POLICY BRIEF

Waste Segregation and Segregated Waste Transportation

Key Messages:

- The community is well-informed in sorting organic and inorganic waste. Nevertheless, the practice of waste segregation from home has to be enhanced.

- Local governments and other stakeholders need to provide more education and dissemination activities on waste segregation to increase community knowledge, awareness, and participation.

- Capacity building related to the ability to handle waste and managing the operation of waste processing facilities needs to target every waste officer to ensure the efficacy and productivity of related facilities such as TPS-3R.

- The provision of facilities from the government or other parties (such as TPS-3R and waste banks) can encourage the community to sort waste from their homes.

- The segregated transportation program is running well because of the community's support with separated organic-inorganic waste and adequate facilities from the government.

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The Urgency to Improve Households Waste Management in Malang Regency

Malang Regency is an area with the fifth largest waste generated in East Java Province after Sidoarjo Regency (SIPSN, 2020).

Based on SIPSN (National Waste Management Information System) data in 2020, the amount of waste generated in Malang Regency is 387,550 tons per year, and waste products every day account for 1,062 tons. Moreover, the largest waste comes from households with 891.57 tons or 80 percent of the total waste composition. On the other hand, only 41% of the disposed waste can be used further.

Thus, waste management policies and programs in Malang Regency are critical and require support and active involvement from both the government and the community itself.

Based on the Malang Regency Regional Regulation (Peraturan Daerah) Number 2 of 2018 concerning Waste Management, community support is essential as every household must sort or segregate waste at the source. The household is one of the most important components in waste management as it is the smallest unit after the individual in waste disposal. As stipulated in Government Regulation (PP) Number 81 of 2012 concerning Management of Household Waste and Similar Waste, households play a role in setting the standards for family members to reduce and manage waste. Efforts from households, for example, would be separating waste from the source, reusing plastic waste, paying a fee for waste management, and participating in the TPS-3R, waste banks, and other waste reduction programs to reduce the overall waste generated. Awareness, knowledge and behavior of households are determinants in the success of waste management. Meanwhile, behavior change is crucial in this improvement effort because waste management needs to be started at the source. Aside from adequate infrastructure and facilities, segregation of household waste is important in determining the effectiveness of improving waste management in Malang Regency.

TPS-3R Program and Community Involvement in Household Waste Management

TPS-3R (Waste Processing Site based on Reduce-Reuse-Recycle) is one of the waste processing facilities provided and funded by the government to improve the household waste reduction system. The implementation of TPS-3R is an approach towards waste management in residential areas by encouraging the community's active role. TPS-3R has the main objective of reducing the amount of waste discharged to the landfill or TPA (Directorate General of Human Settlements, Ministry of Public Works, 2017). Waste generated from households that goes to TPS-3R is then separated for recycling, whereby only the residual goes to the landfill. Thus, the existence of TPS-3R is expected to assist local governments in overcoming the problem of land adequacy for landfills, especially in areas with limited land and with high population.

Therefore the successful implementation of the TPS-3R program depends on the active involvement of the community to segregate waste at home. Waste segregation will affect the quality of the input or waste that enters the TPS-3R for recycling and makes further processing easier.

The active participation of the community in the management of TPS-3R is outlined in the waste management scheme recommended by the Directorate General of Human Settlements, Ministry of Public Works within the TPS-3R Technical Guidelines. In this scheme, sorting at the source is the initial stage of the process. Therefore, the community's willingness is an important determinant for the program's success. Although waste sorting activities can be carried out at TPS-3R, this will increase the operational burden of TPS-3R officers and potentially affect the quality and efficacy of waste recycling. In addition, the collection of waste with a segregated transportation system where the garbage collector separates organic and inorganic waste is an important determinant in the operational effectiveness of TPS-3R management. Segregated transportation is also one of the factors affecting people's willingness to sort waste at home. Difficult access to waste transportation services is an important problem in handling household waste. The community prefers the availability of this service compared to waste sorting (Almazán-Casali et al., 2019). Waste segregation at source and segregated transport are interrelated. People tend to be reluctant to sort if, in the end, the sorted waste will be mixed again by the garbage collector. The segregated transportation system will not work effectively and efficiently if people do not sort their waste at home. Therefore, the community and waste management officers complement each other for TPS-3R management to operate effectively.

In the Ministerial Regulation of Public Works Number 3 of 2013 concerning the Implementation of Waste Infrastructure and Facilities in Handling Household Waste and Similar Waste, the TPS-3R program is open to be integrated with other community-based waste management systems such as waste banks.

People who are customers of waste banks already have the awareness to sort waste, which has a positive impact on the operational sustainability of TPS-3R. Unfortunately, until now, the waste bank has not been directly connected to the TPS-3R. Nevertheless, the presence of a waste bank can be used as a complementary factor to the waste management scheme at TPS-3R in encouraging active community participation in sorting waste and achieving the target of reducing the amount of household waste that goes to the landfills.

Waste Segregation from Home and Transportation of Segregated Waste: A Case Study from Kendalpayak Village, Malang Regency

The household survey was conducted in the Kendalpayak Village, Pakisaji District community, to understand the knowledge and practice of sorting waste.

Kendalpayak Village is one of the areas in Malang Regency that already has a TPS-3R named TPS-3R Langgeng Jaya, which was built in 2020 using the special allocation fund (DAK) from the central budget and has been operating since 2021. Based on the survey results, the majority of the residents already have good knowledge regarding waste sorting and its benefits. They have acquired basic knowledge in sorting waste, such as separating organic and inorganic waste. They also have developed an understanding of 3R practices (reduce, reuse, recycle) and have been aware that the practices would reduce the amount of waste generated. In addition, the majority of the people have had an awareness of sorting waste at home to contribute to reducing the environmental pollution.

Figure 1. Kendalpayak Village Community Knowledge Regarding Waste Segregation

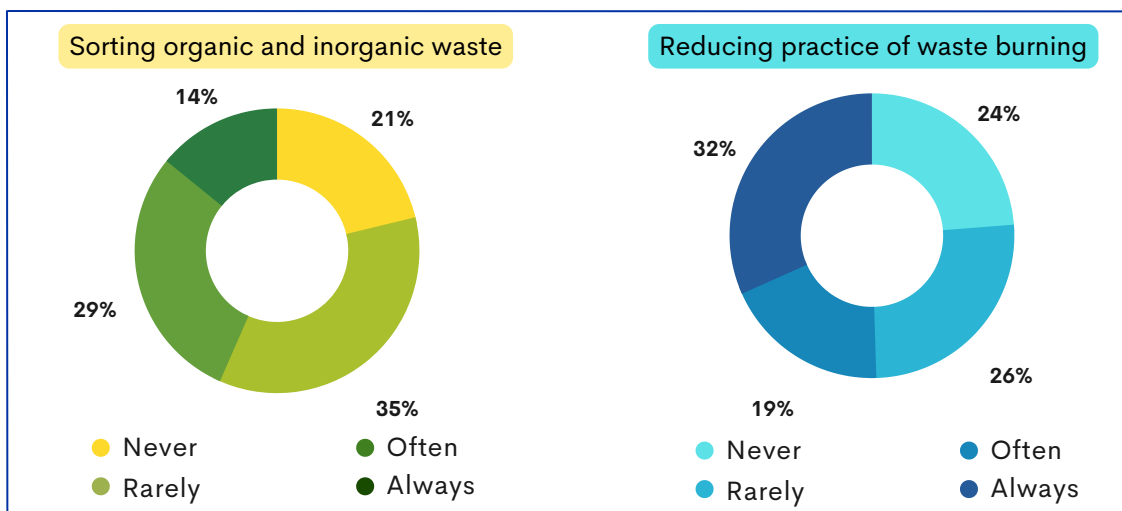| Understand the practice			Do not understand the practice
89%	3R practices are carried out to reduce the amount of waste generated	**11%**	
94%	Waste segregation is able to reduce environmental pollution	**6%**	
95%	Waste has been segregated into organic and inorganic	**5%**	

Source: Data gathered from survey results by CSEAS (2021)

Observed from the practice, the number of people in Kendalpayak Village who have sorted household waste is more dominant than those who have not. Although most of them do not practice it daily, this is an interesting finding to motivate the government and other related stakeholders to build people's habits in sorting waste from their homes. The majority of people have also reduced the practice of waste burning because they already understand the detrimental impact on the health and environment.

The community behavior in reducing waste was also shown by their efforts to comply with policies and guidelines related to household waste management implemented by the government and other institutions as well as participating in environmental programs from the regional government, for example carrying out 3R practices and cleaning rivers or waterways.

Figure 2. Kendalpayak Village Community Practices in Managing Household Waste

Sorting organic and inorganic waste

14%
21%
29%
35%

○ Never   ● Often
○ Rarely   ● Always

Reducing practice of waste burning

32%
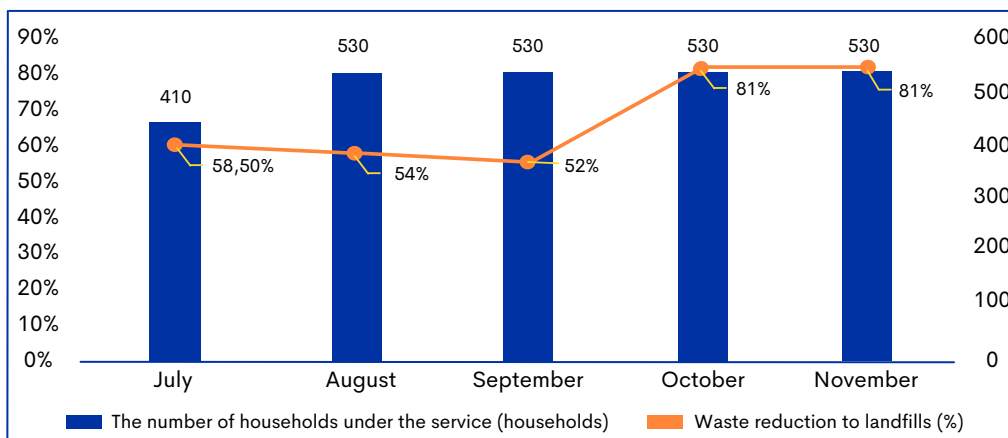24%
19%
26%

○ Never   ● Often
○ Rarely   ● Always

Source: Data gathered from survey results by CSEAS (2021)

The survey results showed that the Kendalpayak community considered the availability of waste management facilities such as TPS–3R to be the main factor in increasing their willingness to sort waste. Previously, the Kendalpayak community was not concerned about the waste problem, and many still dumped their garbage on the banks of the Brantas River, around the residents and in public places. Even though there are people who have not sorted their waste, data from the TPS–3R Langgeng Jaya in 2021 showed that there were 430 households that have sorted waste at home from 530 customers after the intervention in the form of educational activities and waste sorting assistance.

This means that around 81 percent of the total operational area of the TPS–3R Langgeng Jaya service has been currently practicing waste segregation, and this achievement certainly deserves appreciation. In this community-based TPS–3R program, sorting household waste and transporting the waste separately have also received positive support from the village administrator, institutions, and community leaders.

Figure 3. Operational achievements of TPS–3R Langgeng Jaya

July: 410, 58,50%
August: 530, 54%
September: 530, 52%
October: 530, 81%
November: 530, 81%

■ The number of households under the service (households)   ■ Waste reduction to landfills (%)

Source: Data from TPS–3R Langgeng Jaya (2021)

4

All relevant stakeholders need to consider factors that affect community behavior, such as the level of knowledge and awareness, facilities and infrastructure, and incentives to the TPS-3R Program in Kendalpayak Village to operate sustainably and achieve targets that have been set. Looking at the achievements, Kendalpayak Village is qualified to be an example of best practices to follow other areas in Malang Regency in improving household waste management.

Factors Affecting Community Behavior in Segregating Waste

In changing behavior and building habits to sort waste, there are several factors to be considered, as follows:

1. Environmental knowledge and awareness
   Knowledge and awareness of environmental issues are the basic factors to shape a community's attitude in reducing waste. The level of community knowledge is an internal factor influencing people's behavior in managing waste (Sukerti et al., 2017). People who already know the detrimental impacts of unmanaged waste in the environment tend to have eagerness without being forced by other parties (Maulina, 2012). Therefore, to increase knowledge and encourage public awareness, educational and mentoring activities are necessary to build habits in managing waste at home. Good 3R (reduce, reuse, recycle) implementation can only be realized if habits are rooted in the community. This effort requires a fairly long process in continuous education for the community to understand and implement it (Zhang et al., 2019).

2. Access to adequate facilities and infrastructure
   Providing adequate waste management facilities could motivate people to sort waste. The main reason people do not sort their waste is that they think it will be mixed again when collected and transported by collectors, so the effort becomes useless, with the addition of the lack of waste sorting facilities (Setiawan, 2020). The existence of adequate waste management facilities and infrastructure accessible to the community can encourage waste sorting behavior.

3. Time availability
   Apart from knowledge and facilities, one of the main reasons people do not dispose their waste is the lack of time (Setiawan, 2020). Some people, especially those who work, say they are busy and do not have time to sort the waste. This might be influenced by the public perception that sorting waste is a difficult, impractical, and time-consuming activity.

4. Motivation or incentives from the government
   A community's willingness to sort waste will increase if the community is given incentives (Aprilia et al., 2012). Motivation or stimulus from the government directly encourages people's behavior in sorting waste (Zhang et al., 2019). Incentives from the government in monetary form could encourage households to implement waste segregation from the source (Alhassan et al., 2020).

Challenges in Improving Household Waste Management

In the community-based waste management process such as TPS-3R, which requires active involvement from many parties, at least five things challenge stakeholders in the operational activities and prevent waste segregation from running effectively.

Challenge 1: Changing Behavior and Building Community Habits

The effectiveness and efficiency of the TPS3R program are highly dependent on the community's willingness to sort waste. Unfortunately, waste sorting has not become a culture in the Indonesian community, and with differences in sociodemographic characteristics affecting the behavior and habits of each individual, this issue becomes more complex. The diversity of managing household waste is based on different preferences, so it needs to be taken into account in policymaking.

The factors influencing these preferences are household sociodemographic characteristics, time allocation for sorting and handling waste, recycling facilities, and behavioral factors, including personal motivation and social influences (Nainggolan, 2019).

Challenge 2: Provision or Enhancement in Supporting Facilities and Infrastructure

The lack of storage and transportation for sorted waste often causes people to not segregate. Awareness-raising to the community to sort out waste will not be maximal without an adequate container to place the waste at home, especially for households with lower income. Meanwhile, in TPS-3R, the obstacle faced is the number of vehicles for transporting segregated waste. This needs to be considered because it can deter the TPS-3R from broadening service coverage.

Challenge 3: Capacity Building for TPS-3R Management and Workers

The TPS-3R infrastructure that has been built will not be used to the fullest potential if not managed by qualified human resources. TPS-3R officers are human resources with knowledge and experience in solid waste. In addition to managing household waste, TPS-3R officers also interact directly with the community to assist them in sorting waste. TPS-3R officers have an important role in the operational sustainability of TPS-3R, thereby needing support in the form of capacity building for waste management and governance from both local governments and other stakeholders.

Challenge 4: Enforcement and Penalty

The culture of the community to sort waste at home has begun to develop, but undeniably there is a part of the community that has not been involved and still litters garbage that pollutes the environment. However, improving waste management is not enough to change people's behavior and improve facilities; the government must also take a firm stand against those who still exhibit illegal practices. Administrative sanctions or penalties should be given for those who intentionally do not perform as obligated by Malang Regency Regional Regulation Number 2 of 2018, though in the field, it needs to be strengthened to give a deterrent effect.

Challenge 5: The Existence of the Informal Sector

Household waste management in Indonesia cannot be separated from the existence of the informal sector, such as scavengers and collectors. In developing countries like Indonesia, scavengers also have an important role in reducing household waste in landfills. They help collect waste that is still valuable for recycling. There is no agreement from relevant stakeholders on whether the informal sector needs to be integrated and empowered to assist the operation of TPS-3R or separated.

Conclusion

Community-based waste management such as TPS-3R is the right program to improve the household waste management system in Malang Regency. The main concept is to process the incoming household waste and leave only residual waste to contribute to the local government's goal in reducing the waste amounts in the landfill. TPS-3R management cannot run effectively and efficiently if people do not sort their waste from their homes, and on the other hand, people are reluctant to sort their waste if adequate sorting facilities are not provided. Therefore, both sides need to be strengthened simultaneously so TPS-3R operations can run sustainably. The pilot in Kendalpayak Village has shown that the community already has the knowledge and eagerness to sort waste. Factors that can encourage community behavior, namely the level of knowledge and awareness, availability of adequate facilities and infrastructure, time availability, and provision of incentives, need to be the focus of attention for all related parties to build a new habit in sorting waste. With the development of the community's habit of sorting waste and the availability of adequate waste processing facilities and qualified human resources for waste management, a strong and integrated household waste management system can be established in the long term.

Recommendation

There are several recommendations to be considered by stakeholders, as follows:

- Provide education and assistance regularly regarding waste segregation to the community by looking at preferences in processing waste, strengthening knowledge and building community habits. For example, providing inexpensive containers in the kitchen for organic waste such as plastic trays in the local tradition of feast giving. Thus, the sorting will take place in the kitchen, and after then, the waste will be carried forward (to the trash based on waste types) before the organic waste decomposed and dispersed strong smell.

- Provide capacity building for TPS-3R workers related to waste and operational management regularly, and ratify village regulations to provide a strong institutional and legal basis to TPS-3R.

- Encourage the community to sort waste from their homes by providing segregated waste storage containers for each household, especially for the lower-income households, or provide large trash bins to accommodate several households.

- Facilitate additional vehicles for segregated waste transportation at TPS-3R to disrupt the entire waste management process.

- If possible, empower the informal sector such as scavengers or collectors who play a role in the recycling sector to be involved in waste collection to help collect waste littered in the environment and increase the amount of valuable waste that goes to TPS-3R.

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