water contamination caused by plastic waste might detract from foreign visitors' desire to travel Indonesia. The following paragraph will address how to handle waste's in Semarang.

## 4.2 Waste Management in the Municipality of Semarang

In accordance with Law No. 18 of 2008 on waste management by the national government, each local government is tasked with reducing waste generation in the community environment through increased community participation, with the goal of reducing the volume transported to the final disposal site from the household level. Therefore, the Semarang City government then also issued the Semarang City Regional Regulation Number 6 of 2016 concerning the Regional Regulation on Waste Management. From this regulation, it is also known that the waste management in Semarang City is directly handled by the Head of the Semarang City Environmental Service (Dinas Lingkungan Hidup Kota Semarang).

Then, Dinas Lingkungan Hidup Kota Semarang is also assisted in its implementation by special agencies that have dedicated sections to handle and be responsible for waste management in the municipality of Semarang, such as a secretariat consisting of the Planning and Evaluation Division, the Finance and Asset Division, and the General and Personnel Division. Furthermore, there are specialized professions such as environmental management, waste management, pollution control and environmental conservation, and oversight and empowerment of the environment. Besides, Dinas

Lingkungan Hidup Kota Semarang also assisted by the regional technical implementation unit including the Environmental Laboratory UPTD, the Final Processing Unit UPTD, the Wastewater Management UPTD, and the Regional Cleanliness UPTD. For the detail about structure organisation of Dinas Lingkungan Hidup Kota Semarang can be clearly in figure 5 below.

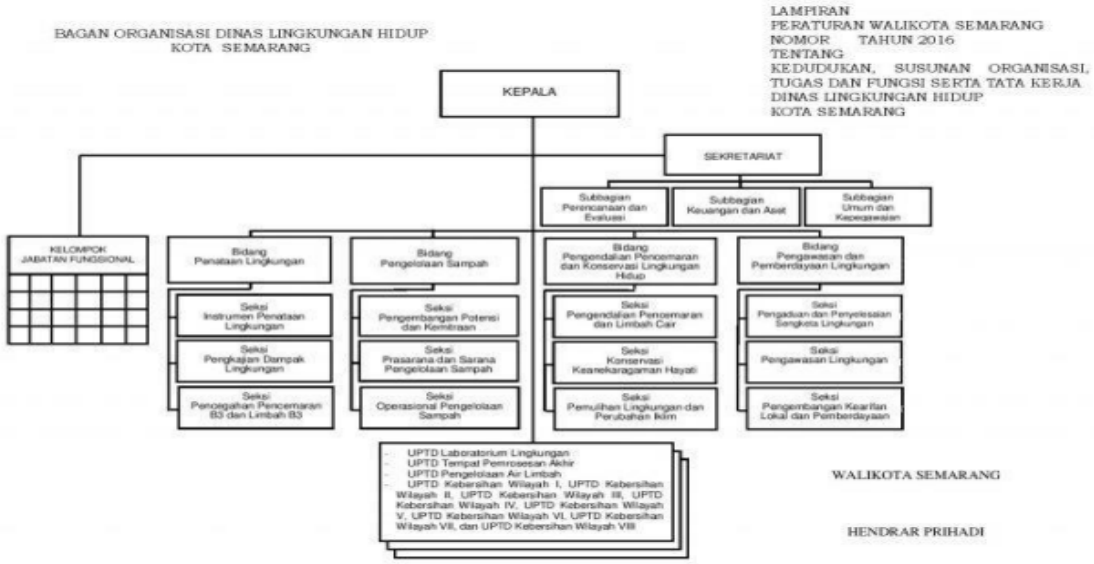


*Figure 5. Structure Organisation of Dinas Lingkungan Hidup Kota Semarang (Source Semarang Mayor Regulation 2016)*

The implementation of waste management in the municipality of Semarang is under the authority of Dinas Lingkungan Hidup Kota Semarang assisted by Bidang Pengelolaan Sampah (Waste Management Agency). In figure 6 below is a method for handling waste in accordance with regional regulation Number 6 of 2016 namely the selection, collection, transportation, processing and final processing of waste.

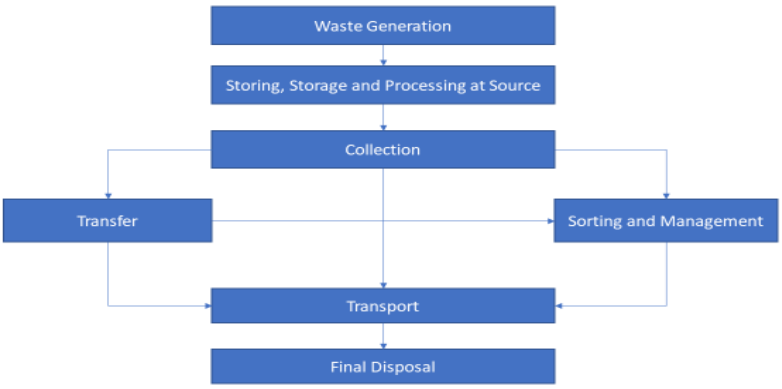


*Figure 6. The Stages of Waste Management in the Municipality of Semarang*

According to the data above, numerous efforts have been undertaken by several sub-districts in the municipality of Semarang to manage waste, most notably through the 3R approach. In this stage, staff from the waste management division of Dinas Lingkungan Hidup Kota Semarang assist the community in disposing of their waste from the accommodation stage in their home to the final waste disposal site (TPA) in Jatibarang. In general, the process of optimizing residential waste management is as follows:

**1. Accommodation Stages**

At this point, residents of Semarang can put their waste in a container (garbage bin). From the Dinas Lingkungan Kota Semarang., there are already rules to sort waste into organic and non-organic, however, there are still many people who mix their domestic waste. The main suppliers of waste from households like this usually have many options for distributing the waste they have. There are communities that choose to collect their waste and give it to the waste bank. After that, staff from the waste management division will collect waste to the sub-district to be taken to the temporary integrated waste collection point (TPST). This has even been stated directly by Dinas Lingkungan Kota Semarang.

> ***"Waste management in Semarang City is both upstream and downstream; upstream, the goal is to decrease waste; therefore, we have the 'Wegah Nyampah' movement, which ensures that when we do activities, we avoid creating garbage. Now that waste has reached the sorting stage, we encourage the establishment of a waste bank to act as a distributor for homes or scavengers" (Sapto Adi Sugihartono, personal communication, 6 November 2021).***

The following in figure 7 is an illustration of waste accommodation from a resident in Semarang's Banyumanik subdistrict. In the picture, residents have sorted organic and organic waste before depositing it to the waste bank or to the garbage collection staff from the sub-district. However, sometimes there are still many residents selling their garbage to give to scavengers.

*Figure 4. A Society have separated organic and non-organic waste in her house*

**2. The Stage of Collection**

After that, the staff from waste management division of Dinas Lingkungan Hidup Kota Semarang will take our household waste to a temporary waste disposal site (TPS) which is usually located at the sub-district office in Semarang City. Each sub-district in Semarang City usually has a garbage disposal site as below in figure 8.


*Figure 5. Garbage Truct in a Sub-District in the Municipality of Semarang*

**3. TPS Processing Stages**

Waste brought or stacked up at TPS is often recycled after being destroyed by TPS guards in each sub-district. Typically, TPS managers from waste management division will sort leaf, twig, grass, and wood debris prior to grinding and compacting it using a compactor or reprocessing it into compost Meanwhile, the remaining material that is not easily milled will be separated for further processing. The material processing will be continued by machines by the waste management staff to the TPS which is close to Dinas Lingkungan Hidup Kota Semarang office.

**4. Transportation Stages to the Final Disposal Site (TPA)**

The Semarang municipal government is known to have granted enough open land in the Jatibarang area for use as a final dumping site (TPA). Most of the garbage disposed of at the Jatibarang TPA is non-biodegradable, such as household waste. waste transportation to the final disposal site (TPA) usually uses a garbage truck like figure 9.

*Figure 6. Transportation waste to landfill (TPA Jatibarang)*

## 5. Waste handling stages at the TPA

Organic waste disposed of at the Jatibarang TPA is the responsibility of Dinas Lingkungan Hidup Kota Semarang. In the past, the municipality of Semarang was known to have collaborated with private companies to process organic waste into compost. However, right now the municipality of Semarang is trying to manage waste into electricity. The following is an explanation by Head of Dinas Lingkungan Hidup Kota Semarang.

> ***"If it is downstream, it is disposed of in a TPA and then used to fuel the one in Jatibarang. Now, at TPS 3R, the organic waste is often composted and processes into electric power" Sapto Adi Sugihartono, personal communication, 6 November 2021).***

The illustration in Figure 10 demonstrates that the final waste disposal site in Semarang City is no longer enough to accommodate all waste generated by the community. In fact, every day there are thousands of cows that eat garbage, which are usually allowed to go wild looking for food in the Jatibarang landfill. During an interview with a resident who worked at the TPA, he said that it was likely that there were more than 1000 cows that had eaten the rotting garbage.

*Figure 7. Collected waste at TPA Jatibarang*

## 4.3 Recycling Plastic Waste in Semarang

Recycling is an important component of a solid waste management strategy. Numerous advantages of recycling. At the very least, preserve natural assets and mitigate environmental damage. Recycling can assist in enhancing the landfill's capacity (Suyoto., 2004). As part of waste management strategy, the Semarang Municipality has made steps to establish a recycling program. Aspects of the rules for recycling waste itself have been mandated by the local government through Law Number 13 of 2006 concerning environmental control. The policy specifies that anybody who generates residential garbage is required to manage it autonomously, from sorting to composting organic waste, and is not permitted to burn rubbish in open locations. This rule can be accessed at the website of Dinas Lingkungan Hidup Kota Semarang.

The "Environmentally Friendly Village or Kelurahan Ramah Lingkungan" program was one of the garbage recycling initiatives spearheaded by Dinas Lingkungan Hidup Kota Semarang. The event, which began in 2011, attracted 16 sub-districts consists of representatives from each district (Maryono & Hasmantika., 2018). The primary criterion for scoring the competition of environmentally friendly village is waste management, which includes waste sorting and organic and inorganic waste recycling. Besides that, the municipality of Semarang also establish the prohibition to use plastic bag, straws or styrofoam in accordance with Semarang Mayor regulation number 27 of 2019. This is explained by Head of Planning of Dinas Lingkungan Hidup Kota Semarang.

> ***"There was a restriction limiting plastic reduction; ultimately, we conducted a direct evaluation of the implementation, and it now operates as though supermarket already offers plastic or, if not, cardboard. In the past, it was considered prudent to begin reducing plastic consumption early. However, it is still difficult" (Yuni Hastuti, Personal Communication, 1 November 2021).***

In addition, Dinas Lingkungan Hidup Kota Semarang also acknowledged that in fact the rules prohibiting the use of plastic bags should have been followed since January 1, 2020.

However, from the results of supervision that has started to run retail stores in the municipality of Semarang, Dinas Lingkungan Hidup Kota Semarang also still often find several stores that provide plastic bags for a fee.

The policy of reducing and handling plastic waste has also been implemented by many local governments in Indonesia with the target of modern shopping centres, supermarkets and retail minimarkets. However, this strategy of prohibiting plastic garbage has not been without criticism. According to Arfah & Kismiyati (2020), one of them claimed that banned on plastic bags are a temporary, non-solution measure. This is because no one has been able to develop a viable alternative to plastic bags for grocery shopping. Indeed, some retailers are still prepared to give plastic bags for a fee. Furthermore, many people, particularly those who live in rural regions, seem to be unaware of the social implications of the plastic prohibition. As a result, Angriani et al. (2020) claim that environmental concern and responsibility are shared by consumers and dealers or producers. However, Producers in the municipality of Semarang were also worried. According to Ood Lantip Waspodo, a businessman from PT Marimas Putera Kencana, several waste recycling programs have yet to generate effective results.

> ***"As a food and beverage company, we are unable to avoid so-called plastic packaging at the time. As a result, we considered ways to recycle plastic garbage. However, we notice that other businesses have been unable to repurpose their plastic packaging trash" (Ood Lantip Waspodo, Personal Communication, 7 November 2021).***
>
> ***"But we also had a chat with the producers of the plastic handicrafts, they said that after it was finished, what to do with it when it was damaged, it became a problem because in the end it was also thrown into the trash. In addition, it also requires special skills that are painstaking and patient and take a long time" (Ood Lantip Waspodo, Personal Communication, 7 November 2021).***

## 4.4 Ecobrick as a New Method of Recycling Plastic Waste

PT Marimas Putera Kencana, a private sector organization, created the Ecobrick initiative, inspired by Ani Himawati and Russell Maier. Then, PT Marimas Putera Kencana collaborated with the Dinas Lingkungan Hidup Kota Semarang to provide 20,000 bottles of Ecobrick for the creation of a park in order to maximize the recycling of plastic waste. The Semarang City government and the private sector are cooperating to build an Ecobrick park. The following is a picture of figure 11 is Ecobrick Park Design in the city of Semarang.

*Figure 8. Ecobrick Park near DLH Semarang (Source: DLH Semarang)*

This Ecobrick Park was built on a land area of 1,010.17 m2 with an area of floor finishing including a canopy of 853 m2. As a public open space, this Ecobrick Park carries the theme 'educational park' which can be used as a community for environmental education tours and as an effort to reduce the remnants of plastic waste in the municipality of Semarang

Ecobrick are now being looked at as a new method of reducing plastic waste which continues to increase. Ecobrick are used plastic bottles that contain all kinds of used plastic, clean and dry and reach a certain density to function as building blocks that can be used repeatedly. Antico (2017) says that these Ecobrick to be made into building blocks have become accessible or low-cost construction materials for social projects in regions where litter and informal dump sites are a common problem and industrial recycling might not be yet available. This is an appropriate policy to implement in Indonesia, where the community's economy is undoubtedly still low in comparison to developed countries such as Europe. Meanwhile, many industrial sectors admit that they are still doubtful about implementing a plastic waste recycling program because the technology or machines used remain expensive. Additionally, Antico (2017) argues that another advantage of utilizing Ecobrick is that it is a manual process that may be completed by staff who previously had this understanding about Ecobrick (unskilled). For this reason, the municipality of Semarang accepted the offer of cooperation from PT Marimas Putera Kencana to carry out a massive Ecobrick program, see figure 12 for more details.

> ***"As a result, we have a responsibility to manage garbage, particularly plastic waste that cannot disintegrate naturally. If people, ask why Ecobrick? Because people can repurpose plastic garbage (repurpose) using the brick or brick concept. Thus far, everything the community has created can be converted into a seat. Finally, we took the initiative to expand the use of the Ecobrick trash recycling process outside. Then we partnered with prominent figures in this industry, like PT Marimas Putera Kencana" (Sapto Adi Sugihartono, Personal Communication, 7 November 2021).***

*Figure 9. Planting Ecobricks as an external building material at the Ecobrick Park Semarang*

Ecobrick are also designed to have a long life and durability of plastic materials using the cradle to cradle concept. Thus, Sapto Adi Sugihartono believed that Ecobrick can be more effective and efficient in reducing plastic waste. This is because Ecobricks can also be used to extend the life of these plastics to be processed into something useful for the needs of the wider community.

> ***"Previously, the Ecobrick were put into drinks in the size of 600 ml with a certain density, ideally 400 grams. But what is in this park is about 200 grams, okay, let's tolerate it. Then our target is 25,000 which is equivalent to five tons of waste. Just imagine that these five tons of waste have been overcome by creating a park like this. Wouldn't it be more effective," said (Sapto Adi Sugihartono, Personal Communication, 7 November 2021).***

In line with Sapto Adi Sugihartono, OOD Lantip Waspodo, as a representative of PT Marimas Putera Kencana also has the same reason behind his initiative to spread the Ecobrick movement to the people of the municipality of Semarang.

> ***"We chose the Ecobrick program as a trash recycling approach because we believe it has the potential to solve the problem of plastic waste in a fraction of the time required by prior waste recycling initiatives" (Ood Lantip Waspodo, Personal Communication, 7 November 2021).***

## 4.5 Steps to make Ecobrick

Making Ecobrick is simple, but you must proceed cautiously. Ecobricks that do not follow to standards can also degrade the quality of the furniture modules, structures, and social spreaders, whereas properly designed Ecobricks can be utilized safely and will protect plastic for future generations (Maeir & Himawati., 2017). This was also noted by Eko Gustini, an Ecobrick Trainer, because many individuals and government entities continue to promote false socialization regarding Ecobrick construction.

> ***"Personally, I was disappointed and sad because there were several cities that made Ecobrick but did not comply with the guidelines. If this can***

***continue, the danger is that Ecobrick will pollute the environment" (Eko Gustini, Personal Communication, 6 November 2021).***

The following is an example of making Ecobrick that is wrong and not in accordance with the procedure by Global Ecobrick Alliance (GEA).

*Figure 10. One method of creating Ecobricks outdoors is incorrect*

***"Any kind of plastic should not be exposed to sunlight because it will produce dioxins or toxins. This problem is not one or two Ecobrick, but thousands, you know" (Eko Gustini, Personal Communication, 6 November 2021).***

According to Eko Gustini, this can happen because there is still a lack of socialization and knowledge of the Ecobrick trainers themselves. The following is an example of an implementation of making Ecobrick that is still wrong and needs to be repaired.

***"Creating Ecobrick is not arbitrary, because trainers must also have knowledge in the field of building experts. Indeed, there are not enough Ecobrick trainers who have a building expert certificate like me. That's why it is necessary to intensify knowledge of making Ecobrick according to the guidelines, both for the community and for people who intend to become trainers" (Eko Gustini, Personal Communication, 6 November 2021).)***

The following are the steps in making Ecobrick in accordance with standard operating procedures (SOP).

**a. Plastic should be Stored, Separated, Cleaned, and Dried**

Ecobrick must be constructed entirely with clean, dry plastic. Then separate the plastic from the remaining elements. If the bottle's plastic is still stained with food, grease, or dirt, it should be cleaned first. This is because the contaminated plastic in your Ecobrick can promote microbial growth and the creation of methane. Most importantly, the plastic used in the manufacture of Ecobrick is completely dry.

***"I prefer to use dry plastic waste. Indeed, the remaining wet plastic waste can also be used, but I myself refrain from teaching until the community determines which Ecobrick are good to use. The problem is that if people are taught to use the remaining wet plastic waste, this will create further complications. Then, who is responsible if something goes wrong, especially if people continue to socialize by producing the wrong Ecobrick?" (Eko Gustini, Personal Communication, 6 November 2021).***

**b. Choose the Right Bottle**

A bottle of approximately the same size can also be used to construct Ecobrick. As a result, a more in-depth conversation with the Ecobrick producers in the community is required to use the same sort of bottle. Additionally, the following three factors must be considered.

1) Availability

   Utilize recycled bottles to create Ecobrick. Please refrain from purchasing a new bottle, as this will simply contribute to the growth of plastic garbage.

2) Volume

   The GEA trainer simplified the process of manufacturing Ecobrick by using bottles with a volume smaller than 600 ml. Indeed, bottles with a 1500 ml volume have the capacity to store a substantial amount of plastic. However, the process of creation is lengthy. However, by utilizing a small capacity container, the Ecobrick builder can complete their Ecobrick. Whereas advanced manufacturers of Ecobrick can make use of large volume bottles.

**c. Use a Special Stick**

To push the remnants of plastic into the bottle, you need a special stick made of bamboo and wood. Ideally, the wand should be about one-third the width of a standard bottle mouth to about 6mm. The wand is about twice if your bottle with a slightly rounded tip. It is important to remember that you should not use a stick with sharp angles as it can tear the bottle.

*Figure 11. Special Stick for Ecobrick (Source: Eko Gustini, Trainer of Ecobrick Semarang)*

**d. Start with the Colour at the Bottom of the Bottle**

This is a component of the circular design approach that guides the production of Ecobrick. When Ecobrick are incorporated into modules or earthen buildings, the colour at the bottom of the container contributes to the pattern and design. Therefore, to create the Ecobrick base, choose a soft plastic with a basic colour and press it into the Ecobrick blind base. Then, approximately half of the bottle should be filled with soft plastic in the desired hue. Following that, use sticks to solidify. Additionally, if your bottle has a foot or a dimple at the bottom, ensure that it is entirely and tightly filled. Once all soft plastic has been compressed, fill the bottle to a height of 1-2 cm from the bottom.

**e. Fill the Bottle until It Is Solid by Mixing the Plastic into It.**

Remember to cut the huge plastic into smaller pieces. The smaller the size of the findings, the denser they are. The following is an illustration of how to cut the remaining plastic waste to be used as Ecobricks.

*Figure 12. The Example How Cutting Plastic Waste (Source: Eko Gustini, Trainer of Ecobrick Semarang).*

Fill the bottle halfway with plastic and press it all the way to the bottle's sides with a stick. Once the container is full and solid, add additional plastic.

> ***"If it is not dense, the socialization will likewise be incorrect over time. Because otherwise, the Ecobrick will burst as well, as I have personally witnessed while providing training. As a result, I constantly advise participants to exercise caution in order to prevent risky situations" (Eko Gustini, Personal Communication, 6 November 2021).***

**f. Ecobrick should be Weighed**

The Ecobrick weight and volume are the strongest indicators of its quality. The total volume of the bottle that has been filled with plastic and has no remaining air or space. According to the GEA, the minimum density of Ecobrick required to qualify is 0.33 gram/ml. This means that a 600 mL bottle must weigh at least 200 grams, whereas a 1500 mL bottle must weigh at least 500 grams. Ecobrick

manufacturers with experience typically select a density of 0.37 gram/ml or greater as a reasonable range for Ecobrick density.

Then, if the density of the Ecobrick is less than 0.33 gram/ml, it will be too soft when employed as a module and will be unsuitable for earth construction. Soft Ecobrick can potentially degrade the structural integrity of the building by readily denting, hence shortening its life. Additionally, low density Ecobrick are fragile due to the presence of air pockets.

**g. Save Ecobrick**

Once completed, store the Ecobrick indoors, out of direct sunlight. If possible, shield it from dust and filth with a cloth or tarpaulin. This is because PET accumulates dust and chemicals that are difficult to remove. After that, stack them horizontally, bottoms facing out. This enables the organization of Ecobrick by colour and brand, which will aid in the planning and implementation of future projects. Ecobrick should be stored above ground level (on a floor or on wooden stilts) and completely protected from sunlight and other factors. However, it is preferable to arrange the Ecobrick horizontally with the bottom facing out. This is to avoid the explosion of the Ecobrick bottles if exposed to the sun for a long-time. **"However, Ecobrick cannot be used immediately; we must also wait 24 hours, for example, if we use Ecobrick for indoor seat"** ***(Eko Gustini, Personal Communication, 6 November 2021).***


*Figure 13. Socialization of Ecobrick Program in the Municipality of Semarang (Source: Eko Gustini, Trainer Ecobrick of Semarang)*

# CHAPTER 5

# ANALYSIS IN ECOBRICK PPP

Numerous actors must be directly involved in the fight against plastic waste. Not only from the government's perspective, but in this time, the community is also expected to actively assist the government in resolving the issue of waste that they continue to utilize for various activities. However, many commercial sectors are increasingly motivated and taking the lead in promoting environmental awareness and reducing plastic in the items their businesses generate. According to Joshi and Ahmed (2016), implementation of the public-private partnership (PPP) model typically occurs at the ground level when neither the public sector nor the private sector can meet their respective stakeholders' aims and expectations on their own. As such, the researcher wishes to present a summary in this chapter of how the PPP scenario helps the implementation of a waste recycling program in Semarang City utilizing the Ecobrick approach.

## 5.1 The Implementation of PPP in the Ecobrick Program

In the analysis of public policy, the term "partnership" has become more prevalent. Both the public and private sectors have grown increasingly dependent on one another as their resources are limited and their demands and opportunities have grown. Moreover, they find it advantageous to leverage one another and form alliances with actors in other sectors (Pieters in Pierre., 1998). According to South et al (2018), PPP are increasingly being studied and used for the provisioning of infrastructure projects around the world.

One example of the implementation of PPP is the construction of an Ecobrick park in Semarang City. This idea first appeared from Dinas Lingkungan Hidup Kota Semarang when it saw an opportunity that the Ecobricks bottles produced from the training with PT Marimas Putera Kencana could be used as building materials to replace bricks as well as an effort to reduce plastic waste in the city of Semarang.

> ***"We had training together to make Ecobricks, so to increase the value of the bottles, we tried to use them to make garden buildings," (Yuni Hastuti, Personal Communication, November 1, 2021).***

*Figure 14. Making Ecobrick Bottles between civil servants and PT Marimas Putera Kencana (Source: PT Marimas Putera Kencana)*

Starting from the training programme, they finally collaborated to get other actors involved, especially the Global Ecobrick Alliance (GEA) organization was previously a business partner of PT Marimas Putera Kencana.

Considering the cost of developing a park that is not cheap and limited funds, the Dinas Lingkungan Hidup Kota Semarang also invites individuals, communities and institutions to donate Ecobricks. In fact, the Dinas Lingkungan Hidup Kota Semarang also promised to provide attractive rewards. In fact, agencies or communities that donate at least 50 Ecobricks are entitled to get a certificate of appreciation and participate in building an Ecobrick park. The following are details regarding the Ecobrick donation letter issued by Dinas Lingkungan Hidup Kota Semarang. From this collaboration, no less than 20,000 Ecobricks are needed to build this park. However, it still takes a number of 9,950 bottles to reach the target, see table 7.

Table 7. List of Ecobrick Bottle Needs for Ecobrick Park (Source: Dinas Lingkungan Hidup Kota Semarang)

| Type of Ecobrick | Ecobrick Needs | |
|---|---|---|
| | Total of Building | Total Ecobrick |
| **Flower Pot** | 29 | 8.700 |
| **Bench** | 2 | 1.250 |
| | Total | 9.950 Bottles |

By collaborating with the private sectors, the municipality of Semarang hopes to engage the entire inhabitants in the program aimed at reducing plastic waste, as this is a problem that must be solved cohesively. Besides that, the Head of Dinas Lingkungan

Hidup Semarang ever stated that the implementation of PPP in the Ecobrick program could be viewed as a new form of bureaucracy.

> ***"In keeping with the times, we as the public sector are required to collaborate with the private sectors, both community and business leaders, to address plastic waste problems (Personal Communication," (Sapto Adi Sugihartono, 7 November 2021).***
>
> ***"This collaboration is critical because it involves them as well; for example, producers produce plastic for the products they manufacture. Similarly, the community utilizes packaged products in their daily activities," (Sapto Adi Sugihartono, Personal Communication, 7 November 2021).***

PT Marimas Putera Kencana representative, Ood Lantip Waspodo, stated that the company supported the collaboration to raise public awareness about the dangers of littering plastic waste. Additionally, as a producer who contributed to the Ecobrick concept's inception, the company plays a significant role in providing training or education for the manufacture of Ecobrick bottles to every government agency, community, and individual. As previously stated, the training began in 2017 with a business partnership with GEA (Global Ecobrick Alliance).

## 5.2 Public and Private Sector Role and Responsibility

In the implementation of the Ecobrick program, especially related to gardening, each actor involved has different roles and responsibilities. However, it is critical to note that, according to Aliu et al., (2014), policies that foster stronger collaborations across two sectors are necessary in emerging economies to increase service providers' financial, infrastructure, and institutional capabilities, particularly in waste management. This is because PPP is schema that can be used to complete important planning where the government (public) and the private sector share the rewards and risks (Aliu et al., 2014).

1. **Dinas Lingkungan Hidup Kota Semarang (Environmental Agency of Semarang)**

   Beginning with Dinas Lingkungan Hidup Semarang, as explained by Yuni Hastuti, the Head of Planning from Dinas Lingkungan Hidup Kota Semarang.

   > ***"Dinas Lingkungan Hidup Kota Semarang have a role in the Ecobrick program is to actively coordinate or act as a bridge between business and the community in order to jointly reduce plastic waste. This is demonstrated by the fact that Dinas Lingkungan Hidup Kota Semarang already conducts a massive socialization program every Saturday and Sunday for all segments of society according to a predetermined schedule" (Yuni Hastuti, Personal Communication, November 1, 2021).***

   Socialization by Dinas Lingkungan Hidup Kota Semarang has purpose to engage the Semarang community in environmental issue, particularly the reduction of

plastic waste that is commonly used daily. This is consistent with the research from Alabi et al., (2019) that governments also provide social responsibility, environmental awareness, indigenous knowledge, and the capacity to mobilize political support.

> ***"Right now, Dinas Lingkungan Hidup Kota Semarang is concentrating on creating outdoor Ecobrick that can be used as parks. As a result, each weekend, we invite representatives from all communities to assist in the construction of the Ecobrick park adjacent to the Dinas Lingkungan Hidup Kota Semarang building" (Yuni Hastuti, Personal Communication, November 1, 2021).***

> ***"The socialization process began in December 2021 and we invited Eko Gustini a representative of the Global Ecobrick Alliance, to provide training on how to make Ecobrick into building materials such as chairs or pots. Following that, we invited representatives of the training participants from various sectors of society. We also encourage schools, universities and institutions to make the Ecobrick program together" (Yuni Hastuti, Personal Communication, November 1, 2021).***

*Figure 15. Making Flower Pot from Ecobrick at Ecobrick Park Semarang*

**2. PT Marimas Putera Kencana**

As a private sector, PT Marimas Putera Kencana implemented an increasingly intensive training schedule in response to the high level of participation in the training for making Ecobrick in the municipality of Semarang. The goal is to reduce the amount of plastic waste that people consume daily and give awareness the danger of plastic waste.

> ***"We provide training on a regular basis, scheduling it for the last week of each month from January to December 2018, and because the response was so positive, we ended up being there every week. Interestingly, Ecobrick training participants are not limited to***

***Semarang City, but also to other cities in Central Java, where it continues to grow rapidly," (Ood Lantip Waspodo, Personal Communication, 7 November 2021.***

Due to the community's strong interest in participating in the Ecobrick program, PT Marimas Putera Kencana expanded the idea of Ecobrick to the school and held a *1000 Ecobrick for free laptops* event.

***"I still remember, in 2019, we launched our brilliant program to distribute 1000 laptops for all schools not only elementary school but also senior high school to spread Ecobrick movement. The mechanism of this event is when schools can produce 100 Ecobrick, they will receive free laptops for their students. However, the goal is each school can manage their own plastic waste, such as that generated by the school canteen, so that it does not go to waste problems again," (Ood Lantip Waspodo, Personal Communication, 7 November 2021).***


*Figure 16. Free Laptop for Schools in Semarang (Source: PT Marimas Putera Kencana)*

PT Marimas Putera Kencana hopes that through the socialization provided, schools will also produce Ecobrick trainers who will be disseminated to the general public, thereby resolving the goal of the municipality of Semarang specially to reduce plastic immediately. Apart from providing a space for in-person and online social interaction, PT Marimas Putera Kencana also serves as a repository for community-made Ecobrick. The majority of Ecobrick collected at the PT Marimas Putera Kencana office were used as outdoor construction materials for the Ecobrick Park.

### 3. Global Ecobrick Alliance (GEA)

As the founder of Ecobrick makers, GEA is actively involved in providing Ecobrick training, both in-person and online, which began during the Covid-19 pandemic. This was explained directly by Eko Gustini as trainer Ecobrick in the municipality of Semarang.

> ***"We developed this GEA in response to our concern about excessive plastic consumption. As one of the GEA trainers who is still active today, I believe that resolving the plastic problem will require a long journey beginning with personal, household, and community changes and culminating with economic changes. Therefore, GEA is actively involved in organizing beginner Ecobrick workshops that begin with the local community, or in this case, the communities of Semarang " (Eko Gustini, Personal Communication, 6 November 2021).***

Not only socialization, Eko Gustini house in Purwoyoso, Ngaliyan, Semarang also serves as a collection point for Ecobrick waste generated by the residents of Semarang City, which is later repurposed as outdoor building materials or Ecobrick park provided by the Dinas Lingkungan Hidup Kota Semarang.

> ***"At the moment, my house also used as a collection point for completed Ecobrick bottles. However, sometimes I also make Ecobrick bottles with other community groups in Semarang. Besides that, I frequently receive bottles of Ecobrick from other free regional or community trainings and they collect it to my house every weekend," (Eko Gustini, Personal Communication, 6 November 2021).***

**4. Waste Bank Association in the Municipality of Semarang**

To assist in the collection of 25,000 Ecobricks bottles for the construction of an Ecobrick park in Semarang City, the Dinas Lingkungan Hidup Kota Semarang also works cooperatively with various waste bank communities. The Lestari Magenta waste bank is one of the waste bank communities that is quite active in providing socialization for Ecobrick production.

> ***"At first, our waste bank served as a catalyst for environmental mobilization by inspiring young people and stakeholders in the city of Semarang to care about the surrounding environment. To be sure, our primary program as a waste bank includes a waste sorting system; from there, we can assist government and business actors in separating plastic waste, for example, by manufacturing Ecobrick like the one currently viral (Gusti, Personal Communication, 10 November 2021).***

Gusti admitted that he frequently held socialization session on Ecobrick construction in schools, both elementary and high schools in Semarang City.

> ***"Typically, we already have schools that have collaborated with a previous waste bank program; from there, we begin socializing school children about the Ecobrick making program. This is consistent with our vision and mission, which is to engage more young people in environmental awareness activities, particularly those addressing***

***the problem of plastic waste," (Gusti, Personal Communication, 10 November 2021).***

*Figure 17. Socialization Ecobrick by Waste Bank Association (Source: Waste Bank Lestari Magenta)*

***"Along with schools, our waste bank association has partnered with PT Marimas Putera Kencana to provide socialization on how to make Ecobrick on national television, in order to increase the spread of Ecobrick not only in Semarang City, but also to inspire other cities or regencies in Central Java, or even the entire Indonesian society," (Gusti, Personal Communication, 10 November 2021).***

As a temporary waste collection site for Semarang City residents, the waste bank association is extremely beneficial in collecting Ecobrick bottles for use as outdoor building materials due to the availability of goods.

**5. Local community**

The local community also plays a vital role in the implementation of the Ecobrick program in the municipality of Semarang. One resident of Semarang City expressed his gratitude for having attended the Ecobrick training organized by PT Marimas Putera Kencana.

***"I believe this program is beneficial because it has increased my awareness as a housewife of how to reduce plastic pollution that we typically ignore or toss in the trash. Prior to this training, I was frequently ignorant and unconcerned about the impact of plastic waste, because, even if I wanted to sell it to scavengers or collectors, the selling price of plastic waste was extremely low," (Siti Aminah, Personal Communication, December 2, 2021).***

***"After joined the Ecobrick training, now I am more diligent in sorting plastic waste because it turns out that there are benefits. However,***

***it is undeniable that there are still many people or my neighbours who do not use the plastic waste they use, for example for Ecobricks. I think there are still a few people who have concerns about Ecobricks. Moreover, the program is not also supervised by the government," (Siti Aminah, Personal Communication, January 10, 2022).***

*Figure 18. Society of Semarang showing her Waste Collection*

Indeed, after learning that the Ecobrick bottles created will give benefit for Ecobrick parks in Semarang, Siti Aminah also excited to educate her neighbours about environmental stewardship.

***"I am also involved in educating residents about the dangers of throwing away plastic waste. Indeed, if there is time remaining after the pandemic, they intend to reintroduce Ecobrick training by inviting Ecobrick trainers to this village," (Siti Aminah, Personal Communication, December 2, 2021).***

**6. NGO (Non-Governmental Organization)**

Non-governmental organizations (NGOs) and/or community-based groups may also be included in the PPP if they represent stakeholders who will be directly impacted by the project (Alabi et al., 2020). Thus, the Ecobrick initiative is also supported by various non-governmental organizations (NGOs) concerned with environmental issues, one of which is the Bina Lestari Foundation, or BINTARI. This organization is accustomed to actively participating in Semarang City's trash management activities. Additionally, it is an organization that has interests in and frequently socializes on various occasions concerning the implementation of circular economy (CE) and Ecobrick program.

***"Our role in this program is to provide input and criticism if we discover flaws in its implementation. However, we fully support the waste recycling program, as this is an effort to identify new ways to reduce the amount of difficult-to-decompose plastic waste." (Nurhadi, 22 November 2021).***

## 5.3 Financing Schemas

The private sector and the public sector have different flows and roles in funding schemes for the Ecobrick program. According the interview from the government, the Ecobrick program is funded exclusively through APBD (regional revenue and expenditure budget) funds in accordance with Semarang City regional regulation Number 5 of 2020 concerning the Semarang City APBD in 2021. APBD is a budget that is managed by each region in Indonesia. Besides that, they also explained that the money they allocated was intended for the construction of buildings in the Ecobrick park such as making benches, pots, providing cement, clay, straw and animal dung as raw materials for pots and hiring several professional builders for the building.

> ***"The Semarang City government's facilities are limited to an Ecobrick park, which includes land for plants and building materials such as sand, cow or buffalo dung, and straw. Meanwhile, the source funds itself through the Semarang City Regional Revenue and Expenditure Budge or called APBD," (Sapto Adi Sugihartono, Personal Communication, 7 November 2021).***

Meanwhile, to meet the requirements for creating additional Ecobrick parks, the community is expected to collaborate, beginning with the collection of Ecobrick bottles, as well as the creation of pots and benches or chairs on land provided by the municipality of Semarang for an Ecobrick park.

> ***"Since the Ecobrick park program is a volunteer system from various communities. building materials such as Ecobrick bottles are provided by the people of Semarang City, whether they are business actors or members of the industrial sector, as well as community groups concerned about environmental issues such as plastic waste reduction," (Sapto Adi Sugihartono, Personal Communication, 7 November 2021).***

If from the private sector, such as from PT Marimas Putera Kencana, it has been using company funds to be used for massive socialization to the community. However, PT Marimas Putera Kencana also contributed greatly to the provision of Ecobrick bottles obtained during the socialization of various trainings with the society of the municipality of Semarang since 2017.

> ***"We are the largest and most frequent contributors of Ecobrick bottles to the Semarang City government's Ecobrick park. We obtain these bottles from environmentalist organizations such as schools, universities, and women's groups, among other," (Ood Lantip Waspodo, Personal Communication, 7 November 2021).***

Because it is voluntary, the community is not required to pay with money to help make the Ecobrick program a success. But they were asked to come directly to help with energy in making Ecobrick pots. In addition, the community is also asked to bring the Ecobrick bottles they have at home to collect together in achieving the target of 25,000 Ecobrick bottles. However, the community said they were happy because apart from

getting the training they had also contributed to reducing plastic waste pollution in Semarang City without expensive fees.

> ***"As a student who is also a member of a youth organization, I am happy to be actively involved in making an Ecobrick park here. The benefits are many, apart from getting free knowledge, I can also make many friends," (student in Semarang City, personal communication, 11 December 2022).***

The same thing was also expressed by Eko Gustini, as a GEA trainer in Semarang and Central Java who often admitted to providing free socialization, especially to school children who did not have much money to learn to make Ecobricks**.**

> ***"I am often invited to various areas which of course require a large amount of transportation and accommodation costs. However, I often provide free training, especially for school children who do not have much money. For me, more and more people understand Ecobrick, that is the biggest pride for me as a coach," (Eko Gustini, Personal Communication, 6 November 2021).***

## 5.4 Ecobrick Program Contract and Sanctions

Typically, PPP involve binding contracts between the private and governmental sectors. As Klijn & Koppenjan (2016) describe, arguments in favor of PPPs basically center on the contract conditions. In PPP agreements, the contract acts as the instrument for tangibly dividing risks and benefits. Similarly, Iossa et al. (2007) defined PPP as a long-term contractual arrangement between the public and private sectors in which the private sector assumes considerable responsibility for the construction and operation of infrastructure used to deliver public services.

However, based on the interview results, the Ecobrick program, which is being implemented by the municipality of Semarang and the private sector in Semarang, is not bound by an official contract. Then, an interview with the Semarang City Environment Service revealed that the public sector had submitted a request for an Ecobrick donation with the reference number 800/3619/Perenc/XI/2021. According to the letter, the entire community, particularly the environmental community, which includes universities, adiwiyata schools, waste banks, saka kalpataru (scout organisation), and environmental communities, can donate their Ecobrick. Lastly, the bottles of Ecobrick will then be collected by Dinas Lingkungan Hidup Kota Semarang.

> ***"Indeed, we requested cooperation from all levels of society, including students, in donating Ecobrick bottles to help build an Ecobrick park. But, important to note that the Ecobrick target that has yet to be met. Thus, we hope this target can be our responsibility as citizen of Semarang City," (Yuni Hastuti, Personal Communication, 11 December 2021).***

Besides that, Yuni Hastuti stated that the regulation was not strongly binding, implying that no significant sanctions were imposed there are communities or people who do not comply with the letter for the Ecobrick donation.

***"Because the system is entirely volunteer, there is no special penalty for not donating Ecobrick bottles. Nevertheless, nearly every environmental community has come to bring their own Ecobrick bottles and then collaborated to build an Ecobrick park. Additionally, the letter explained that the donation request is not frivolous; there is, of course, a strong foundation, such as Mayor Regulation Number 27 of 2019 concerning the Control of Plastic Use. Based on this regulation, we hope that each person has awaraness to understand this law," (Yuni Hastuti, Personal communication, 11 December 2021).***

## 5.5 Ecobrick Program Monitoring

Formally, the Ecobrick park in Semarang is managed by Dinas Lingkungan Hidup Kota Semarang, namely the planning section, which is headed by Yuni Hastuti. As the person in charge of Ecobrick park, she is responsible for supervising and ensuring the construction of the Ecobrick park, which is scheduled to open in December 2021. However, she stated that the development of the Ecobrick park could not be completed on schedule because to Covid-19 restrictions, one of which was a lack of Ecobrick bottles. It is estimated that 9,950 bottles of Ecobricks are still required, with an initial aim of 20,000 bottles being erected on a land area of 1,010.17 m2, with a floor finish area of 853.12 m2 including a canopy.

Table 8. Ecobrick Bottle Required (Source: DLH Semarang, 2021)

| Ecobrick Targets | 20.000 bottles Ecobrick |
|---|---|
| **Number of Ecobrick Built** | 5.100 bottles Ecobricks |
| **Planned number of Ecobrick** | 9.950 bottles Ecobricks |
| Bottle Target Required | **9.950 bottles Ecobricks** |

Therefore, to achieve the target of the Ecobrick bottle, the Head of Dinas Lingkungan Hidup Kota Semarang also appealed and asked the community to directly monitor and assist in the completion of the Ecobrick park. In addition, the entire population of the municipality of Semarang also can monitor directly the progress of Ecobrick park.

***"In terms of monitoring, anyone can participate, particularly in making this Ecobrick park an open space, in the sense that the entire population of Semarang can see how far we've come in terms of construction. The community appreciates the ability to visit directly and witness first-hand how the Ecobrick park is constructed,"(Sapto Adi Sugihartono, Personal Communication, 7 November 2021).***

Along with the community, business in Semarang, such as Ood Lantip Waspodo, expressed their delight at the opportunity to participate in and directly watch the creation of the Ecobrick park.

***"Regarding with monitoring task, especially on Saturdays and Sundays, this Ecobrick park always welcomes any community or individual to come and assist in the completion of the Ecobrick park in Semarang City.***

***Additionally, the location is close to local communities. Thus, I believe if society have critics or suggestion about the construction or about socialization of Ecobrick they can directly come to the office of Dinas Lingkungan Hidup Kota Semarang" (Ood Lantip Waspodo, Personal Communication, 7 November 2021).***

## 5.6 Actor Ecobrick' Transparency and Commitment

One of the proofs of transparency that has been implemented by the municipality of Semarang can be seen through specific information in the donation request letter, regarding the number of Ecobrick required, including the number of Ecobrick built, the number of Ecobrick planned to be built, and the number of Ecobrick targets not met. This was stated directly by Yuni Hastuti as the head of planning for Dinas Lingkungan Hidup Kota Semarang.

***"We have always communicated clearly and transparently with both the public and private sectors about the future potential for the Ecobrick park. Indeed, from the start, we made an official announcement on how to create parks in a structured way via the official website of the Semarang City Environment Service" (Yuni Hastuti, Personal communication, 11 December 2021).***

Likewise, PT Marimas Putera Kencana is also active in official notifications via social media regarding the socialization of the need for Ecobrick bottles for gardening. This was then followed by other environmental communities who also care about the Ecobrick program such as the Waste Bank Community Alliance, Youth Community Cares for the Environment, Wegah Nyampah Community and many more in their social media. Interestingly, to increase the community's commitment to environmental care and the sustainability of the Ecobrick program, Dinas Lingkungan Hidup Kota Semarang also plans to make Ecobrick programs in 2022. The plan, the program will be implemented after the official opening in Ecobrick park.

***"As a consequence, in order to maintain the community's commitment to addressing the issue of plastic waste, we plan to hold competitions in each sub-district in 2022. We know that, Semarang has sixteen sub-districts; consequently, we will hold an exciting competition later this year to determine whether the Ecobrick park will be designated for each sub-district or district representatives will visit the Ecobrick park to help decorate it." (Sapto Adi Sugihartono, Personal Communication, 7 November 2021).***

## 5.7 Advantages and Risk by using PPP in Ecobrick Program

In latest days, the PPP has been recognized with several good outcomes, including the creation of a private-sector-led economy, the acceleration of development, the reduction of project life-cycle costs, the promotion of national growth, and the enhancement of national infrastructure (Otairu et al., 2014). Then, according to Forsyth (2004), PPP has grown significantly as a result of the diversification of actors who engage with foreign investors, as well as the expanding use of partnerships to allow

local participation in environmental and developmental policies. This is also in line with field studies, which show that PPP facilitates the participation of numerous non-traditional actors in the Ecobrick initiative. NGOs and community organizations that care about the environment and plastic trash are among them.

Another benefit of employing PPP is that it lowers the cost of a program that can be costly, especially when it comes to recycling plastic. According to Patni et al., (2013), reducing plastic waste is both costly and unattractive to dispose of in landfills due to its poor biodegradability. As a result, PPP partnership can assist to reduce government spending, which tends to balloon and is less than ideal when it comes to waste management. Another direct consequence of the Ecobrick program on the residents of Semarang City is the addition of green open space to the city's surroundings. The Ecobrick park can be used by the public as a site of recreation as well as education to raise public awareness of the environment, in addition to reducing plastic waste pollution. During a visit to the Ecobrick park, Hanik expressed this explicitly.

> ***"There is a play area for youngsters as well as a comfortable and lovely environment. Normally, I come here every afternoon to just watch the kids play or just hang out with the family in the fresh air " (Hanik, Personal Communication, 14 January 2022).***

Another advantage of PPP is that it increases local community involvement in environmental issues. This is evidenced by the large turnout of community members who came out to help built the Ecobrick park. Furthermore, even though they are still in the Covid-19 epidemic, many people have sought to be taught how to make Ecobricks by Ecobrick trainers. As the Ecobrick trainer in Semarang City, GEA explained this in detail.

> ***"The enthusiasm from society is so high that I occasionally do Ecobrick training in secret with only a few small groups to meet the learners' needs," (Eko Gustiani, Personal Communication, 6 November 2021).***

However, there is a significant risk associated with PPP implementation. PPP initiatives, according to Howick et al. (2009), are extremely complicated, last for many years, and involve numerous partners in dynamic relationships with numerous interdependencies. This may be seen in the scarcity of Ecobrick bottles, which are utilized building materials. As for the business sector, Ood Lantip Waspodo from PT Marimas Putera Kencana admitted to being perplexed because his company provided the majority of the Ecobrick donations.

> ***“Unfortunately, until now we still often cover up if there is a shortage of Ecobricks bottles. It is true that sometimes other communities such as waste banks also help, but the target needs are also large. The hope is that the community will be more active in making Ecobricks, so it's not only when there is training,” (Ood Lantip Waspodo, Personal Communication, 7 November 2021).***

Even though they are the company that started Ecobrick, Semarang City's largest corporation also believes that the community will become much more involved in the production of Ecobrick bottles. If community actively involved, it may have an influence on the relationships and communication between the parties involved.

## 5.8 The PPP Challenge in Ecobrick Program

Behind the advantages and risks of using PPP, of course there are challenges that must be faced. Alabi et al (2019) said that there are things that urban managers in developing countries should pay attention to, mainly in this case, the sustainability of the Ecobrick program. Even though the local government has said that it will make Ecobrick competitions in the future, of course it is necessary to consider how the community remains consistent in reducing plastic waste by recycling Ecobrick waste. Moreover, the fact is that there are still many obstacles in the implementation of Ecobricks. First, it is related to uneven socialization. When seen from a geographic standpoint, the municipality of Semarang, consists not only of metropolitan areas but also of rural areas. Indeed, for residents of Semarang City who live in metropolitan areas and have easy access to information and more familiar with about Ecobrick program. However, there are a lot of residents who live in rural districts are unaware with Ecobrick program.

> ***"I am aware of a plastic garbage recycling program, which is typically comprised of one-of-a-kind objects intended for resale or usage as home décor. However, I am unfamiliar with the Ecobrick program and the process for creating Ecobrick bottles" (Suhartiningsih, Personal Communication, 30 November 2021).***

Furthermore, there are a lot of informal waste sector actors such as waste collectors who are unaware of the Ecobrick program.

> ***"I have no idea; I generally collect used items such as plastic bottles to resell,"(Shadiqin, Personal Communication, 6 December 2021).***

Related with this problems, Dinas Lingkungan Hidup Kota Semarang ever explained that currently Ecobrick socialization still limited because pandemic Covid-19. As a result, the Ecobrick movement has been unable to extend to all sectors of society. Second, public criticism regarding the collection of Ecobricks which is less strategic.

As previously stated, the municipality of Semarang has three collecting stations for Ecobrick bottles. The first is located on Jalan Tapak Raya Tugu, Ngaliyan, West Semarang near with the office of Dinas Lingkungan Hidup Kota Semarang. Another location is located on the premises of PT Marimas Putera Kencana, more precisely in Block D-21 of the Gatot Subroto Temple Industrial Estate in Ngaliyan, West Semarang. Then, third location is the residence of Eko Gustini, which is located at Perum BPI Blok O Number 4 RT 05 RW 10 Purwoyoso, Ngaliyan, West Semarang. Consequently, the majority of Ecobrick collection locations remain concentrated in a single area or district, namely the West Semarang area. On this basis, there are several people in the municipality of

Semarang who complain that the Ecobrick collection point is quite far and cannot be reached by other sub-districts.

> ***"As a resident of East Semarang, I have a critique with the collection location for Ecobrick. Like, how can the community participate in Ecobrick production if the collecting location is located outside of our area? This reason can also undermine the community's enthusiasm for environmental responsibility, particularly in the case of Ecobricks," (Endang, Personal Communication, 11 December 2021).***

*Figure 19. One of Collection Ecobrick Bottles at Eko Gustini House's*

Then, one of residents of the municipality of Semarang who live quite a distance from the Ecobrick park explain her concern about the transparency of parties who can be used as temporary Ecobrick distributors or collection agents, as there is no robust system in place to ensure or sanction whether these actors perform their duties correctly or not.

> ***"Moreover, this is a voluntary system that is not subsidized; yes, if we have a waste bank or trusted environment community to bring or collect our Ecobricks; if not? how if they are only throw the Ecobrick because didn't know the value. Fact, it is hard too for making one bottles of Ecobrick," (Endang, personal communication on December 30, 2021.***

The interview results revealed a new fact that the topic of transparency remains a source of contention in the community. Numerous individuals have expressed concern that the collection of Ecobrick bottles is still not strategic, and that there are no environmental actors committed to distributing Ecobrick bottles. Joshi & Ahmed (2016) also explained that PPP challenges in handling waste in developing countries are related to planning and implementing sustainable low-cost strategic waste management.

Furthermore, there are also several challenges in handling waste using the PPP scheme, such as awareness to enhance segregation, characterization of municipal solid waste, urbanization and lack of appropriate level funding, implementation of rules at ground level, lack of coordination among centres and state (Joshi & Ahmed., 2016). Another

challenge in the development of the Ecobrick program is increasing public awareness and participation to make Ecobricks which may be done independently per house so that the government can implement a door to door collection program, for example in collecting Ecobricks bottles to be used not only as a park benches but also buildings or other infrastructure in the municipality of Semarang.

# CHAPTER 6

# DISCUSSION

This chapter will discuss how Ecobrick PPP method is an important illustrative example of the growth of NPM and development of CE in Semarang, Indonesia. At step 6.1 will explain in detail the strength of the partnership between the municipality of Semarang and the private sector during this one-year Ecobrick program. Then, section 6.2 will concentrate on indications of a shift away from traditional bureaucracy toward new public management (NPM). Finally, at section 6.3, the researcher will discuss the circular economy (CE) application in Semarang, Indonesia.

## 6.1 The Strength of the Partnership of Ecobrick Program

Three critical aspects should be considered when forming an effective partnership: 1) need; 2) political, legal, and administrative considerations; and 3) communication (Skietrys et al., 2008). The first is the participants' strong desire to complete the Ecobrick park. Indeed, as described by Jacobson and Choi (2008), a high willingness to compromise or collaborate indicated that project members shared values or goals. This is also supported by the facts on the ground, which show that the level of community participation, alliances, and government employees who attend Ecobrick park development activities is extremely high, even though it is entirely voluntary systems. In a collaboration, it is also critical to have a shared vision. According to Tang et al. (2006), one of the first steps in partnering is to develop a shared vision. This vision includes the creation of a partnering agreement that addresses mutual goals and timelines.

The second is political, legal and administrative consideration. Political stability also contributed to a lack of political will to use PPP as a tool for governance. This is because if a region or country's political climate is conducive, it will also influence how decisions are made, such as regarding public infrastructure development (Huque., 2021). This is also consistent with the fact that an efficient strategy for a PPP project requires good coordination in order to achieve political and administrative consensus and ensure that the project gets off the ground (Mahalingam., 2011).

The third, hearing voices from diverse sectors is also critical in PPP. This is aligned with Li et al (2020) statement that communication is the foundation of PPP. This is because both formal and informal communication can serve to increase mutual understanding and reduce conflict and frictions between cooperation partners. On the other side, information sharing can successfully prevent cooperative partners from engaging in opportunistic conduct as a result of knowledge imbalance. It is feasible that, if communication is successful, these actors can also share information regarding the barriers and struggles they confront in their respective fields. However, if

communication is not functioning effectively, this will inevitably impede the program's progress. Take a good example, according to the official website of Dinas Lingkungan Hidup Kota Semarang, there is no information about the development of the Ecobrick park in Semarang. This, of course, complicates matters for Semarang City residents who want to know how the park project is progressing in detail, such as how many Ecobrick bottles remain unbuilt and how many benches or pots remain unbuilt. Similarly, the private sector, such as PT Marimas Putera Kencana, provides little information about the park on social media or their website. Communication between actors has typically occurred primarily through informal meetings during the creation of an Ecobrick park, which is typically held on Saturdays and Sundays and in accordance with the time allocated by Dinas Lingkungan Hidup Kota Semarang. Osei-Kyei and Chan (2015) expressed the same point, stating that with effective communication, the parties can consult one another for clarification on project delivery. Furthermore, both public and private sector organizations must be transparent and accessible to external stakeholders or consumers. Indeed, the project's material and findings must be made publicly available.

Besides that, Klijn and Teisman (2002) believed that there are three variables frequently function as impediments to the growth of PPP: the complexity of the participation structure, institutional considerations, and strategic selection of public and private participants. As a result, it cannot be denied that PPP in the Ecobrick program in the municipality of Semarang is still not optimum, particularly given the complexity of the program's participant structure. Rakic & Radenovic (2011) have emphasized this point, noting that because the bulk of PPP projects are implemented by local governments so there is a high degree of interdependence among all project participants. This dependence can be seen when the Dinas Lingkungan Hidup Kota Semarang issued a letter requesting Ecobrick donations to all elements of the Semarang City community to assist in the completion of the Ecobrick park. On the one hand, this policy does provide positive things to increase community participation to be seen in the program. But on the other hand, it can also be seen that the efforts of the public sector in providing Ecobrick bottles are also still lacking to mobilizing civil servants as public servants to be more solution-oriented in solving problems.

Moreover, considerations from institutions or the public sector are also an impediment to implementing the Ecobrick program in Semarang City. This can be seen in the informal agreement that is only limited to a letter of request for donations and the lack of an official contract between the government and the relevant actors in the program, which then affects the program's performance, such as the postponement of the park's inauguration. According to Zhang et al. (2014), contractual arrangements in PPP are constrained by the institutional environment, both informal and formal. The informal institutions include public perceptions of PPP and a culture that facilitates or hinders PPP, whereas the formal institutions include the government's constitution,

regulations, laws, edicts, guidelines, and administrative structures. In the context of cooperation in the development of Ecobrick parks, the government should set clear rules and standards to achieve the desired target and how to make strong rules to bind other actors when collaborating in the sense of not just issuing an Ecobrick application letter. This implies that strong institutions and have potentially large markets attract more investment through PPP. This makes sense as stability in the economy reduces the risk of an infrastructure projects (Sharma., 2011).

Another issue with the Ecobrick PPP model is that participants are not selected to represent the entire community. To begin, the Semarang City administration is known to work with only one enterprise in the city, namely PT Marimas Putera Kencana, under the existing arrangement. Indeed, the government should be able to collaborate with a variety of other businesses in order to demonstrate the industry's commitment to resolving plastic waste in Semarang City. Additionally, under this PPP arrangement, actors can collaborate with informal organizations such as garbage collectors to collect used bottles or receive training to make Ecobricks, as these groups are frequently actively involved in waste management. Besides that, it can also be seen from the dominance of the private sector which is larger than the public sector. It was clear that the idea for Ecobrick originated with PT Marimas Putera Kencana, a business and industry participant. However, transferring the burden of training entirely to the private sector doesn't appropriate. This was also stated by Rakic & Radenovic (2011), who noted that because private partners possess the requisite expertise, skills, and resources for project implementation, but their replacement is quite restricted.

According to the findings of in-depth interviews and field observations, collaboration between actors, it can be said that PPP in Ecobricks is strong enough to help accelerate CE in Semarang, Indonesia. First, although there is no attached formal letter that binds the actors, in fact the partnership between the government and the private sector can work effectively. Second, the private sector or in this case PT Marimas Putera Kencana is directly involved in the construction of an Ecobrick park in Semarang City, which means that it also participates in supervising and monitoring the course of the collaboration. Third, the community and communities are also actively helping to build Ecobrick park facilities where they have a high enthusiasm and level of participation despite the Covid-19 pandemic.

Moreover, the Ecobrick PPP scheme in the Ecobrick program can be solutions in dealing with plastic waste in Semarang City because the need for Ecobrick bottles in Semarang City is 20,000 bottles for one park which is equivalent to a reduction of five tons of plastic as explained by the head of Dinas Lingkungan Hidup Kota Semarang. In fact, when referring to data from The National Plastic Action Partnership (NPAP), there are around 4.8 million tons of plastic waste per year in Indonesia that are not managed properly. In addition, according to the environmental organization Ecoton, especially on the Java province, every year there are 8 million tons of plastic waste, of which 3 million

tons can be processed and 5 million tons are not managed, and 2.6 million tons are dumped into rivers. Meanwhile, an interview with Dinas Lingkungan Hidup Kota Semarang also said that the amount of waste in Semarang City reached 800 to 900 tons per day and plastic waste contributed 18 percent of the total waste production per day. Indeed, we need a lot of Ecobrick park to get effective results with fast progress.

The PPP scheme in Ecobrick is also good opportunity to implemented as a form of new public management (NPM) because it has a great opportunity to accelerate the CE transition in Indonesia. With responsive public services with a model of cooperation between various sectors, the problem of plastic waste can also be quickly resolved because various groups or communities will have the same vision and mission for the common good.

However, the PPP Ecobrick scheme still has shortcomings and challenges that can be improved. First, lack of competence in forming partnerships and its continued reliance on old service delivery models by public sector. Then, based on the findings of interviews with resource personnel from the Dinas Lingkungan Hidup Kota Semarang, it is known that this PPP was formed on purpose owing to budget restrictions. This is consistent with Thatcher's 1995 definition of NPM, as cited by Osborner (2006), who defined NPM as a paradigm that places importance on input and output control and evaluation, as well as performance management and audit.

Apart from that, Covid-19 pandemic has also acted as an indirect impediment to actors for strengthening the cooperative relationships that should be developed. Consequently, this difficult situation contributes to have poor communication among actors who participate in this project. On the other hand, the government and private sector can pursue other avenues or ideas to keep Ecobricks operational during the Covid-19 pandemic, such as online training at home. Then, in order to increase community participation, the government should be able to offer Ecobricks as a business opportunity that can be traded for suppliers of bricks and interesting handicraft materials, thereby increasing the amount of locally produced goods. Naturally, during the Covid-19 situation, which has a negative impact on the community's economy, innovative solutions are required to raise the community's overall standard of living.

## 6.2 The Shift from Traditional Bureaucracy to New Public Management

In reference to point 6.1, it has been stated that the political, legal, and administrative environment are also critical factors in the success of PPP. However, Stoker (2006) argue that there are three critical parameters can be utilized to assess the performance of NPM: efficiency, accountability, and equity. Firstly, efficiency that has a focus on the value of a project, it is closely related to administrative products and services. According to Weber, the most important goal of the ideal bureaucracy is to promote efficiency (Persson & Goldkuhl., 2010). Meanwhile, according to Giauque., (2003) efficiency

models or market models are usually used and aim to make public sector organizations more efficient by measuring performance compared to the private sector. However, now in the concept of economic competition and dominant productive performance there is widespread use of private management tools. This may be seen in the public sector's reliance on the private sector in the private sector for Ecobrick bottles. If this Ecobrick park is a planned program, the public sector can offer the instruments necessary to manufacture Ecobricks in huge quantities and to distribute them broadly for their communities. Of course, with good planed, it can also save time and money when manufacturing Ecobrick bottles.

The second is accountability in NPM project. Both standardization of documentation methods and standardization of data collection are examples of Weberian perspectives on accountability (Persson & Goldkuhl., 2010). However, accountability is achieved through the superior level of control's oversight of each level of implementation. If a policy is not followed faithfully, accountability can be given by reviewing each stage of the process to establish who is at fault (and in whose position) (Pfiffner., 2004). In this context, another organization and institution also required to oversee the Ecobrick program, so that if there is friction in cooperation via the PPP scheme, the organization can provide feedback, assess, and evaluate. However, Pfiffner (2004) reiterated that it is frequently rather slow and impracticable in businesses that continue to employ the traditional approach. Thus, incorporating the NPM concept into a PPP system would alleviate the challenges associated with tight management, such as hierarchical control, by delegating greater flexibility and discretion to lower levels of production. In addition, the NPM idea will promote the principle of 'accountability' by delegating implementation policies to those closest to service delivery, allowing them to exercise greater influence over recruiting and terminating staff, as well as spending policies to accomplish policy objectives. Pfiffiner (2000) also argues, in the context of the private sector-led Ecobrick initiative, that management decisions can be made at the discretion of private sector managers, if they are lawfully producing goods or services on a contract basis. Lastly, the involvement of informal actors and NGO are also vital part in this program. The informal sector can be given skills and empowered to make bottle Ecobricks. Meanwhile, NGOs can be used as input providers or perhaps research to what extent Ecobrick bottles can really be effective in dealing with plastic waste or the safety of Ecobrick bottles as a building material.

The third aspect that can influence the role of NPM in a PPP scheme is equity, particularly in the provision of public services. Equity, according to Liyala (2011), is also associated with the adaptability, accessibility, and sustainability of intermunicipal collaboration. Additionally, equity refers to the extent to which governmental institutions are capable of tailoring service delivery to the unique requirements of the varied groups of residents they serve (Andrews & Walle., 2013). In the context of Ecobrick park, the community now has a green area as well as educational place for

environmental education and it can be accessed by anyone. They can also use this Ecobrick park as healing amid the Covid-19 pandemic. In the implementation of the Ecobrick program to meet the needs of the community as a place that can be used for green space areas as well as an educational event about environmental care, in PPP, a more modern management model known as New Public Management (NPM). In reforming public administration, the NPM movement shifted its emphasis to performance, effectiveness, citizen centricity, and efficiency (Persson & Goldkuhl., 2010). In the context of achieving better waste management through the Ecobrick program, NPM can be used by the Semarang Municipality as a new approach in delivering their planned program by creating a more stable and organized political and administrative system (Persson & Goldkuhl., 2010).

However, NPM still have challenges, in terms of delivery or services provided by the Semarang Municipality, it continues to use the traditional approach. In fact, in the problem of waste management, the government is expected and required to be more responsive in overcoming a problem. According to Bugge et al. (2018) research, system change would have likely ensured a stronger degree of directionality and a broader anchoring of actors. Such an approach is likely to have gotten to waste prevention mode faster than the step-by-step solutions that have been implemented so far. These should be approached through collaborative initiatives that span the entire value chain from the start. An empowered cooperation among stakeholders would have most possibly guaranteed stronger orientation and improved joint reflective thinking among the stakeholders involved (Bugge et al., 2018). Therefore, it is also necessary to know what the traditional approach is and what the modern approach or better known as New Public Management (NPM) is in the PPP scheme.

Moreover, Weber also emphasized that the traditional definition of bureaucracy as top-down control in the form of a monocratic hierarchy or control system in which policies are established at the top and implemented through a series of offices in which each manager and employee reports to a single superior who holds them accountable (Pfiffner., 2004). Meanwhile, in the context of Indonesia, the bureaucratic approach tends to be patrimonialism or traditional administration of dominance, such as Weber's concept. According to Max Weber's classic definition, patrimonial government lacks above all bureaucratic separation of the private and official spheres. Patrimonial rulers have the freedom to use their power as if it were their personal property, without regard for binding norms and regulations (Gaus et al., 2017).

Overall, using the NPM concept in the PPP scheme contribute to a variety of benefits for both the commercial and public sectors. The primary objective for the public sector is to strengthen its capabilities for developing integrated solutions. Then, assisting in the process of producing new and innovative solutions. For example, if previously in the interview results it was stated that so far there has been no effective waste recycling program, the Ecobrick program carried out under the PPP scheme could be an

important solution if planned carefully. Following that, the necessary expenditures and time for project implementation are reduced. Then there is risk transfer. After that, monitoring and quality control of the public service delivered. Finally, avoiding the debt limit (Rakic & Radenovic., 2011). If this is related to Dinas Lingkungan Hidup Kota Semarang frequent mention of a limited budget system. However, for the PPP program to succeed, the private sector and other participants must invest in money, goods, and socialization. Similar with the public sector, the company benefits financially from this Ecobrick program by providing education and training to the community about Ecobricks. Furthermore, PT Marimas Putera Kencana also get benefits from expanding its network in order to expand its business through Ecobrick education to businesses, communities, groups, and government agencies. The private sector can also take pride in contributing to environmental education and being directly involved in the provision of public infrastructure.

## 6.3 The Implementation of Circular Economy (CE) in Semarang, Indonesia

The numerous analyses of waste management in Semarang City, it is considered that PPP in the Ecobrick program has a significant potential for the development of circular economy in Semarang. To begin, PPP can be a financing solution, particularly for trash recycling projects that incur high expenditures. This is because, based on field observations, the circular economy in Semarang may well have social benefit. As an illustration, when constructing an Ecobrick park, the community, producers, and other volunteer communities all contribute directly to the park's construction. Ferronato et al., (2019) also stated that no CE model is similar in every scenario due to social, environmental, financial, and political variances. Additionally, there are several inconsistencies between waste management in large cities and small villages, since financial resources, trash output, social behaviors, and metropolitan locations are all quite diverse, necessitating case-by-case analysis. Indirectly, this Ecobrick initiative establishes a new understanding that financial constraints or the high cost of labor for environmental activities can be alleviated by a community-based volunteer workforce. Thirdly, PPP can be utilized as a venue for local governments to advocate for the community's voice over ineffective waste management, particularly the issue of recycling waste.

Moreover, the PPP scheme can s be used as a promising approach to be implementing a circular economy in Indonesia for the better with proper planning. As previously stated, Recycling remains a problem for the people of Semarang City, and this is acknowledged by the actors involved in the PPP in the Ecobrick program. This is influenced by several factors, including high recycling costs, expensive recycling machines, and a lack of innovation on the part of both the local government and the community. As a result, the PPP scheme is expected to be able to bridge the problem of waste recycling so that Semarang's circular economy can continue to develop. This is also supported by Hongo (2016) research, which found that there is great potential in

the use of the PPP model in Asia and other developing countries, as well as the necessary conditions for PPP approaches.

According to Atmanti et al. (2019), waste management in the city of Semarang is inefficient. This seems to be down to lack of infrastructure rejuvenation and poor maintenance of existing infrastructure. Similarly, it was stated that waste management in the city of Semarang has not become a major concern for the community. This is supported by data on community waste piles, which are growing every year. Furthermore, waste management is still based on the old paradigm of collect-transport-dispose (Sitanggang et al., 2017). As a result, given the limited land available for final disposal, the Semarang City government provides a temporary waste collection location prior to waste being transported to the final disposal site (TPA), but the issue is that the cost of waste transportation is occasionally still complained about by the middle and lower classes of the society. This has occurred not only in Semarang, but in many cities across Indonesia that have attempted to reform their waste management through a wide range of funding and planning strategies, but none of them have yet succeeded in finding a long-term solution to waste disposal (Supriyadi et al. al., 2000).

The issue of human resources also contributes to the fact that circular economy (CE) implementation in Indonesia is still weak. This is because it is frequently discovered that temporary waste dump remains overcrowded and even distributed without being transported by the municipality of Semarang, specifically through Dinas Lingkungan Hidup Kota Semarang see the figure 23.

*Figure 20. Overloaded garbage in the temporary garbage dump in Semarang*

The availability of infrastructure such as Ecobrick parks has a good opportunity to reduce plastic waste. As previously explained by Dinas Lingkungan Hidup Kota

Semarang in an interview, it said that 20,000 bottles of Ecobricks are equivalent to 5 tons of plastic waste. In fact, according to the Ecoton organization, it is recorded that Central Java often produces 8 tons of plastic waste per year. This can be used as a real opportunity or to accelerate the transition of CE with a partnership scheme.

Besides that, scavengers might be considered informal players who contribute significantly to the management of more valuable waste. Scavengers in Semarang are occasionally still stigmatized as a lower-class group. Thus, the researcher believe that the government can employ scavengers to assist it in controlling waste, not just during the transit stage, but also throughout the sorting step, which remains the government's responsibility. This is in accordance with the research revealed by Sembiring & Nitivattanon., (2010) that scavengers are often associated with waste and have low status so that this often reinforces low social status for scavengers. Informal waste workers occur in developing countries because of low levels of economic development. Poor wages and low prices for products and services create viable profit margins from collecting and selling secondary raw materials (Wilson et al., 2010). In fact, informal actors such as scavengers can provide economic benefits in developing countries. This is because they can provide a steady, reliable supply of secondary raw materials for local manufacturing industry which can replace more expensive imported raw materials. In addition, they can also help reduce the cost of formal waste management systems as they reduce the quantity of waste for collection, resulting in less money and time spent on collection and transport (Wilson et al., 2010).

Thus, in order to improve the city of Semarang's management of plastic waste, it is also required to incorporate informal actors, particularly in overcoming the waste management process's human resource shortage. Participation of informal workers undoubtedly has several benefits, including an increase in their own socioeconomic status within the community. Furthermore, the participation of informal waste workers can help to offset some of the expenditures associated with formal waste employees, who are typically hired by the government. Including the involvement of actors, field research indicates that the role of industrial players in Semarang in reducing the plastic waste they produce is still relatively limited. Even though there are already standards requiring producers to contribute to the creation of a sustainable environment, this is referred to as extended producer responsibility. EPR is a policy initiative that acknowledges the producer's responsibility for minimizing the impact of their product throughout its life cycle, including waste management and product recovery (McKerlie et al., 2016).

Indeed, the government has cooperated and enforced tight guidelines to encourage industry participation in Semarang's plastic waste management efforts, ranging from factory wastewater treatment for agricultural soil fertility to the prepaid plastic bag program. However, limiting the environmental impact of end-of-life systems involves more than a strategy that governs how products are appropriately managed when they

are no longer in use. It necessitates end-of-life product and system design. To properly integrate product retirement issues into design considerations, cost and data must be feedback and internalized (Spicer & Johnson., 2002).

# CHAPTER 7

# CONCLUSION AND RECOMMENDATION

The researcher revisits and summarizes the research issues in this chapter, focusing on how Ecobrick PPP as a form of New Public Management can supports and contributes to CE development in Semarang, Indonesia. At point 7.1, the researcher draws conclusions based on interview findings and field observations, as well as earlier chapter discussions. The researcher will then connect to point 7.2, which concerns study recommendations for the parties involved in the PPP scheme for the construction of an Ecobrick park in Semarang Municipality.

## 7.1 Conclusion

The following is the main research question in this research.

1. How can PPP help overcome circular economy (CE) challenges by examining the PPP scheme applied to the provision of public infrastructure from Ecobrick park in Semarang, Indonesia?

Then, it is followed by a sub-research question as follows:

1. How does the interaction formed between the public and private sectors through the PPP scheme help overcome CE barriers in the Ecobrick program?
2. What are the challenges in the Ecobrick program that have a significant impact on the CE implementation through the PPP scheme?
3. What are the responsibilities of the private sector and the public sector in implementing CE through the Ecobrick program within the PPP scheme?
4. How does the PPP scheme assist in the monitoring of CE implementation through the Ecobrick program?
5. To what extent does the new public management model (NPM) approach influence the outcomes of the Ecobrick PPP scheme in Semarang, Indonesia?

The primary characteristic of a PPP is that it is a contract or arrangement between a government entity and a private entity (Sharma & Bindal., 2017). In the context of Semarang City, PPP emerged after the Semarang City invited several private actors to participate actively in the construction of the Ecobrick park. The idea for this park came from an initiative by one of industry in Semarang, PT Marimas Putera Kencana, to use the remnants of plastic waste as Ecobricks bottles. Ecobrick bottles can be used not only as outdoor structures such as bricks, but also as indoor structures such as tables and chairs. Participants who want to explore Ecobrick must, however, learn specific strategies and techniques. Seeing that Ecobricks have a great opportunity to overcome the remnants of plastic waste, Dinas Lingkungan Hidup Kota Semarang collaborated with the private sector to invite the wider community to socialize together regarding

the Ecobrick program while building an Ecobrick park that can be used as a green open space as well as for the wider community. Ecobrick PPP can also be regarded as a form of NPM that can facilitate the acceleration of CE with a partnership scheme that is mutually beneficial to both the public and private sectors.

In concluding the main questions and supporting questions, the researcher uses several theories, the first is to understand the concept of the circular economy (CE) and how it plays a role in waste management in big cities in Indonesia and the PPP scheme which is clearly visible in the construction of the Ecobrick park in the city of Semarang. Besides that, the researcher also using the NPM theory to answer the challenges and obstacles that exist in the Ecobrick program with the PPP scheme.

Overall, Ecobrick PPP model enhance CE in Semarang. The first reason because the Municipality of Semarang was also able to reduce its limited budget expenditures with the assistance of PT Marimas Putera Kencana and other actors. This is critical, because local governments can still implement other programs that promote economic growth, particularly during the Covid-19 pandemic. Second, PT Marimas Putera Kencana has the advantage of providing Ecobrick training to agencies, communities, and individuals. Additionally, its benefits companies like PT Marimas by expanding their business networks. Besides that, some Ecobrick trainings come at a cost, which can influence the company's financial benefits. Third, the community has a new infrastructure in the form of an environmental education park that can be accessed by anyone. This park can be used as a learning arena for various groups of people on how to deal with plastic waste in the city of Semarang as well as a fun place for cheap recreation with family during the Covid-19 pandemic.

Thus, this PPP model scheme can also be considered a new bureaucratic approach that is more adaptable and responsive to pressing issues such as plastic waste. As is well known, Indonesia continues to face difficulties managing the volume of plastic waste that is not properly managed, but by establishing an Ecobrick park, the remaining plastic waste will be reduced by 5 million tons. Finally, implementing PPP in the provision of public infrastructure is a win-win situation for both parties. Moreover, PT Marimas Putera Kencana was able to secure funding for 20,000 bottles of Ecobricks. It means that the private sector is fully accountable for contributing to the construction, management, and monitoring of infrastructure facilities and infrastructure.

However, there are also the hurdles in the Ecobrick PPP, one of the issues is poor communication. If the PPP has effective two-way communication, both formal and informal, this can be avoided. The obstacles in the Ecobrick program are part of the risk of establishing a PPP that involves many stakeholders with diverse interests and desires. This is accordance with Dermirag et al., (2020), stakeholders should identify and resolve divergent risk perceptions through risk communication. It is hoped that by communicating risks, they will be able to overcome difficult situations and improve

coordination among policymakers and the community as policy recipients (Ahmad et al., 2017). Not only is communication important, but the development of a modern bureaucracy has an impact on whether the PPP scheme will be successful. Furthermore, Indonesia is known to still frequently use a patrimonialism system or traditional approaches to provide community services. As a result, new public management is deemed critical in the Ecobrick program's PPP model. If these obstacles are overcome, it is possible that PPP will have a significant impact on the circular economy (CE) in Semarang, Indonesia.

Based on the results of a survey conducted by Dinas Lingkungan Hidup Kota Semarang, the use of Ecobrick is being recommended because it is more effective in reducing plastic waste. Aside from that, Ecobrick has a lower cost because it can also be used as a brick. Ecobrick is a good idea if it is implemented in a strategic economic plan for developing countries like Indonesia. Ecobrick was developed as a low-tech solution that does not require machines, special skills, or capital (Marini., 2021). Therefore, Sharma & Bindal (2014) ever stated that in many countries, the requirement of service delivery by the private sector drives the question of whether and how much private investment is required for the project. As a result, rather than asset creation or investment, the emphasis is on service delivery to meet public service or infrastructure needs.

## 7.3 Limitation and Implication for Future Research

The transition to CE acceleration in Semarang City in terms of waste management is still lacking. First, lack of infrastructure rejuvenation and poor maintenance of existing infrastructure. Second, limited land available for final disposal, this is due to the volume of waste in Semarang City which is increasingly booming due to the high population growth rate. Third, the problem of unskilled human resources in waste management in the city of Semarang also contributes to be an obstacle in this research. The bureaucratic service approach that is still driven by the traditional approach is also an obstacle in CE. From these factors, the authors are interested in examining the effectiveness of the PPP scheme as a form of NPM to overcome the problem of plastic waste.

However, the PPP implementation still has several obstacles, such as the lack of communication and the Covid-19 pandemic. In addition, another obstacle in developing the PPP scheme in Ecobrick is that both the private and public sectors have not seen Ecobrick as something of economic but social value or a commodity in garden building materials. Therefore, in future research, I hope researchers can be more detailed what if we maximize communication in the PPP scheme to get maximum results. It is also possible that researchers can maximize or test CE acceleration with other theories besides NPM or PPP after post Covid-19. In addition, researchers also hope that in the future there will be new research if Ecobrick has developed widely and has an economic impact on the wider community.

## 7.2 Recommendation

This recommendation will be divided into three parts. First, recommendations are given to the public sector or in this case the Semarang Municipality. Second, recommendations are given to the private sector such as PT Marimas Putera Kencana. Third, recommendations are given to the informal sector such as waste collectors.

### 7.2.1 Recommendation for Public Sector

The first recommendation is made to the Semarang Municipality, which is represented in this case by the Semarang City Environmental Service. Researchers observe that the government remains less responsive in creating the Ecobrick program. Based on the data gathered in the field, it was discovered that several informants admitted to still having issues with the availability of Ecobrick bottles. In fact, the Ecobrick program has been in the works or has been widely discussed since 2017, which means that the government took nearly four years to recognize that Ecobrick was the best option for dealing with plastic waste. Of course, the bureaucracy has a decision-making system that is difficult and time-consuming.

However, it would be preferable if Indonesia's bureaucratic system was also willing to change in order to provide better services to its people. As a result, the researcher proposes a change that will lead to the concept of New Public Management in the use of PPP schemes. The NPM paradigm was thought to cure the developmental state's ills and usher in a new era of post-developmental, society-driven, and democratic policy making (Kim & Han., 2018). In this case, it is hoped that the government can provide a large space for the community to be able to express their opinions related to government projects, for example related to Ecobricks. Indeed, the Covid-19 pandemic is certainly an obstacle to the implementation of these ideas, but the government should also have had the initiative to advocate for community ideas ahead of time, especially since the Ecobrick program has long been launched by private actors.

But it should also be noted that NPM was determined to bring diverse management techniques from the private to the public sector. The reforms associated with NPM contained a high dose of managerialism (Kim & Han., 2018). Therefore, these changes must also be accompanied by the provision of skills for civil servants so that there is no dominating role in the implementation of the concept (Kim & Han., 2018). Besides that, the researcher hopes that the Semarang Municipality will conduct as many Ecobrick trainings as possible to ensure that the target for the bottles used to construct the park. In addition, it is critical to involve informal actors in decision- and policy-making. For instance, through the Ecobrick program, the government can also train waste pickers to develop high-level skills that can be used to improve scavengers' standard of living and welfare. A noteworthy point to emphasize is that the government has thus far viewed these used bottles as social goods rather than economic goods, which may influence

people's desire to be more creative. Ecobrick bottles, particularly in the context of the Covid-19 pandemic, have the potential to significantly improve the economic situation of people affected by Covid-19.

### 7.2.2 Recommendation for Private Sector

During the interview with PT Marimas Putera Kencana, researchers were unable to determine what benefits the company expects when they decide to participate in the government program. Indeed, the company is a key initiator in the production of Ecobricks and one of the producers who contribute to plastic waste in Semarang City. However, the researcher also hopes that the collaboration with the municipality of Semarang will bring benefits to the private sector, such as investment. This is because private businesses are profit-driven, and for private parties to invest in public projects, they must be convinced of the opportunity to earn a profit (Koppenjan & Enserink., 2009). However, if a public infrastructure project is unprofitable, private participation may still be possible if combined with profitable activities (Koppenjan & Enserink., 2009). As an example, in the case of Ecobrick, the company may earn a modest profit, but this is also significant because the project has an impact on sustainability.

According to Clauhan and Marisetty (2019), PPP ventures provide the private sector with two major benefits. For starters, the government's willingness to absorb demand-side risk lowers the uncertainty of future cash flows. Second, managing PPP as a separate entity improves transparency and external financing availability. In fact, in PPP private sector and public sector programs offer unique risk sharing, encouraging the private sector to invest in large-scale infrastructure projects. Therefore, prior to signing the contract agreement, it is hoped that the private sector and public sector will communicate effectively about their objectives and strategies for achieving them.

This is because insufficient contracts may result in projects being completed, resulting in limited population coverage, inefficient resource use, and negative environmental and health impacts. Expensive, overengineered infrastructure may result in government indebtedness. The centrally standardized service delivery that results may not meet the needs of local users and may result in affordability issues. Another possible effect is the displacement of existing informal institutions, the reduction of local job opportunities, the loss of a sense of local ownership, and political instability (Koppenjan & Enserink., 2009).

### 7.2.3 Recommendation for Informal Sector

In the context of waste management, the informal sector is thought to play a significant role, particularly in developing countries (Puyate., 2008). There are also garbage scavengers who can help to strengthen the entire waste management supply chain. In fact, the informal sector plays an important role in waste recycling

(Ezeah et al., 2013). This situation is usually caused by a combination of factors such as governance gaps, economic opportunities, industrial symbiosis, and social realities in the region (Ezeah et al., 2013).

Thus, how can Semarang's waste recycling process function optimally if important factors such as the informal sector, their voices and presence, are not considered and ignored? In fact, if we look at the Western experience, we can see that it is very expensive to build a new formal recovery system after the existing informal system has declined or disappeared. Developing countries face challenges, but they also have opportunities to build on rather than replace. Concrete steps must also be taken to improve the efficiency and living and working conditions of the informal waste management sector (Wilson et al., 2006).

# Annex A: General Set of Questions

1. How is plastic waste managed in Semarang City?

2. What steps have been taken by the Semarang City to deal with plastic waste?

3. What is the background for the formation of the Ecobrick program?

4. How was the waste recycling process before the Ecobrick program in Semarang City?

5. To what extent is the involvement of the private sector in dealing with the problem of plastic waste in Semarang City?

6. Who are the actors involved in the Ecobrick program in Semarang City?

7. Is there a third party who helps solve the problem if there is a breach of the partnership contract in implementing the Ecobrick program in Semarang City?

8. Are there certain sanctions if the actors involved in the Ecobrick program violate the contract agreement?

9. What is the cooperation between the Semarang City and the private sector in the Ecobrick program?

10. How do the Semarang City and the private sector socialize the Ecobrick program to the community?

11. What is the financing scheme for the Ecobrick program in Semarang City?

12. What are the obstacles or barriers faced by the Semarang City and the private sector in the Ecobrick program?

13. Is the Ecobrick program an obstacle or an advantage during the Covid-19 pandemic like this?

14. What are the efforts made by the Semarang City and the private sector related to the implementation of the Ecobrick program?

15. Who supervises the implementation of the Ecobrick program in Semarang City more?

16. What are the expectations of the Semarang City and the private sector for the implementation of the Ecobrick program in the future?

**Topics**

1. An overview of plastic waste management in Semarang City

    a) How is plastic waste managed in Semarang City?

    b) Dumped into the sea or burned or buried?

    c) What programs have been carried out in dealing with plastic waste in Semarang City?

2. Background of the Ecobrick program in Semarang City

    a) Since when was the Ecobrick program implemented in Semarang City?

b) In which district?

3. The purpose of establishing the Ecobrick program in Semarang City

a) How long will the Ecobrick program target be implemented?

b) How long will it take to reach the target?

c) How is the sustainability of the Ecobrick program after the partnership contract ends?

4. Socialization of the Ecobrick program

a) Through what is the Ecobrick program explained to the people of Semarang City?

b) Who provides counselling to the people of Semarang City?

c) How will the socialization of the Ecobrick program continue during the Covid-19 pandemic?

5. Ecobrick program training

a) What is an Ecobrick in Semarang City?

b) What types of waste can be used to make Ecobricks?

c) What are the difficulties or obstacles when making Ecobricks?

d) Are there any special measures related to making Ecobricks as items that have new value?

e) What are the advantages and disadvantages of recycling waste using the Ecobrick method?

6. Actors involved in the Ecobrick program

a) Who are the actors involved in the Ecobrick program?

b) How do the actors resolve conflicts of interest in the implementation of the Ecobrick program?

7. Cooperation contracts in the Ecobrick program

a) Is there a written contract that clearly regulates the implementation of the Ecobrick program in Semarang City?

b) What is the content of the partnership contract like?

c) How long is the cooperation contract valid?

d) What sanctions will the relevant actors receive if they violate the contract?

8. Funding of the Ecobrick program programme

a) What is the funding system for the Ecobrick program in Semarang City?

b) Are there special investments from other parties that contributed to the success of the Ecobrick program in Semarang City?

c) What are the facilities provided by each party in implementing the Ecobrick program?

9. Monitoring the Ecobrick program

a) Which actors have a full mandate in monitoring the running of the Ecobrick program in Semarang City?

b) How do the Semarang City and the private sector work together in overcoming the barriers to the Ecobrick program in Semarang City?

c) Has Ecobricks been effective in reducing plastic waste in Semarang City so far?

# BIBLIOGRAPHY


Afriza, E. F. dkk. (2018). Edukasi Ecobrik Sebagai Solusi Manajemen Pengelolaan Sampah Berbasis Masyarakat. Proceeding of Community Development, 2, 799–807.

Akhmetshina, E. R., & Mustafin, A. N. (2015). Public-private Partnership as a Tool for Development of Innovative Economy. *Procedia Economics and Finance*, *24*(July), 35–40. https://doi.org/10.1016/s2212-5671(15)00609-7

Aliu, I. R., Adeyemi, O. E., & Adebayo, A. (2014). Municipal household solid waste collection strategies in an African megacity: Analysis of public private partnership performance in Lagos. Waste Management and Research, 32, 67–78. https://doi.org/10.1177/0734242X14544354

Andersen, M.S. (2007). An Introductory Note on the Environmental Economics of the Circular Economy. *Sustain. Sci*. 2, 133e140

Angriani, P., Muhaimin, M., Hastuti, K. P., Adyatma, S., & Saputra, A. N. (2021). Ban on Plastic Bags Usage: Consumer Perception of Single-Use Plastic Bags in Traditional Market. Proceedings of the 2nd International Conference on Social Sciences Education (ICSSE 2020), 525(Icsse 2020), 226–232. https://doi.org/10.2991/assehr.k.210222.036

Antico, F. C., Wiener, M. J., Araya-Letelier, G., & Retamal, R. G. (2017). Eco-bricks: A sustainable substitute for construction materials. Revista de La Construccion, 16(3), 518–526. https://doi.org/10.7764/RDLC.16.3.518

Bachér, J., Pihkola, H., Kujanpaa, L., & Mroueh, U. M. (2018). Advancing the Circular Economy Through Group Decision-making and Stakeholder Involvement. *Detritus*, *4*(December), 22–35. https://doi.org/10.31025/2611-4135/2018.13741

Bacher, J., Pihkola, H., Kujanpää, L., Mroueh, U.-M., Vanderreydt, I., and Garcia Zambrano, L. (2016). Bottleneck analysis of WEEE, ELV and Plastics packaging chains: key findings and commonalities. Retrieved from http://www.newinnonet.eu/downloads/D2.5 Bottleneck_analysis_key_findings_and_commonalities.pdf

Backstrand, K. (2006). Multi-stakeholder partnerships for sustainable development: Rethinking legitimacy, accountability and effectiveness. *European Environment*, *16*(5), 290–306. https://doi.org/10.1002/eet.425

Badan Pusat Statistik Kota Semarang. (2016). Semarang City in Figures, Semarang City: BPS.

Batley, R. (1999). Policy Arena the New Public Management in Introduction. *Journal of International Development*, *760*, 755–760.

Bennett., J. W., Pearce, D. W., and R. K. Turner. (1991). Economics of Natural Resources and the Environment. Baltimore MD: Johns Hopkins University Press, 1990, 378 pp., *American Journal of Agricultural Economics*, *73*(1), 227–228. https://doi.org/10.2307/1242904

Berg, A., Antikainen, R., Hartikainen, E., Kauppi, S., Kautto, P., Lazarevic, D., Piesik, S., & Saikku, L. 2018. Reports of the Finnish Environment Institute -Circular Economy for Sustainable Development. *Reports of the Finnish Environment Institute*, *26*, 24 https://helda.helsinki.fi/handle/10138/251516%0Ahttp://hdl.handle.net/10138/25156

Berman, A. (2017). The Rise of Multi-stakeholder Partnerships. *Proceedings of the ASIL Annual Meeting*, *111*, 205–208. https://doi.org/10.1017/amp.2017.19

Bryman, A., & Bell, E. (2011). Business research methods (3rd ed.). Cambridge; New York, NY: Oxford University Press

Cheng, J., & Fu, Y. (2013). Inter-organizational relationships and knowledge sharing through the relationship and institutional orientations in supply chains. *International Journal*

Chauhan, Y., Marisetty, V.B., 2019. Do public-private partnerships benefit private sector? Evidence from an emerging market. Res. Int. Bus. Finance 47, 563–579.

Dhokhikah, Y., & Trihadiningrum, Y. (2012). Solid Waste Management in Asian Developing Countries: Challenges and Opportunities. J. Appl. Environ. Biol. Sci. Journal of Applied Environmental and Biological Sciences, 2(7), 329–335. www.textroad.com

Droege, H., Raggi, A., & Ramos, T. B. (2021). Co-development of a framework for circular economy assessment in organisations: Learnings from the public sector. Corporate Social Responsibility and Environmental Management, August 2020, 1–15. https://doi.org/10.1002/csr.2140

Dutz, M., Harris, C., & Shugart, C. (n.d.). Dutz, Mark, Clive Harris, Inderbir Dhingra & Chris Shugart (2006) *Public Private Partnership Units: What Are They, and What Do They Do? Public Policy for the Private Sector* 311, World Bank, Washington, D.C. table 1

Ellen MacArthur Foundation. (2013). Towards a Circular Economy – Opportunities for the consumer goods sector (2013; http://www.ellenmacarthurfoundation.org/publications/).

Ellen MacArthur Foundation. (2013). Towards the Circular Economy, vol. 2 (Isle of Wight).'

Ellen MacArthur Foundation. (2016). The New Plastics Economy: Rethinking the Future of Plastics. https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics. (Accessed 7 September 2021)

Ellen MacArthur Foundation. 2015. Growth within: A Circular Economy Vision for a Competitive Europe, London. EMAF (Ellen MacArthur Foundation), 2013. Towards the Circular Economy, London.

Ezeah, C.; Roberts, C.L. Analysis of barriers and success factors affecting the adoption of sustainable management of municipal solid waste in Nigeria. J. Environ. Manag. 2012, 103, 9–14.

Ferronato, N.; Rada, E.C.; Gorrity Portillo, M.A.; Cioca, L.I.; Ragazzi, M.; Torretta, V. Introduction of the circular economy within developing regions: A comparative analysis of advantages and opportunities for waste valorization. J. Environ. Manag. 2019, 230, 366–378

Faraca, G., Martinez-Sanchez, V., & Astrup, T. F. (2019). Environmental Life Cycle Cost Assessment: Recycling of Hard Plastic Waste Collected at Danish Recycling Centres. *Resources, Conservation and Recycling*, *143*(October 2018), 299–309. https://doi.org/10.1016/j.resconrec.2019.01.014

Ferza, R., Hamudy, M. I. A., & Rifki, M. S. (2019). Regional Waste Management Cooperation in West Java. Bisnis & Birokrasi Journal, 26(2). https://doi.org/10.20476/jbb.v26i2.10019

Forsyth, T. (2005). Building deliberative public-private partnerships for waste management in Asia. Geoforum, 36(4), 429–439. https://doi.org/10.1016/j.geoforum.2004.07.007

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, *143*, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

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/10.1016/j.jclepro.2015.09.007

Global Ecobrick Alliance. (2021). Ecobrick are 100% Cradle to Cradle: Ecobrick Techniques Apply The Principles of Circular Design. (accesses 24 August 2021, from https://www.ecobricks.org/circular/)

Haque, M. S., & Islam, S. (2021). Effectiveness of waste plastic bottles as construction material in Rohingya displacement camps. Cleaner Engineering and Technology, 3,

100110. https://doi.org/10.1016/j.clet.2021.100110

Havitasari, A. D. U. A., & Rahman, Y. (2019). Ecobrick Illustration Book Design for Handling Plastic Waste for Elementary School Children. *E-Proceedings of Art & Design*, *6*(3), 3554–3560

Hidayat, Y. A., Kiranamahsa, S., & Zamal, M. A. (2019). A study of plastic waste management effectiveness in Indonesia industries. *AIMS Energy*, *7*(3), 350–370. https://doi.org/10.3934/ENERGY.2019.3.350

Hongo, T. Circular economy potential and public–private partnership models in Japan. In Towards a Circular Economy; Anbumozhi, V., Kim, J., Eds.; Economic Research Institute for ASEAN and East Asia: Jakarta, Indonesia, 2016; pp. 17–29.

Hood, C. 1991. "A Public Management for All Seasons?" Public Administration 69 (1): 3–19. doi:10.1111/padm.1991.69.issue-1

Hull, C. E., Millette, S., & Williams, E. (2021). Challenges and Opportunities in Building circular-economy Incubators: Stakeholder Perspectives in Trinidad and Tobago. *Journal of Cleaner Production*, *296*, 126412. https://doi.org/10.1016/j.jclepro.2021.126412

Ikeanyibe, O. M. (2016). New Public Management and Administrative Reforms in Nigeria. *International Journal of Public Administration*, *39*(7), 563–576. https://doi.org/10.1080/01900692.2015.1023446

Ilić, M., & Nikolić, M. (2016). Drivers for development of circular economy - A case study of Serbia. Habitat International, 56, 191–200. https://doi.org/10.1016/j.habitatint.2016.06.003

Jamali, D (2004) 'Success and failure Mechanism of public private partnership (PPPs) in developing countries: Insight from Lebanon context'. International Journal of Public Sector Management, 17 (5) PP.414-430

Jacobson, C., Choi, S.O., 2008. Success factors: public works and public– private partnerships. Int. J. Public Sect. Manag. 21 (6), 637–657

Jambeck J. R., Geyer R., Wilcox C., Siegler T. R., Perryman M., Andrady A., Narayan R., & Law K L. (2015). Plastic Waste Inputs from Land into the Ocean Science 347 1655–734

Jarratt, D. G. (1996). A Comparison of Two Alternative Interviewing Techniques used within an Integrated Research Design: A Case Study in Outshopping Using Semi-Structured

and Non-Directed Interviewing Techniques. *Marketing Intelligence & Planning*, *14*(6), 6–15. https://doi.org/10.1108/02634509610131108

Joshi, R., & Ahmed, S. (2016). Status and challenges of municipal solid waste management in India: A review. Cogent Environmental Science, 2(1). https://doi.org/10.1080/23311843.2016.1139434

Jia, F., & Rutherford, C. (2010). Mitigation of Supply Chain Relational Risk Caused by Cultural Differences between China and the West. *International Journal of Logistics Management,* 21(2), 251–270

Jovanović, D., & Živković, T. (2019). Public-private partnership as a possibility for improving municipal waste management. Spatium, 2019(42), 41–48. https://doi.org/10.2298/SPAT1942041J

Kaplan, Sarah. (2016). By 2050, There Will Be More Plastic Than Fish In The World's Oceans, Study Says. (Accesses 29 August 2021, from https://www.washingtonpost.com)

Kaul, M. (1997). The New Public Administration: Management Innovations in Government. *Public Administration and Development*, *17*(1), 13–26. https://doi.org/10.1002/(sici)1099-162x(199702)17:1<13::aid-pad909>3.3.co;2-m.

Khanom, N. A. (2010). Conceptual Issues in Defining Public Private Partnerships (PPPs). *International Review of Business Research Papers*, *6*(2 July), 150–163

Kirchherr, J., Reike, D., Hekkert, M. (2017). Conceptualizing the Circular Economy: Analysis of 114 definitions. *Resour., Conser*. Recycling 127, 221–232

Klein, N., Ramos, T. B., & Deutz, P. (2020). Circular economy practices and strategies in public sector organizations: An integrative review. Sustainability (Switzerland), 12(10), 1–24. https://doi.org/10.3390/su12104181

Klijn, E. H., & Teisman, G. R. (2003). Institutional and Strategic Barriers to Public-Private Partnership: An Analysis of Dutch Cases. *Public Money & Management*, 7, 7-146

Korhonen, J., Honkasalo, A., & Seppala, J. (2018). Circular Economy: The Concept and its Limitations. *Ecological Economics*, *143*, 37–46 https://doi.org/10.1016/j.ecolecon.2017.06.041

Kristanto, G. A., Gusniani, I., & Ratna, A. (2015). The Performance of Municipal Solid Waste Recycling Program in Depok, Indonesia. *International Journal of Technology*, *6*(2), 264–272. https://doi.org/10.14716/ijtech.v6i2.905

Kruljac, S. (2012). Public-Private Partnerships in Solid Waste Management: Sustainable Development Strategies for Brazil. Bulletin of Latin American Research, 31(2), 222–236. https://doi.org/10.1111/j.1470-9856.2011.00659.x

Kuo, T. C., Hsu, N. Y., Wattimena, R., Hong, I. H., Chao, C. J., & Herlianto, J. (2021). Toward a Circular Economy: A System Dynamic Model of Recycling Framework for Aseptic Paper Packaging Waste in Indonesia. *Journal of Cleaner Production*, *301*, 126901. https://doi.org/10.1016/j.jclepro.2021.126901

Kyriakis, E., Psomopoulos, C., & Kalkanis, K. (2019). Investigating the correlation of Purchase Power Parity (PPP) with the adopted waste management method in EU28. Social Sciences, 8(5). https://doi.org/10.3390/socsci8050162

Koppenjan J, Enserink B. 2009. Public-private partnerships in urban infrastructures: reconciling private sector participation and sustainability. Public Administration Review 69(2): 284–296

Leigland, J. (2018). Public-Private partnerships in Developing Countries: The Emerging Evidence-based Critique. *World Bank Research Observer*, *33*(1), 103–134. https://doi.org/10.1093/wbro/lkx008

Li, B., Akintoye, A., Edwards, P. J., & Hardcastle, C. (2005). Perceptions of positive and negative factors influencing the attractiveness of PPP/PFI procurement for construction projects in the UK: Findings from a questionnaire survey. Engineering, Construction and Architectural Management, 12(2), 125–148. https://doi.org/10.1108/09699980510584485

Louise Barriball, K. and While, A. (1994). Collecting Data using a Semi-Structured Interview: a Discussion Paper. Journal of Advanced Nursing, 19: 328-335. https://doi.org/10.1111/j.1365-2648.1994.tb01088.x

Lossa E. and Martimort D., 'The Simple Microeconomics of Public-Private Partnerships', Journal of Public Economic Theory 17(1) (2015), pp. 4-48.

Maier, R., Angway, I., & Himawati, A. (2017). Plastik, lingkungan, dan ecobricks. Ecobricks.org

Manning, N. (2001). The legacy of the New Public Management in Developing Countries. *International Review of Administrative Sciences*, *67*(2), 297–312. https://doi.org/10.1177/0020852301672009

Mays, N., & Pope, C. (1995). Observational Methods in Health Care Settings. British Medical Journal, 311(6998), 182–184. doi:10.2307/29728110

Maryono, M., & Hasmantika, I. H. (2019). Preliminary Study of Smart Urban Waste Recycling in Semarang, Central-Java, Indonesia. IOP Conference Series: Earth and Environmental Science, 248(1). https://doi.org/10.1088/1755-1315/248/1/012048

MBDC LLC. (2013). Cradle to Cradle Certified™ Product Standard Version 3.0. Cradle to Cradle Products Institute

Morritt D., Stefanoudis P. V., Pearce D., Crimmen O. A., Clark P. F., (2014). Plastic in the T hames: A river runs through it. *Marine Pollution Bulletin* 78(1-2):196-200

Moruf, A. A., Oluwasinaayomi, F. K., & Mubarak, O. L. (2020). Public-Private Partnership (PPP) in residential solid waste management in Ibadan: Challenges and opportunities. Journal of Geography and Regional Planning, 13(1), 30–40. https://doi.org/10.5897/jgrp2019.0721

Morgan, J. S., Howick, S., and Belton, V. (2017). A toolkit of designs for mixing discrete event simulation and system dynamics. Eur. J. Operat. Res. 257, 907–918. doi: 10.1016/j.ejor.2016.08.016

Mulhall, A. (2003). In the field: Notes on Observation in Qualitative Research. *Journal of Advanced Nursing*, 41, 306–313. doi:10.1046/j.1365-2648.2003. 02514.x

Murray, A., Skene, K., Haynes, K. (2015). The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context. J. Bus. Ethics 1e12

Naustdalslid, J. (2017). Circular Economy in China the Environmental Dimension of the Harmonious Society. *Int. J. Sustain. Dev. World Ecol.* 21 (4), 303e313

Nebbia, G. (2000). Kenneth Boulding (1910-1993). Altronovecento, p. 2

Oliveira Silva, W. D., & Morais, D. C. (2021). Transitioning to a circular economy in developing countries: A collaborative approach for sharing responsibilities in solid waste management of a Brazilian craft brewery. Journal of Cleaner Production, 319(May), 128703. https://doi.org/10.1016/j.jclepro.2021.128703

Olson, O., Guthrie, J., & Humphrey, C. (1998). Global warning! Debating international develop- ments in new public financial mangement. Oslo: Cappelen Akademisk Forlag.

Otairu, A. G., Umar, A. A., Zawawi, N. A. W. A., Sodangi, M., & Hammad, D. B. (2014). Slow adoption of PPPs in developing countries: Survey of nigerian construction professionals. Procedia Engineering, 77, 188–195. https://doi.org/10.1016/j.proeng.2014.07.014

Osei-Kyei, R., & Chan, A. P. C. (2015). Review of studies on the critical success factors for public-private partnership (PPP) projects from 1990 to 2013. International Journal of

Project Management, 33(6), 1335–1346. https://doi.org/10.1016/j.ijproman.2015.02.008

Osborne, S. P. (2000). Public–Private Partnerships: Theory and Practice in International Perspective. London: Routledge

Parker, C., Scott, S., & Geddes, A. (2019). Snowball Sampling. In P. Atkinson, S. Delamont, A. Cernat, J.W. Sakshaug, & R.A. Williams (Eds.), *SAGE Research Methods Foundations.* https://www.doi.org/10.4135/9781526421036831710

Payne, S. L., & Calton, J. M. (2017). Towards a Managerial Practice of Stakeholder engagement: Developing multi-stakeholder learning dialogues. *Unfolding Stakeholder Thinking: Theory, Responsibility and Engagement*, *6*, 121–135. https://doi.org/10.9774/gleaf.978-1-909493-28-5_8

Pfiffner, J. P. (2004). Traditional public administration versus the new public management: accountability versus efficiency. Berlin: Institution Enbildung in Regierung Und Verwaltung

Pertiwi, A., Kiky, S. M. P., Wiwik, B., Ratna, P., Budi, P. S., & Arya, R. (2018). Preliminary Study on Plastic Waste Handling in Semarang City - Indonesia: Estimated Generation and Existing Management. *E3S Web of Conferences*, *73*. https://doi.org/10.1051/e3sconf/20187307008

Patni, N., Shah, P., Agarwal, S., & Singhal, P. (2013). Alter- nate strategies for conversion of waste plastic to fuels, ISRN Renewable Energy, 2013, 1–7. https://doi.org/10. 1155/2013/902053.

Peterson M. (2004). Cradle to Cradle: Remaking the Way We Make Things*. Journal of Macromarketing.* 2004;24(1):78-79. doi:10.1177/0276146704264148

Peters, B. G. (1998). 'With a Little Help From Our Friends': Public-Private Partnerships as Institutions and Instruments. Partnerships in Urban Governance, 11–33. https://doi.org/10.1007/978-1-349-14408-2_2

Pinupolu, P., & Kommineni, H. raja. (2020). Best method of municipal solid waste management through public-private partnership for Vijayawada city. Materials Today: Proceedings, 33, 217–222. https://doi.org/10.1016/j.matpr.2020.03.816

Purwoko, & Tri, W. (2018). Fiscal Incentives and Disincentives to Reduce Plastic Waste in. *A Transformative Community: Asia in Dynamism, Innovation, and Globalization*, *6*, 213.

Ragossnig, A. M., & Agamuthu, P. (2021). Plastic waste: Challenges and opportunities. Waste Management and Research, 39(5), 629–630. https://doi.org/10.1177/0734242X211013428

Reim, C. (2009). Challenges to Public Private Partnerships. The Example of the London Underground PPPs (Doctoral dissertation, University of Potsdam)

Rezaei, J. (2015a). Best-worst Multi-criteria Decision-making Method. Omega 53, 49e57

Rezaei, J. (2015b). A Systematic Review of Multi-criteria Decision-making Applications in Reverse Logistics. *Transportation Research Procedia* 10, 766e776

Ritchie Hannah. (2018). MR: Plastic Pollution. "Our World in Data (2018)"

Robson, C. (2002). Real World Research: A Resource for Social Scientists and Practitioner-Researchers. Oxford, UK: Blackwell Publishers

Roloff, J. (2008). A Life Cycle Model of Multi-stakeholder Networks. *Business Ethics: A European Review*, *17*(3), 311–325. https://doi.org/10.1111/j.1467-8608.2008.00537.x

Saadeh, D., Al-Khatib, I. A., & Kontogianni, S. (2019). Public–private partnership in solid waste management sector in the West Bank of Palestine. Environmental Monitoring and Assessment, 191(4). https://doi.org/10.1007/s10661-019-7395-2

Sabatier, V., Medah, I., Augsdorfer, P., Maduekwe, A., 2017. Social business model design and implementation in developing countries: learning from an affordable medicine developed in Burkina Faso. J. Manag. Dev. 36 (1), 48–57

Scharle, P. (2002). Public-Private Partnership (PPP) as a social game. *Innovation*, *15*(3), 227–252. https://doi.org/10.1080/1351161022000027630

Sekito, T., Prayogo, T. B., Dote, Y., Yoshitake, T., & Bagus, I. (2013). Influence of a Community-based Waste Management System on People's Behaviour and Waste Reduction. *Resources, Conservation and Recycling*, *72*, 84–90. https://doi.org/10.1016/j.resconrec.2013.01.001

Sembiring, E., V. Nitivattananon, 2010. Sustainable solid waste management toward an inclusive society: Integration of the informal sector. Resources, Conservation and Recycling, 54: 802-809.

Setyanto, D. W., & Adiwibawa, B. A. P. (2019). R3 Campaign Instructional Infographic Design. *2nd National Expert Seminar of 2019*, 1–7

Stoker, G. (2006). Public value management: A new narrative for networked governance? American Review of Public Administration, 36(1), 41–57. https://doi.org/10.1177/0275074005282583

Skietrys, E., Raipa, A. and Bartkus, E.V. (2008), "Dimensions of the efficiency of public-private partnership", Engineering Economics, Vol. 58 No. 3, pp. 45-50

Singh, B., Sharma, N., 2008. Mechanistic implications of plastic degradation. Polym. Degrad. Stab. 93 (3), 561–584

Sikdar, S. (2019). Circular Economy: Is There Anything New in This Concept? *Clean Technologies and Environmental Policy*, *21*(6), 1173–1175. https://doi.org/10.1007/s10098-019-01722-z

Sonia, V., & Sunyowati, D. (2020). The State Liability of Plastic Waste Dumping in Indonesia. *Utopia y Praxis Latinoamericana*, *25*(Extra1), 493–505. https://doi.org/10.5281/zenodo.3784901

Sousa-Zomer, T. T., Magalhães, L., Zancul, E., & Cauchick-Miguel, P. A. (2018). Exploring the challenges for circular business implementation in manufacturing companies: An empirical investigation of a pay-per-use service provider. Resources, Conservation and Recycling, 135(August 2017), 3–13. https://doi.org/10.1016/j.resconrec.2017.10.033

Stoker, G. (2006). Public Value Management: A New Narrative for Networked Governance? *American Review of Public Administration*, *36*(1), 41–57. https://doi.org/10.1177/0275074005282583

Strielkowski, W. (2016). Entrepreneurship, Sustainability, and Solar Distributed Generation", *The International Journal Entrepreneurship and Sustainability Issues*, 4(3), pp. 102–103. doi: 10.1027/0227- 5910.16.3.102

Supriyadi, S., Kriwoken, L. K., & Birley, I. (2000). Solid waste management solutions for Semarang, Indonesia. Waste Management and Research, 18(6), 557–566. https://doi.org/10.1034/j.1399-3070.2000.00161.x

Sharma, M., Bindal, A., & Cantt, S. D. C. A. (2014). Public-Private Partnership, (7), 1270–1274

Tchobanoglous, G., H. Theisen, and S.A. Vigil, 1993. Integrated solid waste management: Engineering, principles and management issues. McGraw-Hill International Editions

Tura, N., Hanski, J., Ahola, T., Ståhle, M., Piiparinen, S., & Valkokari, P. (2019). Unlocking circular business: A framework of barriers and drivers. Journal of Cleaner Production, 212, 90–98. https://doi.org/10.1016/j.jclepro.2018.11.202

UNEP (United Nations Environment Programme), 2004. State of Waste Management in South East Asia. http://www.aseansec.org/files.unep.pdf (retrieved November 2011).

United Nations Environment Progamme. (2019). "Plastic Recycling: An Underperforming Sector Ripe for a Remake". http://unenvironment.org/news-and-stories/story/plastic-recycling-underperforming-sector-ripe-remake. Accessed September 2021.

Upadhayay, S., & Alqassimi, O. (2018). Transition from Linear to Circular Economy. *Westcliff International Journal of Applied Research*, *2*(2), 62–74. https://doi.org/10.47670/wuwijar201822oasu

van Buren N, Demmers M, Van der Heijden R, Witlox F. Towards a Circular Economy: The Role of Dutch Logistics Industries and Governments. *Sustainability*. 2016; 8(7):647. https://doi.org/10.3390/su8070647

Vassilakou., Athina., Maniatis., & Antonious. (2012). *PPP in French Law and Practice.* Published by EuroMed Press. ISBN: 978-9963-711-07-9

Winans, K., Kendall, A., & Deng, H. (2017). The history and current applications of the circular economy concept. *Renewable and Sustainable Energy Reviews*, *68*(September 2016), 825–833. https://doi.org/10.1016/j.rser.2016.09.123

Yandra, A., Utami, B. C., & Husna, K. (2020). Distortion of Government Policy Orientation in Public-Private Partnership (PPP). *Policy & Governance Review*, *4*(1), 40. https://doi.org/10.30589/pgr.v4i1.172

Yin, R. K. 1994. Case Study Research: Design and Methods (2nd ed.). Thousand Oakes, CA: Sage

Zhang, A., Venkatesh, V. G., Liu, Y., Wan, M., Qu, T., & Huisingh, D. (2019). Barriers to Smart Waste Management for a Circular Economy in China. *Journal of Cleaner Production*, *240*, 118198. https://doi.org/10.1016/j.jclepro.2019.118198