



Extended Producer Responsibility for Waste Management Policy

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Abstract: Solid waste management, which always ends in landfills, causes various environmental and socio-economic impacts. Tegal City also experiences overcapacity landfill conditions because the waste management model focuses on landfills. This study aims to identify existing waste management regulations and how EPR can become a policy framework to achieve waste management beyond landfills. The result explains that by regulation, the government has regulated the flow of solid waste management by prioritizing the 3R principles, starting from the transportation process, sorting at TPS/TPST, and even processing to become a product with economic value. However, in the end, all this waste still ends up in landfill. From the government's perspective, this is due to the need to integrate responsibilities between the government, society, and producers. Producer responsibility must be fully implemented in waste management. However, several regulations have yet to regulate the form of waste management that producers can carry out the responsibility of producers as specifically to be responsible for the product until it ends up as waste. In addition, this study illustrates that EPR as a policy framework for waste management can be applied in other cities, primarily if the government's point of view supports the division of responsibilities for waste management.

Keywords: Circular economy; EPR; Policy; SMEs; Solid waste management

Introduction

Solid waste has become a problem as well as a threat to the sustainability of life. The increase in the world's population every year directly increases the consumption of daily needs related to solid waste generation. Globally, good waste management at the surface level is waste segregation and recycling. On average, it can reduce 1.4 million kilotons of CO₂ emissions per day in 2012 and will increase to 1.9 kilotons in 2025. In Indonesia, waste is a complex problem in line with population growth (Meta, 2014).

Annual report by UNEP (2017) shows that the average waste generation generated by residents of Southeast Asia is 1.14 kg/capita/day, where Indonesia is the largest waste producer, namely 64 million tons per year. On average, in 384 big cities in Indonesia, waste generation is 2.2 to 2.7 kilograms of solid waste per capita per day (Brotosusilo & Handayani, 2020). From the amount of inorganic or solid waste generation of

40%, the level of recycling in Indonesia is only 9% (UNEP, 2017). Renou et al. (2008) explained that TPA is still the best choice for solid waste management in Indonesia because other waste disposal or management options tend to be more expensive (Sharholy et al., 2008).

Tantau et al. (2018) explained that the recycling process could be carried out to assess the success of solid waste management. However, Kurniawan et al. (2021) explained that Indonesia is still trying to overcome its solid waste management problems, especially regarding recycling. A study by Nizar et al. (2018) explained that if serious action is not taken in less than five years, there will be an explosion of waste generation because the landfill can no longer accommodate it. The landfill in Kampung Jawa in Aceh is an example of the capacity of a landfill that can no longer accommodate discarded trash. Tegal is also facing the same condition as the second largest city on the island of Java, where solid waste generation continues to increase every month (BPS, 2020).

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In the Rencana Pembangunan Jangka Menengah Daerah (RPJMD), the City of Tegal has an urban planning strategy related to waste management by creating a beautiful, clean city. However, this is still a challenge because, based on data from the BAPPEDA Kota Tegal (2016), the average composition of waste generated by the City of Tegal is 67.4% organic, 14.6% plastic, and the rest consists of paper, cardboard, cloth, and iron with 40 Temporary Shelters (TPS) facilities. Only now, Tegal City has an official landfills (TPA) with adequate facilities. Therefore, the problem of waste management becomes more challenging to overcome. The available landfill is temporary and the only one (Samsinar & Anwar, 2018) with 1.3 hectares in Muarareja Village, which operates with an open disposal system. The land lease ended in November 2015 (Iryanthony, 2018).

Based on these data, it can also be seen that the amount of waste that ends up in the TPA every day is 761.44 tons. In previous research, data showed that until 2037, the landfill area required by the City of Tegal was 13.69 hectares (BP4D, 2017). Meanwhile, the area is currently only about 10%, 1.3 hectares. Therefore, in its policy, the Tegal City government must consider the source of the waste that ends up in the TPA. The government's focus must start from upstream, especially on producers as parties who play a significant role, especially in plastic waste.

Extend Producer Responsibility (EPR) is a waste management system that can be implemented by focusing on producers. Shan et al. (2020) explain that producers are the parties that create products, so it is essential to assume responsibility for the products they produce. In EPR, the integration of responsibilities becomes essential during the product life cycle (Campbell-Johnston et al., 2020). This integration comprises producers, the government, and consumers (Safira, 2020). In the Permen LHK RI (2019), concerning the Roadmap for Reducing Waste by Producers, it is explained that producers can be interpreted as parties who not only create products but also distribute or sell them so that Businesses such as grocery stores also have a responsibility in managing their waste. In line with this, Japan, as one of the countries that implement the EPR scheme in its waste management, also places producers as part of product sales which are also responsible for the final product cycle. Therefore, Shan et al. (2020) research states that manufacturers comprise design, production, and sales.

As part of producers, grocery stores sell products to consumers or the public and must bear the waste they produce. Grocery stores, or in Indonesia they are often called grocery stalls, are included in Micro Enterprises in the SME realm. RI Presidential Decree No. 19 of 1998 explains that SME is an economic activity carried out by

the people on a small scale. Even though on a business scale, the business is at a trim level, grocery stores contribute to waste generation, namely grocery stores or stalls. Wagner et al. (2013) explains that grocery stores play an essential role in the recycling process, especially in the EPR system, because producers, distributors, and consumers are responsible for ensuring recycling runs.

Tegal is one of the cities in Central Java that currently has the second-largest solid waste generation on the island of Java (Darus et al., 2020). Of the total waste sent to the TPS, only 20% was successfully segregated, and the rest was mixed and ended up in the TPA. Based on data from the BAPPEDA Kota Tegal (2016), most of the existing waste is generated by domestic waste, namely 53.7%, while markets and grocery stores dominate non-domestic sources. With the condition of the TPA needing to be improved but the existing waste always ending up in the TPA, it is crucial to change the waste management scheme and system. As a city dominated by the trade sector, 3,411 grocery stores spread across Tegal City will continue to grow, including the waste it produces. Thus, it is vital to involve grocery stores in waste management that are more sustainable and does not end up in landfill.

By regulation currently, the policy in the City of Tegal regarding waste management is regulated in the Regional Regulation of the City of Tegal Number 4 of 2019 and the Regulation of the Mayor of Tegal Number 66 of 2012. Both regulations regulate the management of household waste and the like and the disposal and transportation of waste in the City of Tegal. Generally, the two regulations have divided the waste management actors from the government to the community. However, the responsibilities of producers as parties involved in producing waste have yet to be explained in detail. Meanwhile, Bhadra et al. (2021) explains that the government can share responsibility with producers in providing the necessary support for waste management, from sorting and collecting waste to processing, which can be regulated in policies. Therefore, this research will focus on how EPR-based policies can be implemented in Tegal City by looking at the government's perspective on integrating responsibilities with other waste management actors, especially producers.

This study aims to analyze waste management policies and see the government's views regarding implementing EPR in waste management in Tegal City. This research is essential to do because considering that waste generation continues to increase in Tegal City. At the same time, the existing TPA infrastructure's capacity needs to be increased to accommodate the amount of waste. Using EPR as one of the concepts of waste management in Tegal City, the research results are expected to provide an overview of more sustainable waste management.

Method

This research was conducted in Tegal City, Central Java Province, with an area of 39.24 km² and four sub-districts (BPS Kota Tegal, 2022). Administratively, the city of Tegal is at the western end and is located on the north coast of Java Island, consisting of four sub-districts, and is directly adjacent to the Java Sea in the north. At the same time, in the west, it is bordered by Brebes Regency, in the east by Pemalang Regency, and in the south, it is bordered directly by Tegal Regency. This city continues to experience increased waste generation while the TPA capacity is minimal.

In the Tegal City policy, plans for constructing a new TPA to accommodate and process waste in Tegal will only be built in 2022. Under these conditions, it is essential to manage waste in Tegal by considering the producer as one of the actors responsible for waste management. It can be done by implementing EPR. The government's view of the EPR scheme will be very influential in realizing this scheme for waste management in Tegal City.

For the analytical method, this study examines government policies regarding waste management from grocery stores and in-depth interviews with several stakeholders in Tegal City. A review of waste management policies is carried out to examine the three main instruments in EPR, namely environmental, social, and economic, concerning regulations set by the government. Then, in-depth interviews were conducted to understand the views of the Tegal City government on handling waste in their area and to find out their views on EPR.

This research focuses on waste management policies, so the informants used are the Tegal City government, which consists of: (a) Informant A, the Mayor of Tegal, interviewed this informant to examine the city government's views on waste management with the EPR scheme. (b) Informant B is the Head of the Waste Management Section of the Tegal City Environment Service (DLH); the interview with this informant aims to examine the views of DLH as the agency mainly responsible for waste problems in Tegal City. (c) Informant C is the Head of the Regional Planning and Development Agency (BAPPEDA) for the City of Tegal, interviewing this informant to see the future planning of waste management for the development of the City of Tegal.

The analysis used a descriptive qualitative method to answer the research objectives. In Figure 1, a more profound elaboration is carried out regarding the results of a study of Tegal City government regulations and their views on current waste management and EPR as one of the concepts of waste management in the future. At the end of the analysis, an EPR scheme will be

described that can be implemented in Tegal City with the aim of sustainable waste management.

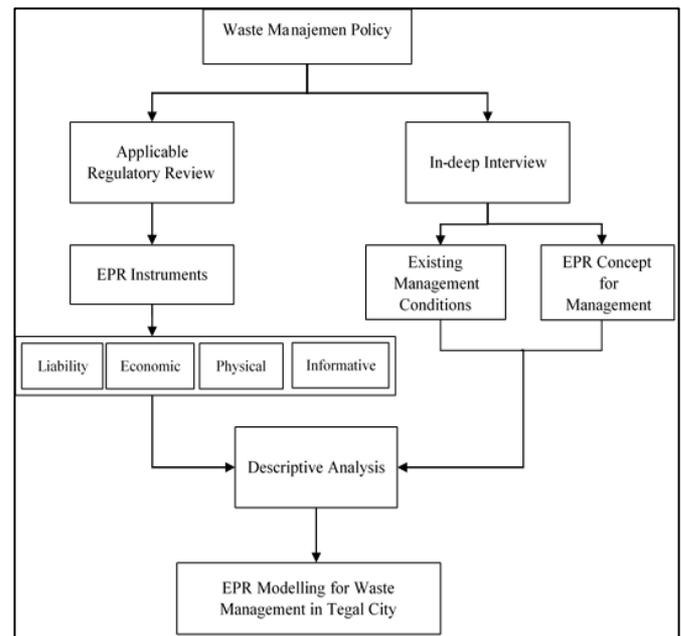


Figure 1. Analysis flow

Result and Discussion

Waste Management in Tegal City: Regulations and Management System

Tegal City, a medium-sized city, has a population of 275,781 people (BPS Kota Tegal, 2022). Based on field results, the waste generation generated by the City of Tegal ranges from 150-200 tons/day for household waste and other activities, including grocery stores. The waste generation can only be handled around 160 tons/day. This condition results in high waste that cannot be appropriately managed. In fact, by regulation, waste management in the city of Tegal has been comprehensively regulated, including the handling and reduction of waste, up to the obligations of various parties—the local government, community, and business actors—to carry out waste management.

Based on the analysis results, waste management in the City of Tegal is regulated in Regional Regulation Number 4 of 2019, which regulates management, disposal, rights and obligations, incentives, costs, permits, and the sanctions that apply to waste management in the City of Tegal. This rule is a derivative of Law no. 8 of 2008. Based on the study results, regulations related to waste management in Tegal City, in general, have provided precise arrangements for waste management. However, the regulation still focuses on the government as the party that manages waste. The following is a summary of the

policies in force in Tegal City regarding waste management.

Overall, policies related to waste management in Tegal City (Table 1), still need to be seriously focused on reducing and handling waste in an integrated manner, namely with producers as parties who play an essential role in the source of waste. The regulated waste

management flow also does not explain producers as parties involved in waste processing (Figure 2). Sukresno et al. (2019) explained that to maintain the value of waste, and there must be an effort to manage it, namely sorting it directly from the source so that it is quickly sorted and does not end up in the TPA.

Table 1. Waste Management Regulations in Tegal City

| Policy | Details |
|--|--|
| Peraturan Daerah Kota Tegal Nomor 18 Tahun 2008 concerning Tegal City Regional Long Term Development Plan 2005-2025 | One of the missions raised in the 2015-2019 RPJMD is to realize adequate infrastructure and environmental sustainability for sustainable development, including waste management facilities |
| Peraturan Daerah Kota Tegal Nomor 4 Tahun 2012 concerning the Regional Spatial Plan (RTRW) for the City of Tegal for 2011-2031 | Regulating specific urban waste systems related to the development and development of TPA areas, including integrated waste management, as part of realizing an urban network system. |
| Peraturan Walikota Tegal Nomor 66 Tahun 2012 concerning Arrangements for Garbage Disposal and Transportation | Regulating in more detail the waste disposal and transportation process, which explains that waste must be packed neatly before being handed over to the TPS, including the obligation of the community (excluding business actors) in disposing of waste. The responsibilities regulated by business actors related to the waste produced are responsible for managing waste only in their business environment. |
| Peraturan Daerah Kota Tegal Nomor 4 Tahun 2019 concerning the Management of Household Waste and Household-like Waste | Regulating comprehensive waste management. There are rules for distributing obligations to business actors that are more detailed for the waste they produce. The responsibilities are divided into deduction and handling. The responsibility for reducing waste is regulated by applying the 3R principles while handling it environmentally soundly. |
| Tegal City Solid Waste Masterplan 2016 | Planning a waste management system related to technical/operational, financial, institutional, policy, and community participation. Producers and business actors are still not regulated in this plan. Business actors are still categorized in the unified trading area, not specifically for those with a stake in waste management. |

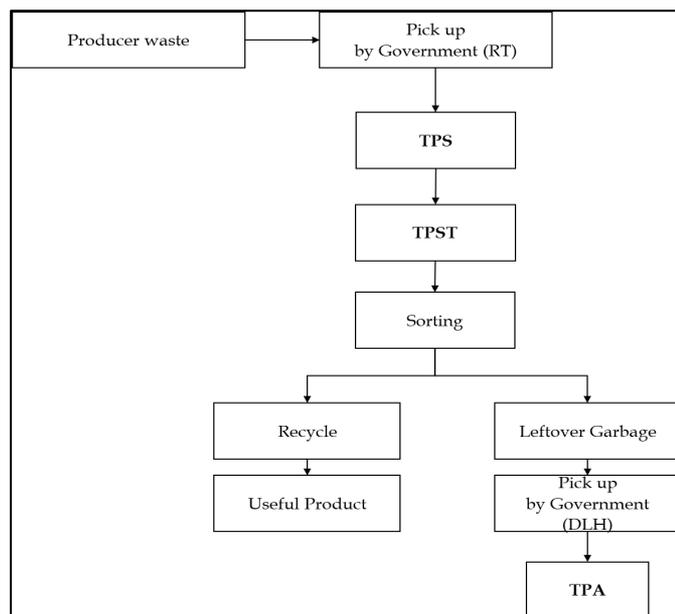


Figure 2. The flow of waste management based on regulations in force in the city of Tegal

In addition, the regulations in force only explain the sorting process, which is the duty of the local government. Meanwhile, responsibility for

environmental damage caused by waste should be shared, including producers. Regulation can be the first tool to support sustainable waste management, so regulating the responsibility of producers for the waste from the products they create can lead to circular economic activities (Shan & Yang, 2020).

Maitre-Ekern (2021) explains that regulation enables changes in waste management, especially if it is transitioning to a circular economy. With the current regulatory conditions of Tegal City, the local government must change the pattern of policies for waste management so that changes can be made in the product life cycle so that it only sometimes ends up in the TPA. The national policy regulates the roles and responsibilities of producers in the waste management process in Indonesia, namely the Ministry of Environment and Forestry Regulation Number P.75/MENLHK/SETJEN/KUM.1/10/2019 concerning a roadmap for reducing waste by producers (Permen LHK RI, 2019). However, this rule has yet to be implemented in Tegal City, so the regulations in force in that area still consider the scope of the product life cycle as part of the producer's responsibility. Therefore, in the future, the regulation by the Ministry of Environment

and Forestry needs to be implemented so that it can become the basis for waste management in Tegal City so that the management system can form a more integrated and sustainable management cycle.

EPR as A Policy Framework for Sustainable Waste Management

In the process, waste management cannot be carried out independently to reduce landfill waste. The government, community, and business actors must integrate responsibilities between various parties. In the concept of EPR, Filho et al. (2019) explained that EPR is a policy approach that gives responsibility to producers, that significantly includes both financial and physical, for the management of the products they produce post-consumption. The analysis results show that the Tegal City government, having a significant role in waste management, has thought about producer responsibilities. There is a waste management program that the Tegal City government carried out in collaboration with packaging waste producers to process waste into asphalt material.

EPR itself in theory, (Lindhqvist, 2000) explains four aspects of the EPR concept: liability, economic, physical, and informative. Based on the interviews with stakeholders, it is known that they are aware of the need for cooperation between the government, the community, and producers in waste management in Tegal City. However, if it relates to the four aspects of EPR, the economic responsibilities still need to be well described.

The government still thinks that costs related to damage caused by waste are the government's responsibility. In line with this, in the regulations that apply, namely Regional Regulation No. 4 of 2019, it is also still explained that the plan for reducing and handling waste in the City of Tegal for the need for its provision is borne by the government, and the community. In this regulation, specifically, Article 10 does not mention the responsibility of producers financially for waste reduction and handling. Meanwhile, Safira (2020) explains that this economic aspect can be an instrument for preventing and overcoming waste problems. It was also explained by Verawati (2022) that in handling waste problems, the government requires integration between product costs and environmental costs.

In addition, aspects of informative responsibility have yet to be clearly described either in the applicable regulations or from the perspective of the Tegal City government. The regulations only regulate how manufacturers produce environmentally friendly products and packaging. However, the information regarding the products produced to become part of consumer information has yet to be regulated. Based on

the analysis results, liability, and physical responsibility, it is found that the current waste management system already covers both of these aspects in terms of regulation and the views of stakeholders. The applicable regulations explain that business actors need to minimize specific waste throughout the product life cycle, which means from use to the end of the product. That is in line with the liability principle of the EPR.

However, for physical responsibility, there are no regulations related to producer responsibility for the impacts arising from the products they create. The regulations that apply only explain the responsibilities of business actors to reduce waste with the 3R principle, including selecting resources that are safe for the environment, utilizing waste to be used as products and energy again, and optimizing the use of recycled materials as product raw materials. Meanwhile, the rules related to the impact caused still need to be regulated. In addition, based on the results of the IDI, the government's views regarding this responsibility have yet to be obtained.

With the existing conditions, EPR has been developed in the waste management system in Tegal City, but it still needs to be detailed and comprehensive. The application of EPR can be an effort in a circular economy transition; Maitre-Ekern (2021) explains that this transition can be carried out by preventing waste generation, including reducing the consumption of new products, which requires fundamental changes to the business model. Therefore, regulating the waste management process that starts from the upstream - product production - by giving responsibility to producers, can encourage the reduction of waste generation and waste handling. Based on the analysis results, the waste management system in Tegal City can be carried out by starting from the producer and returning to the producer (Figure 3).

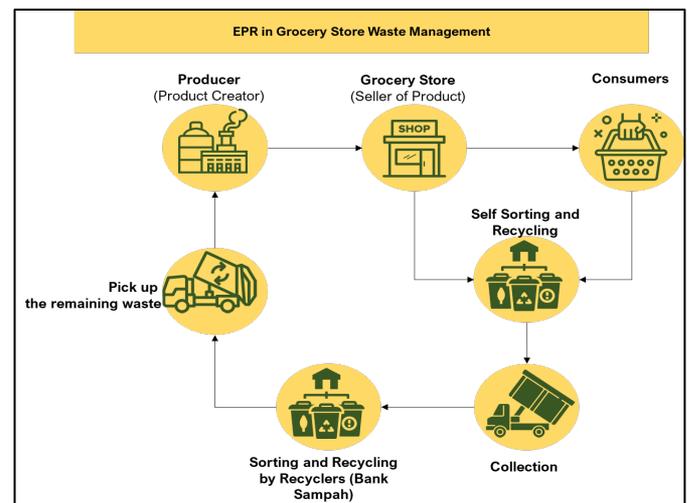


Figure 3. EPR modelling for waste management in Tegal City

Implementing EPR can be one of the solutions for waste management in Tegal City by ensuring that the source is directly upstream. Bhadra et al. (2021) explain that EPR has become a promising alternative to conventional waste management policies. Giving responsibility to producers, in addition to creating environmentally friendly products, also impacts caused by the products they create and is responsible for financing the product waste cycle. This financial responsibility can cover collection, recycling, and up to final disposal, with examples of financing such as subsidies, product taxes, advanced disposal fee systems, and deposit refund systems. Therefore, waste management in the city of Tegal can involve producers seriously both in the regulated regulations and in their implementation in the field to create a waste management scheme that is more economically valuable, responsible, and sustainable following the principles of the current regulations.

Conclusion

Waste management in the City of Tegal, according to regulations and from the government's perspective, has involved producers or business actors as one of the parties responsible for handling and reducing waste. In terms of regulations, the responsibility of producers has been established. However, it must still be comprehensive, especially regarding financial, informative, and physical responsibility. The government's current focus is still on how producers also get involved in managing the waste produced by optimizing the resources used for product creation, producing products and packaging that are more environmentally friendly, handling them in an environmentally sound manner, and reducing waste with the 3R principle. Thus, the EPR principle has been included in the regulations that are currently in effect, and the government, in its program, has directed this principle. However, it still needs sharpening, especially in directing producer responsibility throughout the product life cycle. It can be done by referring to the national policy, which currently regulates the waste reduction roadmap as the responsibility of producers. Lastly, this research still focuses on studying applicable regulations and the views of the government, so further research is expected to lead to the view of producers as the main party in EPR.

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Author Contributions

Dinni Septianingrum conceptualized research idea, methodology and data analysis. Kosuke Mizuno and Herdis Herdiansyah give critical feedback and substantial review.

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Conflicts of Interest

The authors declare no conflict of interest.

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