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Educational and Outreach Initiatives to Support Community-Based Waste Management for a Sustainable Environment in Dech Charoen Village, Thailand

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ABSTRACT

The rapid rise in urbanization and waste production has significantly impacted the environment. Therefore, community-based waste management is a crucial approach for reducing the environmental impact of domestic and household waste. This community service project aims to promote environmental sustainability through community-based education on waste management. This initiative was carried out in Dech Charoen Village, Thailand, aiming to increase community awareness about the importance of sustainable waste management practices. This paper discusses the community service activities conducted in Dech Charoen Village and their impact on community empowerment and environmental sustainability. The activities included a sharing session on community-based waste management, outreach on the reduce, reuse, and recycle (3R) principle for inorganic waste, and practical outreach on processing organic waste using a composting machine. Results showed a considerable rise in awareness of waste management methods, with more than 90% of participants achieving a better understanding of waste segregation, recycling, composting practices, and the importance of community involvement.

Keywords: Community Service; Domestic Waste; Recycling; Inorganic; Organic

INTRODUCTION

The projected global escalation of municipal solid waste (MSW) is alarming, with estimates indicating an increase from approximately 2.1 billion tonnes in 2023 to around 3.8 billion tonnes by 2050. This surge is largely attributed to rising urbanization and consumption patterns, resulting in increased waste management costs that could escalate from approximately USD 252 billion in 2020 to USD 640.3 billion annually by 2050 if current practices continue unchanged (United Nations Environment Programme, 2024). Waste management in urban areas is becoming an increasingly urgent issue, particularly in some developing countries lacking adequate waste disposal facilities. For example, Dech Charoen Village, located in Khu Khot Municipality, Bangkok, Thailand, faces significant challenges in managing household waste, which, if left unaddressed, can lead to negative impacts on public health and the environment. Due to the unavailability of a dedicated waste disposal facility, wastes from this municipality are collected and transported to the external waste

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disposal site, which is located approximately 40-50 kilometers from the municipal office, causing high waste processing costs.

Recent studies emphasize the growth in waste generation and its subsequent implications. Kaneesamkandi & Sayeed (2023) and Holubčík et al. (2022) reported that global MSW generation is expected to double by mid-century, reaching nearly 4 billion tonnes annually, consistent with projections from multiple sectors. This significant increase highlights the urgent need for improved waste management strategies to mitigate the associated financial and environmental impacts. The cost implications of failing to effectively manage waste systems are profound. As the urban populations expand, the costs related to municipal waste management increase, further straining financial resources without necessary reforms (Sadessa & Balo, 2025). This economic burden is intensified by inefficient waste collection processes and insufficient infrastructure, especially in developing regions where the challenge is most evident (Nepal et al., 2022).

To address this, community-based waste management offers a practical solution by empowering residents to actively participate in waste reduction and recycling efforts. The urgency of implementing community-based waste management in Dech Charoen Village is highlighted by the escalating environmental and economic challenges associated with inadequate waste disposal. Adopting effective waste prevention and management strategies could limit the annual costs endured by the municipality. The objective of this initiative was to educate the Dech Charoen Village community on the importance of sustainable waste management practices, with a specific focus on the 3R principle for inorganic waste. Additionally, practical outreach on processing organic waste using a composting machine was conducted to demonstrate a sustainable method for managing biodegradable waste, fostering a cleaner and more sustainable environment within the community.

LITERATURE OR CONCEPTUAL REVIEW

Effective waste management is essential for maintaining a sustainable environment, particularly in urban areas where waste generation is high. MSW management is a critical issue globally, with improper waste disposal leading to various environmental and health problems such as pollution, greenhouse gas emissions, and disease spread (Haider & Riaz, 2021). The challenge for municipalities is not only the high volume of waste but also the lack of efficient systems for its segregation, recycling, and disposal.

The integration of community participation into waste management strategies can yield substantial benefits in terms of both waste reduction and cost-efficiency. Community-based waste management offers a decentralized approach to waste management, enabling residents to take responsibility for waste reduction, segregation, and recycling within their communities. As indicated by Musiana et al. (2024), successful waste management policies necessitate a collaborative approach involving various stakeholders, including community members. Furthermore, it is reported that well-formulated recycling policies that involve community participation substantially enhance waste reduction efforts (Auliani et al., 2024). This active involvement not only empowers residents but also elevates community awareness and environmental stewardship. Implementing educational programs and community service projects is another effective method for enhancing public understanding and participation in waste management. Conducting outreach programs through educational and skill development and empowering communities to manage their waste effectively can lead to changing their behavior and priorities (Pratama et al., 2021). This approach can cultivate a sense of ownership and responsibility towards local waste management, further enhancing participation levels.

The 3R principle (reduce, reuse, recycle) plays a central role in sustainable waste management by promoting the reduction of waste generation at its source, the reuse of materials to extend their life cycle, and the recycling of materials to reduce environmental impact. By reducing waste generation at the source, communities can minimize the burdens on waste management systems and lower associated costs (Suwerda et al., 2018). Reuse represents the second pillar of the 3R strategy, which

emphasizes the importance of extending the life of products and materials rather than discarding them prematurely. The concept of community-based waste banks serves as an effective mechanism for promoting reuse within communities. These initiatives facilitate the repurposing of waste materials while also fostering economic opportunities and community learning (Salsa Billah et al., 2023). Recycling, the final component of the 3R principle, plays an equally crucial role. Community-based projects such as those facilitated by waste banks not only contribute to recycling efforts but also raise awareness about the importance of recycling among residents, thereby enhancing community engagement in waste management (Asteria & Heruman, 2016). Effective recycling practices show that engaging the community through education about the benefits of this step can lead to substantial reductions in waste needing final disposal, which is critical for environmental sustainability (Ruliana et al., 2019). The adoption of these principles has been shown not only to reduce waste but also to create economic opportunities, as recycled materials can be sold or used in the production of new products.

Organic waste management is another key component of community-based waste management. Organic waste, including food scraps, yard waste, and other biodegradable materials, constitutes a significant portion of municipal waste. Composting is one of the most widely adopted methods for managing organic waste. Composting not only reduces the volume of organic waste but also produces valuable compost that can be used to improve soil quality in agricultural and gardening practices. Moreover, the process of composting helps mitigate the environmental impacts of landfilling organic waste, such as methane emissions, and supports a circular economy by returning nutrients to the soil (Dharani et al., 2021). Finally, the role of community engagement in waste management cannot be overstated. Additionally, providing education and outreach programs about the benefits of waste reduction and the 3R principle has been found to increase public awareness and motivate individuals to take action. These community-driven approaches not only improve waste management but also promote a sense of responsibility over local environmental issues.

MATERIALS AND METHODS

The community service activities in this program were conducted in Dech Charoen Village, Khu Khot Municipality, Bangkok, Thailand, on 16-17 December 2024. The methodology followed a structured approach including three key steps: (1) preparation, (2) implementation, and (3) evaluation. The target group for this initiative includes residents in the neighborhood.

The program began with a planning and coordination phase, where the collaborative academic team from Universitas Ahmad Dahlan Indonesia and Kasetsart University, Thailand, coordinated with community leaders to do the preparation and identify the most important issues related to waste management in the area. This step was conducted to ensure that the activities meet the needs of the community. The preparation also involved the development of educational materials, such as presentations and pamphlets about the topic.

The implementation step consisted of a series of educational and practical activities aimed at raising awareness and building capacity within the community. The first activity was a sharing session where the academic team presented information on community-based waste management and its importance. This was followed by an outreach session on the 3R principle, focusing on how to reduce, reuse, and recycle organic and inorganic waste. Participants were encouraged to segregate plastics, glass, and metals for recycling. The final activity involved the demonstration of organic waste processing using a composting machine designed by the Energy and Environmental Engineering Center, Faculty of Engineering, Kasetsart University. These activities were designed to be interactive, with community members actively participating and asking questions.

In the evaluation phase, the team assessed the effectiveness of the activities by conducting preliminary tests, post-tests, and interviews with the participants to be used as the primary data, and then supported by data from municipal official reports as secondary data. The data was analyzed using

qualitative descriptive analysis for narrative data. The evaluation focused on the increase in knowledge about sustainable waste management practices and the level of community engagement in waste segregation and composting. The feedback from participants was also used to identify areas for improvement in future waste management programs.

RESULTS AND DISCUSSION

The community-based waste management initiative in Dech Charoen Village, Khu Khot Municipality, Thailand, involved a series of activities aimed at educating and empowering residents to take active roles in sustainable waste management. This program successfully engaged the participants to develop positive behavior to increase environmental awareness.

Figure 1. Sharing Session and Outreach About The 3R Principle in Community-Based Waste Management

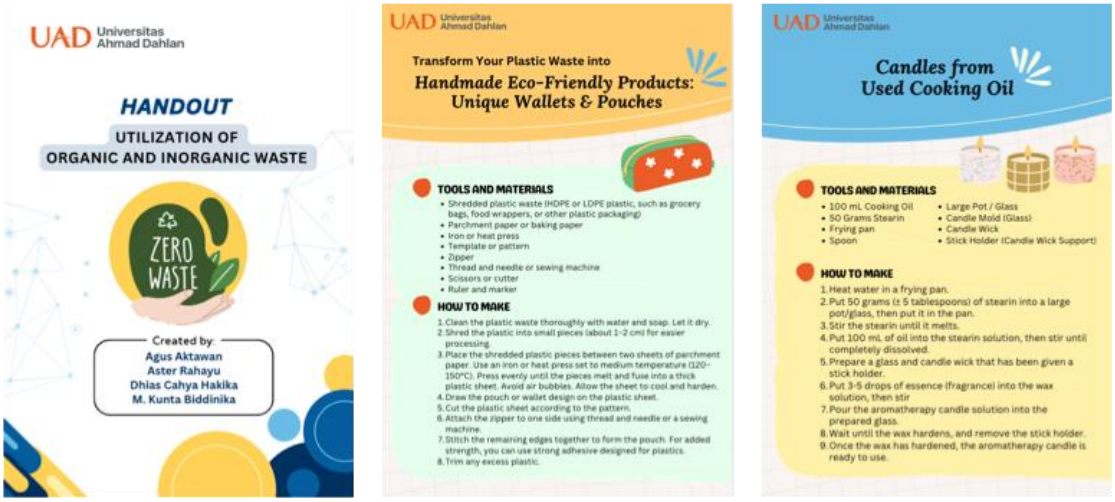

Figure 2. The Educational Pamphlets Contain Information About How to Utilize Organic and Inorganic Domestic Waste

The first activity was a sharing session on community-based waste management and followed by outreach on the 3R principle as shown in Figure 1. During this session, the participants were introduced to the concept of community-based waste management, with an emphasis on household-level responsibility for reducing, reusing, and recycling waste. This session highlighted the crucial role that individuals and communities play in mitigating the environmental impact of waste and

promoting long-term sustainability. Additionally, the participants also learned about waste segregation and the 3R principle to reduce the volume of waste sent to the disposal facility. The outreach focused on practical steps individuals can take to reduce waste at the source, such as buying products with less packaging, reusing items when possible, and recycling materials that can be processed into new products. Some examples are also provided on how to separate waste effectively based on their types, such as organic from kitchen waste, and inorganic materials such as plastics, glass, and metals. In order to improve the participants' knowledge, a pamphlet, as presented in Figure 2, about some methods that can be used to recycle organic and inorganic household waste was also introduced.

The final activity in this program involved demonstrating the processing of organic waste using a composting machine. As organic waste constitutes a large portion of household waste, this session aimed to showcase an environmentally friendly solution for managing biodegradable materials. A composting machine designed by the Energy and Environmental Engineering Center, Faculty of Engineering, Kasetsart University, was set up for demonstrations, where residents learned how to convert food scraps, yard waste, and other organic materials into nutrient-rich compost, as shown in Figure 3. This composting process not only reduces the volume of organic waste but also contributes to improving soil quality for local gardens and agricultural activities. The demonstration received positive feedback, with many participants interested in this knowledge to reduce organic waste in their homes.

Figure 3. Demonstration Of Organic Waste Processing Using a Composting Machine

As part of the evaluation step, the effectiveness of this program was assessed using preliminary and post-test surveys to measure changes in participants' knowledge regarding waste management practices. Table 1 summarizes the key outcomes of the initiatives, which show a significant increase in participant knowledge and understanding.

Table 1. Summary Of Participants' Outcomes After Educational and Outreach Programs

Aspect	Before program	After program	Change
The importance of waste segregation	83%	99%	+16%
Skill of composting practices	67%	97%	+30%
Community participation in waste management	45%	90%	+45%

It is indicated that before the program, 83% of participants were already familiar with the concept of waste segregation, while 67% knew about composting. However, in terms of community participation in waste management, only 45% of the respondents have been involved. These findings highlighted the need for educational outreach to improve waste management knowledge and practices

in the community. Following the completion of the activities, a post-test was given to assess the knowledge gained by participants. The results were significantly improved, with 99% of participants reporting that they demonstrated a clear understanding of waste segregation and the 3R principle. Furthermore, 97% of participants indicated that they gained more knowledge about skills in composting practice. When asked about their involvement in community participation in waste management, 90% of the participants expressed their commitment. These findings demonstrate that while the program was effective in raising awareness of recycling and waste categorization, additional efforts could further strengthen community understanding of the composting process and the broader environmental and social implications of waste management. Enhancing knowledge and skills through community-based education strengthens the community's intention and behavioral control to handle waste more sustainably (Pandey, 2024). Overall, this program not only raised awareness but also highlighted the importance of localized and community-driven solutions in tackling waste management challenges.

CONCLUSIONS

Community-based waste management proves to be an effective approach in addressing household waste management issues, particularly in areas lacking adequate waste disposal facilities. Through education, outreach, and practical training, the community in Dech Charoen Village demonstrated significant improvements in both understanding and awareness of waste segregation and recycling practices. The evaluation of this initiative revealed that the knowledge of waste segregation and, 3R principle increased 16%, while the understanding of composting practice rose 30%. The active participation of community members and local leaders played a key role in this success, emphasizing the importance of community involvement in addressing environmental challenges. Hopefully, this program can lead to a reduction in waste volume and a positive change in the community waste management behavior in order to create a cleaner and more sustainable environment.

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Conflict of Interests

The authors declared that no potential conflicts of interest with respect to the authorship and publication of this article.

REFERENCES

Asteria, D., & Heruman, H. (2016). Bank Sampah Sebagai Alternatif Strategi Pengelolaan Sampah Berbasis Masyarakat Di Tasikmalaya (Bank Sampah (Waste Banks) as an Alternative of Community-Based Waste Management Strategy in Tasikmalaya). *Jurnal Manusia Dan Lingkungan*, *23*(1), 136.

Auliani, R., Andaningsih, I. R., & Karyasa, T. B. (2024). The Effect of Waste Management Technology, Recycling Policy, and Community Participation on Waste Generation Reduction in East Java. *West Science Interdisciplinary Studies*, *2*(01), 226–234.

Dharani, S., Saliha, B. B., Suresh, S., & Shenbagavalli, S. (2021). Evaluation and Acceleration of Municipal Biowaste Compost Production and Its Effect on Growth and Yield of Amaranthus. *International Journal of Plant & Soil Science*, 195–201.

Haider, M. Z., & Riaz, M. R. (2021). Municipal Solid Waste Management in Bangladesh: A Study of X Municipality. *Khulna University Studies*, *18*(1), 37–43.

Holubčík, M., Klačko, A., Jandačka, J., & Drga, J. (2022). Pyrolysis Treatment of Municipal Solid Waste and Automotive Waste with Study of Each Component Energy Potential. *MATEC Web of Conferences*, *369*, 03005.

Kaneesamkandi, Z., & Sayeed, A. (2023). Assessment of Energy-Efficient Spouted Bed Aerobic Composting Performance for Municipal Solid Waste: Experimental Study. *Processes*, *11*(12), 3427.

Musiana, M., Ishak, S. N., Soamole, M. S., & Surasno, D. M. (2024). Analysis of Community-Based Waste Management Policies to Achieve Clean and Healthy Environment. *West Science Interdisciplinary Studies*, *2*(04), 749–753.

Nepal, M., Karki Nepal, A., Khadayat, M. S., Rai, R. K., Shyamsundar, P., & Somanathan, E. (2022). Low-Cost Strategies to Improve Municipal Solid Waste Management in Developing Countries: Experimental Evidence from Nepal. *Environmental and Resource Economics*.

Pandey, D. (2024). Community-Based Waste Management Education to Promote Environmental Sustainability. *Assoeltan: Indonesian Journal of Community Research and Engagement*, *3*(1), 35–54.

Pratama, A., Kamarubiani, N., Shantini, Y., & Heryanto, N. (2021). *Community Empowerment in Waste Management: A Meta Synthesis*. First Transnational Webinar on Adult and Continuing Education (TRACED 2020), Bandung, Indonesia.

Ruliana, V., Roekmijati, W., Soemantojo, S., & Asteria, D. (2019). Assessing a community-based waste separation program through examination of correlations between participation, information exposure, environmental knowledge, and environmental attitude. *ASEAN Journal of Community Engagement*, *3*(1), 1–27.

Sadessa, Z. H., & Balo, H. T. (2025). Municipal solid waste management strategy selection: Multi-criteria decision making under uncertainty. *Journal of Future Sustainability*, 91–106.

Salsa Billah, R., Utama Putri, R., Reza Wagas, A., Zuhrita Adjaran, W., Makehe, U., Odemadi, F., Hamja, B., & Rahman, H. (2023). Community Empowerment at The Akehuda Digital Waste House to Support Circular Economy Activities in Ternate City. *International Journal of Community Service*, *3*(4), 374–379.

Suwerda, B., Handoyo, S. R., & Kurniawan, A. (2018). Determinant Factors for Managing Sustainable Waste Bank in Bantul Urban Areas. *Sanitasi: Jurnal Kesehatan Lingkungan*, *10*(1), 37–44.

United Nations Environment Programme. (2024). *Global Waste Management Outlook 2024: Beyond an age of waste*. https://wedocs.unep.org/20.500.11822/44939