

Environment Agency Strategy for Waste Management in Karimun Regency

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Abstract. This study aims to describe and analyze the strategies implemented by the Environmental Agency (DLH) of Karimun Regency in managing waste and to evaluate the effectiveness of these implementations in the field. Employing a qualitative descriptive approach, data were collected through in-depth interviews, observations, and document reviews. Findings reveal that DLH Karimun has developed and executed key strategies, including the formulation of the Regional Waste Management Master Plan (RIPSD), optimization of Temporary Waste Disposal Sites (TPS) with 3R principles, active collaboration with waste banks and community groups, and community-based education and socialization efforts. However, operational challenges persist, particularly in waste transportation fleet distribution, handling of the Sememal Final Disposal Site (TPA), and monitoring and evaluation mechanisms that remain suboptimal. Additional challenges include limited human resources and funding, low public awareness, and regulatory conflicts impacting strategic decision-making. Nevertheless, the strategies implemented have contributed to improvements in environmental cleanliness across several sub-districts and increased volumes of processed waste through recycling initiatives. Community involvement through schools, youth organizations, family welfare groups, mutual cooperation activities, and waste banks proved critical to success. The study recommends the adoption of digital-based waste management systems (smart waste management), capacity building for DLH personnel, community empowerment, and revision of local regulations to support sustainable waste management. This will enhance the effectiveness and sustainability of DLH Karimun's waste management strategies moving forward. The findings provide valuable insights for policy formulation and practical implementation in similar regional contexts.

Keywords: Community empowerment, Environmental Agency, Waste management, Strategy

1 Introduction

A clean and healthy living environment is the foundation of every human being. However, along with the development of the times and population growth, environmental problems are increasingly complex, especially in terms of waste management. Waste that is not managed properly can cause various negative impacts, such as soil, water, and air pollution and reduce the quality of life of the community. Therefore, waste management is one of the important aspects in maintaining environmental sustainability.

The term "strategy" in the context of the Environment Agency refers to a series of actions that are systematically planned and implemented by the agency to realize the goals of optimal and efficient environmental management and conservation. This strategy includes the identification of environmental problems, the determination of program priorities, and the involvement of various parties such as the community, the business world, and local governments. With a directed and sustainable approach, this strategy is expected to be able to create a balance between development and environmental sustainability.

The Environment Agency has an important role in preserving the environment. This institution is tasked with assisting local governments in formulating technical policies, controlling pollution and preventing environmental damage. In addition, this agency also manages waste, hazardous waste and helps environmental quality in an organized manner. Its role includes law enforcement, community guidance, and coordination of nature conservation programs. Thus, the Environment Agency contributes to realizing sustainable development and a healthy environment for the community [2].

Waste management in Indonesia in general still faces various challenges, especially in areas with rapid population growth and limited waste management facilities. In Karimun Regency, the waste management situation has become a serious problem that is increasing along with the population growth in Karimun, causing the accumulation of waste in several locations, including in the Sememal Final Disposal Site (TPA) which is now full and cannot be managed properly due to damage to heavy equipment needed to clean up waste. This condition shows that waste management in Karimun Regency cannot only depend on existing facilities, but also requires long-term planning. One form of planning can be to invest in more modern and efficient waste management technology, such as automatic sorting systems, large-scale composting or the use of energy from waste. This needs to be considered so that problems such as damage to heavy equipment or the accumulation of waste in landfills do not continue to recur in the future. In addition, waste management in Karimun is still hampered by limited facilities and infrastructure, such as transportation fleets that often suffer damage and lack of adequate facilities at the sub-district level [8].

The special challenges faced in waste management in Karimun Regency include the limited fleet of garbage transportation which results in accumulation in several locations, as has happened due to the lack of fleet and the strike of cleaners due to late payment of salaries. In addition, low community participation in waste sorting is also a major obstacle, because waste sorting is an important requirement for all waste management technologies, but the less promising economic value of composting reduces public interest in active participation. The ineffectiveness of the existing management system can also be seen from regulations that are not strong enough and adequate management to overcome this problem comprehensively [11]. In addition to technical problems and applicable rules, cultural factors and community habits also affect the success of waste management. Many people are still used to littering or not sorting household waste. Therefore, a better and sustainable approach is needed, such as education, the use of social media, and community empowerment through waste bank programs or simple recycling at the household level.

The Karimun Regency Environmental Agency (DLH) has the responsibility to support the Regent in carrying out some government affairs related to the environment, including waste management and environmental conservation in a sustainable manner. The functions of the Environment Agency include the prevention of the exploitation of natural resources, pollution control and the enforcement of

environmental laws in Karimun Regency in terms of waste management, the Environment Agency is tasked with managing waste starting from the stage of collection, transportation, to final processing and ensuring that environmental cleanliness and health are maintained. In addition, DLH also plays a role in providing education to the public about the importance of good waste management and the application of the reduce, reuse, recycle (3R) principle. This effort aims to foster collective awareness and encourage active community participation in preserving the environment.

This study aims to identify waste management strategies implemented by the Environment Agency (DLH), analyze the effectiveness of the implementation of these strategies, and provide recommendations that can strengthen waste management policies. By emphasizing the role of the Environment Agency in integrated waste management, this study is expected to provide a comprehensive overview of the obstacles, challenges, and opportunities in sustainable waste management, so as to support the improvement of the quality and effectiveness of waste management in the study area. In addition, the results of this study can also be a reference for policy makers in formulating strategies that are more adaptive to field conditions, as well as some evaluation materials for related agencies in improving existing systems.

The importance of a waste management strategy not only has an impact on the aspect of environmental cleanliness but also affects public health, the beauty of the city, and the quality of life in general, if managed properly, waste can even become a valuable resource, such as compost or recycling raw materials, therefore a comprehensive and sustainable strategy is needed so that waste management in Karimun Regency not only solves current problems, but also able to face future challenges.

2 Research Methods

NaturalThis research uses a qualitative research approach, according to [13] Qualitative research methods are an approach based on the philosophical view of postpositivism and are usually applied to study objects in natural situations, not in experimental settings. In this method, the researcher acts as the main instrument. The selection of data sources was carried out deliberately (purposive) and developed through the snowball technique which aims to describe the strategy carried out by the Karimun Regency Environment Agency in waste management. This research was conducted at the Karimun Regency Environment Office, which is located on Jalan Jendral Sudirman, Poros, Karimun Regency, Riau Islands.

Data collection is carried out through various methods (triangulation), and the data analysis is inductive or qualitative. The results of this study focus more on understanding meaning than on trying to make generalizations. Data collection was carried out through various methods, including in-depth interviews, document or documentation studies, and direct observation in the field. This research is focused on policies implemented by the Environment Agency, especially in the Field of Waste and Waste Management B3. The research activity lasted for four months, starting from March to June. The main subject in this study is the Head of Waste and Waste Management B3.

In this study, the author is fully involved from the selection of topics to the analysis and interpretation of data. The data collection process is supported by interview guidelines, field observation results and documentation studies. Interview data is then analyzed, techniques. Data collection is the key to obtaining valid information, because without mastery of this technique, the data obtained will not meet research standards.

3 Result and Discussion

Risk The strategy carried out by the Karimun Regency Environment Agency (DLH) in waste management is an integrated and sustainable systematic effort, including several main strategic steps. The preparation of the Regional Waste Management Master Plan (RIPSD) is the foundation in determining the direction and priorities of waste management comprehensively, referring to regional conditions and community needs. This RIPSD is a guideline for program implementation, infrastructure development, and the necessary human resource arrangements. In addition, the optimization of the role of the *Reduce, Reuse, Recycle* (TPS 3R) Waste Treatment Site is carried out as a technical step to reduce the volume of waste and maximize the reuse of waste as a resource. This 3R principle has proven effective in several areas, such as Cimahi City, where the Environment Agency has succeeded in reducing waste generation by implementing the same strategy [5]. DLH Karimun also encourages collaboration with waste banks and the community as important actors in waste management. Community involvement, including community groups, schools, and youth organizations, is an integral part of this strategy. Community-based education and socialization are carried out on an ongoing basis to increase public awareness and participation in maintaining environmental cleanliness. As happened in Samarinda City, where the Environmental Agency issued an appeal for "Save Waste" which was socialized from the sub-district to RT levels to regulate community behavior in waste management [12].

The implementation of this strategy in the field faces a number of operational challenges. The limited distribution of the garbage carrier fleet is the main obstacle in reaching the entire Karimun Regency area effectively. This is similar to the condition in Mimika Regency which indicates the lack of a waste transportation fleet as the main inhibiting factor in the effectiveness of waste management [6]. The handling of the Sememal Final Disposal Site (TPA) is also a critical point, where the availability of facilities and uncertain transportation schedules affect the smooth running of waste management as a whole. This problem is also reflected in the evaluation of the implementation of waste management in various regions which shows the limitations of adequate infrastructure and TPS facilities [4]. The monitoring and evaluation mechanism implemented by the Karimun Environment Agency seeks to ensure that the program runs as planned, although it still needs to be strengthened in terms of data and formal procedures to ensure the sustainability of waste management. Therefore, cross-sectoral collaboration, including with the community and the private sector, is needed to support the availability of transportation facilities and sustainable landfill management. In addition, increasing human resource capacity and utilizing information technology in the collection and analysis of operational data can be a strategic solution to strengthen the implementation of waste management programs in the field.

Another challenge faced by the Karimun Environment Agency is related to limited funds and human resources (HR). Budget limitations result in the non-optimal procurement of supporting facilities and the development of competent human resources. This is in line with conditions in other areas that also face similar problems, thus having an impact on the quality of waste management [14]. In addition, low public awareness of the importance of waste management is a serious obstacle, where active participation in waste management is still not optimal. Regulatory conflicts and delays in decision-making also make it difficult to coordinate between stakeholders, so program implementation is sometimes untimely and ineffective. This situation is exacerbated by the uneven training or socialization that reaches all levels of society, especially in rural areas. The lack of environmental education facilities also makes public understanding of waste management remain low. This condition underscores the need for policy alignment and acceleration of the decision-making process so that waste management programs can run optimally.

Regarding the effectiveness of the strategy, the Karimun Environment Agency has shown several positive achievements, especially in improving environmental cleanliness per sub-district. Data on the volume of waste that has been successfully processed through TPS 3R and waste banks has also increased significantly, which at the same time reduces waste residue entering landfills. This is in line with the results of research in Sukoharjo Regency which shows the implementation of waste management strategies in accordance with the Environmental Agency's Strategic Plan, especially during

the Covid-19 pandemic [7]. Increased recycling and waste reduction are indicators of the success of the program that not only impacts cleanliness, but also supports the circular economy at the local level. This success shows that the waste management strategy in Karimun is running in a directional manner and has a real impact. In addition to protecting the environment, improving waste management also opens up new economic opportunities for the community.

Community involvement is the main pillar in the success of waste management in Karimun. School communities, youth organizations, and PKK actively play a role in various educational activities and environmental clean-up actions. Mutual cooperation programs and clean village competitions are routinely carried out to motivate residents to be more concerned about waste management. In addition, waste banks provide economic incentives to the community through organized waste management, thereby increasing awareness and welfare of residents. This approach is similar to the strategy implemented in Samarinda City in dealing with the surge in waste volume during Eid al-Fitr, by adding overtime workers and intensively socializing appeals from the RT to sub-district levels (Ul Awaly et al., 2023). In the future, the Karimun Regency Environment Agency can export innovative approaches, such as the use of citizen-based waste reporting applications, the integration of CSR programs from local companies, and the development of recycling-based creative economy activities. In addition, it is a comparison with waste management strategies in other regions in Riau Islands Province.

4 Conclusion

The Karimun Regency Environment Agency has implemented various strategies in waste management which include master planning, optimization of 3R TPS, collaboration with waste banks and the community, and community-based education. However, the implementation of the strategy still faces significant technical and structural obstacles, especially related to limited transportation fleets, human resources, and insufficient funding. The limitation of the transportation fleet causes delays in the process of collecting and transporting waste from temporary shelters to landfills. This has an impact on the accumulation of waste in several residential areas and public facilities. In addition, the lack of operational workforce with technical competence also hinders the implementation of strategic programs, such as the management of 3R TPS and strengthening the function of waste banks, so that the long-term goal of reducing waste significantly has not been achieved.

The effectiveness of waste management in Karimun is highly dependent on synergistic cross-sector coordination and active community participation, which currently still needs to be significantly improved to achieve optimal results. Several strategies implemented by the Karimun Environment Agency show innovation and progress, such as integrating the role of waste banks and community approaches in environmental education. However, innovation it still needs to be strengthened in terms of clearer and stricter regulations, as well as an adequate budget to be able to support the implementation of the program in a sustainable manner. Without regulatory adjustments and financial strengthening, existing waste management efforts have the potential to be not optimal and difficult to adapt to the dynamics of environmental and community needs.

As a suggestion, it is very important for the Karimun Environment Agency to optimize waste management based on digital technology through the implementation of a smart waste management system that can improve the efficiency of waste collection and monitoring. Increasing the capacity of the Environmental Agency's human resources through training and competency development also needs to be a priority, accompanied by community empowerment so that they are more involved in maintaining environmental cleanliness. In addition, the implementation of a *reward-punishment system for citizens can motivate more consistent public participation*. The application of this technology also allows for real-time data analysis, so that decisions related to waste management can be made more quickly and accurately. Active community involvement, for example through educational programs in schools and environmental campaigns, can also foster awareness from an early age. With a comprehensive approach, waste management in Karimun will become more sustainable and future-oriented

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