Policy on optimization of household waste and hazardous waste management based on community empowerment at the local level

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Abstract. Central Bureau of Statistics (BPS) survey in 2018 showed that only 1.2% of households recycle waste and around 66.8% incinerate waste. Low community participation has a negative impact on landfill dependence, managing-cost, sustainable waste management, and the environment. This study aims to optimize community-based household and hazardous waste management at the local government level. This research used policy analysis, field surveys, and in-depth interviews regarding the issuance of Jakstrada. However, Jakstrada is not necessarily the answer to the waste problem. This is in accordance with the target to be achieved from the preparation of the Jakstrada, whereby in 2025 the national waste problem is 100% managed, with no more waste being dumped into the river or open burning in the environment. Waste is encouraged to be managed by applying the 3R (reduce-reuse-recycle) principle, with the key strategy by changing the community's paradigm to build awareness in managing their waste. As the hierarchy of sustainable waste management emphasizes the importance of public participation and changes their perception of waste management as the first step to achieve waste reduction, support for reliable technology is also needed to recycle and reuse waste.

1. Introduction

Waste is one of the major environmental issues in Indonesia. Indonesia's waste problem is quite a complicated national issue because of the need for handling from upstream to downstream. The central or local government and the community need to work together to solve it. It was recorded that in 2018, Indonesia's waste production had reached 65.2 million tons, an increase of 4.9 million tons from 2017 [1]. The increase in the amount of waste in Indonesia is generally caused by an increase in population followed by an increase in the community's needs and power, especially in urban and urban areas, which experience a relatively high population increase.

In accordance with the mandate of Law (UU) Number 18 of 2008 concerning Waste Management, the authority over waste management rests with the central government and local governments at the provincial, district/city, sub-district, and village / kelurahan levels. Based on Article 44 of the law, it is explained that each local government must close the final waste processing site using an open dumping system for a maximum of five years from the enactment of this law. Law Number 18 the Year 2008 emphasizes that waste management administrators focus on reducing waste, namely preventing a product from turning into waste as much as possible. If it has been done as much as possible, but there is still waste, it will be handled with waste handling. According to KLHK's monitoring, until the
2016/2017 period, there were 188 districts/cities from 355 districts/cities (53 percent) that changed the landfill system (TPA) from open-dumping to controlled landfills or controlled landfill [1]. However, these efforts have not been sufficient to optimize stakeholders' roles from upstream to downstream, especially by relying on TPA with a controlled landfill system, which is only an advanced level of open-dumping (without optimal final processing).

According to the Director-General of Waste, Garbage and Hazardous Toxic Materials Management (PSLB3) KLHK, Rosa Vivien Ratnawati, waste sources in Indonesia are dominated by households (48%), followed by waste from traditional markets (24%), commercial areas (9%), and evenly distributed in other regions [2]. This is what underlies the issuance of Government Regulation (PP) Number 81 of 2012 concerning Management of Household Waste and Waste Similar to Household Waste, which is technically stated in Presidential Regulation (Perpres) Number 97 of 2017 concerning Policies and National Strategies (Jakstranas) for Waste Management. Household and Household-like Waste. Almost all regional governments have widely adopted the issuance of the PP and Perpres as Regional Policies and Strategies (Jaksstrada). One of the Regional Government of Central Java Province issued Governor Regulation (Pergub) Number 11 of 2019 concerning Central Java Provincial Policies and Strategies in Management Household Waste and Similar Waste Household Waste.

The issuance of Jakstrada is not necessarily the answer to the problem of waste, especially household waste and similar waste in Central Java, both for districts/cities that have or have not adopted the provincial Jakstrada. This is in accordance with the target to be achieved from the preparation of Jakstrada, whereby 2025 the national waste management is 100% managed, with no more waste being dumped into the river or open burning in the environment. Waste is interpreted as something of value through applying the 3R (reduce-reuse-recycle) principle, with the key strategy being a change in the community's paradigm to build awareness in managing their waste. As the hierarchy of sustainable waste management emphasizes the importance of public participation and changes their perception of waste management as the first step to achieving waste reduction, support for reliable technology is also needed to recycle and reuse waste [3].

One of the districts/cities in Central Java that has not adopted the Provincial Jakstrada to become the District Jakstrada is Karanganyar Regency. Until now, there are still many villages/kelurahan in Karanganyar Regency that experience solid waste problems because there are no rules that strictly bind people in the same village to participate in household waste management in their environment. In addition, every village / lurah head has a different understanding of waste management in his village / kelurahan. This needs attention because authority over household waste management must start from the lowest level of local government, namely the Village / Kelurahan, which needs to get direction through precise and firm policies from local governments at the top level, starting at the sub-district level. To district/city level and provincial level. It is necessary to make a comprehensive policy that regulates regional waste management at the village / kelurahan level, which in its implementation must be adjusted to the conditions and needs of the community in the area.

It is assumed that the village / kelurahan-level regional policies on waste management are able to encourage a change in perception and increase community participation in waste management such as reducing-reuse-recycling or known as the 3R (reduce-reuse-recycle) concept and sorting waste. This study aims to optimize the management of household waste and community-based B3 waste at the local level through sorting waste at the household level and developing a waste processing network system from household to the final level by taking cases in several villages located in Karanganyar Regency, Central Java. This research is expected to become a suitable policy brief to be submitted as an academic paper as a consideration for the government at the village / sub-district, district/city, and provincial levels, especially in Central Java Province, making policies on regional waste management. In addition, by carrying out independent waste management at the village / kelurahan level, it is hoped that it will be able to reduce dependence on TPA, which every day has an increase in the amount of waste generation, especially those coming from households.
2. Method
This article used a mix-method (combined method), quantitative and qualitative, with data collection techniques in the form of analysis of the latest policies, field surveys by conducting questionnaires and in-depth interviews with relevant stakeholders consisting of government at the provincial, district/district levels, city, and village/sub-district; sectoral agents; Public; NGOs; private sector; media; academics; and financial institutions. The first step in this research is an analysis of the latest policies related to waste management in Karanganyar Regency, starting from policies at the central level, Central Java Province level, to the Karanganyar Regency level regarding the management of household waste and B3 waste originating from households with the aim of evaluating the implementation of the policy. In addition, policy analysis on waste management will be carried out. The policy analysis results will form the basis of questionnaires and in-depth interviews that will be given to the relevant stakeholders.

3. Results and Discussion
Waste can be defined as an object that has lost its main function for its users [4]. However, not all objects that are considered trash cannot be reused. This is because what is considered junk for most users can become useful objects for a small percentage of users. For example, much of the waste material can be reused and could become the raw material for industry or energy generation if appropriately managed [5].

Based on Law Number 18 the Year 2008, the types of waste in Indonesia are divided into three groups, namely: household waste - which comes from daily activities in the household (excluding feces and specific waste); household-like waste — originating from commercial areas, industrial areas, special areas, social facilities, public facilities, and/or other facilities; and specific waste — includes waste containing hazardous and toxic materials (B3), containing B3 waste, arising from disasters, building debris, waste that cannot be processed (technologically), and appears periodically. When viewed from the original source, Ceclan et al. (2011) stated that waste originating from households is generally harmless to humans. However, humans are very close to B3, whose waste requires special handling [4]. Inglezakis & Moustakas (2015) divides into three levels of household products, which are B3, namely: Level I — paints and similar products, wooden furniture, fluorescent lamps, and other mercury-containing products, pesticides, and degreasers or other cleaning fluids; Level II — waste oil, batteries, and batteries, and construction waste/debris; Level III — car oil filters, skins (ingredients), pharmaceutical products, and ink/toner cartridges [6]. Household products that fall into the B3 category are often mixed with daily waste, which ends up in the TPA without further processing so that it can have a negative impact on the environment and human health. Therefore, the government and related stakeholders' role is needed to encourage the community to separate, as waste sorting efforts are the first step to realizing sustainable waste management [3].

The basic aspect of sustainable waste management is the proper planning and supervision of the central government for national-level management and local governments for local-level management [7]. Wan et al. (2019), in their research, provides a framework for developing a sustainable strategy in waste management based on the waste hierarchy proposed by the European Commission with the following priorities for handling (highest to lowest): waste prevention/reduction - related to changes in production and consumption patterns; reuse — helps reduce waste by extending service life; recycling - provides an economic value for waste while increasing the efficiency of product materials; recovery/recovery — extraction of energy or material from waste (for example biogas and waste power plants or PLTSa); and disposal - applies to waste that cannot be prevented, reused, recycled and recovered [8].

The series of activities starting from production, source reduction, sorting, storage, handling, collection, processing, and disposal of waste are technical aspects of waste management that need to be balanced with institutional, environmental, financial, legal, and social aspects to achieve sustainability [9]. According to Joseph (2006), there are ten stakeholders who need to be involved in sustainable waste management, namely: environmental regulators, planning agencies, politicians, sectoral agents,
communities, non-governmental organizations (NGOs), the private sector/industry, media, academia, and financial institution [9]. In this case, community participation plays an important role because it requires awareness about waste reduction, separation, and recycling as a basic step in sustainable waste management [10].

The regulation is used as a guide for stakeholders regarding the division of roles and responsibilities in managing waste, monitoring regulatory activities regarding waste, as a tool to enforce the law for the community and non-governmental organizations (NGOs) [11]. Regulations and policies regarding waste management are urgently needed to protect public health and the environment [12]. Policies define the boundaries of authority and ensure consistency, transparency, and accountability. Limited resources and equity require a system that everyone can rely on when seeking redress. People expect consistent and transparent decisions [13].

In the institutional aspect, things that need to be considered are the planning and implementing waste management in the area and supervision of waste management. There is a waste management organizational structure [14]. The role of institutions is very important in increasing the capacity of waste officers in monitoring waste sorting/recycling activities in the community. Training for garbage collectors can improve the efficiency of waste collection, sorting, and recycling. Training materials can be in the form of work efficiency, increasing sorting efficiency, use of personal protective equipment, or other materials tailored to local needs and conditions [15].

In the financial aspect that needs to be explored are the economic instruments used (fees, subsidies, and taxes), participation from the private sector related to solid waste financing to overcome limited waste management costs [16] and the ability of the community to pay waste retribution [17, 18, 19]. The technical aspects of the waste management system are related to the facilities and infrastructure needed to manage waste. These facilities and infrastructure are used to collect, transport, process environmentally friendly ones [5, 12, 16, 18, 20].

Environmental aspects must be considered in managing waste. Organic waste that is not appropriately managed has an impact on the environment and public health. Organic waste is a breeding ground for vectors such as mice and flies. Organic waste has the potential as a food source for rodents. Organic waste disposed of by open dumping can function as a distribution site for rat and fly populations up to a radius of 8 km [18]. This situation has an impact on the environment due to odors and other aesthetic disturbances that arise from poorly managed waste. The environmental impact due to uncontrolled decomposition of waste can pollute the air, water, and land resources. For this reason, it is necessary to carry out an environmental impact assessment, namely by monitoring to detect the detrimental impacts of a landfill in the air, water, and land environment [18]. Environmental aspects in assessing waste management performance consist of an environmental control system, membership in environmental or organizations, and environmental impact assessments [16].

4. Conclusion
The implementation of waste management should prioritize the 3R approach to reduce the volume of generated waste from its source, namely households. Waste management in Karanganyar Regency requires improvements in terms of synchronization of solid waste targets, budget, coordination across related sectors, and increasing the capacity of human resources in the solid waste sector.

1. That synchronization of waste handling targets includes revisions and re-synchronization between the Jakstrada, Strategic Plan, and Renja OPD targets to be aligned with the actual conditions of solid waste.
2. That also includes coordination and commitment to the solid waste budget provision by increasing coordination and commitment at each institution and between institutions appointed in Jakstrada, where the person in charge acts to supervise and unify solid waste management's vision and mission. In addition, it emphasizes the responsibilities of the person in charge, main sectors and supporting sectors, the determination of Minimum Service Standards (SPM), and Main Performance Indicators (IKU) for all OPDs involved in waste management. Further coordination is needed between policymakers regarding waste management and policy content. In addition, there must be clarity
regarding government agencies in Karanganyar Regency, which are regulators or operators in waste management, so that there are no overlapping problems of authority or responsibility.

Acknowledgements
This research is funded by the Research Based Policy Grant Research and Development (Risbang) Universitas Indonesia Contract Number NKB-3173/UN2.RST/HKP.05.00/2020

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