



Improving the environmental quality of Kesiman Village, Mojokerto Regency through household waste sorting

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ARTICLE INFO	ABSTRACT
<p>Article history Received: 2023-07-11 Revised: 2024-02-04 Accepted: 2024-02-05 Published: 2024-02-05</p> <p>Keywords Household waste Non-organic waste Organic waste Village empowerment Waste sorting</p>	<p><i>The most significant source of waste in Indonesia is households. This community service aims to improve the environmental quality of Kesiman Village by educating residents to sort waste from their households. This activity begins with observations and interviews with residents. Preliminary survey results show that the waste problem has been around for a long time, and accumulation occurs in the Final Disposal Site (TPA). Based on interviews with villagers, they are willing to participate in the waste management assistance program. Furthermore, waste sorting facilities are provided for each resident's house by empowering village communities with expertise. Counseling or education is carried out at the home of a resident, as well as providing a real example of waste segregation. Sorting is done based on the categories of organic and non-organic waste. Two weeks after the counseling, the service team evaluated by direct surveying several residents' houses to see if the sorting had gone well and smoothly. The evaluation results show that residents understand and carry out waste segregation consistently. However, there are several obstacles; for example, some houses feel the trash can needs to be bigger, and sometimes they place organic and non-organic waste upside down. After the household waste sorting program runs smoothly, the community service team will plan and realize the Village waste management program so that the volume of waste is reduced and the environment is cleaner.</i></p>
<p>Kata kunci Pemberdayaan desa Pemilahan sampah Sampah non-organik Sampah organik Sampah rumah tangga</p>	<p>Peningkatan kualitas lingkungan Desa Kesiman, Kabupaten Mojokerto melalui pemilahan sampah rumah tangga. Sumber sampah paling signifikan di Indonesia adalah rumah tangga. Pengabdian masyarakat ini bertujuan untuk meningkatkan kualitas lingkungan Desa Kesiman dengan mengedukasi warga untuk memilah sampah dari rumah tangganya. Kegiatan ini diawali dengan observasi dan wawancara dengan warga. Hasil survei pendahuluan menunjukkan bahwa permasalahan sampah sudah ada sejak lama, dan penumpukan terjadi di Tempat Pembuangan Akhir (TPA). Berdasarkan wawancara dengan warga desa, mereka bersedia mengikuti program pendampingan pengelolaan sampah. Selanjutnya, disediakan fasilitas pemilahan sampah untuk setiap rumah warga dengan memberdayakan masyarakat desa dengan keahlian. Penyuluhan atau edukasi dilakukan di rumah warga, sekaligus memberikan contoh nyata pemilahan sampah. Pemilahan dilakukan berdasarkan kategori sampah organik dan non organik. Dua minggu setelah penyuluhan, tim layanan mengevaluasi dengan survei langsung ke beberapa rumah warga untuk melihat apakah pemilahan telah berjalan dengan baik dan lancar. Hasil evaluasi menunjukkan bahwa warga memahami dan melakukan pemilahan sampah secara konsisten. Namun, ada beberapa kendala; misalnya, beberapa rumah merasa tempat sampah harus lebih besar, dan terkadang mereka menempatkan sampah organik dan non-organik terbalik. Setelah program pemilahan sampah rumah tangga berjalan lancar, tim pengabdian masyarakat akan merencanakan dan merealisasikan program pengelolaan sampah desa agar volume sampah berkurang dan lingkungan menjadi lebih bersih.</p>

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INTRODUCTION

Soil, water, and air pollution can all be caused by improper garbage disposal (Lian et al., 2020; Rajpal et al., 2020; Saikawa et al., 2020). In addition, it is also bad for human health because, over the years, it has caused several health problems (Báreková et al., 2020; Handoyo et al., 2020; Odonkor & Sallar, 2021). The waste problem still needs to be fully overcome, even continuously increasing yearly. Based on data from KLH (Ministry of Environment) and BPS (Central Statistics Agency), the volume of waste is increasing. In 2015, Indonesia's waste reached 64.4 million tons; And in 2021, the amount of waste reached 68.5 million tons. In most cities in developing countries, municipal solid waste management is addressed with formally organized waste collection (Asgari et al., 2019; Sosna et al., 2019), inadequate waste management (Procházková et al., 2019; Wang et al., 2018), and recycling policies and practices (Kanhai et al., 2021; Xiao et al., 2017). The waste problem will ultimately affect the sustainability of a country (Sahar & Ahmad, 2019). The condition of waste accumulation does not only occur nationally but is also seen at the village level. Therefore, it is crucial to take concrete actions by assisting in managing waste from upstream or waste sources, namely households. Household waste is the largest source of waste (sipsn.menlhk.go.id). Household waste generally consists of paper, electronic equipment, food scraps, plastic and glass bottles, metal cans, and discarded clothes. Garbage separation, or garbage classification or garbage separation, is the process of separating waste of different elements operated manually in households or through curbside collection schemes (Harasarn et al., 2022; Taghipour et al., 2016). There is an urgent need to address this significant problem by implementing effective household waste sorting programs (Xu et al., 2017).

Kesiman Village is located in the Trawas sub-district, Mojokerto Regency. Kesiman Village has good natural and tourism potential but needs help with waste problems (Andono & Girindratama, 2023; Eriandani et al., 2023). If the village becomes a tourist destination but has yet to start managing its waste, the pile of garbage will be higher. Tourism growth is usually accompanied by an increase in some environmental and socioeconomic impacts (Obersteiner et al., 2021), in addition to emissions from transport and the impact of all necessary infrastructure (restaurants, lodging). Kesiman Village consists of 3 hamlets: Kemlagi Hamlet, Summersari Hamlet, and Kesiman Hamlet. The area of Kesiman Village is 118 Ha, and the population is 2924 people. In addition to having quite a large population, Kesiman Village also has a large enough market, so every day, it produces much waste.

Waste management activities have not been sorted from the source (Household). The waste will be collected in a landfill (Landfill), then burned. There are two places in the Village Landfill: Kemlagi and Summersari Hamlets. The conditions at both landfills are already very full. There are better solutions for handling waste than burning waste because it will cause various problems, such as health problems due to combustion substances, fire potential, etc. Burning waste in open spaces could be more efficient because the oxygen supply is limited, and the temperature is difficult to control. This incomplete combustion results in the emission of toxins, such as particulates, carbon monoxide (CO), and other gases, into the atmosphere without air pollution control (Agarwal et al., 2020; Ramadan et al., 2022). Another problem, if the rainy season, the pile of garbage cannot be burned and is increasingly mounting. The act of burning waste does not follow Article 29 in Law No. 18 of 2008 and has the potential for land fires. The accumulation of garbage in the disposal area has begun to pollute the flow of the village river.

There has never been a community-based environmental program, particularly on the issue of waste (Iryanto et al., 2022; Wandee et al., 2022). The number of households is almost 1000 households, the estimated waste produced with an area of 15m³ per day. If waste management is done well, it will provide economic benefits, be healthy for the community, and be environmentally safe (Fajfrlíková et al., 2020; Liu et al., 2022). In the end, it achieved the Clean Indonesia program in 2025. Kesiman Village has also never held counseling on waste sorting, so until now; everything is mixed. Likewise, the most straightforward facilities for waste sorting have yet to be available. Separation of waste sources can reduce emissions of gases that cause global warming and climate change (Shyamal et al., 2023; Teng et al., 2022). Despite the benefits, previous research has shown that household waste sorting practices are rare in developing countries (Zambrano-Monserrate et al., 2020).

Based on the description of the situation analysis, it is known that Kesiman Village still needs to take the first steps for waste management. This is quite worrying because the development of Kesiman Village's tourism potential must be balanced with clean and comfortable environmental conditions. In addition, all communities and village officials have never received training and assistance for waste management. Based on the results of discussions with the head of Kesiman Village, there are three problems that we want to be resolved. First, how to manage waste from upstream to downstream so that there is a manageable amount of waste accumulation. Second, Kesiman Village needs a 'first step' to start household waste management actions. Third, Kesiman Village needs the help of facilities to encourage residents to sort waste. Waste separated from home will be easy to process further and reduce the volume of village waste (Sastrawan et al., 2022).

This community service activity in Kesiman Village aims to make two contributions. First, training and mentoring for the community along with village equipment. They need to know the basics of sorting and processing. After counseling is given, practices will be carried out in the form of assistance in sorting household waste. After counseling and practice, the actual implementation is carried out with supervision. Furthermore, monitoring and evaluation will be carried out within the specified time. Second, empowering villagers in making or providing facilities for sorting bins for each house. With the

existence of sorting bins, it is hoped that people are biased and accustomed to sorting their waste so that waste can be managed better.

This community service activity supports efforts to achieve Sustainable Development Goals (SDGs). Of the 17 SDGs, this activity has contributed to achieving the 11th and 13th SDGs (United Nation, n.d.). Waste sorting activities can create a more sustainable village by reducing the negative impact of waste on the environment and public health. Activities can also be the initial foundation in helping to reduce greenhouse gas emissions by reducing the volume of waste in landfills. The learning process concerning achieving the SDGs goals requires training and assistance with community empowerment (Quiroz-Niño & Murga-Menoyo, 2017).

METHOD

The community service team consists of five lecturers and five students. The community service program for Kesiman Village, a village in Trawas sub-district, Mojokerto Regency, East Java Province (see Figure 3) was carried out over four months. It was carried out in several stages (see Figure 4)—first, observation and mapping of the needs of rural communities. Before the observation, the service team discussed with the village head to identify problems and determine the location of the service. Given that waste management assistance has never been carried out in Kesiman Village, it is necessary to choose one of the hamlets as a *pilot project*. If the program is successful, it will be continued in other Hamlets. Furthermore, the service team will conduct observations and interviews in selected hamlets.

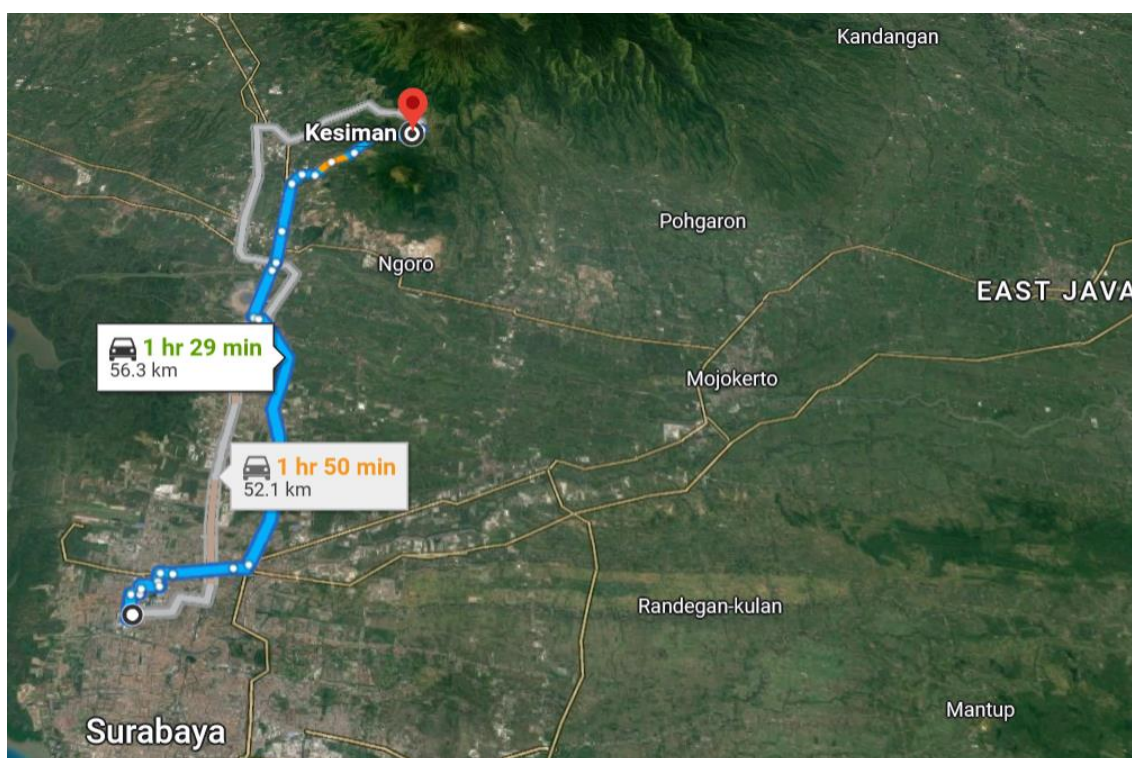


Figure 1. Location Map of Kesiman Village

Second, the provision of waste disposal facilities by empowering the village community. After the observation stage and interviews with Hamlet residents, it will be decided whether it is necessary to provide trash cans to encourage households to be willing to sort waste. This stage has two options for its implementation, namely, finding a supplier of trash cans or fully empowering the village community to make their trash cans.

Third, counseling and guidance on household waste sorting. This stage of counseling or education is carried out almost simultaneously with the process of providing trash can facilities so that waste sorting practices can be carried out when the facilities are available. Education is carried out on all selected Hamlet residents and will be collected in one place. The method of delivering material semiformal, followed by discussion and question and answer. The presenter is a lecturer who has much experience in waste management.

Fourth, the evaluation and planning of the following program. After all Hamlet residents have participated in education and understand how to sort waste, regular assistance is carried out. The evaluation is carried out as a survey at the end of the mentoring period to see whether the program is running well. The evaluation was carried out by re-observing the environmental conditions of the selected Hamlets, as well as interviews and discussions with several residents. Based on the survey results at the end of this program, a follow-up service program will be determined that can be implemented again in Kesiman Village (Figure 2).

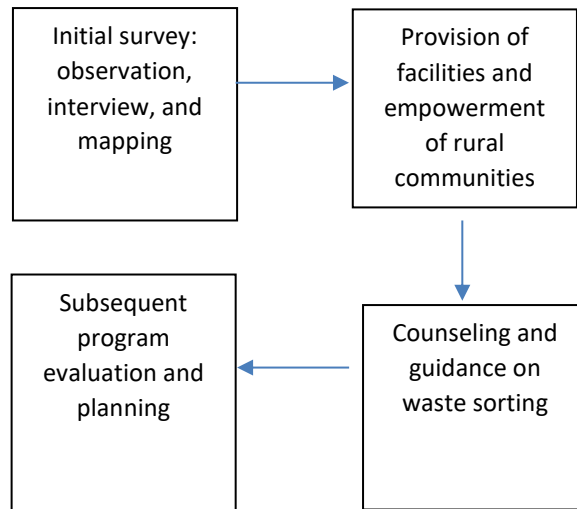


Figure 2. Stages of the community service program

RESULTS AND DISCUSSION

Community service activities began to be carried out starting in August 2022 in Kesiman Village, Trawas District, Mojokerto Regency. In the early stage, the service team met the Head of Kesiman Village. The Village Head explained the environmental conditions of the Village. Telling the condition of village waste as well as taking around the village and to the landfill location (see Figure 1 and 2). After discussion, the hamlet selected as a *pilot project* is Kemlagi Hamlet. So far, kemlagi residents are not willing to pay the waste levy because they feel that their homes are close to the kemlagi landfill. Furthermore, the service team met the Head of Kemlagi Hamlet to compile an initial waste management program, namely sorting household waste (Figure 3). The initial survey was conducted on several residents of Kesiman Hamlet on Figure 5. The service team was divided into 2 groups, and scattered to visit residents from house to house.



Figure 3. Initial Survey

The observation results show that the environmental conditions of residents' homes are pretty clean, there is no accumulation of garbage, but garbage is still mixed. The interview was conducted with a *semistructure*. The service team made a short list of questions to discuss with residents. Based on the results of the interview, it is known that waste dues are worth 10,000 Rupiah every month, and garbage collection is carried out two times a week (Monday and Thursday). Of the 14 respondents who were successfully visited by the service team, four respondents (29%) claimed to have known about the separation of organic and non-organic waste, three respondents (21%) had only heard and had an understanding that only plastic bottles needed to be separated, and seven respondents (50%) stated that they did not know about waste sorting at all. Regarding the type of waste produced by residents of Kemlagi hamlet, six respondents (43%) claimed to produce more organic waste, and eight respondents (57%) had a lot of plastic waste or food packaging.

The interview results also showed the enthusiasm of Dusun residents to manage their waste. Then the plan to provide sorting bin facilities can be implemented. The community service team and village officials find information about the supplier of sorting bins and calculate the budget needed. Finally, it was decided that sorting bins were provided by empowering the community (Figure 4). Villagers who have expertise in welding or painting iron are responsible for the activities of making iron frames. Timba for bins is purchased by comparing suppliers with good quality and affordable prices. The process of making this sorting bin takes about a month. Sorting bins will be given to each house in Kemlagi Hamlet, totaling 130 pieces. Garbage bins are distinguished between organic and non-organic. Blue barrels are for organic waste, while white barrels are for non-organic waste. To avoid being misplaced in placing waste, 'organic waste' and 'non-organic' stickers are attached to each sorting bin.



Figure 4. The process of making sorting bins

While waiting for the process of making a sorting bin, socialization, counseling, and coaching were held for the first steps in managing waste (Figure 5). This third step and the regular meeting schedule were held in the afternoon. Approximately 65 residents attended. Education is provided so the community can distinguish and sort waste based on organic and non-organic categories. The speaker gave real examples of household waste and how to sort it. After delivering the material, waga discussed and questioned. This activity was carried out in approximately 2 hours. Counseling is carried out once, then continued with mentoring, where every month, the service team will visit Kesiman Hamlet.



Figure 5. Waste sorting education

The service team evaluated waste sorting practices one month after the counseling by conducting a field survey. Like during the first survey, the service team was divided into two groups. Each group will look for homes of residents who are willing to be interviewed and discussed. Based on the interview results, the people of Kemlagi hamlet felt helped by the availability of sorting bins. Every household has made waste according to organic and non-organic categories. Figure 8 shows that plastic waste has been separated from kitchen waste (food waste, vegetables, and so on). After the waste is sorted, running the next service program, namely waste management, will be easy. The condition of waste in the Kemlagi landfill has also decreased (Figure 6).



Figure 6. Segregated garbage

There are obstacles felt by some communities regarding waste sorting. First, garbage cans are less extensive, especially for business houses (homes with grocery store businesses). Plastic bottle waste is quite a lot, so more is needed, and we prefer to collect it in sacks. Plastic bottle waste is isolated because it is easier to sell. Second, some residents complained about garbage pickups that were late or not on schedule. Third, sometimes, the garbage picked up by the janitor is put together in the tailgate of the pickup car so that the sorted waste is often mixed back.

These obstacles arise because this service program is still limited to providing sorting bins and sorting education to households. Furthermore, it is necessary to continue the waste utilization or management program, both organic and non-organic. Education for village cleaners or garbage units needs to be done so that the waste that has been sorted is not used as one.

A more comprehensive approach is needed to overcome the obstacles that arise during the implementation of community service programs. The plans that can be realized in the future include, first, educational training and training for village cleaners. The hamlet community and village cleaners are given education in sorting and processing waste efficiently. Second, there is the implementation of an integrated waste management system. Each individual or unit has a

clear role in an integrated waste management system, which involves the entire waste processing chain from selection to final disposal. Third, education on waste management technology. There are many ways to manage waste, including composting or recycling processes for non-organic waste. Also, ensure the technology adopted can be accessed and appropriately operated by the community—fourth, partnership development. Actively partner with relevant parties, including local governments and the private sector, for additional support and resources—fifth, local economic empowerment. Residents can also develop the local economy through waste management. For example, by supporting the waste recycling business or the production of organic fertilizer from waste. By making this effort, community service programs can develop into more holistic and sustainable waste management initiatives by involving all community components to create a more significant positive impact on the village environment.

Aligning waste management programs with the Sustainable Development Goals (SDGs) will achieve a broader positive impact on sustainable development. The education provided to the community and training for village cleaners raise awareness of the importance of waste management and improve the skills and knowledge of related communities. This can increase the capacity of communities to address environmental challenges. In addition, active community involvement in waste management programs can strengthen social bonds and a sense of shared responsibility towards the environment, creating togetherness and solidarity among villagers. Waste utilization programs like recycling and organic fertilizer production can create new job opportunities for local communities. This not only provides an additional source of income but also improves the economic welfare of the village. Local businesses involved in waste processing can contribute to local economic growth, creating a buoyant circular economy around the village area. Effective waste management can reduce environmental pollution, including greenhouse gas emissions from decomposed waste. This aligns with efforts to address climate change (SDG 13) and protect biodiversity (SDG 15). Sustainable use of waste, such as recycling, can reduce pressure on natural resources and help create more sustainable consumption and production patterns (SDG 12).

By achieving these SDGs goals, Kesiman Village can be an example of how local actions can have a broad positive impact. In addition, involving various stakeholders, such as government, society, and the private sector, can strengthen synergies to achieve comprehensive and sustainable development goals. Thus, Kesiman Village can pioneer sustainable development at the local level and inspire other communities.

CONCLUSION

UBAYA's community service team has completed activities in Kesiman Village for four months with an education program on sorting household waste and providing sorting bins. All activities run well and align with the Village's interests. Every house in Kemlagi Hamlet has a sorting bin that has been utilized. This program has succeeded in increasing the understanding of Kesiman Village residents, especially Kemlagi Hamlet, regarding organic and non-organic waste. Residents have also been able to sort household waste well, although some households experience a few obstacles. Furthermore, a mentoring program for organic and non-organic waste management will continue. It is also essential to establish a waste bank so that there is a place for the village community to distribute their waste. Another program that can be implemented provides training to homemakers in waste utilization.

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