

Legal Innovation in Waste Management: Examining the Effectiveness of Zero Waste Regulation in Indonesia

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Abstract

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The problem of waste management in Indonesia is a serious challenge that has a wide impact on the environment and public health. This study aims to identify the urgency of implementing innovations in zero waste-based waste management systems through legal policies, especially Regional Regulations (Perda), as a sustainable solution. This study uses a literature study approach by analyzing regulations and waste management practices in various regions in Indonesia. The results of the study show that the implementation of the Zero Waste Perda reflects effective legal innovation in encouraging systemic change, through the obligation to sort waste from source, restrictions on single-use plastics, and a combination of incentives and sanctions. This approach has been proven to be able to increase community participation, reduce waste generation, and strengthen the circular economy at the local level. However, challenges still arise related to limited infrastructure, low public awareness, and the need for harmonization of central and regional regulations. This study suggests the need to strengthen regulations based on the principles of sustainability, community empowerment, and technology integration in the national waste management system in order to accelerate the transition to an inclusive and efficient zero waste system.

Keywords: waste management, legal innovation, zero waste regional regulation, sustainability, circular economy, community participation.

1. INTRODUCTION

Waste management is a major challenge faced by Indonesia in recent decades. Population growth, massive urbanization, and a culture of consuming disposable products have caused a significant spike in waste generation each year. Based on data from the Ministry of Environment and Forestry (KLHK), the total waste generation in Indonesia in 2023 will reach more than 68 million tons, dominated by household waste and plastic as the main composition (KLHK, 2023). Plastic waste is of particular concern because of its non-biodegradable nature and its direct impact on terrestrial and marine ecosystems (HS Magirah, 2023).

This condition is exacerbated by the limitations of inadequate waste management infrastructure and the lack of public awareness in sorting and reducing waste from the source. Many Final Disposal Sites (TPA) in large cities have exceeded capacity and no longer meet environmental sanitation standards. This situation requires the birth of a new policy approach

that is not only technical, but also regulatory and transformative in order to encourage systematic change in national waste management.

The waste problem is now a crucial issue, where its management is a mandatory responsibility that must be carried out by the regional government. So far, government policies in waste management are considered to still pay less attention to environmental sustainability aspects and have not fully accommodated the local potential of the community. In fact, waste management matters have become the authority of the region, as emphasized in Government Regulation No. 14 of 1987 and Law No. 33 of 2004 which strengthen the position of autonomous regions in regulating waste management in their respective regions. This provision is also strengthened through Law No. 18 of 2008 and Permendagri No. 33 of 2010 which regulates technical guidelines in the implementation of waste management (Government Regulation, nd).

One form of regulation that is currently developing is the implementation of the Zero Waste policy through Regional Regulations (Perda). Zero Waste is an approach that emphasizes the prevention of waste generation from upstream, increasing recycling practices, and reusing materials and goods. In various countries, this approach has become an important part of sustainability strategies and circular economy. In Indonesia, several regions have begun to adopt this policy as a form of commitment to environmentally conscious development.

At the national level, the legal framework related to waste management has been regulated in Law Number 18 of 2008 concerning Waste Management. This law emphasizes the importance of reducing and handling waste in an environmentally friendly manner. This policy is reinforced through Presidential Regulation Number 97 of 2017 concerning the National Policy and Strategy for the Management of Household Waste and Household-Similar Waste (Jakstranas), which targets a 30% reduction in national waste generation by 2025. The implementation of Zero Waste through Regional Regulations is expected to be one of the strategic instruments in supporting the achievement of this target, while strengthening community participation.

The waste problem in Indonesia is still a serious issue that has a wide impact on the environment, health, and quality of life of the community. The high volume of waste that is not balanced with an effective management system shows an urgent need for innovation in handling it. One approach that is considered relevant and sustainable is a zero waste-based waste management system, which focuses on reducing waste from its source. Therefore, it is important to examine the urgency of implementing this innovation and how legal policies can support the optimal implementation of a zero waste system in Indonesia (Satria Ariayudha Widiatmoko et al., 2024).

Considering these problems, this study aims to identify and understand the condition of waste problems in Indonesia and examine the urgency of the need for innovation in its management system. In addition, this study also aims to examine the importance of implementing a zero waste-based waste management system as a sustainable and environmentally friendly solution. Furthermore, this study aims to analyze the main objectives of the existence of legal policies that support the zero waste management system, in order to encourage the implementation of the system effectively and comprehensively in Indonesia.

2. METHOD

This study uses an in-depth literature study approach, with an emphasis on the analysis of sustainable waste management in Indonesia. The data collection process is carried out by searching various sources of information such as books, scientific journals, official government reports, scientific articles, and websites that are relevant to issues and solutions related to waste

management in Indonesia. The main objective of this study is to gain a comprehensive understanding of the actual situation of waste management in Indonesia, including the volume and type of waste, the condition of supporting infrastructure, and applicable policies and regulations.

This literature study approach allows researchers to systematically evaluate and compare findings from various previous studies. The data obtained are then analyzed using content analysis methods, in order to identify patterns, themes, and concepts that emerge in the related literature. With this strategy, the study is expected to provide a significant contribution to understanding the main challenges of waste management in Indonesia, while also offering useful insights for the development of more effective and sustainable strategies and solutions.

3. RESULT AND DISCUSSION

3.1 Legal Innovation in Zero Waste Regional Regulation

The Regional Regulation (Perda) that carries the Zero Waste concept is a legal innovation that aims to change the waste management pattern from a linear system to a circular one. The legal substance in the Zero Waste Perda covers several important aspects, including (Adifa & Wibero, nd).

- a. The obligation to sort waste from source is an important part of sustainable waste management efforts in Indonesia, with responsibilities shared between the government, producers, and households. Law No. 18 of 2008 stipulates that everyone, including households and business actors, has an obligation to manage waste and separate waste in an environmentally friendly manner. sorting waste from source means grouping plastic, paper, and hazardous waste.

- b. Testrictions on the use of single-use plastic waste

One of the most significant legal innovations in waste management in Indonesia is the restriction of the use of single-use plastics, such as plastic bags, plastic straws, styrofoam (food containers made of polystyrene), and other plastic packaging. This step is in line with national and global commitments to reduce plastic pollution which has long-term impacts on the terrestrial and marine environment. Single-use plastics are the type of waste that dominates waste generation in Indonesia. According to data from the Ministry of Environment and Forestry (2023), of the approximately 68 million tons of national waste generation each year, approximately 17% is plastic waste, with most of it coming from single-use products. This plastic is difficult to decompose naturally and can pollute the environment for hundreds of years. Several local governments have issued Regional Regulations (Perda), Governor Regulations (Pergub), and Mayor Regulations (Perwali) that explicitly limit or prohibit the use of single-use plastics, especially in the retail and trade sectors. The legal substance includes:

- Ban on providing plastic bags in shopping centers and modern shops
- Obligation to use environmentally friendly containers or bags
- Imposition of administrative sanctions on business actors who violate
- Educational campaign to the public to bring their own shopping bags

Several local governments in Indonesia have integrated incentive and sanction policies in waste management to encourage the creation of a Zero Waste system. The city of Surabaya, through Mayoral Regulation No. 16 of 2022, provides awards for active RT/RW and imposes

administrative fines for violators. DKI Jakarta in Governor Regulation No. 142 of 2019 offers training for environmentally friendly MSMEs while also setting legal sanctions for business actors who still use single-use plastic. Bandung also encourages community participation through free training and equipment, while sanctions in the form of fines of up to five million rupiah are applied to violators. The cities of Bogor and Denpasar provide incentives in the form of support for facilities and promotion of environmentally friendly businesses, as well as setting administrative sanctions and fines for violations. Meanwhile, the province of Bali, through Governor Regulation No. 97 of 2018, pioneered the ban on single-use plastics and gave awards to tourism actors who obey the rules. This comparison shows that a balanced combination of incentives and sanctions is key to the effectiveness of waste management at the regional level (Kurnia et al., nd).

In implementing the Zero Waste waste management policy, several regions in Indonesia have designed legal strategies that combine elements of incentives and sanctions as an effort to encourage active involvement from the community and the business sector. This policy reflects the implementation of regional autonomy in addressing environmental issues through a responsive approach that is in accordance with local conditions.

For example, the City of Surabaya has implemented Mayoral Regulation No. 16 of 2022 which regulates waste management policies by providing awards to RT/RW who play an active role, recycling training, and implementing environmentally friendly school programs. The sanctions applied include administrative fines, written warnings, and revocation of business licenses for parties who violate the provisions (Mahendra & Widya Kartika, nd).

In DKI Jakarta, waste management policies are outlined in Pergub No. 142 of 2019 by integrating economic aspects, such as providing access to MSME training through the Jakpreneur program and promotion for zero waste communities. To enforce the rules, sanctions are applied in the form of fines, termination of services, and legal proceedings against violations.

Bandung also implemented a similar policy through Regional Regulation No. 9 of 2018 and Mayoral Regulation No. 37 of 2019, which prioritizes an educational-technical approach by providing training, free waste sorting tools, and community assistance. However, there are quite severe sanctions for violators, namely a fine of up to IDR 5,000,000, termination of service, and written warnings.

Bogor City regulates waste management policies through Mayoral Regulation No. 61 of 2018, with a focus on community empowerment through waste bank support, household waste processing training, and promotional access. The sanctions imposed include warnings, administrative fines, and permit evaluations for business actors who do not comply with the rules.

Denpasar, as the capital city of Bali Province, has a progressive approach to reducing the use of single-use plastic through Mayoral Regulation No. 36 of 2018. The incentives offered include providing environmental certificates to environmentally friendly business actors and promotion in the local government agenda. The sanctions include fines of up to IDR 500,000, warnings, and confiscation of single-use plastic products.

At the provincial level, Bali's commitment to zero waste is manifested through Pergub No. 97 of 2018, which provides environmental awards and encourages collaboration between recycling communities and the tourism sector. Strict sanctions are imposed for violations, in the form of severe warnings, fines, and evaluation of business operating permits.

From the description, it can be concluded that incentive and sanction policies in various regions not only act as a monitoring tool, but also as a means of internalizing sustainability

values in social practices. This approach shows the need for environmental regulations that are adaptive, results-oriented, and ensure broad participation from all levels of society (Juli a Lingga et al., nd).

Based on comparisons between regions, it can be concluded that legal innovation in the Zero Waste Regional Regulation plays a significant role in forming a more participatory, structured, and sustainable waste management system. Each region implements an innovative approach that is tailored to local characteristics, such as the prohibition of single-use plastics, the obligation to sort waste, strengthening waste banks, and cross-sector collaboration. In addition, the combination of legal instruments in the form of incentives and sanctions has proven to be an important element in ensuring the effectiveness of the implementation of the Regional Regulation. Legal innovation is also seen in the form of technology-based regulations and strengthening the role of the community. The more progressive the form of legal innovation adopted, the greater the impact on reducing waste generation and increasing public awareness. This shows that legal innovation is not just a written rule, but also a catalyst for change towards an inclusive and effective Zero Waste system (Andini & Nur Fazria, nd).

Waste management in Indonesia has not yet fully referred to the principles of environmentally friendly management. Most Final Disposal Sites (TPA) still use the open dumping and sanitary landfill methods as the main approach. In addition, there are also other methods such as composting, incineration, sorting, and recycling, but their implementation is still limited. The open dumping method is carried out by dumping waste directly into the TPA without any processing, while the landfill method is carried out by leveling and compacting the waste using heavy equipment, then covering it with soil. Both methods are considered less environmentally friendly because they have the potential to pollute groundwater and contribute to air pollution. TPA also has the potential to become a source of Greenhouse Gas (GHG) emissions, especially methane (CH_4), carbon dioxide (CO_2), and nitrous oxide (N_2O). Based on these conditions, innovation is needed in waste management so that it does not only become a burden on the TPA, but can be utilized optimally to support sustainable development (Purwanta et al., 2022).

Understanding the origins of waste from various sectors, such as households, industries, and public institutions, is crucial in designing targeted waste management strategies. Identifying the patterns and characteristics of waste produced by each sector allows the government and other stakeholders to formulate more responsive and effective policies. For example, initiatives to reduce the use of single-use plastic among consumers can contribute significantly to reducing the amount of plastic waste that pollutes the environment.

Overall, comprehensive knowledge of the types and sources of waste is the main foundation in realizing a sustainable waste management system. Through synergy between the government, society, and the business world, this collaborative approach is expected to be able to maintain environmental sustainability and encourage efficiency in the use of increasingly limited natural resources (Otivriyanti et al., 2023).

1. Zero Waste as a Sustainable Innovation in Waste Management

One approach that offers a sustainable solution in waste management is the Zero Waste concept. This approach focuses on preserving resources by prioritizing the production, consumption, reuse, and recovery of products and packaging, without burning or disposing of them into the environment that risks polluting the soil, water, and air. The five main principles in Zero Waste include refuse, reduce, reuse, recycle, and rot (Nusamuda Pratama, nd).

Furthermore, the application of this concept is not only limited to household activities, but can also be applied in the field of education, such as the use of used goods as learning

media. This approach also emphasizes the importance of self-control in consumption and responsibility for the life cycle of the resources used. Thus, existing products can be optimally reused and do not immediately end up as waste.

Through the Zero Waste program, communities, especially households, are encouraged to sort waste directly from the source. This initiative is carried out with active support from local governments to reduce the volume of waste sent to the Final Disposal Site (TPA) and strengthen a sustainable waste management system.

Furthermore, based on Table.1, legal innovation plays a strategic role in supporting the realization of the Zero Waste system in Indonesia. Through the formulation and implementation of new regulations based on the principles of sustainability and environmental protection, the government can create a more adaptive and progressive legal framework. Legal policies that support an integrated recycling system, incentives for environmentally friendly industries, and stricter regulations on organic waste processing are examples of concrete steps in increasing the effectiveness and efficiency of national waste management. In addition, regulations can also be directed to strengthen the monitoring mechanism and sanctions for violations that have an impact on environmental pollution due to waste.

Table1. Relevance of Legal Policy in Indonesia to Zero Waste System

Legal Policy	Main Contents of the Policy	Relevance to Zero Waste
Presidential Decree No. 97 of 2017	Set a target of 30% waste reduction and 70% handling by 2025	Encouraging waste reduction at source as part of a zero waste strategy
Minister of Environment and Forestry Regulation No. 75 of 2019	Manufacturers are required to reduce packaging waste and take responsibility for post-consumption.	Reducing waste from production upstream through product redesign and producer responsibility
Minister of Environment and Forestry Regulation No. 14 of 2021	Organizing waste management through community-based waste banks	Encourage waste sorting and recycling at the community level

PP No. 27 of 2020	Specific waste management (B3 waste, disaster waste, etc.)	Handle non-recyclable waste so that it does not pollute the environment.
Circular Letter of the Minister of Environment and Forestry No. SE.1/MENLHK/PSL/B3/PLB.0/1/2023	Promoting zero waste and zero emissions through circular economy principles	Strengthening commitment to a zero waste system nationally and across sectors.

Source: Budianto & Ghanistyana (2024)

Based on the analysis of the table, legal innovation must also pay attention to the participatory aspect in waste management. The Zero Waste principle emphasizes active community involvement in decision-making, from the planning stage to policy evaluation. Therefore, the regulations developed need to provide space for community empowerment and collaboration between local governments, business actors, and civil society. Through an inclusive and responsive legal approach, a fair, transparent, and sustainable waste management system can be realized.

According to the World Health Organization (WHO), waste can be understood as something that is not used, not needed, not liked, or thrown away because it no longer has any use value, which generally comes from human activities and not from natural processes. Meanwhile, Law Number 18 of 2008 concerning Waste Management defines waste as the remains of daily human activities and/or natural processes in solid form. Waste itself is a by-product of various economic activities carried out by the household sector, government, and business actors. If managed optimally, this waste can contribute back to the economic process, either through material reuse or energy conversion. For companies, efficient waste management can not only reduce production costs but also increase productivity (Amirulkamar et al., 2025).

The high volume of waste produced also creates a significant social cost burden for the community. Therefore, if a policy designed by the government or economic actors is able to reduce the amount of waste to near the point of economic efficiency, then the policy can be said to have provided a net benefit to the community at large. Based on data from the Ministry of Environment and Forestry, Indonesia produces a large amount of waste, reaching around 175,000 tons per day (Rustan et al., 2023).

Economic efficiency is an important aspect in waste management, because it reflects that the volume of waste produced has reached an optimal level. To achieve this condition, an active role is needed from economic agents and policy intervention by the government in dealing with waste issues. One form of policy that can be implemented is providing incentives to communities that successfully manage and collect their waste independently without polluting the environment. This policy aims to reduce waste generation from the production sector and households in a sustainable manner.

4. CONCLUSION

Waste management in Indonesia still faces various structural challenges, such as the lack of supporting facilities and low levels of public awareness of the principles of environmentally friendly waste management. In this case, the existence of Regional Regulations (Perda) that adopt a zero waste approach reflects a form of legal innovation that is progressive and responsive to local dynamics. This regulation not only includes the obligation to sort waste from the source and restrictions on the use of plastic waste, but also adopts a system of incentives and sanctions as an effort to optimize the implementation of policies in the regions. The results of the study show that the effectiveness of the implementation of the zero waste policy is greatly influenced by the integration of contextual regulations, active community involvement, and the existence of adequate institutional support. Therefore, strategic efforts are needed in the form of policy synchronization between the central and regional governments, increasing institutional capacity, and strengthening education strategies and public involvement. Legal innovation in the form of a zero waste policy is not only positioned as a technical administrative approach, but also as a transformative instrument in building an inclusive, adaptive, and sustainable waste management system.

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NOVELTY

This study presents a novelty by using a comparative-juridical approach to assess the effectiveness of the implementation of the Zero Waste Regional Regulation (Perda) as a legal innovation in waste management in Indonesia. This study combines normative analysis with mapping of incentive and sanction policies in various regions, to evaluate how effective the regulation is in encouraging changes in the behavior of the community and business actors. In addition, this study also emphasizes the importance of the transition from a linear approach to a legal system based on a circular economy, and shows the strategic role of regional regulations in strengthening participatory, adaptive, and sustainable principles in waste management. This approach contributes to the development of regional legal instruments that are more responsive to today's environmental challenges.

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