

Institusional Preparedness in Waste Management During Crisis Situations

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Abstract: Waste management during crisis situations presents a significant challenge that necessitates robust, coordinated, and adaptive institutional preparedness. The increased volume of waste due to natural disasters, pandemics, and other emergencies can exacerbate public health risks and environmental degradation if not managed effectively. This study aims to analyse the level of institutional preparedness for waste management in Indonesia, focusing on institutional mechanisms, implementation challenges, and strategies for strengthening governance in crisis situations. A qualitative approach employing a case study design was utilised, involving primary data collection through in-depth interviews with key stakeholders and secondary data from policy documents and institutional reports. Data analysis was conducted using a thematic approach to identify coordination patterns, resource capacity, and risk management practices. The findings indicate that institutional preparedness faces significant obstacles, including weak inter-agency coordination, limited resources, and suboptimal utilisation of information technology in waste management. Nevertheless, collaborative practices, the application of risk-based approaches, and increased community participation are shown to have the potential to strengthen the resilience of waste management systems. This study concludes that enhancing collaborative governance, consistent policy support, and institutional capacity building are essential prerequisites for achieving effective and sustainable waste management in crisis situations.

Keywords: *institutional preparedness, waste management, crisis situations, governance, risk management*

I. Introduction

Waste management stands as one of the primary challenges faced by many countries, including Indonesia. In crisis contexts—whether due to natural disasters, pandemics, or other emergencies—the institutional preparedness for waste management becomes critically important. According to the United Nations Environment Programme (2021), poorly managed waste can worsen the impacts of crises and jeopardise public health and the environment. This underscores that waste management is not merely a cleanliness issue but is closely linked to public health, environmental sustainability, and community resilience in facing crises.

Data from the World Bank (2021) indicates that Indonesia generates approximately 67.8 million tonnes of waste annually, with only around 60% being effectively managed. This figure reflects the substantial challenges confronting Indonesia's waste management system, particularly during crisis situations. In the context of natural disasters, such as floods or earthquakes, the volume of waste can increase significantly, creating additional challenges for both government and communities. For instance, during the major floods that struck Jakarta in 2020, vast amounts of waste were swept away, leading to serious pollution issues that required rapid responses from various stakeholders.

Thus, understanding how institutions can adapt and respond to crisis situations is vital for ensuring effective waste management. Institutional preparedness encompasses various aspects, from planning and organisation to implementation and evaluation. In this regard, collaboration among institutions—government, private sector, and communities—becomes key to establishing a resilient and responsive waste management system in times of crisis.

This research aims to explore institutional preparedness for waste management in Indonesia, focusing on existing mechanisms, challenges faced, and potential solutions. Various policies will be discussed, alongside their implementation in the field and the role of the community in supporting sustainable waste management. For instance, source reduction programmes initiated by local governments can serve as concrete examples of how communities can be engaged in improving waste management practices.

Through this analysis, it is hoped that deeper insights will be gained regarding the importance of planning and risk management in waste management, particularly in crisis contexts. The study will also examine existing policies and their field implementation, as well as the community's role in supporting sustainable waste management. Consequently, this research aims to significantly contribute to the development of waste management policies in Indonesia.

To achieve this goal, it is crucial to delve deeper into various factors influencing waste management, including social, economic, and environmental aspects. For example, in the context of health crises like the COVID-19 pandemic, the increased use of single-use materials and medical waste presents new challenges that must be addressed. Therefore, this study will explore how waste management policies can be adapted to meet emerging needs in crisis situations and how communities can actively participate in these efforts.

Effective waste management in crisis situations is not solely the responsibility of the government; it also requires the involvement of all societal layers. Community awareness and participation in waste management can be decisive in creating a clean and healthy environment. Therefore, it is essential for all parties to collaborate and commit to sustainable waste management efforts, ensuring a better future for generations to come.

II. Theoretical Framework

The theoretical framework employed in this study centres on the concepts of risk management and sustainability in waste management. In today's modern era, characterised by rapid urbanisation and population growth, the challenges faced in waste management have become increasingly complex. Beck (2021) posits that risk societies encounter diverse challenges related to risk management, including environmental risks stemming from ineffective waste management. This illustrates that waste management is not merely a technical issue but also a social and environmental concern requiring serious attention. In this context, developing strategies that assist institutions in identifying, evaluating, and managing risks associated with waste management is crucial.

One relevant theory within this framework is the governance theory, which emphasises the importance of collaboration among various stakeholders in resource management. Gencer (2021) explains that effective governance in waste management necessitates the involvement of government, private sector, and communities to achieve sustainable outcomes. For instance, in several waste management programmes in developed countries, community involvement in recycling initiatives has proven effective in reducing waste generation. Such collaboration not only enhances efficiency but also fosters a sense of ownership among communities regarding their environment. Furthermore, involving diverse parties allows for more comprehensive information gathering for decision-making, resulting in more targeted solutions.

In crisis situations, this collaboration becomes even more critical to ensure a swift and effective response to increased waste volumes. For example, during the COVID-19 pandemic, many regions experienced a significant surge in medical waste. In such conditions, cooperation between government entities, hospitals, and waste management companies became crucial to ensure that medical waste was disposed of safely, mitigating public health risks. This situation illustrates that without good governance and close collaboration, the impacts of crises can become exacerbated and more challenging to manage.

In this context, a risk-based approach is also essential. Wicaksono and Setyowati (2023) assert that risk-based planning in waste management can aid in mitigating crisis impacts. This approach involves identifying potential risks, assessing impacts, and developing appropriate mitigation plans. For instance, by conducting risk analyses on various types of waste, managers can plan necessary steps to reduce the negative impacts of such waste. This encompasses not only solid waste management but also liquid and gaseous waste, each posing distinct environmental risks.

By understanding this theoretical framework, this study aims to explore how institutions can apply these principles in waste management in Indonesia. Given Indonesia's significant waste management challenges, the application of risk management theory and good governance can serve as effective solutions. For example, programmes involving

community participation in waste management, such as waste banks, have shown positive results in reducing the amount of waste sent to landfills.

Thus, the theoretical framework discussed provides a strong foundation for understanding the dynamics of waste management in Indonesia. Through the application of risk management principles and good governance, it is anticipated that waste management can be conducted more effectively and sustainably. This research is expected to contribute significantly to the understanding and practice of waste management in Indonesia, serving as a reference for better policies in the future.

In conclusion, the theoretical framework focusing on risk management and sustainability in waste management is crucial for addressing the complex challenges in the current context. By engaging various stakeholders and applying a risk-based approach, waste management can be conducted more effectively and sustainably. This research not only aims to explore existing theories but also to apply them in real practices in Indonesia, thereby providing beneficial solutions for communities and the environment.

III. Methodology

The methodology employed in this study adopts a qualitative approach, focusing on case study analysis. This approach was selected as it provides a deeper understanding of the dynamics of waste management in local contexts. Data collection involved in-depth interviews with various stakeholders, including government officials, waste managers, and community members. The interview process aimed not only to gather factual information but also to understand the perceptions, experiences, and challenges faced by each stakeholder in waste management.

In-depth interviews allow researchers to extract richer information and nuances that may not emerge through other data collection methods. For example, when speaking with government officials, researchers can inquire about the policies implemented and their impacts on communities. In this regard, researchers can identify gaps between policy and field implementation. Conversely, interviews with waste managers can provide insights into operational challenges they face, such as resource limitations or lack of government support. Meanwhile, interviews with community members can reveal how they perceive the impacts of existing waste management policies and their hopes for future improvements.

In addition to interviews, document analysis is also a significant component of this methodology. The documents to be analysed include existing policies and their implementation in the field. By analysing policy documents, researchers can assess the extent to which these policies are implemented and whether discrepancies exist between what is written and the actual realities. For instance, if a policy states that waste management should be conducted in an integrated manner, researchers can verify whether all stakeholders, from government to community, are collaborating in practice. This analysis is crucial for understanding the broader context and providing evidence-based recommendations.

Primary data sources will be obtained through interviews with key informants at various levels of government and non-governmental organisations involved in waste management. These key informants are selected based on their experience and knowledge in the field of waste management. This ensures that the data collected is relevant and representative. Secondary data will also be gathered from policy documents, annual reports, and relevant statistics from the Central Statistics Agency and the Ministry of Environment and Forestry. This secondary data will provide additional context and support the analysis conducted based on primary data.

In the data analysis process, a thematic approach will be employed to group the data obtained based on themes relevant to institutional preparedness in waste management. This thematic approach allows researchers to identify patterns and relationships between various aspects related to waste management. For instance, researchers may discover recurring themes related to the lack of coordination among government agencies, which could be a hindrance to effective waste management. The results of this analysis are expected to provide a clear picture of existing challenges and opportunities, as well as recommendations for future improvements.

In conclusion, the methodology applied in this study is designed to provide a comprehensive understanding of waste management. By combining in-depth interviews, document analysis, and thematic approaches, this research aims to uncover the challenges faced by various stakeholders and provide evidence-based recommendations for future

improvements. Through this approach, it is hoped that the research findings can significantly contribute to the development of more effective and sustainable waste management policies in Indonesia.

IV. Data analysis and discussion

In the in-depth data analysis concerning waste management, it is essential to delve deeper into the challenges faced by institutions, especially in crisis contexts. Effective waste management is not solely an environmental issue but is also a critical aspect of public health and sustainable development. In this regard, the primary challenge that often arises is the lack of coordination among relevant agencies. According to the report by the Ministry of Environment and Forestry (2022), many regions in Indonesia still struggle to integrate various existing waste management programmes. This misalignment can lead to overlapping functions, where agencies that should collaborate end up neglecting their respective responsibilities. This potential creates significant inefficiencies in management, resulting in available resources not being optimally utilised.

For instance, in several areas, one agency may be responsible for waste collection, while another manages recycling and waste processing. The ambiguity in task division often leads to confusion in the field. For example, if the collection agency does not coordinate with the processing agency, waste that should be recycled may end up in landfills. This situation not only harms the environment but also hinders efforts to achieve more sustainable waste management targets. To address this issue, it is crucial for local governments to establish better coordination mechanisms, such as forums or communication networks among agencies that can strengthen collaboration.

In addition to the lack of coordination, another significant issue is the limitation of resources. The National Development Planning Agency (2020) notes that the budget for waste management in many regions remains severely constrained. This limitation encompasses not only financial resources but also human resources and adequate infrastructure. In emergency situations, such as natural disasters, the volume of waste often increases suddenly and exponentially. If regions do not have sufficient budgets to manage this surge, the consequences can be dire. For example, following a natural disaster, unmanaged waste piles can create larger public health issues, such as the spread of diseases.

A concrete example can be seen in Banyumas Regency, where despite efforts to enhance waste management, challenges persist. According to data from the Banyumas Central Statistics Agency (2023), the level of waste management in the region remains below the expected standards. This indicates that despite political will and programmes designed to improve management, implementation on the ground still faces numerous obstacles. With low management levels, the community in Banyumas Regency is at risk of experiencing negative impacts from inadequate waste handling, including environmental pollution and health issues.

In facing these challenges, several regions in Indonesia have begun to implement innovative approaches to waste management. One intriguing example is the application of information technology in waste management. According to an OECD report (2020), the use of information systems can aid in monitoring and evaluating waste management. This technology allows for real-time data collection, which can facilitate coordination among agencies. For instance, by using location-based applications, the community can report waste pile locations, which can then be accessed by waste management agencies for prompt follow-up.

Moreover, information technology can also be employed to enhance transparency in budget management. With systems that enable the community to view how funds for waste management are utilised, better accountability can be established. This is crucial for building public trust in the agencies responsible for waste management. Communities that feel engaged and have access to information are more likely to actively participate in waste management programmes, such as recycling initiatives or plastic waste reduction efforts.

However, the implementation of information technology does not automatically resolve all issues. Training and capacity building for waste management personnel are also necessary to ensure that they can effectively utilise this technology. Skills in using software and information systems should be part of standard training for waste management staff. Additionally, it is essential to ensure that the infrastructure supporting this technology is available and functioning properly.

In conclusion, effective waste management in crisis situations requires a holistic and integrated approach. Challenges such as the lack of coordination among agencies and resource limitations must be addressed with better strategies, including the application of information technology and institutional capacity building. With these measures, it is hoped that waste management in various regions of Indonesia can be enhanced, enabling better responses to emergency situations. This is not only important for environmental preservation but also for protecting public health and creating better sustainable development in the future.

V. Conclusions and Recommendations

In response to the increasingly complex challenges associated with waste management, it is essential to formulate comprehensive and integrated recommendations. Waste management is not merely an environmental issue; it also pertains to public health, economic stability, and sustainability. Therefore, a holistic and coordinated approach is crucial to enhance institutional preparedness in addressing this matter. By considering the various challenges and opportunities present, the following recommendations aim to provide a clear direction for improved waste management practices in Indonesia.

Firstly, enhancing coordination among institutions is a fundamental step in ensuring that waste management programmes are effectively integrated. Effective coordination can prevent programme overlap and optimise the use of available resources. Establishing a coordination forum that includes various stakeholders—such as local government, non-governmental organisations, and the community—is vital. For instance, in countries like Japan, such forums have proven effective in unifying diverse waste management initiatives, facilitating collaboration and information exchange (Yoshida et al., 2020). Through these forums, institutions can share data, experiences, and best practices, which in turn will enhance the effectiveness of waste management programmes.

Secondly, increasing the budget for waste management should be a priority in regional development planning. Without adequate financial support, efforts to improve waste management during crises will be severely limited. The National Medium-Term Development Plan (RPJMN) 2020–2024 should include waste management as a primary focus. This is crucial, as effective waste management requires investments in infrastructure, human resource training, and educational campaigns. For example, in Sweden, the government allocates a significant budget for waste management, resulting in a highly efficient recycling system and a reduction in the volume of waste sent to landfills (Hogg et al., 2019). Thus, appropriate budget allocation will significantly influence the success of waste management programmes.

Thirdly, the adoption of information and communication technology (ICT) in waste management must be encouraged. By leveraging technology, waste management can be conducted more efficiently and responsively to changing circumstances. The use of applications for reporting and monitoring waste management can enhance transparency and accountability. For instance, in several major cities worldwide, mobile applications have been employed to enable residents to report waste management issues, such as full bins or unscheduled collections. This not only accelerates response times but also increases community participation in waste management (Bertin et al., 2021). Therefore, investment in information and communication technology should be an integral part of a modern waste management strategy.

Fourthly, education and community engagement are also critical. The community needs to be involved in the waste management process, especially during crises. Educational programmes that emphasise the importance of waste reduction and recycling can help decrease the volume of waste generated. For example, educational campaigns in various countries have demonstrated that raising community awareness about the significance of waste reduction can alter their waste disposal behaviours (Schmidt et al., 2020). Through these programmes, individuals are not only taught how to sort waste but are also encouraged to participate in waste management activities, such as recycling communities or waste banks. By engaging the community, waste management can become a shared responsibility that is more effective.

Finally, further research is required to explore best practices in waste management across different regions. By understanding what has been successful elsewhere, institutions in Indonesia can adopt more effective strategies to enhance preparedness in waste management. This research should include in-depth analyses of policies, technologies, and practices implemented in other countries, as well as their impacts on waste management. For instance, a study conducted by Pires et al. (2019) indicated that the implementation of community-based waste management policies in several developing countries has successfully reduced waste volume and increased community participation. Thus, ongoing research will provide valuable insights for the development of improved waste management policies in Indonesia.

In conclusion, effective waste management necessitates an integrated and collaborative approach. Enhancing coordination among institutions, ensuring adequate budget allocation, adopting information technology, engaging the community, and conducting continuous research are key steps that must be taken. By adopting these recommendations, it is anticipated that waste management in Indonesia can be significantly improved, thereby not only reducing negative environmental impacts but also enhancing the quality of life for its citizens. Through collective efforts and strong commitment, Indonesia can serve as a model for other countries in sustainable and effective waste management.

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