

Waste management through the sanitary landfill system

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Abstract

Waste management is a public issue that requires comprehensive and sustainable government policy intervention. The Malang Regency Government has established Regional Regulation Number 2 of 2018 on Waste Management as the legal basis for efforts to control and reduce environmental impacts from waste generation. This study aims to analyze the implementation of waste management policies under Regional Regulation Number 2 of 2018 at the Talangagung Final Processing Site (TPA) in Kepanjen District, Malang Regency. This study uses a qualitative descriptive approach, with data collected through interviews, observation, and documentation. Data analysis was carried out through the stages of data reduction, data presentation, and conclusion. The analytical framework used refers to Edward III's policy implementation theory, which includes aspects of communication, resources, disposition, and bureaucratic structure. The results of the study indicate that waste management policies at the Talangagung TPA have been implemented but are not optimal. The main obstacles found are limited resources, a lack of coordination between agencies, and low community participation in waste management. However, the local government's commitment and the implementation of management innovations, such as the sanitary landfill system, are supporting factors in policy implementation. This research is expected to make academic contributions and offer practical recommendations to local governments for strengthening the implementation of sustainable waste management policies.

Keywords: Public policy, waste management, policy implementation, regional regulation no. 2 of 2018, talangagung landfill

Introduction

The increase in population density has led to higher waste volumes from these residents' activities. Furthermore, this is related to the community's increasing economic needs for survival, which, in turn, affects rising product demand from domestic and foreign companies. The results of this consumerism will give rise to activities that then produce household waste. According to Law No. 18 of 2008, waste is the residue of daily human activities and/or natural processes in solid form. Given the increasing population growth each year, it is directly proportional to waste production, especially in Malang Regency, where waste is a crucial issue across the region.

Population growth and rising consumption patterns have driven a significant increase in waste volume. The quality of public service provided by the Environmental Agency in managing waste from various sources at Final Processing Sites (TPA) is a challenge that must be addressed in urban waste management.

In terms of sustainable waste management, collaboration between the government and the community has a significant impact on the longevity of landfills by actively reducing waste and properly handling it. Damanhuri & Padi (2010) [3], Waste collection begins by collecting waste from each waste source to be transported to (1) temporary storage, (2) inter-regional waste management, or (3) can be transported directly to final processing. Waste from the source will be transported by officers using TPA operational vehicles, such as pick-ups and tricycles, and then leveled using heavy equipment in the TPA area. The use of heavy equipment during operational activities at the TPA plays an important role in planning the processing of incoming waste to ensure optimal processing. This heavy equipment is a key element in the process of transporting, filling, and compacting waste.

In practice, the 3Rs (Reduce, Reuse, Recycle) help reduce waste. This activity can reduce all factors that lead to waste

generation. This activity aims to reuse waste that is still usable by processing it into new products.

Through the Malang Regency Environmental Service as a policy agent holding central authority in managing the environment by controlling and preventing emerging problems. In this case, the manager of the Talangagung Landfill, namely the UPT PP Kepanjen in the PSLB3 Sector, needs innovative measures to control and manage incoming waste. Activities carried out include sorting, collecting, transporting, managing, and final processing of waste at the landfill. Waste management in the Malang Regency still relies on outdated methods and ideas. Waste management in rural areas mainly still uses the old method of collecting and disposing of, or collecting and then burning independently. At the same time, in urban areas, they still use the collect-transport-dispose method. However, due to the lack of land in urban areas, residents burn waste in random places. Waste management services by the Malang Regency Environmental Service require effective, efficient systems.

This research study examines the need to improve public and government understanding of waste management to improve the quality of services provided by the Malang Regency Environmental Agency (DLH). Technically, the sanitary landfill approach, widely adopted at the regional level, often suffers from deficiencies in drainage design, embankment management, leachate handling, and methane management. However, this research can recommend targeted policies and techniques for landfill managers and stakeholders.

The results of this research will provide the following objectives: to describe and analyze the implementation of waste management policies using the Sanitary Landfill system. To describe and analyze the driving and inhibiting factors in the implementation of waste management policies using the Sanitary Landfill system at the Talangagung Kepanjen Landfill, Malang Regency.

The research taken with the above theme will provide benefits that can be obtained, namely, theoretically, the thematic selection of this research is expected to provide new insights to academics and practitioners in developing educational studies based on the implementation of public policies on waste management with the Sanitary Landfill system at the Talangagung Kepanjen TPA, based on existing Regional Regulations. In addition, it can serve as a reference for further research by researchers who will take up similar themes—strengthening the theoretical framework of environmental policy implementation, especially by examining the relationship between regulations, institutional capacity, and management outcomes in the field. Practically, the benefits of this research for the Malang Regency DLH are to provide a case study contribution on the strategy for implementing waste management policies with the Sanitary Landfill system at the Talangagung Kepanjen TPA, Malang Regency and as evaluation material for the Environmental Service and TPA managers in assessing the effectiveness of the implementation of the sanitary landfill system and determining technical and operational improvement steps. Based on Regional Regulation No. 2 of 2018 concerning Waste Management, and as comparative material for similar research.

Literature Review

According to Damanhuri (2010) [3], waste is the waste produced by humans or animals, which can be solid, liquid, mud, or even gaseous. Malang Regency's regional policy regulations define waste as the solid waste of daily human activities and/or natural processes. Waste sources can come from various sources, such as household waste, market waste, office waste, tourist attractions, and many others. The term waste refers to organic and inorganic substances that are no longer useful and must be processed to prevent harm and disruption to activities or the environment (Kisworo, 2010).

According to the theory of Tchobanoglous and Kreith (1993), waste can cause complex problems, namely problems of aesthetics and comfort in activities, the leading causes of air, water, and soil pollution, and blockages in water channels and drainage.

Reviewing the concept of waste management under Malang Regency Regional Policy No. 2 of 2018, the existence of organized, systematic, and sustainable waste management activities will be ensured. In the process of waste management, an activity changes the characteristics of waste, thereby reducing the amount collected. The most important points in reducing and managing waste include limiting waste, recycling waste, and reusing waste with economic value.

Waste management at the Talangagung Kepanjen Landfill implements a Sanitary Landfill system. This final waste management system involves burying waste underground in a systematic, controlled manner, and in accordance with environmental standards, thereby preventing water, air, and soil pollution.

Waste has been a national issue for the past few years. The increase in waste generation is the source of the waste itself. Therefore, to achieve a healthy, waste-free environment, binding Regional Regulations have been established for integrated waste management from upstream to downstream through proportional, effective, and efficient arrangements, such as Regional Policy No. 2 of 2018 on Waste Management. In line with existing regulations, waste

management aims to create a waste-free environment, maintain environmental sustainability, and safeguard public health.

According to Regional Regulation No. 2 of 2018, waste is the remains of daily human activities. Waste itself arises from waste generation, meaning it first appears. Based on Malang Regency Regional Policy No. 2 of 2018, it explains the issues that can be addressed in waste management within the Malang Regency environment. This is in accordance with existing regional regulations, as part of the local government's responsibility to ensure cleanliness, health, and environmental sustainability.

Managing waste from start to finish involves the role of the government, business actors, and the community, and must be supported by the provision of facilities and infrastructure. Through the implementation of this policy, it is hoped that waste management will not only focus on disposal but also on controlling environmental impacts and increasing public awareness of independent waste management. The policy contained in Regional Regulation Number 2 of 2018 provides rules or SOPs (Standard Operating Procedures) in the waste management system at the TPA/TPST level (from upstream to downstream). Regional regulations that explain the flow of the waste management process serve as the primary legal basis for implementing the region's waste system. Through this Regional Regulation, the Regional Government will determine the duties and responsibilities, as well as the waste management mechanism covering technical, institutional, and financial aspects.

One of the landfills in Malang Regency is the Talangagung Landfill, located on Jalan Imam Bonjol, Talangagung Village, Kepanjen District, Malang Regency. The Talangagung Landfill operates Monday through Saturday, 8:00 a.m. to 3:00 p.m. WIB (Western Indonesian Time), with Sundays off. The Talangagung Landfill is a waste-processing facility that also serves as an environmental education center. It is designed not only to manage and recycle waste but also to provide insight and education about the importance of waste management and environmental protection.

As a final processing site, the Talangagung Landfill (TPA) is the final step in proper waste management. From initial transportation, through collection, and reprocessing, waste must comply with existing regulations. The existence of this landfill should reflect the government's efforts to provide organized waste management services to protect the environment and public health.

In addressing the growing volume of waste, it is necessary to apply the concept of Environmental Governance as a basic framework for institutional mechanisms, processes, and stakeholder interactions related to the management of natural resources and the environment. According to the United Nations Environment Programme (UNEP), Environmental Governance includes principles such as transparency of Regional Governments as policy implementers and service providers to the community, involving the public in waste processing, starting with independent waste sorting from waste generation sites. In this case, waste generation is defined as the place where waste is produced, namely, homes. Then, the government's commitment to account to the public for the use of resources. Environmental justice, which means treating the environment as the primary resource, requires policies to prevent overproduction that endangers the environment. The law enforcement process for violators of regulations that can

damage the environment, including the community and the government, is the responsibility of the rule makers. Coordination between institutions and sectors, as a form of collaboration between various parties, for example, the national and regional governments work together with the private sector in terms of funding, then collaborate with the media as a marketing trick, so that the public is aware of the latest news in environmental management.

Year-to-year political, social, and economic developments present new challenges for the public sector, particularly in this era of globalization, which demands effective, efficient public services. This situation has clearly encouraged the adoption of business-to-business management principles in the government context. Public management theory focuses on increasing the efficiency and effectiveness of public services by applying management principles commonly used in the private sector.

Management is a concrete action without any tangible form. In other words, management aims to achieve specific goals through various means, known as objectives (tangible objects). Management itself is the output of human effort (Terry, 2019, p. 5). The existence of general truths has explained the development of management theory. Causal relationships between management variables have been established as a form of generalization for research and adapted to new knowledge.

Method

1. Research Approach

By using a qualitative descriptive approach, the research is expected to provide a clear, factual, and in-depth picture of the research object. This approach is relevant because it aligns with the research objective of explaining social phenomena in terms of existing realities. Therefore, the research results can be scientifically justified, particularly in the waste management policy research process in Malang Regency.

2. Scope of Research

This research was conducted within a limited scope, namely government efforts to implement Regional Regulation Number 2 of 2018 on Waste Management, carried out by the Malang Regency Environmental Agency (DLH), specifically in the field of waste management at the Talangagung Final Processing Site (TPA). The location selection was based on data from the Malang Regency Environmental Agency and the Talangagung TPA. This topic remains a significant issue for the relevant agency as part of its service to the community.

3. Research Location

The locations to be studied are the Talangagung Landfill and the Malang Regency Environmental Service.

4. Research Focus

Based on the topic to be studied, namely Waste Management through the Sanitary Landfill System, in accordance with the Regional Regulation Number 2 of 2018 on Waste Management in Malang Regency, this study focuses on the main challenges in implementing policies and waste management.

5. Types and Sources of Research Data

The data sources used in this study are two (2), namely: primary data in the form of interviews and observation data

collected directly from the Talangagung TPA and the Malang Regency Environmental Service. This data was obtained from sources considered trustworthy regarding the primary data. In-depth interview techniques were used to conduct interviews with research subjects, focusing on parties directly related to the main problem. Secondary data are information from the literature used to support primary data derived from reading materials, documents, and research papers on the problems presented in this study.

6. Research Instruments

The instrument in qualitative research is the researcher themselves. Sugiyono (2013:305) states that "in qualitative research, the research instrument is the researcher themselves." Research instruments are used to support the operational steps of the research, especially those related to data collection techniques. Research instruments are tools used in the research process. This research uses various methods to collect data in order to obtain accurate and relevant information. The methods used in this study are observation, interviews, and documentation of informants.

7. Research Informants

In this study, informants were selected from various sources relevant to the research, particularly those related to waste management at the Talangagung Landfill, Kepanjen District, Malang Regency. The researcher's selected informants played an important role in gathering accurate information. Some of the primary informants in this study were the Head of the PSLB3 Division of Malang Regency (1 person), the Head of the UPT PP Kepanjen (1 person), the Head of the Talangagung Landfill, Kepanjen District (1 person), the Administrative Staff of the Talangagung Landfill (1 person), and the Field Supervisory Staff of the Talangagung Landfill (1 person).

8. Data collection technique

In this study, researchers used data collection techniques through interviews, observation, and documentation.

9. Data Analysis Techniques

In this study, the researcher used qualitative data analysis techniques according to the concepts of Miles and Huberman, collecting data directly in the field throughout the study. The analysis used was Data Triangulation from Observation, Documentation, and Interviews, by digging for the truth of certain information using data sources such as documents, archives, interview results, and observation results, or by interviewing more than one subject with a different point of view. Then, comparing the results of observations with interviews, and comparing the results of interviews with existing documents. Each of these methods will produce different evidence or data, which will then provide different views (insights) regarding the phenomenon being studied and will later be analyzed.

Results and Discussion

Result

1. Implementation of Policy Based on Regional Regulation Number 2 of 2018 Concerning Waste Management

Based on interviews with various sources within the Environmental Service at the Talangagung Landfill, it is evident that communication is an important aspect in implementing waste management policies at the

Talangagung Kepanjen Landfill. Communication is carried out in two ways, namely: offline communication. Communication between organizations and between policy implementers is evident in the way the Malang Regency Environmental Service directly conveys information, instructions, and implementation guidelines to the Kepanjen Waste Management UPT and the Talangagung Landfill managers. Information is delivered through regular coordination meetings, circulars, official memos, and online communication, which facilitate understanding and the execution of field activities. The sophistication of communication technology, through internal WhatsApp groups, also makes it easier for stakeholders within the Environmental Service and the Talangagung Landfill to exchange information quickly and in real time.

The resource aspect of the research results that have been conducted shows that this element in the implementation of waste management policies at the landfill includes: human resources, where the information obtained shows that the number of field officers, from garbage truck drivers to waste processing workers at the landfill, is considered not comparable to the volume of daily waste generation. The Head of the UPT said that the increase in population and community activities has led to an increase in waste volume, but adding workers cannot be done optimally because the recruitment process must comply with the ASN quota and the needs of casual daily employees from the local government.

Facilities and infrastructure indicate that the main waste management facilities, including the truck fleet, heavy equipment at the landfill, and waste-processing machines, are operating at or near capacity. The operational budget comes from the Regional Revenue and Expenditure Budget (APBD). However, the amount of the budget received is not always in line with operational needs, considering the costs of fleet maintenance, fuel purchases, and other operational needs continue to increase. Disposition, including the commitment, attitude, and willingness of policy implementers to carry out waste management tasks, significantly influences the effectiveness of policy implementation at the Talangagung Landfill. The bureaucratic structure shows that the implementation of waste management policies is influenced by work processes, task divisions, and coordination flows within the Malang Regency Environmental Agency. Based on field data, the bureaucratic structure of the Talangagung Landfill management has been arranged hierarchically, starting from the Environmental Agency as the policy authority, the Waste Management Technical Implementation Unit (UPT) as the regional operational implementer, and the Talangagung Landfill as the technical implementer of waste management at the final disposal site. This division of structures formally facilitates task delegation and the issuance of work instructions.

2. Driving Factors and Inhibiting Factors of Policy Implementation Based on Regional Regulation Number 2 of 2018 Concerning Waste Management

From the driving factors influencing the implementation of Regional Regulation Number 2 of 2018 on waste management, the research identified several internal factors that strengthened support for the policy's implementation at the Talangagung TPA.

First, a strong legal framework underpins the planned program, ensuring its implementation with a clear direction.

Implementers can work safely and confidently because waste management policies comply with SOPs. Second, the organization operates effectively because the work structure is clearly divided between the Environmental Agency, the Waste Management Technical Implementation Unit (UPT), and the landfill management. This clear division of tasks facilitates operational and administrative coordination. Third, the quality of competent human resources, although still lacking in number compared to the high workload, can be optimized to drive policy implementation activities, as seen from the commitment of field officers, heavy equipment operators, and managers who continue to maintain the smooth running of activities despite limited facilities.

Fourth, the government's optimally managed operational budget supports management activities, such as fuel provision, heavy equipment maintenance, and administrative support. This is even though existing facilities and infrastructure are often damaged and require extensive maintenance. Fifth, the organizational culture within the UPT and TPA is quite positive, as evidenced by staff solidarity and the desire to maintain the TPA's status as a model facility in Malang Regency.

Overall, these internal factors form the foundation for effective policy implementation. Work commitment, structural support, and staff's emotional attachment to their responsibilities provide a strong impetus for waste management efforts, even though they are not entirely free from challenges in the field.

Based on research findings from interviews, observations, and documentation, internal strengths and external factors both positively influence policy implementation. First, support from cross-agency agencies, such as the Education and Health Departments, is provided in collaboration with the Environmental Agency. Inter-agency coordination positively impacts the smooth implementation of waste management policies. Second, private-sector and waste bank participation provides added value by reducing the volume of waste sent to landfills through recycling and source reduction processing.

Third, regional political and bureaucratic support, such as government attention through policy priorities and budgeting, has contributed to the development of waste management capacity at the Talangagung Landfill. Fourth, support from communities and educational institutions, particularly through educational visits and waste literacy activities, has helped raise public awareness of the importance of waste management.

These external factors show that policy implementation does not rely solely on internal institutions but also on relationships among social actors, which help strengthen the waste management system in Malang Regency.

Internal barriers arise from limitations within the implementing organization. Based on observations and interviews, three key points were found to be the most influential:

The first finding was limited facilities and infrastructure. Some heavy equipment, such as bulldozers and excavators, experienced functional decline due to long service life, but replacement units were not readily available. Second, the number of workers was not commensurate with the operational workload, especially when waste volumes increased. Limited human resources also impacted the inconsistent implementation of standard operating procedures (SOPs) across all areas.

Budget support remains a priority, so urgent needs may not be addressed quickly because they depend on agency approvals and procurement processes. Another internal factor relates to the distribution of authority. Although the organizational structure is clear, not all decisions can be made directly by landfill managers, so some technical actions must await higher-level instructions, which causes delays in fieldwork implementation.

Through field research, researchers highlighted several external environmental barriers. The biggest obstacle is the lack of public awareness about sorting waste at the source, resulting in much of the waste arriving at the landfill being mixed. This increases the sorting workload and accelerates landfill accumulation. Furthermore, fluctuations in waste volume due to seasonal fluctuations, economic activity, and population growth require landfill operations to adjust their intensity without adequate additional resources.

Another obstacle stems from the waste collection system's reliance on local government fleets. If there are technical problems with the trucks or access roads, waste delivery to the landfill is hampered. In some areas, awareness of local waste management among village and sub-district governments remains uneven, leaving landfills as the sole solution without upstream reduction efforts.

Discussion

1. Implementation of Policy Based on Regional Regulation Number 2 of 2018 Concerning Waste Management

The research results indicate that communication between policy implementers has been ongoing through coordination meetings, technical instructions, and the dissemination of SOPs from the Environmental Agency to the Technical Implementation Units (UPT) and Landfills (TPA). However, in practice, information transmission has not been entirely equitable. Information clarity is inconsistent, particularly when transportation schedules change, management systems shift, or waste-sorting regulations are disseminated to the public. Consistency of information is also still disrupted because instructions sometimes change based on field conditions without prior socialization, requiring spontaneous adjustments by field implementers. These findings indicate that the biggest obstacle to communication indicators lies in the clarity and continuity of information, even though formal communication channels are in place.

Existing field resources remain a significant obstacle to successful policy implementation. The fleet of trucks is inadequate for the number of service routes, heavy equipment at the landfill is limited, and supporting facilities, such as safety equipment and operational areas, still need improvement. In terms of human resources, the number of personnel is not commensurate with the volume and daily workload, leading to operational fatigue and delays. Budgetary support for equipment maintenance, staff capacity building, and operational facility upgrades is also inadequate. Thus, according to Edward III's theory, good policies are challenging to implement due to limited financial, human, and technical resources.

The study found that policy implementers' attitudes toward waste management demonstrated a strong commitment. Field officers, heads of technical implementation units (UPTs), and landfill managers demonstrated a strong understanding and a willingness to fulfill their duties in accordance with policy targets. However, differences in

motivation levels persisted due to high workloads, limited facility support, and a suboptimal performance-reward system. Although implementers demonstrated dedication and concern for the environment, there were no sustainable motivational tools such as regular training, incentives, or career development. This suggests that dispositional indicators are generally positive but require strengthening to become key drivers of successful policy implementation.

The bureaucratic structure for policy implementation has been established through the division of authority between the Environmental Agency, the Waste Management Technical Implementation Unit (UPT), and landfill officials. Operational standard operating procedures (SOPs) are also in place to support implementation. However, field research has found that SOP implementation is not entirely consistent due to often suboptimal conditions, such as excessive waste volume, equipment failure, or extreme weather.

2. Driving Factors and Inhibiting Factors of Policy Implementation Based on Regional Regulation Number 2 of 2018 Concerning Waste Management

Internal driving factors in the implementation of waste management policies have contributed positively to the operational sustainability of the Talangagung Landfill. These internal factors include institutional factors, human resource capacity, budget support, and organizational culture. These four aspects interact and strengthen policy implementation, although some technical challenges remain in the field.

The factors mentioned above, when linked to Edward III's policy theory, emphasize that policy implementation is heavily influenced by the adequacy of resources, including human, material, and non-material resources. When resources are available and well managed, policy implementation can proceed effectively even in challenging operational environments. In the context of this research, competent human resources and a supportive organizational culture are a crucial combination that strengthens the implementer's ability to achieve policy objectives.

In addition to internal factors, successful policy implementation is driven by external factors. The three external factors that contributed most significantly were private-sector collaboration, the presence of environmental communities, and the media's role. All three synergize and act as catalysts to accelerate the realization of policy objectives.

While there is a push for success in the policy implementation process, obstacles can become stumbling blocks. Internal inhibiting factors include limited facilities and infrastructure. In addition to internal inhibiting factors, there are also external inhibiting factors, namely, the results of the study indicate that one of the most significant external obstacles in the implementation of waste management policies is the still low level of community participation in supporting waste programs, both at the stage of waste sorting, household waste reduction, and payment of waste service fees.

Conclusion

Based on the results of research and discussion regarding the implementation of waste management policies through the sanitary landfill system at the Talangagung Landfill, Kepanjen District, Malang Regency, it can be concluded that the implementation of Regional Regulation Number 2 of 2018 has been running but is not yet fully optimal. The

policy's implementation has demonstrated the local government's commitment to managing waste more sustainably through the sanitary landfill system, particularly in technical areas such as waste compaction, leachate control, and methane gas management.

Viewed from the perspective of George C. Edward III's policy implementation model, the policy communication aspect has been quite successful through coordination among relevant agencies. However, there are still obstacles to the consistency of information delivery down to the technical implementation level and within the community. The resource aspect is a major inhibiting factor, including limited infrastructure, a shortage of competent technical personnel, and budgetary support that is not yet fully adequate to sustain the landfill's operations. In terms of disposition, the attitude and commitment of implementing officials are relatively positive, but not yet fully supported by a strong incentive and oversight system. Meanwhile, the bureaucratic structure has been formally established, but cross-sector coordination still needs to be strengthened to achieve more effective, integrated policy implementation.

The main supporting factors in implementing this policy are a clear regulatory framework, local government support, and innovative landfill management as a center for environmental education. Conversely, low public participation in waste sorting at source, limited resources, and weak oversight are significant inhibiting factors. Therefore, the success of waste management through a sanitary landfill system depends not only on technical aspects but also on strengthening institutional capacity, increasing community participation, and fostering stakeholder synergy.

Overall, this study confirms that implementing waste management policies at the regional level is a complex and multidimensional process. Optimizing the implementation of the sanitary landfill system at the Talangagung Landfill requires a more holistic, sustainable, and participatory policy approach to achieve effective, environmentally sound waste management and contribute to improving the quality of public services and environmental sustainability.

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