

Strengthening community participation in waste management through education and innovation

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ABSTRACT

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Urban waste management in Indonesia faces challenges from rapid population growth, increased waste generation, limited landfill capacity, and low public awareness of waste segregation. Although regulations promote the 3R principles (Reduce, Reuse, Recycle), their implementation is hampered by inadequate infrastructure and community participation. Bank Sampah IKHLAS exemplifies community-based waste management by empowering residents, especially women, to transform waste into valuable products while fostering environmental awareness. To enhance its effectiveness, the community service programs focused on education and motivation through socialization and personalized approaches to raise awareness of reducing waste volume at landfills. Creativity training based on the 3R principle was conducted, resulting in products like wallets, bags, laptop cases, and tumbler covers. The program increased awareness and participation, reflected in a rise in customers from 24 percent to 37 percent of total households. Although the increase is modest, the program successfully encouraged broader community involvement. Waste management has expanded from basic sorting to producing reusable items through recycling, showcasing the potential of integrated community-based approaches. This initiative highlights the role of education and creativity in building sustainable waste management systems.

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1. INTRODUCTION

Good waste management is one of the major challenges faced by modern society. Poorly managed waste can have adverse effects on the environment and public health. Urban waste management in Indonesia has become a pressing issue as the population growth rate leads to increased waste generation. Problems include a lack of strict legal frameworks, inadequate waste disposal sites, insufficient composting efforts, and improper landfill management systems (Mahyudin, 2017). As the population and consumption grow, the volume of waste continues to rise while the capacity of landfills becomes increasingly limited. In this context, community-based waste management initiatives like waste

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banks have emerged as promising solutions to address waste issues while empowering communities. Community-Based Waste Management is a concept driven by community needs, planned, implemented, controlled, and evaluated collaboratively. The government and other organizations act as motivators and facilitators (Joleha et al., 2023a).

Bank Sampah IKHLAS (IKHLAS Waste Bank), located in Perumahan Putri Tujuh II, Sidomulyo Barat, Tuahmadani, Pekanbaru, stands as a concrete example of self-reliant community waste management efforts. Established in 2023, this waste bank not only focuses on waste collection and segregation but also educates the public on sustainable waste management. Waste banks play an essential role in educating and raising awareness about environmentally friendly waste management. Communities are key players in shaping habits and behaviors to protect their environment. Such behaviors foster awareness about environmental cleanliness, a critical factor in creating a clean and healthy environment (Joleha et al., 2023b). The initiatives by Joleha et al. (2023a) emphasize the importance of education and active community participation for the success of waste bank programs.

In 2024, a program to develop Bank Sampah IKHLAS was carried out as part of the Integrated Community Service Program (KUKERTA) of Universitas Riau. The program aims to enhance the waste bank's capacity to process waste into economically valuable products while empowering local residents, particularly women in Perumahan Putri Tujuh II (Joleha et al., 2023b). Development activities include training on recycling plastic waste into marketable products such as bags and wallets and expanding the reach of waste bank customers. The program also highlights challenges, strategies implemented, and the social and economic impacts on the local community (Novianty, 2013).

Law Number 18 of 2008 on Waste Management, along with Government Regulation Number 81 of 2012, mandates a fundamental paradigm shift in waste management—from the collect-transport-dispose system to a management approach emphasizing waste reduction and treatment. Waste reduction activities aim to involve all societal layers, including government, businesses, and the general public, in waste minimization, recycling, and reuse, commonly known as Reduce, Reuse, and Recycle (3R) through smart, efficient, and well-structured efforts. However, 3R initiatives still face major obstacles, primarily the low public awareness of waste segregation (Joleha et al., 2023b). Steps taken include providing knowledge and implementing household waste management practices, with the hope of raising awareness about waste processing to alleviate the burden on landfills.

Winahyu et al. (2019) state that this approach not only benefits the community but also actively involves them as managers in the waste management process in their environment. This aligns with the vision of Bank Sampah IKHLAS, which aims to empower communities to manage waste independently and sustainably.

Waste banks serve not just as waste collection centers but also as tools to raise environmental awareness and create economic value from managed waste. Research highlights that community participation, especially by women, in waste bank operations can be a significant social capital in community-based waste management strategies (Asteria & Heruman, 2016; Shiratina et al., 2023).

One way to enhance waste bank activities is by effectively applying the 4R principles (Reduce, Reuse, Recycle, and Recover). Implementing these principles in locations like Tasikmalaya demonstrates that waste banks can function as an alternative strategy for community-based waste management (Asteria & Heruman, 2016). Additionally, innovative programs involving technology and community training have proven effective in increasing the volume of managed waste, which subsequently helps reduce greenhouse gas emissions (Nurani et al., 2020).

Education and communication play a crucial role in increasing public knowledge about waste banks. Outreach efforts by local governments and community organizations can boost community participation

in waste management (Suwerda et al., 2018). Research in Bantul shows that public knowledge of waste banks can be acquired through various information channels, contributing to increased participation in waste management (Suwerda et al., 2018). Thus, effective communication strategies are vital to building community awareness and involvement.

The development of waste banks through skill training using waste materials as raw materials is an effective strategy to enhance community participation and create economic value from waste. Waste banks serve as platforms for collecting and managing sorted waste, while skill training equips communities with the knowledge and ability to turn waste into valuable products (Ummah et al., 2020).

One approach is conducting training on crafting with waste materials such as plastic and paper. This activity not only improves community skills but also encourages active participation in waste management within their environment. For instance, a training program in Rejodani Village demonstrated that socialization and discussions about waste banks can enhance community understanding of the importance of proper waste management (Maslamah et al., 2021). Furthermore, training focused on recycling plastic waste into economically viable products has been proven effective in increasing community knowledge and skills (Anifah et al., 2020; Susilo et al., 2019).

Through the community service activity centered on developing waste bank management at the project site, it is expected that the number of participants will increase and that waste will be utilized more effectively into useful products, aligning with the objectives of this initiative. Moreover, by studying the case of Bank Sampah IKHLAS, a deeper understanding of the potential and role of waste banks in addressing household waste issues, as well as their contribution to community economic empowerment and environmental preservation, can be achieved.

2. METHODS

This community service activity was carried out in an integrated manner with the 2024 Riau University Kukerta students. The method of implementing the service was made effective and applicable.

Pre-Test

A pre-test was conducted before the core activity began. The objectives were to measure participants' initial understanding of the topics to be discussed, identify specific participant needs to ensure the material delivered is more relevant, and provide a general overview of aspects requiring further emphasis during the activity. The pre-test process involved presenting participants with multiple-choice questions that were relevant to the subject matter.

Training and Education

Providing training and education to the community on the importance of proper waste management and the benefits of a waste bank. The training covers technical aspects such as managing organic and inorganic waste and waste sorting. Additionally, education on the importance of reducing, recycling, and sustainably managing waste should also be imparted to the community.

Participatory Approach

The participatory approach involves actively engaging the community in decision-making, planning, and implementing waste bank management activities. This approach ensures that the community feels a sense of ownership over the program, thereby enhancing its sustainability and effectiveness. The participatory approach places the community at the center of waste bank management, fostering a sense of responsibility and ensuring the program's long-term success while benefiting both the environment and community well-being.

Socialization and Campaign

Conducting intensive outreach and campaigns, providing the community with a better understanding of the benefits of waste banks and how to manage them. Campaigns can be carried out to raise public awareness about reducing the use of single-use plastics and utilizing waste banks to generate economic benefits.

Recycling Waste

Recycling waste involves processing discarded materials into raw materials that can be reused to create new products, thereby reducing environmental impact and generating economic value. The process typically includes several key steps and offers numerous benefits for sustainability and commerce: collection and sorting, processing into raw materials, creation of new products, and economic and environmental benefits.

Post-Test

Post-tests are conducted after the main activities are completed. The purpose of the post-test is to evaluate the participants' improved understanding compared to the pre-test results, measure the effectiveness of the community service methods used, and identify areas that still need improvement in the delivery of materials. The post-test process uses the same format as the pre-test to ensure results can be compared objectively.

3. RESULTS AND DISCUSSION

Results

Bank Sampah IKHLAS, which was established in 2023 in Perumahan Putri Tujuh II, Kelurahan Sidomulyo Barat, Kecamatan Tuahmadani, Kota Pekanbaru, began its journey with significant challenges in terms of community participation. In its early stages, the waste bank was only able to reach a small portion of the total number of households (KK) in the area. Data shows that in its first year of operation, Bank Sampah IKHLAS only had about 24 percent of the total KK in its operational area as customers. This figure reflects a great potential for development and increased community participation in this community-based waste management program (Muttaqien et al., 2019).

To assess the effectiveness of the intervention program and the community's understanding of Bank Sampah IKHLAS, a pre-test survey was conducted with 13 respondents. The survey revealed several important findings, including: (1) The awareness and knowledge of the waste bank was very high among the respondents. All participants (13 out of 13) had heard of the waste bank, and almost all (12 out of 13) knew the location of the waste bank nearby. The majority (10 out of 13) had even visited the waste bank, showing a good level of engagement; (2) The understanding of the waste bank concept was also high, with 11 out of 13 respondents stating they understood the concept. All respondents agreed that the waste bank was beneficial to the community, showing a positive perception of this initiative; (3) The community's readiness to participate was also high. All respondents were willing to sort waste at home, and almost all (12 out of 13) were ready to deposit waste at the waste bank. This shows a large potential to increase active participation in the waste bank program.

However, the survey also revealed several challenges. Although most respondents found the process of depositing waste to be easy and practical, nearly half (6 out of 13) had encountered obstacles. The main problems reported were issues with the waste bank's operational hours and the distance to the facility.

The results of this survey provide valuable insights into the community's perceptions and readiness to participate in Bank Sampah IKNILAS. Although awareness and willingness to participate are high, there is still room for improvement, particularly in addressing the operational challenges faced by some respondents. The survey results, comparing responses before and after training, are illustrated in Figures 1 and 2.

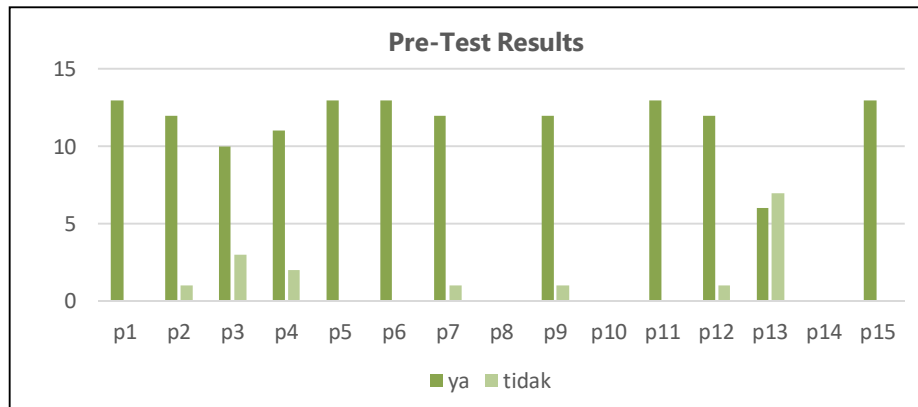


Figure 1. Pre-test results

Post-test was conducted on 6 respondents to assess their understanding and attitude towards bank after the intervention program. The post-test results showed several changes and improvements compared to the pre-test.

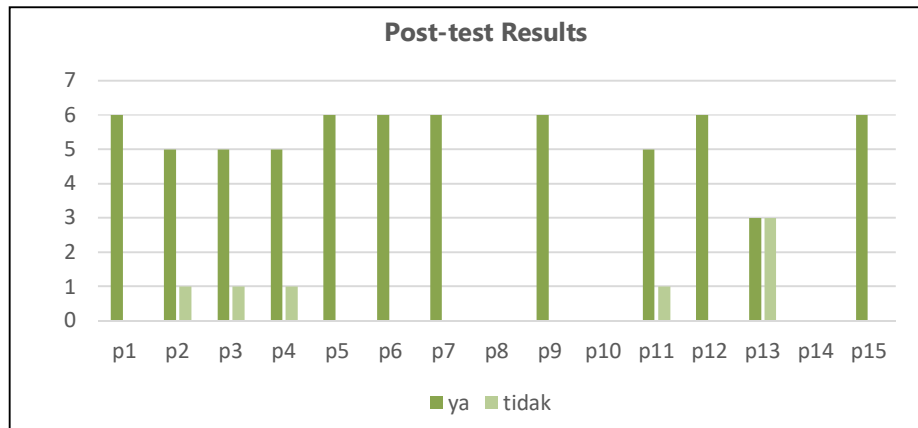


Figure 2. Post-test results

Awareness of the Waste bank remains high, with all respondents (6 out of 6) having heard of the Waste bank. Knowledge of the Waste bank location is also high, with 5 out of 6 respondents knowing its location near their residence. The visit rate to the Waste bank increased, with 5 out of 6 respondents having visited the Waste bank. The reasons for visits include becoming a customer, depositing waste, increasing income, and saving. The understanding of the Waste bank concept is also high, with 5 out of 6 respondents stating that they understand the concept. All respondents agree that the Waste bank is beneficial for the community, showing consistent positive perceptions.

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Willingness to participate is very high, with all respondents (6 out of 6) willing to sort waste at home and deposit waste at the Waste bank. Knowledge of the types of waste that can be deposited increased, with all respondents knowing that plastic and paper waste can be deposited. No respondents selected organic waste, showing improved understanding of the types of waste accepted. All respondents are aware of the rewards from the Waste bank, with money being the most attractive form of reward. Although all respondents consider the process of depositing waste easy and practical, half of them (3 out of 6) still experienced obstacles, mainly related to the Waste bank's operational hours not being suitable.

The results of the post-test show some improvements compared to the pre-test: (1) The visit rate to the Waste bank increased, with a higher proportion of respondents having visited the Waste bank; (2) Willingness to participate reached 100 percent, with all respondents willing to sort waste at home and deposit it at the Waste bank; (3) Knowledge of the types of waste that can be deposited increased, with no respondents selecting organic waste as a type of waste to deposit. (4) All respondents considered the process of depositing waste easy and practical, showing an improvement in the perception of the ease of using the Waste bank. However, there are still challenges that need to be addressed: (1) Half of the respondents still experienced difficulties, mainly related to the Waste bank's operational hours being unsuitable; (2) One respondent still did not know the location of the Waste bank and did not understand its concept, showing the need for further efforts to reach the entire community.

Overall, the results of the post-test show that the intervention program has successfully increased awareness, understanding, and readiness for the community to participate in the Waste bank program. However, there is still room for improvement, especially in addressing operational challenges and reaching all community members. Given the need to increase community participation, an intervention program was implemented in 2024. This program is part of the *Kuliah Kerja Nyata* (Kukerta) activity of University of Riau students, integrated with community service. Kukerta students designed and implemented various activities aimed at increasing community awareness about the importance of waste management and the benefits of becoming a customer of Waste bank IKHLAS. These activities included door-to-door socialization, waste management workshops, demonstrations of recycling waste into economically valuable products, and social media campaigns to reach more residents.

The results of this intervention program show a significant increase in the number of Bank Sampah IKHLAS customers. After the community service program by Kukerta students, the percentage of waste bank customers increased from 24 percent to 37 percent of the total KK in the area. This 13 percent increase represents a substantial growth in community participation. From a relative growth perspective, this increase is equivalent to a 54.17 percent rise from the initial customer base.

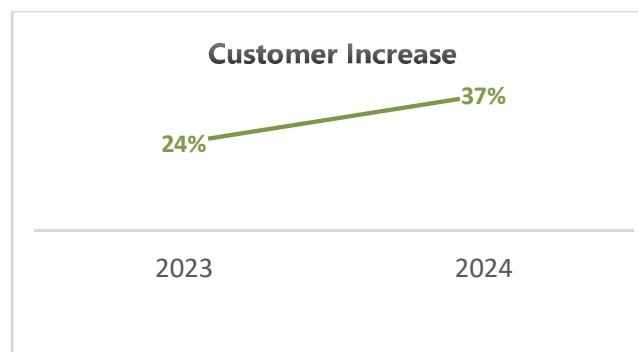


Figure 3. Customer increase

This achievement indicates the success of the program in attracting community interest and participation in community-based waste management. The increase in the number of customers not only demonstrates success in quantitative aspects but also reflects a positive change in the community's awareness and behavior towards waste management. However, the fact that 63 percent of households (KK) are still not customers of Bank Sampah IKHLAS shows that there is a great potential for further development in the future. This success provides a strong foundation for the sustainability and growth of Bank Sampah IKHLAS. The increase in community participation not only impacts the volume of waste that can be managed but also has the potential to enhance the economic and social impact of this waste bank initiative on the local community. Thus, these results serve as an important starting point for a more comprehensive and sustainable strategy for the future development of waste bank.

Achievement Analysis

Program Effectiveness: A 13 percent increase shows that the community service program by Kukerta Unri students successfully attracted public interest to participate in Bank Sampah IKHLAS. **Significance of the Increase:** The rise from 24 percent to 37 percent indicates the program's success in raising awareness and participation in the community. **Development Potential:** Despite the significant increase, there is still room for further growth, as 63 percent of households have not yet become customers of Bank Sampah IKHLAS. **Social Impact:** The increase in the number of customers indicates a growing awareness of waste management and participation in environmental activities.

The 2024 community service program by Kukerta Unri students has met its objective of increasing public participation in Bank Sampah IKHLAS, with a significant rise in the number of customers. This success provides a strong foundation for the future development and sustainability of Bank Sampah IKHLAS.

Making Bags and Wallets from Plastic Waste

Based on the conditions found in the field, the main problem in plastic waste management is the high volume of plastic waste generated by households and the lack of efforts to utilize the plastic waste, which is often discarded carelessly, leading to environmental pollution. To address this issue, students of the Kuliah Kerja Nyata (KUKERTA) program initiated a project to help the community by processing plastic waste into marketable products, such as bags and wallets. The production of bags and wallets from plastic waste requires used plastic as the main raw material, which is why we need support from Bank Sampah Ikhlas to provide the collected plastic waste from the community around the Perumahan Putri Tujuh II area.

This innovation has received positive feedback from various circles. For example, the speaker at the training held by KUKERTA students from Universitas Riau, has successfully sold hundreds of bags and wallets to customers in various regions. This success shows that recycled plastic products have a promising market potential. The production of bags and wallets from plastic waste not only provides economic benefits but also contributes to environmental preservation efforts. By turning plastic waste into valuable products, this activity helps reduce the amount of plastic waste that ends up in landfills (TPA), which could otherwise pollute the environment. Furthermore, this process also opens up opportunities for the community, particularly housewives, to develop new skills and even start small businesses based on recycling.

Through the training and demonstrations held, such as the ones conducted by KUKERTA students at Perumahan Putri Tujuh II, Pekanbaru, the community is expected to be inspired and motivated to participate in more responsible waste management efforts. Activities like these not only transfer

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technical skills in product creation but also raise community awareness about the importance of waste management and the economic potential that can be derived from plastic waste. Figure 4 shows the production flowchart.

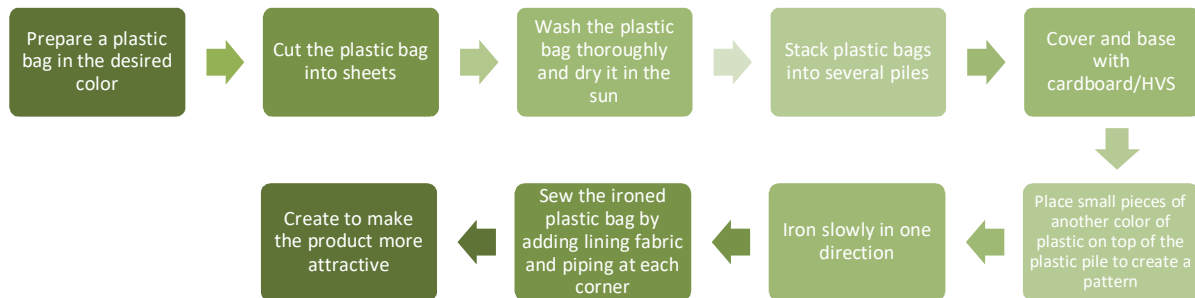


Figure 4. Plastic waste recycling product manufacturing flow

This training is also a development of waste bank management. Waste banks play a significant role in addressing waste issues in communities, and they add value to waste. By creating new products from waste, waste banks are a form of creative economy movement and also contribute to environmental preservation (Linda, 2016). Recycling plastic waste into bags and wallets is a real example of the utilization concept explained in the KBBI (Indonesian Dictionary). This process transforms plastic waste, which originally had no value, into useful and economically valuable products. This aligns with Karyawan et al. (2024), who emphasize that recycling can turn waste into useful goods. The process of making bags and wallets from plastic waste involves several stages: (1) Collection and Sorting: Plastic waste is collected from the waste bank or other sources. The plastic is sorted by type and quality to ensure the appropriate material for making bags and wallets; (2) Cleaning: Selected plastic is cleaned to remove dirt and contaminants; (3) Cutting: The plastic is cut according to the required patterns for making the bags or wallets; (4) Adding Motifs: The cut plastic pieces are given motifs according to the desired design; (5) Ironing: The plastic pieces are ironed to fuse them together and form sturdy sheets; (6) Adding Lining: The plastic sheets are lined with fabric for added durability; (7) Sewing: The prepared plastic sheets are sewn together to form the shape of the bag or wallet; (8) Finishing: Accessories such as zippers and keychains are added to complete the product.



Figure 5. Collection of plastic waste to be processed

This process not only reduces plastic waste in the environment but also creates products with economic value. As mentioned by Permadi (2011), plastic takes a very long time to degrade naturally. By

transforming it into products that can be used in the long term, we extend the life cycle of plastic and reduce its negative environmental impact.

Creative waste management can reduce the negative effects of environmental pollution and raise public awareness about the importance of maintaining the environment and utilizing everything, whether it's waste or unused items, turning them into economically valuable products. Recycling is one of the strategies for solid waste management, which includes activities such as sorting, collecting, processing, distributing, and creating products or materials from used items. It is a key component in modern waste management (Riyanto et al., 2021).

The initiative of the Kuliah Kerja Nyata (KUKERTA) students in seeking alternatives for utilizing plastic waste demonstrates an awareness of the importance of innovation in waste management. Collaboration with motivators like the owner of the Assoy Recycle account demonstrates how knowledge and skills can be shared to empower communities in managing plastic waste.

The benefits of this activity align with two key points you mentioned: reducing environmental pollution and increasing the economic value of waste. By turning plastic waste into useful and marketable products, communities not only contribute to environmental conservation but also gain economic benefits.

However, the implementation of waste recycling also faces challenges such as inadequate infrastructure, lack of public awareness, and the absence of supporting policies and incentives from the government. For the success of waste recycling programs, active collaboration and participation from all stakeholders, including the government, industry, environmental organizations, and the general public, are necessary (Aqilla, 2024).



Figure 6. Results of making bags and wallets from plastic waste

Discussion

This community service activity aims to enhance the capacity of community-based waste management and strengthen the contribution to reducing waste generation at the household level. Through this program, a series of training, mentoring, and evaluation of waste bank management involving residents and the management of Bank Sampah IKHLAS were conducted.

The results of the activity show significant changes in the waste bank management aspect. Based on the analysis of the pre-test and post-test results, the average understanding of the participants regarding waste bank management increased from 60 percent in the pre-test to 85 percent in the post-test. Additionally, operational data of the waste bank shows an increase in the number of waste bank members, from 22 households (KK) to 36 KK within two months after the training. This indicates an

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increase in public awareness and participation in the program. It has also led to an increase in additional income, from around 1,000,000 IDR to 3,500,000 IDR.

Compared to similar activities conducted by [Yasri & Sidabutar \(2024\)](#), which state that residents actively identify and address waste management issues, leading to customized solutions, [Rohmaniyah et al. \(2023\)](#) and [Widiyono et al. \(2024\)](#) mention that training sessions educate community members about waste sorting and management, improving their ability and capacity to manage waste effectively. [Bilgies et al. \(2024\)](#) and [Widiyono et al. \(2024\)](#) emphasize that waste banks not only reduce waste but also provide economic benefits by enabling residents to earn income from recyclable materials. Therefore, the community service activities conducted with an intensive training and mentoring approach have proven to be effective in improving the quality of waste bank management.

The benefits of this activity have been directly felt by the partner, Bank Sampah IKHLAS, with improved operational efficiency and financial transparency. In addition, positive impacts have been felt by the surrounding community, which has become more aware of household waste management and is now able to utilize waste as an economic resource through the waste savings program. With quantitative changes, such as improvements in management capacity and the volume of collected waste, this activity has made a real contribution to supporting the reduction of waste generation in the Pekanbaru area.

4. CONCLUSION AND RECOMMENDATIONS

The development program of Bank Sampah IKHLAS in Perumahan Putri Tujuh II, Sidomulyo Barat Subdistrict, Tuahmadani District, Pekanbaru City, has shown significant success in increasing community participation and managing waste effectively. Through the integration of the Kuliah Kerja Nyata (KUKERTA) program by Universitas Riau students with community service, this program successfully increased the number of waste bank customers from 24 percent to 37 percent of the total households (KK) in the area, reflecting a relative increase of 54.17 percent. The success of this program is not only reflected in the increase in the number of customers but also in the innovation in plastic waste processing. The initiative to transform plastic waste into economically valuable products such as bags and wallets has opened up new economic opportunities for the community, especially for housewives. This demonstrates that proper waste management not only positively impacts the environment by reducing plastic waste volume but also serves as an additional source of income for the community. Although significant success has been achieved, this program still has substantial potential for further development. With 63 percent of households not yet participating in Bank Sampah IKHLAS, there is considerable opportunity to expand the reach and impact of this program in the future. This development program highlights the importance of collaboration between educational institutions, local government, and the community in addressing environmental issues and empowering the economy. This success can serve as a model and inspiration for similar initiatives in other areas, proving that community-based waste management can provide dual benefits, both environmentally and economically.

Although the development program for Bank Sampah IKHLAS has shown significant results, there are still several limitations that need to be addressed for further growth. One of the main challenges is the low level of community participation, with 63 percent of households (KK) yet to become members. Additionally, the capacity to process plastic waste is still limited, and the lack of product diversification from waste processing presents a challenge in maximizing the benefits of this program. The sustainability of the program heavily relies on support from various parties, including the government and educational institutions, which require more effective coordination. Therefore, to further develop the program, the following recommendations should be considered: (1) Improving Education and Socialization to the

Community. The program needs to increase the intensity of education and socialization efforts to address the lack of community participation. This strategy could include holding regular workshops, door-to-door campaigns, and creating engaging educational content about the importance of community-based waste management. Collaborating with local communities or influential figures could help expand the program's reach and build trust among the public; (2) Product Diversification and Processing Capacity Development. To maximize economic potential, the program can expand the types of processed plastic waste products, such as decorative crafts, household items, or other innovative products. Additionally, investment in more advanced waste processing tools and technology is necessary to improve production capacity and management efficiency; (3) Strengthening Partnerships and Ongoing Support. The program can strengthen partnerships with private sector entities, government, and non-governmental organizations to secure financial support, training, or marketing for processed products. Developing incentive schemes, such as awarding active participants, can also encourage community involvement. Furthermore, it is crucial to ensure the program's sustainability by forming a professional and committed management team.

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