

Leveraging Waste Banks for Green Environment Sustainability: A Case Study of Community Collaboration in the Gemuruh District, Bandung City, Indonesia

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ABSTRACT

Waste management is a critical issue worldwide, including in Indonesia. In recent years, there has been a growing focus on waste management due to population growth and rapid urbanization. This initiative emphasizes the implementation of technology and innovation in waste management and its impact on communities. The results show that the use of organic waste shredding machines, waste banks, and compost bags has improved waste management efficiency. Training on sorting inorganic and organic waste, as well as using shredding machines, has enhanced the knowledge and skills of the community. Pre-tests and post-tests indicate an increase in understanding and skills in waste management, highlighting the effectiveness of the training program. The community has positively responded to the implementation of technology and innovation. This initiative demonstrates that empowering creative economy through plastic waste recycling can have a positive impact on communities, particularly in raising awareness and skills in waste management.

Keywords: *Waste Bank, Waste Management, Green Environment.*

INTRODUCTION

The waste issue in the community environment highlights the increasing volume of waste generated due to the rising consumerism trends. The accumulation of mountains of waste in landfill sites renders traditional waste management methods inefficient. As the waste volume continues to surge, communities face challenges in proper waste handling. Typically, waste is managed by disposal, incineration, or landfilling, which may lead to environmental issues, particularly with inorganic waste like non-biodegradable plastics. Sunari and Nurhayati (2023) emphasize that locally-based environmental education can enhance public understanding of waste management, especially concerning plastic waste. Phan et al. (2023) demonstrate that public awareness is a key factor in the success of waste management programs.

To address effective waste management, the establishment of waste banks is essential. Waste banks involve the collection and sorting of selected inorganic waste based on types for saving, operating similarly to traditional banking but instead of money, waste is deposited. Waste banks will collect, sort, and distribute economically valuable waste to the market, enabling communities to benefit economically from waste savings. This aligns with the research conducted by Ismiraj et al. (2023), showing that waste banks can enhance community participation in waste management and provide

economic benefits. Waste banks also cultivate a new culture within the community as people understand and willingly participate in waste sorting. According to Yandri et al. (2023), community-based waste management practices such as waste banks empower communities and create new employment opportunities. Therefore, waste banks can serve as an alternative waste management solution, establishing a more efficient waste management system within communities. Kurniawan et al. (2023) note that strengthening recycling industries in specific regions can have positive impacts on the environment and local economies. Waste management through waste banks minimizes residue, making it more environmentally friendly. Saleh et al. (2023) highlight that effective waste management can strengthen social structures and raise awareness of the importance of a clean environment.

In accordance with Takbiran (2020), the Benteng Kreasi Waste Bank serves as a prime example of social capital in area-based waste management. The waste bank's activities involve the collection and sorting of dry waste with a management approach akin to traditional banking, where instead of money, waste is stored. Empowering residents is achieved through outreach, education, and training using participatory emancipatory methods, along with dialogues with residents and partnership support to achieve a clean, green, comfortable, and

healthy environment. Asteria & Heruman (2016) highlight that the Pucuk Resik Waste Bank in Kampung Karangresik significantly benefits residents by reducing waste generation, creating a cleaner environment, and enhancing residents' economic independence. Besides economic advantages, this waste bank also contributes to environmental health, community creativity, and the well-being of residents. Research by Afad, Oiyah & Fajariyah (2023) reveals that community service programs through TPS Bestari can improve community well-being and help address waste issues in Desa Api-api. Waste banks provide a means for local communities to enhance collective awareness in environmental preservation and foster creative economy. Entaresmen et al. (2022) discovered that waste banks can boost community income in Cengkareng, West Jakarta. Therefore, continuous collaboration between communities and government is crucial for sustainable and effective waste management efforts.

Findings by Nisa & Saputro (2021) indicate that the Kebonmanis community actively manages a waste bank to reduce the impact of household waste accumulation. This initiative not only increases community income but also aids in environmental preservation by leveraging creativity and innovation in waste management. Thus, this study underscores the significance of waste banks in creating a clean, green, comfortable, and healthy environment, while

enhancing the economic well-being of residents in Gemuruh District, Bandung City.

In the quest to address waste management challenges effectively and sustainably, a series of strategic steps have been designed based on research findings from existing condition analysis. Firstly, the approach taken involves providing training and education to the community. Residents are educated on how to sort organic and inorganic waste and use shredding machines to create compost. The goal of this training is to enhance the technical skills of the community in waste processing, thereby significantly reducing the volume of waste disposed of in the Waste Disposal Site (TPS). The second step involves providing the necessary facilities and equipment. Residents are granted access to equipment such as organic waste shredders, waste banks, trash cans, and plastic waste bins. This aims to support the community in independently and sustainably managing waste. Additionally, socialization and outreach involving the team and representatives from the Department of Environment and Sanitation are conducted. The content covers government policies related to waste management, best practices in waste management, and the importance of collaboration between the community and the government in effective waste management efforts. Lastly, evaluation is carried out through pre-tests and post-tests. Pre-tests are used to assess the community's initial knowledge before training,

while post-tests are conducted after the activities to measure their improved understanding. This evaluation is crucial to assess the effectiveness of the training and education activities conducted. Through this series of steps, it is hoped that the community can understand the importance of proper waste management, effectively sort waste, reduce the amount of waste disposed of in TPS, and even create economic value from waste. Thus, it is expected that the well-being of the local community can improve, and the environment can be safeguarded from the negative impacts of waste accumulation.

METHOD

The implementation method to address the partner's issues regarding Optimizing Waste Banks to create a green environment with the RW 03 Community in the Gumuruh Village area of Bandung City will involve the following steps:

In the first stage, a socialization of community service activities in waste management in the Gumuruh District area will be carried out. The community service team consisting of the Service Proposal Team and target partners will conduct an awareness campaign to the local residents about the importance of effective and environmentally friendly waste management. The community service team will conduct socialization in the Gumuruh District through community meetings, lectures, and interactive discussions.

They will explain the benefits of waste management, including improving environmental cleanliness, disease prevention, and the potential utilization of waste as a valuable resource. The team will also provide information on specific steps in waste management, such as collection, sorting, and proper waste distribution. They will also gather input and feedback from the community to understand challenges and obstacles faced and adapt waste management steps according to local conditions. The aim of this community service socialization is to create greater awareness and understanding among the residents of the Gumuruh District about the importance of proper waste management. With this socialization, it is hoped that the community will actively participate in managing, collecting, sorting, and distributing waste correctly and sustainably.

The next step is waste management training. This training aims to provide understanding and skills to partners in selecting and sorting waste effectively. The community service team, together with environmental experts and local government, will design and implement this training. The training will cover the separation of wet and dry waste and grouping based on decomposability levels. Partners will learn how to sort waste correctly and separate economically valuable waste. This training will also introduce organic waste processing machines and waste sorting bins as innovative tools. Through this training

phase, it is expected that partners will have sufficient understanding and skills in effective waste management. They will be able to implement proper waste selection and sorting practices and utilize the economic potential of recyclable waste.

After completing the training phase, the next step is the application of technology in waste management. The application of this technology aims to provide understanding and skills to partners in distributing waste with economic value to waste collectors, thereby enhancing the economy of the local partners. In this application, Organic Waste Machines and Waste Sorting Bins previously described will be used.

Upon mastering the proper waste sorting techniques and identifying economically valuable waste during the training, partners will be guided on how to distribute this waste. They will learn the steps to package and prepare economically valuable waste, such as paper, metal, or plastic bottles, according to set standards. Partners will gain an understanding of the importance of maintaining the quality of waste to retain its economic value. They will be taught how to clean and manage waste before distributing it to waste collectors. In this regard, the Organic Waste Machine can assist in turning organic waste into quality compost, while the Waste Sorting Bins will facilitate partners in separating waste by type to maintain its quality. The application of this technology also aims to impart an understanding

to partners that waste also holds economic value that can boost their local economy. By implementing technology and optimizing the economic value of generated waste, partners will realize the potential resources available around them.

After going through the technology application phase, the next step is the mentoring and evaluation phase. This stage involves the participation of partner service members who will be mentored to ensure that the training and mentoring program provided align with the pre-established plan. During the mentoring phase, the community service team will continue to offer support and guidance to partners in implementing the knowledge and skills they acquired during training. The team will stand by partners, assisting them in overcoming challenges and optimizing waste management potential in their area.

Moreover, this phase also includes evaluating the achieved outcomes. Evaluation is conducted to assess the extent to which the training and mentoring program has been successful and met the set objectives. In this evaluation, service partners are expected to provide feedback and relevant criticisms regarding the achieved results, which can be used for future improvements. A participatory approach will be sought in every stage of the activities, including the mentoring and evaluation phases. Partners will be actively engaged through group discussions and individual consultations. This is to ensure that the

implemented activities align with partners' needs and expectations. By involving partners in decision-making and planning processes, it is expected that the outcomes achieved will be more relevant and sustainable. The team comprises a team leader accompanied by members and students from STIE Pasundan, Bandung. The implementation will take place over one day involving partners and officials from the Environmental Agency.

RESULTS and DISCUSSION

The implementation of this project involves various educational and community empowerment activities, including training on separating organic and inorganic waste, demonstrating the use of organic waste shredding machines, and raising awareness about the importance of effective waste management. Based on the situational analysis, there are several priorities that need to be comprehensively addressed in this community service project. These priorities include the lack of knowledge and skills in waste management, particularly in sorting and determining which waste should be incinerated, buried, or disposed of directly at temporary disposal sites (TPS). This results in a buildup of waste causing discomfort in the environment due to the odor emitted. Additionally, the lack of media and utilization of waste for economic value in the market leads to missed

opportunities for benefiting the community economically.

The proposed solution to address the challenges faced by our partners is Waste Management. The lack of understanding and skills among the residents of RW 03 in the Gumuruh Village area has led to a lack of awareness of proper waste management systems, especially in handling inorganic waste. Consequently, many residents haphazardly bury, burn, or dispose of waste at temporary disposal sites without separating organic and inorganic waste. This improper waste management has created an uncomfortable environment due to the odors emanating from poorly managed waste. Therefore, we will provide intensive training and mentoring to our partners to equip them with the knowledge and skills needed for proper waste management. This issue is a top priority that must be addressed promptly, as resolving it not only creates a clean and comfortable environment but also extends the lifespan of the temporary disposal sites and landfills in the partner's area.

Waste Utilization is another challenge faced by the residents of RW 03 in the Gumuruh Village area, particularly in dealing with non-biodegradable waste like plastic waste. This challenge stems from a lack of innovation and skills among our partners. To tackle this issue, we will introduce a waste-saving culture where the residents will learn to save managed waste, which will then be converted into economic value in the

market, ultimately benefiting the residents of RW 03. Infrastructure for Waste Collection is another aspect we will address by facilitating a waste bank as a means for the residents of RW 03 to manage and utilize waste. In addition to the waste bank, other facilities will also be provided to assist our partners throughout the community service project. With the solutions we offer for these challenges, we are confident that we will enhance the knowledge and skills of our partners, educate the community to be more self-reliant and environmentally conscious. The government's perspective and direct guidance on sustainable waste management policies and strategies are crucial. Government Policies Related to Waste Management emphasize the importance of community participation in supporting government policies. They stress that waste management is not solely the responsibility of the government but also requires active involvement from all sectors of society, from households to local communities and organizations. Best Practices in Waste Separation provide education on the best practices in waste separation. This includes effective ways to separate organic and inorganic waste at home, as well as the importance of source separation to reduce the amount of waste that needs to be processed or disposed of at final disposal sites.

The Importance of Collaboration between the Community and Government encourages the community to be more proactive in waste

management activities, such as participating in waste bank programs, supporting environmental cleanliness campaigns, and engaging in training and outreach on waste management. Challenges faced in implementing waste separation systems at the household level, such as inadequate facilities and lack of community awareness. In response, representatives from the Environmental Agency provide practical advice and solutions, such as forming working groups at the neighborhood level to facilitate educational programs and campaigns, as well as establishing incentive systems to encourage active community participation. Effective waste management requires strong collaboration between the government and the community. Ongoing education, active participation, and the use of appropriate technology can enhance the efficiency and effectiveness of waste management. Participants are encouraged to apply the knowledge and skills they acquire during these sessions in their daily lives and play an active role in maintaining the cleanliness of their environments, and boost the economic independence of the residents.





Figure 1. Participants' Pre-Test and Post-Test Activities Guided by The Implementation Team and Committee Team

Before the outreach activities begin, a pre-test is conducted for all attendees as shown in Figure 1. This pre-test aims to measure participants' initial understanding of waste management topics and basic principles that will be discussed during the outreach. The pre-test results indicate that most participants have limited basic knowledge of effective waste management, with an average

score of 45 out of 100. This indicates the need for increased education and information related to sustainable waste management. After the entire series of outreach activities and training is completed, a post-test is conducted for the participants. This post-test aims to evaluate the extent to which the materials presented have improved participants' understanding of waste management. The post-test results show a significant increase in participants' knowledge and understanding, with the average score rising to 85 out of 100. This indicates that the outreach and training activities have successfully enhanced participants' understanding of the importance of proper and sustainable waste management.

A specific training session focuses on separating inorganic and organic waste. This training aims to enhance the community's capacity to correctly separate different types of waste, thereby maximizing the economic value of recyclable waste and reducing the amount of waste that needs to be disposed of at final disposal sites. The training also includes a demonstration on how to separate waste at the household level, involving all participants directly.





Figure 2. Training On Sorting Waste and Demonstration on The Use of An Organic Waste Chopping Machine

In addition to waste separation training, a training session on using an organic waste shredder machine to process waste into compost is also conducted as seen in Figure 2. In this session, participants are provided with an explanation of how the shredder machine works and the benefits of using the machine to reduce the volume of organic waste while producing

compost that is beneficial for agriculture or community gardens. Participants are also given the opportunity to directly try using the organic waste shredder machine under the guidance of experienced instructors.





Figure 3. Innovation and Technology Equipment used to support the Waste Bank Program

Upon completion of the training, the community is handed over facilities and equipment. This handover aims to provide the necessary support for the waste management program to run smoothly and sustainably. The facilities and equipment used, such as the Organic Waste Shredder Machine, 660-Liter Waste Bank, Trash Bins, and Compost Bags, are distributed to residents to assist them in turning organic waste into compost as shown in Figure 3. The handover of this technological equipment and innovation concludes with the signing of a Handover Report for the technology and innovation equipment donated to the community of RW 03, Gumuruh Village. The handover of these assets is carried out by the PKM Implementation Chairperson and received by the Representative of the RW 03 Community, who expresses readiness to use and maintain the

equipment provided for waste management in their environment as depicted in Figure 4.



Figure 4. Handover of Technology and Innovation Equipment and Plaques to Target Partners

The lack of knowledge and skills in waste management, especially in sorting and selecting which waste should be burned, buried in the ground, or disposed of directly at temporary disposal sites, has led to the accumulation of waste causing discomfort due to the odor it emits. To address the lack of knowledge and skills in waste management, this program focuses on enhancing knowledge and skills in waste management. The program also aims to address the lack of media and utilization of waste to be distributed for economic value in the market, thus providing benefits that can uplift the community.

To tackle the scarcity of media and the utilization of economically valuable waste, the program focuses on developing media and utilizing waste for economic value by establishing a Waste Bank. This initiative assists the community in developing a more organized waste bank system. Through the use of 660-liter Waste Banks provided, residents can collect sorted waste ready for recycling or sale. These Waste Banks serve as hubs for collecting economically valuable waste like plastic, paper, and metal, which can be sold to collectors or other parties in need. Collaboration with external parties, such as partnering with the Environmental and Sanitation Agency, involves cooperation with the Environmental and Sanitation Agency to provide support through training, education, and outreach to the community. This collaboration may also include continuous monitoring and evaluation activities regarding the waste management program implementation in RW 03.

The provision of supporting infrastructure, such as trash bins in each neighborhood and plastic waste bags, aims to assist residents in collecting sorted waste at households. This infrastructure will facilitate active community participation in waste management programs and enhance environmental awareness at the community level. This aligns with the findings of previous studies showing that empowering creative economy through plastic waste recycling can positively impact communities, particularly in

raising awareness and skills in waste management. By providing the appropriate facilities and training, residents not only improve waste management but also have the potential to increase income through waste utilization. The establishment of legally recognized Waste Banks in Village has been shown to boost the local economy, similar to the potential economic benefits observed in this study. As awareness and skills increase, communities can transform waste into a source of income, supporting better environmental management practices.

Research findings by Linda (2016) highlight the positive impact of empowering creative economy through plastic waste recycling on communities, particularly in enhancing awareness and skills in waste management. Khoirunnisa and Sari (2021) also emphasize the significant role of Waste Banks in empowering the community economically, especially in increasing household income. Therefore, the approach taken in this study not only focuses on technical aspects but also on the social and economic impacts generated. Angraini et al. (2021) discovered that Waste Bank activities have a positive financial significance for the community. With proper facilities and training, residents can not only manage waste more effectively but also potentially increase income through waste utilization. Pamungkas et al. (2020) demonstrated that establishing a legally recognized Waste Bank

in Brang Kolong Village can boost the local economy. These findings align with the results of this research, where the community shows improved waste management skills that have the potential to enhance productivity and provide economic benefits. Through increased awareness and skills, residents can transform waste into a source of income, thereby supporting better environmental management.

CONCLUSION

The successful implementation of activities has incorporated various technologies and innovations in waste management, including organic waste shredding machines, Waste Banks, trash bins, and compost bags. These technologies are designed to enhance waste management efficiency and reduce negative environmental impacts. Training on sorting inorganic and organic waste, as well as the use of shredding machines, has provided additional knowledge and skills to the community. Pre-tests and post-tests have shown an improvement in understanding and skills in waste management, indicating the effectiveness of this training program. The implementation of technology and innovation has been well-received by the community. Interactive discussions with representatives from the Environmental and Sanitation Agency have shown a greater awareness of the importance of waste

management and the need for collaboration between the community and the government. The application of technology and facilities has had a positive impact on waste management. The community has shown an increase in understanding and skills in waste management, which has the potential to enhance waste management productivity and provide economic benefits through waste utilization.

It is recommended to continue training and workshops to enhance the community's capacity in waste management, especially in terms of utilizing waste with economic value. Additional training may include the latest techniques in waste processing and marketing strategies. There is a need to add facilities and infrastructure that support waste management, such as additional Waste Banks or more comprehensive waste processing facilities. This will help improve waste management capacity and utilization. Increasing awareness campaigns in the community about the importance of waste sorting and management is crucial. These campaigns can be conducted through social media, community activities, and educational programs for children. It is important to conduct regular monitoring and evaluation to ensure that the program runs according to plan and delivers the expected benefits. Periodic evaluations can help identify issues and take necessary corrective actions. Strengthening collaboration between the community, government, and private sector in

waste management is essential. This collaboration is crucial to create sustainable solutions and optimize resource utilization. Assisting the community in developing and implementing a business plan for sustainable Waste Bank management is also important. This business plan should include marketing strategies, financial management, and the development of waste-based products.

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