

Effectiveness of Waste Management Regulation in Denpasar City, Indonesia

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Abstract. This study aims to examine the effectiveness of waste management regulations in Denpasar City and understand the challenges faced in implementing the Gubernatorial Regulation on Waste Management. Based on this understanding, the study aims to explore the effectiveness of source-based waste management arrangements in Denpasar City and understand the obstacles encountered in implementing waste management arrangements. The research method used is empirical legal research, which involves analysing the gap between what should be done and what is done. Both a legal approach and a factual approach are used to assess the effectiveness of waste management regulations. The legal approach examines source-based waste management arrangements in Bali, while the factual approach analyses the current situation in society. The data sources include interviews as primary data and legislation related to source-based waste management as secondary data. Qualitative analysis techniques are used to process the data. The research plan spans one year and aims to publish in international journals and register intellectual property. This study is part of TKT 4, which focuses on using statutory regulations to provide facilities and infrastructure for waste management, such as waste trucks and recycling machines offered by the Bali Provincial Government. It also integrates technical management to ensure collaboration and functionality among all stakeholders involved in waste management programs. However, the reliability of this system is still relatively low compared to the final system, which is why further research is conducted during its implementation.

Keywords: Effectiveness; Regulation; Management; Waste.

INTRODUCTION

Waste is a very complex problem in households and the village environment. The issue of waste should not be underestimated or ignored because it will negatively impact the environment and the community's survival. Since the closure of the landfill in Suwung Village, South Denpasar, at the end of October 2022, the community has experienced confusion in waste disposal [1]. The final disposal site (TPA) closure is accompanied by a Source-Based Waste Program involving villages and traditional villages. In the program's planning, 102 units of temporary disposal sites (TPS-3R) will be built in Denpasar City, Badung Regency, Gianyar Regency, and Tabanan Regency.

Referring to the program, the community is directed to dispose of waste at TPS in the customary village area. Customary villages can manage waste independently and can also manage waste in synergy with villages/sub-districts (Article 9 § 2 of Bali Governor Regulation No 47 of 2019 concerning Source-Based Waste Management). Waste is collected at the TPS, and then sorting is carried out, sorting plastic, degradable, and waste that is difficult to decompose. The Desa Adat Owned Business Entity (BUMDes) manages the waste management. Desa Adat is authorised to manage waste in its area [2].

Based on the provisions of Article 1 No 15 of the Pergub on Source-Based Waste Management, it is stipulated that a Waste Processing Station with

the 3R principle (reduce, reuse, recycle), from now on referred to as TPS 3R, is a place where regional-scale collection, sorting, reuse, and recycling activities are carried out. This provision requires collection, sorting, reuse and recycling at the TPS location.

These activities require significant time or cannot be completed within a single workday. Since sorting, reusing, and recycling tasks are still pending, new waste will accumulate. The collection of waste can happen at any given time, leading to a buildup of waste in the TPS. The accumulation of unsorted, unused, and unrecycled waste will increase daily. This buildup of waste in the TPS also poses significant issues for the community. Problems arise when the waste emits a strong and unpleasant odour [3]. The pungent smell significantly hampers the everyday routines of native individuals, particularly those residing near the TPS.

TPS sites in residential areas pose new challenges for the community. Since these TPS locations are situated within residential areas, they are near people's homes. However, some residents in Denpasar City do not favour having TPS sites in their neighbourhoods. The placement of TPS sites in Denpasar City requires approval from the local community. If the community agrees, TPS sites can be established, but TPS sites cannot be set up if they disagree. As a result, many areas in Denpasar City without TPS sites confuse residents regarding waste disposal. Currently, in certain regions like North Denpasar, people still resort to burning their garbage in front of their houses or yards despite the prohibition in the governor's regulation.

The research addresses two fundamental problems concerning the outlined issues. Firstly, it investigates the effectiveness of waste management regulations in the city of Denpasar. Secondly, it explores the constraints encountered in waste management within the same city. The specific objectives of the research include building synergy between higher education research results and the Bali Provincial Regulation on Source-Based Waste Management in Denpasar, enhancing the competence of lecturers and the overall quality of higher education, and improving scholarly publications and research quality in both national and international scientific journals.

The research findings are anticipated to provide solutions for the Denpasar City Regional Gov-

ernment and the community in waste management without disrupting their daily activities. This research is precious in enhancing government programs concerning waste management in Denpasar City. It benefits the Government, the private sector, and the community, particularly in Denpasar.

Moreover, these study results are expected to contribute directly to the lecture material in the form of textbooks, aligning with the Merdeka Learning Campus Merdeka curriculum on waste management. This will enhance the quality of lecturers' teaching, enabling them to provide better guidance for thesis writing and offer valuable insights to students working on waste management-related theses. Ultimately, this research can potentially improve and enhance the waste management system in Denpasar City.

Theoretical Basis

The research [4] raised the issue of community perceptions of waste management in Singaraja City and DKP Buleleng Regency's efforts regarding waste management. The research [5] raised the issue of the effectiveness of the waste bank program and how the community participates in it. The problems [6] raised are related to the factors that influence the presence of waste and its impact on the environment and society. The three studies are for comparison with this research and as a reference to support this research. The three studies mentioned above have similarities and differences with this research, while the similarities are related to the object of research on waste and waste management.

Meanwhile, the difference lies in the research location and research study. The research location is in Buleleng Regency and Bali, while this study took the location in Denpasar City. This research study is based on the laws and regulations governing waste management at the Bali Province and City levels. Thus, this study is very different from the three studies mentioned above.

METHODS

Type of Research. This research uses empirical legal research because it examines the reality in society related to source-based waste management in Denpasar City. Empirical legal research is a scientific activity based on methods and sys-

tematics to analyse specific legal symptoms and seek solutions to the problems faced [7].

Type of Approach. The types of approaches used are factual approaches and statutory approaches. The fact approach is to collect primary and secondary data that form the basis for the preparation of this research. The statutory approach analyses the rules relating to source-based waste management.

Nature of Research. This research is descriptive-analytical, describing/explaining the facts at the research location found, then tracing, digging and in-depth analysis of these facts by linking laws and regulations, related data and legal theories related to source-based waste management.

Data and Data Sources. This research uses primary data and secondary data. Primary data is obtained from interviews with respondents and informants. Meanwhile, secondary data is received by collecting laws and regulations related to source-based waste management; then, the data is processed qualitatively.

RESULTS AND DISCUSSION

Effectiveness of Waste Management Regulation in Denpasar City. Etymologically, the term effectiveness comes from the word practical, which means achieving success in meeting predetermined goals. Effectiveness is always related to the relationship between the expected and actual results [8]. Thus, legal effectiveness is defined as achieving success in realising predetermined goals.

Legal effectiveness is closely related to legal objectives. According to Gustav Radbruch, law achieves three goals: legal certainty, expediency, and justice. The primary purpose of law is justice; if that is not possible, then the law will pursue the effectiveness of the law [9]. Based on this understanding, the law may not achieve justice, but other goals can be achieved.

Formulating legal rules means that the rules must be strictly enforced or implemented [10]. This causes the law to be known by the citizens, as the law consists of principles established for current events and future periods, which apply universally. Thus, in addition to the tasks of certainty and justice, there is also an element of utility in the law. This means that every citizen knows exactly what he or she is allowed to do and what he or she is forbidden to do so that he

or she does not have his or her interests harmed within reasonable limits [11].

The effectiveness of waste management arrangements in Denpasar City must be seen from the objectives of the regulation. The purpose of regulating source-based waste management in Bali is to create a clean, green, and beautiful Bali. Another goal is source-based waste management, which aims to improve public health and environmental quality.

Based on the results of an interview with Mr A. A. Marhaen, the head of the Village-Owned Business Entity in Padangsambian, West Denpasar, the goal of regulating source-based waste management is challenging to realise because implementing a clean, green and beautiful Bali must have the support of the Regional Government. The Desa Adat community can't achieve this goal without the support of the local Government. The intended support is to provide a legal basis for waste management related to the place or location of waste generation. In addition, the Government must also provide facilities for waste management in each Indigenous village, in the form of tools or recycling machines, shredding machines, and workers who assist in waste management. If you only rely on workers from Indigenous community members, it will be very insufficient and not even meet the daily achievement target. In the past, seven workers were provided by the Denpasar City Government, but this did not last long. The seven workers who were seconded gradually decreased until now. There are no more workers from the Regional Government. Padangsambian Traditional Village polling station only has three workers. The reduction in labour from the Government is because the workers are transferred to other places or given different tasks, so West Denpasar TPS is short of labour. A minimal workforce is causing waste management to be unoptimal.

The waste received is around 2.8 tons every day. It is impossible to decompose everything with three workers. So that the waste that has not been decomposed accumulates at the TPS location. The accumulation of garbage in the area creates an unpleasant odour because the undecomposed garbage is still mixed with the trash that is difficult to decompose or has not had time to be sorted. Public health is compromised, and people protest because of the pungent smell of garbage for days. Therefore, it has not been able to realise the quality of the environment. The ac-

cumulation of large amounts of waste will reduce the quality of the environment.

According to Ms Ni Made Nurwati, a resident of North Denpasar District, her health was disturbed due to the pungent odour from the polling station. Mrs Trisna had nausea and even vomited because she smelled the scent of the TPS. In addition, it also disrupts community activities. The problem of odour from this garbage must be resolved immediately so as not to disturb the health and activities of the community.

In East Denpasar Subdistrict, there was a similar incident where residents expressed dissatisfaction with the smell of the waste management at the Kertalangu TPST. Mr. I Ketut Wisna, as Bendesa Adat Kesiman, explained that the unpleasant odour complained about by the community results from waste deposition and the drying process. These activities can create solid and unpleasant odours combined with certain weather conditions. The accumulation of unprocessed and untransported waste is a significant factor in this issue. The odour emitted from the site can adversely affect health and the overall quality of the environment for the residents living nearby.

According to the firsthand experiences of the community, the waste management system in Denpasar City has proven ineffective. This inefficiency is primarily attributed to the foul smell emanating from the waste sediment and the process of waste drying. As a result of garbage being left unattended for several days, it accumulates and decomposes. If the waste is not promptly decomposed or dried, it will lead to precipitation. Unfortunately, the settling and drying process requires significant time and cannot be completed within a day.

According to the principles of source-based waste management, waste is managed systematically, comprehensively, and continuously. This involves reducing waste by limiting its generation, reusing waste whenever possible, recycling waste materials, and properly sorting and handling waste [12], collection, transportation, processing and final waste processing [13]. Citizens in West Denpasar, North Denpasar, South Denpasar and East Denpasar sub-districts have not implemented these restrictions. Waste reduction and handling is only carried out by TPS in each sub-district.

Challenges Faced in Waste Management in the City of Denpasar. The challenges faced in waste management in the city of Denpasar consist of internal and external challenges. Internal difficulties in waste management include: 1) Insufficient workforce; 2) Lack of shredding and drying machines; 3) Inadequate facilities; 4) Marketing of fertiliser sales; 5) Limited budget funds available.

Similarly, as with the internal challenges in the research location, there are also external challenges. The external challenges include: 1) Workforce needs from the Local Government of Denpasar City; 2) Support from private parties; 3) Lack of provided supporting facilities; 4) Community involvement in waste management; 5) Insufficient financial assistance from the Denpasar City Government.

The lack of a workforce causes waste management at the TPS very slow. Compared to the volume of waste entering the TPS, the availability of a limited number of workers makes it impossible to manage waste quickly. In working with so much waste, enough time is needed to sort, crush, dry and transport the waste. If the only machine available is a shredder, it will be challenging to dry the waste. Thus, waste management must have a dryer and shredder. The shredder crushes easily decomposable waste such as leaves, paper and others. After crushing, the next stage is smoothing and drying. Drying machines are needed to quickly complete the waste drying process, considering that the time available is minimal because waste enters the TPS every day. If no crushing is done, waste will be deposited, continuing to grow in volume. The deposited waste cannot be transported immediately because it must wait for transportation provided by the Denpasar City Government. If the garbage truck does not arrive for three days, the garbage will certainly accumulate at the TPS location. The accumulation of waste will cause deposition. With limited facilities, the TPS cannot transport its waste because it does not have a garbage truck. In addition, if drying has been done, the fertiliser produced from the waste is compost [14]. The compost fertiliser will be sold to the market so that TPS can earn money. Revenue from fertiliser sales is used for operational costs, but there are obstacles to marketing compost products. The constraints experienced in waste management require a sufficient budget. The funds owned by TPS are minimal, so it is not enough to solve these problems.

External constraints include the need for labour from the Denpasar City Government. If only relying on workers from Indigenous community members, it will be very insufficient and will not meet the achievement target daily. The volume of waste entering the TPS is vast, so it cannot be resolved with only a minimal number of workers. Therefore, support from the private sector is needed to provide labour assistance. In addition, help from the private sector is required to give shredders, pulverisers, and dryers. Another obstacle experienced at the TPS is the unavailability of supporting facilities such as motorcycles and cars and waste transportation trucks, both waste transported from households to TPS and from TPS to TPA. The facilities are minimal, and no vehicle is available for waste transportation. Some individuals take advantage of the situation by using motorcycles or private cars to transport waste from households to the TPS. Another obstacle is the absence of direct community involvement in sorting waste at home. Waste segregation at home done by community members is very important for TPS because TPS no longer does the waste segregation. If the waste sorting has been completed at the household level, the TPS will only process biodegradable waste, while the biodegradable waste will be transported directly to the landfill. So that the time available at the TPS to manage waste is adequate, and the destroyed waste will amount to more. The community's involvement in sorting waste at home can prevent the deposition of waste in TPS.

Air and environmental pollution occurs due to the accumulation of waste, leading to a high concentration of waste that cannot decompose quickly. This type of waste is no longer recyclable (refuse) as it has lost its primary function and economic value. There are three detrimental effects of waste on human life and the environment. Improper waste management in a particular area can spread harmful bacteria, leading to diseases like diarrhoea, cholera, and typhoid. These diseases are more likely to occur in slum environments where bacteria and viruses multiply rapidly. Dengue fever occurs when stagnant water from garbage becomes a breeding ground for mosquitoes, which can transmit dangerous diseases.

Additionally, poor hygiene can lead to the spread of skin diseases like fungus. Diseases found in farm animals can also be transmitted to humans through the food chain. For instance, if farm animals consume infected tapeworms, the disease

can enter their digestive system through food scraps or garbage.

Moreover, improper waste management can have negative impacts on the environment. Waste fluids seeping into the water can pollute it and cause various diseases and unpleasant odours. This can disrupt the development of organisms, such as fish, and harm multiple species. Changes in the biological ecosystem occur due to the decomposition of waste in water, producing organic acids and gases that can damage water hygiene levels. The impact of poor waste management will also affect the socio-economy in the community, among others:

1. The decline in human health directly results from environmental pollution, which is spreading rapidly. This affects our well-being and leads to increased financial burdens due to the rising costs of medical treatments.
2. Poor waste management hurts the environment and affects other essential infrastructures. For instance, polluted water requires costly treatments to restore its quality and remove non-decomposed waste.

The lack of storage facilities for waste will also certainly cause a social condition, namely that someone will often throw their garbage on the street carelessly because of the difficulty of finding a shelter. This will undoubtedly reduce comfort while in the neighbourhood.

Community participation is essential for the success of an applicable policy because humans are both an object and a subject of policy. One of the roles of the community is participation through the mass media; with technological advances like today, of course, the community can easily invite and disseminate a way of handling or managing the dangers of waste generation, which can cause various losses to the community, participation, in this case, includes a form of indirect participation so that with increasingly unlimited distance communication between people can be easily carried out.

The economy of Denpasar City has had its consequences, leading to an increase in population, higher incomes, and elevated consumption levels. As a result, there has been a significant rise in the amount of waste generated, which includes household waste, garbage in public areas, and industrial waste. The changing needs of individuals have also contributed to this increase in waste production daily. According to estimates from

the Strategic Plan of the Denpasar City Environment and Hygiene Service (RSDLHK), each person in Denpasar City produces approximately 4 litres of waste daily. Additionally, it is predicted that waste volume will further increase during major holidays such as *galungan* and *nyepi* brass, as well as during ceremonial events and other activities. Therefore, managing this waste effectively, especially during these periods, is crucial to prevent pollution and protect the environment.

The Denpasar city government has reduced waste by implementing various programs and initiatives. They have also encouraged community involvement through waste banks, which effectively manage and recycle waste materials. This helps maintain cleanliness in Denpasar City and has economic benefits. Additionally, establishing an integrated waste management site (TPST) is crucial in converting waste into biogas. These efforts contribute to a cleaner and safer environment in Denpasar City, ensuring comfort and security for its residents.

The community should use the available waste processing facilities to reduce or prevent waste generation, which aligns with the policy. The decision-making, implementation, and supervision processes in waste management and the guidance provided to the community are outlined in Article 30 § 1 of Regional Regulation 3 of Denpasar City in 2015. This regulation emphasises the importance of community involvement in addressing waste management issues. Furthermore, Article 35 of the local regulation highlights the active role that the community plays in waste management.

Waste management must be supported by all existing sectors, from the Government, the community, and the private sector [15]. Often seen in reality, the obstacle is the lack of coordination. It is not uncommon for cons against waste handling or even mutual indifference between one another to the problems that occur. The community has been allowed to make the best use of it, as it is crucial in addressing and resolving the waste management issues in Denpasar City. Such opportunities should be embraced, especially when combined with advanced technology. The active involvement of the community plays a significant role in enhancing the quality of their concern and support for public policies in the region. Receiving numerous complaints by an agency does not necessarily indicate a negative aspect. It could

signify the community's genuine concern, prompting the waste management organisers to improve and enhance their practices.

In Indonesia, the Government takes responsibility for ensuring security, welfare, comfort, and the fulfilment of human rights to health and a clean environment. The introduction of Regional Regulation No. 3 of 2015 has opened up opportunities for the community to actively participate in managing waste, from its creation and monitoring to environmentally friendly disposal. This has led to the establishing of waste banks and integrated waste management sites in Denpasar City. The findings of this study also play a crucial role in enhancing public awareness and understanding of waste management practices in Denpasar City.

CONCLUSIONS

Based on the discussion of the research results above, several conclusions can be drawn, including:

1. The effectiveness of waste management regulation in Denpasar is not yet optimal due to ongoing challenges in its implementation. These challenges are experienced by field officers in the Temporary Collection Points (TPS) and Waste Final Disposal Sites (TPST) managed by the Traditional Village in Denpasar. These challenges contribute to the ineffectiveness of waste management regulation in Denpasar.
2. Waste management challenges in Denpasar encompass internal and external factors. Internal difficulties in waste management in Denpasar include a shortage of workforce, lack of shredding and drying machines, inadequate facilities, fertiliser sales marketing, and a minimal budget. External challenges involve the need for a workforce from the Local Government of Denpasar, support from private entities, the lack of provided supporting facilities, community involvement in waste management, and insufficient financial assistance from the Denpasar City Government.

Based on the conclusions above, recommendations for waste management in Denpasar are as follows:

1. Waste management in Denpasar should be conducted professionally by the Denpasar City Government. The implementation can be facilitated through the creation of municipal regulations by the Mayor of Denpasar. Through these

regulations, the Mayor provides opportunities for private entities to invest in waste management in Denpasar. With investors involved, it is expected that all challenges faced by the Traditional Village in TPS and TPST can be addressed, especially those related to funding, machinery, and transportation needed in the field.

2. The challenges experienced by the Traditional Village, both internal and external, should be

promptly addressed by the Denpasar City Government. Considering the daily influx of waste into the TPS and TPST, urgent measures are needed to prevent waste accumulation and associated odours that may disrupt the activities of residents in the vicinity. Meeting the needs at TPS and TPST is crucial to prevent waste from accumulating.

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