



EDUCATION AND INNOVATION-BASED WASTE MANAGEMENT: BUILDING A CLEAN AND FUNCTIONAL ENVIRONMENT

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Abstract. This study aims to evaluate the effectiveness of educational billboards as a medium to raise public awareness of the timing of waste decomposition and its impact on the environment. Waste, especially inorganic waste that takes a very long time to decompose, is one of the biggest environmental challenges of this modern era. The lack of public understanding of the waste decomposition process and its negative effects, such as soil, water, and air pollution, as well as threats to biodiversity, are key issues that need to be addressed. Educational billboards, with attractive visual designs and short but dense information, are believed to be effective communication media and reach many levels of society, including those not exposed to digital information. This study used pre- and post-intervention survey methods with questionnaires to measure the level of knowledge, awareness, attitudes, and intentions of community behavior before and after the installation of educational billboards in strategic locations. The results of this study are expected to provide empirical evidence on the role of billboards in improving environmental awareness and providing policy recommendations for governments and stakeholders in optimizing visual media for future environmental campaigns.

Keyword: Educational billboards, Environmental awareness, Waste decomposition time, Waste management, Environmental impact

INTRODUCTION

Waste management is one of the main challenges faced by many communities, especially in areas with limited facilities and public awareness in handling domestic waste. Poorly managed waste can have various negative impacts, ranging from environmental pollution and health hazards to a decline in the aesthetic quality and functionality of public spaces (Pramesti, 2022). Therefore, an approach is needed that is not only effective in reducing and managing waste, but also capable of building public awareness and active participation. An approach based on education and innovation is key to creating a clean and functional environment, while encouraging sustainable behavioral change.

Geranting Island, as a community with its own potential and challenges in waste management, has initiated a series of activities that integrate education and innovation as key strategies. These activities include the construction of waste incinerators, the creation of educational boards about the decomposition period of waste, and the construction of functional tables from used wood resulting from the renovation of a mosque. These three activities are designed not only to address waste issues technically, but also to provide the community with a



deep understanding of the importance of responsible and creative waste management.

The construction of waste incinerators is an innovative step aimed at reducing waste volume directly in a safe and environmentally friendly manner (Pratama et al., 2025). These incinerators are a practical tool that can be used by the community to manage non biodegradable waste, thereby reducing waste accumulation in the surrounding environment. In addition, these incinerators also serve as an educational medium that teaches the importance of proper and disciplined waste management.

Furthermore, the creation of educational boards about the decomposition period of waste is an effective communication tool for conveying critical information about the long term impact of various types of waste. By understanding how long certain types of waste take to decompose, the community is expected to be more prudent in choosing and managing the waste they produce (Pratiwi et al., 2025). These educational boards also play a role in encouraging behavioral change, such as reducing the use of materials that are difficult to decompose and increasing waste sorting at the source.

In addition, the innovation in making functional tables from used wood from mosque renovations shows how wood waste, which has been considered useless, can be turned into items that have practical and aesthetic value (Grace & Robbie, 2023). These tables not only beautify the environment, but also serve as a tangible symbol of the principles of recycling and reuse of existing resources. Through this activity, the community is encouraged to see waste as a resource that can be utilized creatively and sustainably.

By combining these three activities, waste management on Geranting Island focuses not only on technical aspects, but also on education and innovation that can build collective awareness and create a clean and functional environment. This approach is expected to become a model that can be adopted by other communities in dealing with waste problems, while strengthening the role of the community as agents of change in preserving the environment (Firmansyah et al., 2024).

METHODOLOGY

In order to achieve the established community service objectives, namely to increase the awareness of the people of Geranting Island regarding the decomposition period of waste and its impact on the environment through the installation of educational billboards, a structured and systematic community service methodology was developed. This methodology covers various stages, from planning and implementation to evaluation, utilizing a qualitative and participatory

approach that involves the local community.

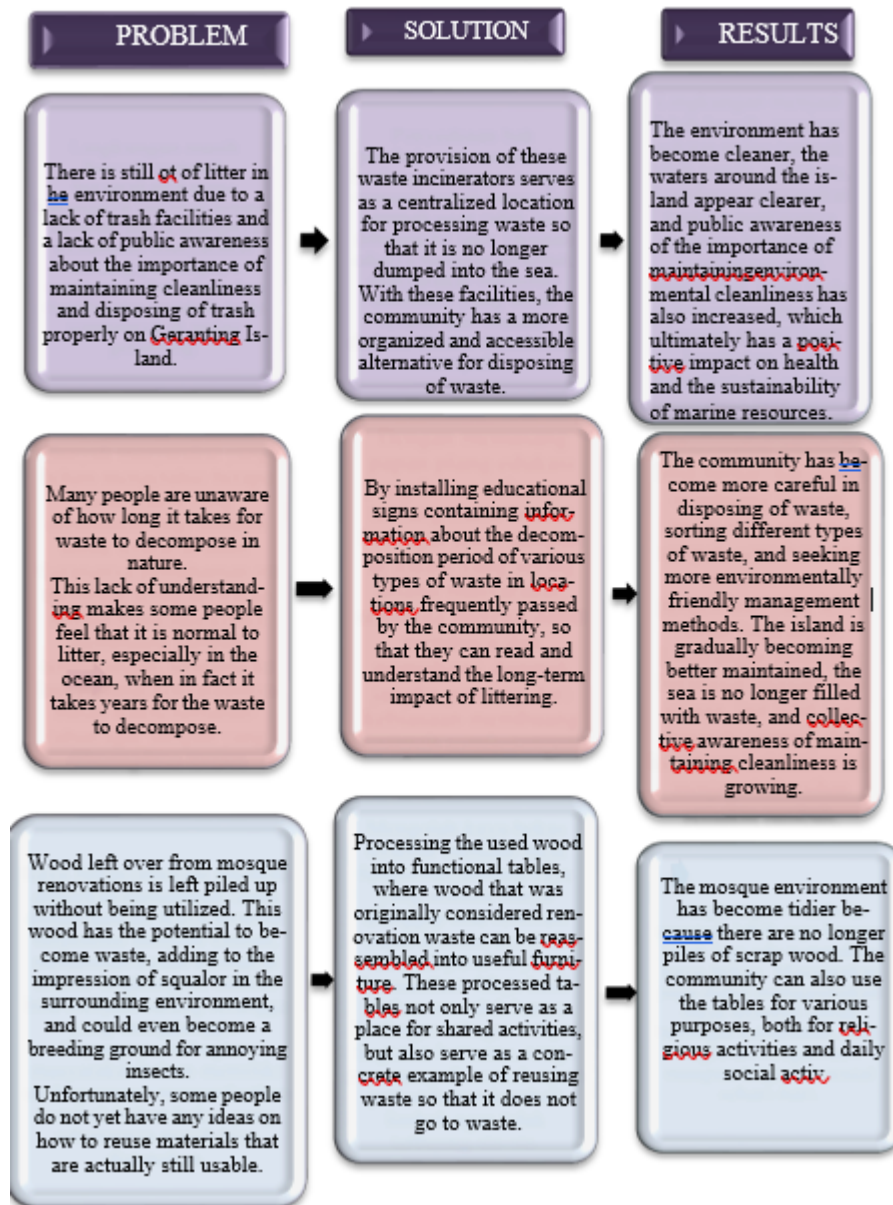


Figure 1. Community Service Implementation Methods



A. Activity Form

The main activity in this community service is the creation and installation of educational billboards. These billboards are designed as informative visual media that are easily understood by the general public. The information presented includes the time required for various types of inorganic waste to decompose in the environment, as well as a visualization of the impact of poorly managed waste (Marlina et al., 2023). In addition to installing the signs, this activity also includes providing tips and practical ways to reduce the amount of non-biodegradable waste and manage waste more responsibly.

These educational signs are expected to become a means of sustainable education, fostering collective awareness and motivating the community to actively participate in efforts to improve waste management. By understanding the long-term impact of each type of waste, the community is expected to change their behavior in disposing of waste, sorting it, and reducing the use of non-biodegradable (Mahadewi & Dewi, 2025).

B. Activity Preparation Stage

The preparation stage is a crucial foundation to ensure the smoothness and success of the entire series of community service activities. This stage includes:

a. Survey and Site Observation:

The community service team conducted an initial survey of Geranting Island, Terong Island Village, Belakang Padang District, Batam City. The purpose of this survey was to identify the waste problems faced by the community firsthand and to determine the most strategic and effective location for installing educational billboards. Based on the observation results, the location considered most strategic was next to the neighborhood association leader's house, as it was deemed to have high visibility and be easily accessible to most residents. The community service team also conducted in-depth observations to identify the types of tools and materials needed in the process of making educational signs.

b. Planning the Content of the Educational Signboards:

The team designed the information content to be displayed on the signboard. This content includes a list of types of inorganic waste commonly found in the community (plastic bags, plastic bottles, styrofoam, cans, cigarette butts, cardboard) along with estimates of their decomposition time in nature. The visual design was made to be attractive, clear, and easy to read by various age groups. A brief message about the importance of maintaining



environmental cleanliness and the negative impact of non-degradable waste is also included.

c. Preparation of Tools and Materials:

After surveying and planning, the team identified and prepared all the necessary tools and materials. The tools used included: wooden boards as the main medium, wooden beams for support poles, nails as fasteners, various colors of paint for coloring and design, and canned varnish to protect the boards from the weather. Supporting equipment such as hammers, saws, brushes, sandpaper, and measuring tapes. The materials used for visualization on the signboard included samples of collected inorganic waste, such as styrofoam, plastic bottles, used cans, plastic bags, cigarette butts, and cardboard. These materials were attached to the signboard along with text and explanations about their decomposition times.

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C. Technical Implementation

This community service activity was carried out in a structured and organized manner, with a clear division of tasks among team members. The educational signboard about the decomposition time of waste was created as an effort to raise public awareness about the importance of proper waste management. Information about the time required for various types of waste to decompose is presented in an attractive and easy-to-understand signboard. This activity also included tips on reducing the amount of non-biodegradable waste.

The preparation stage included surveying and observing the location where the signs would be installed. Based on the survey, a strategic location was chosen next to the neighborhood association chairman's house. The materials displayed on the signs included inorganic waste such as styrofoam, plastic bottles, cans, and plastic bags, accompanied by text and explanations about their decomposition times.

D. Technical Implementation

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RESULT AND DISCUSSION

Results

The construction of waste incinerators has successfully provided a practical solution for managing organic and inorganic waste that is difficult to decompose naturally. These incinerators are designed with safety and combustion efficiency in mind, thereby significantly reducing waste volume and minimizing negative impacts on the surrounding environment. In addition, these



incinerators also serve as a medium for educating the local community about the importance of proper and responsible waste management (Jampur et al., 2025).

The creation of educational boards about the decomposition period of waste has made an important contribution to raising public awareness about the impact of waste on the environment (Sartiah et al., 2024). These boards display easy to understand information about the time required for various types of waste to decompose naturally, from organic waste to plastic and metal waste. With these educational boards, the community can better understand the urgency of reducing the use of materials that are difficult to decompose and the importance of sorting waste at the source.

The creation of functional tables from wood salvaged from mosque renovations demonstrates innovation in the utilization of wood waste that has traditionally been considered useless (Fatah et al., 2024). The resulting tables not only have aesthetic value and functionality, but also serve as a tangible symbol of the principles of recycling and reuse of used materials. These tables are used in public facilities on Geranting Island, providing a concrete example of how waste can be transformed into useful items that support community social activities.

Discussion

Education and innovation-based waste management is a highly effective approach to creating a clean and functional environment. Through the creation of waste incinerators, the community is encouraged to actively participate in waste management in a more structured and environmentally friendly manner (Hendra et al., 2024). These incinerators not only reduce waste piles that can cause various health and aesthetic problems, but also teach the importance of responsible waste management. This is in line with the principles of sustainable waste management, namely reducing, reusing, and recycling.

The waste decomposition education board serves as an effective communication medium to convey important information to the community. By knowing how long certain types of waste take to decompose, the community becomes more aware of the long-term impact of the waste they produce (Ada et al., 2025). This education encourages behavioral changes, such as reducing the use of single-use plastics and increasing waste sorting, which will ultimately reduce the burden on the environment and improve the quality of life of the community.

Innovation in the manufacture of functional tables from used wood from mosque renovations is a concrete example of the circular economy principle applied on a local scale. The use of used wood not only reduces wood waste, but also reduces the need for new raw materials,



thereby conserving natural resources (Bariyah, 2021). The resulting tables have social and environmental added value, as they not only serve as furniture but also as a means of education and inspiration for the community to be more creative in managing waste.

Overall, these three activities complement each other in building the awareness and capacity of the people of Geranting Island to manage waste effectively and in novatively. The education based approach ensures that behavioral change can occur sustainably, while innovation in waste utilization provides practical solutions that can be immediately felt (Kalista Putri Apriliana et al., 2025). Thus, waste management is not only the responsibility of the government or certain institutions, but becomes part of the culture and lifestyle of a community that cares about the environment.

Through this activity, Geranting Island can serve as an example for other regions in implementing waste management that is not only clean and functional, but also educational and innovative. This success shows that with the right approach, waste management can be an opportunity to create a healthier, more comfortable, and sustainable environment for current and future generations (Marlina, 2024).





CONCLUSION AND RECOMMENDATION

Conclusion

The community service program, which was carried out through the creation and installation of educational billboards about the decomposition period of waste, proved to be an effective means of environmental communication. This activity was able to raise public awareness about how long waste, especially inorganic waste, remains in the environment if it is not managed properly. Through simple but informative visual media, the community gained new knowledge about the ecological impact of littering. The evaluation results show a positive change in the community's perspective on waste management. Residents have gained a better understanding of the difference between quickly degradable waste and non-degradable waste, and have begun to realize the importance of reduction, sorting, and recycling efforts.

The active participation of the community in the process of making and installing the signs also strengthened their sense of ownership of the program, giving rise to collective motivation to maintain environmental cleanliness. Thus, educational signs can be positioned as a strategic instrument in supporting sustainable development, as they are able to encourage social behavioral change towards a more environmentally friendly lifestyle. This program not only impacts cleanliness but also contributes to the formation of longterm ecological awareness that has the potential to improve the quality of life for the community.

Recommendations

To improve the effectiveness and sustainability of similar programs in the future, several things need to be considered. First, educational activities through billboards need to be synergized with direct outreach programs, waste management training, and simple recycling practices that can be applied by the community in their daily lives. This integration will strengthen understanding and encourage more consistent behavior. Collaboration between the community, local government, educational institutions, and the private sector is essential to provide supporting facilities, such as separate trash bins, waste collection facilities, and waste bank programs. This kind of institutional support will ensure the sustainability of the positive impact of educational billboards.

There needs to be periodic evaluation of the effectiveness of these educational media so that the message delivery strategy can be continuously updated and adapted to the social dynamics of the community. The placement of signs in strategic and easily visible locations must also be maintained so that the information continues to reach a wide audience. Similar



activities should be expanded to other areas with similar environmental problems. With continuous program development, educational billboards can serve as a catalyst in building ecological awareness at the local and regional levels, while supporting the achievement of sustainable environmental development goals

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We hope that our collective efforts will not only have a positive impact on the environment but also encourage better behavioral changes in waste management. By raising awareness about the decomposition period of waste, we hope that we can all contribute to environmental sustainability and a better quality of life. Thank you once again to everyone involved. Let us continue to work together to create a cleaner and healthier environment for future generations.



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