
Ecobrick Innovation for Economic Empowerment and Sustainable Plastic Waste Management

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Abstract

This community service initiative in Dringu Village, Indonesia, responds to the pressing plastic waste predicament exacerbated by population growth and challenges in reducing plastic dependence. The village, rich in natural resources, faces environmental threats and significant floods due to waste accumulation, impacting social and economic structures. The program's objectives center around implementing the ecobrick method to train and mentor residents, enhance practical skills in plastic waste management, and economically empower the community by viewing plastic waste as a resource for potential business opportunities. Employing a Community-Based Participatory Research approach, the initiative actively involves the community in issue identification through dialogues, fostering local capacity to independently tackle the plastic waste problem. Key participants include cadre members, PKK, and village officials, forming a robust framework for comprehensive and sustainable plastic waste management. The meticulous preparation by participants involved sorting waste, creating ecobricks by filling plastic bottles with small-cut plastic waste, and adding an aesthetic touch through green painting. Plywood pieces complemented the design, forming a two-level shoe rack. This innovative product not only addresses plastic waste but also presents economic opportunities for the community, fostering self-sufficiency and overall well-being.

Keywords: Ecobrick, Plastic waste management, Community empowerment, Economic sustainability.

INTRODUCTION

The waste issue in Indonesia, which has the potential to harm the environment and public health, is closely related to the continuously increasing population growth every year (Apriyani et al., 2020). Plastic waste is one of the elements among various causes of ecosystem degradation in the environment (Leria et al., 2020). Communities are increasingly finding it challenging to reduce dependence on plastic usage (Sunandar et al., 2020). The use of plastic, involving various human needs, poses a significant issue related to non-biodegradable plastic waste, further exacerbated by the difficulty in controlling its comprehensive usage (Fauzi et al., 2020; Yusiyaka & Yanti, 2021). Advancements in plastic waste management are not confined to large corporations but can also be undertaken by individuals or small groups, replacing the practice of indiscriminate burning alongside other types of waste, which is inherently unsafe for health and the environment. Hence, the implementation of the 3R principles (Reduce, Reuse, Recycle) becomes crucial in handling plastic waste (Apriyani et al., 2020; Leria et al., 2020; Widiyasari et al., 2021). With the growing awareness of the importance of managing plastic waste, innovative solutions such as ecobricks have emerged as an intriguing alternative to address this issue (Ariyani et al., 2021). Ecobrick is a method of plastic waste management that involves the packaging process of cleaned and dried plastic into plastic bottles, achieving a specific density (Fauzi et al., 2020).

Dringu Village, situated in Probolinggo Regency, encompasses an area of 244,261 hectares with distinct geographical boundaries, including the Madura Strait to the north,

Kalisalam Village to the east, Kedungdalem Village to the south, and Pabean Village to the west. Its potential natural resources are realized through the production of staple crops such as corn and shallots, as well as sheep farming with a population of 133,457 sheep. With a population of approximately 4,207 residents, the majority are engaged in agriculture, fishing, and Micro, Small, and Medium Enterprises (MSMEs) such as crackers and fish paste production. The village also preserves traditional arts such as ludruk, gamelan, and traditional dances. Well-organized institutional structures involve Neighborhood Unit (RT), Community Unit (RW), Family Welfare Empowerment (PKK), and Fishermen's Association. Facilities like the Village Hall, Health Post (Polindes), mosque, and school buildings from Early Childhood Education (PAUD) to Elementary School (SD) support community life. Despite its natural potential and diverse human resources, Dringu Village faces serious challenges due to environmental issues, particularly significant floods triggered by waste accumulation. The waste, which should be a recyclable resource, now threatens environmental sustainability and causes severe losses to property, river ecosystems, and the social and economic structures of the community. The residents of Dringu Village are aware that addressing the waste issue is crucial for maintaining the sustainability and preservation of their environment.

The core focus of this community service initiative revolves around conducting training and mentoring for the residents of Dringu Village, with a strong emphasis on addressing the issue of plastic waste through the implementation of the ecobrick method. The foundation of this endeavor is a genuine effort to enhance the understanding and skills of the community regarding the principles of sustainable plastic waste management. The program aims not only to provide understanding but also concentrates on building practical skills for the residents of Dringu Village to effectively and sustainably manage plastic waste. By delivering intensive training, it is expected that each participant can master the process of plastic waste collection, selecting suitable materials, and employing proper packaging techniques in plastic bottles to create ecobricks with the desired density standards. However, extending beyond technical understanding and skills, this program has broader dimensions. Emphasizing the creation of economic self-sufficiency within the community, the program views plastic waste as a potential resource that can be utilized to improve the residents' quality of life. Introducing ecobricks as a product derived from plastic waste is not only intended to reduce the negative impacts of plastic waste but also serves as a gateway to high-demand business opportunities. The knowledge and skills provided to the residents of Dringu Village are expected to encompass not only the technical aspects of plastic waste management but also insights and skills that can form the foundation for developing new economic ventures. Fundamentally, this program establishes a groundwork for achieving economic self-sufficiency within the community, allowing them to independently continue and expand ecobrick practices to meet local needs and potentially reach broader markets. Approaching the issue of plastic waste from an economic perspective, this program does not solely focus on waste reduction but also designs strategic measures to enhance the income and well-being of the residents of Dringu Village. It is anticipated that by viewing plastic waste as a resource with economic value, the community can shift their paradigm and develop a new perception of the potential around them.

Overall, this community service program creates a holistic framework, integrating technical training, mentoring, and economic empowerment aspects. By encouraging the residents of Dringu Village to perceive plastic waste as a profitable business opportunity, it is hoped that this program will not only provide concrete solutions to the issue of plastic waste but also open doors to positive and sustainable changes in the long-term lives of the Dringu Village community.

RESEARCH METHODS

Community service in this context adopts a Community-Based Participatory Research (CBPR) approach to address the serious issue of plastic waste in the village of Dringu. By actively involving the community in every stage of the service, CBPR fosters a close collaboration between community servers and the local community (Arifin et al., 2021; Mandeka et al., 2023; Windirah et al., 2023). Dringu is not merely the subject of the service but an active partner contributing to the design and implementation of solutions. The process begins with a collective identification of the main issues through community dialogues, and the design of the ecobrick training program is tailored to local needs. The significance of this method lies not only in providing concrete solutions but also in building the community's capacity to address the issue independently. Collaboration builds strong social bonds, stimulates the exchange of ideas, and creates a sense of togetherness in facing challenges. Through this participatory approach, it is hoped that the ecobrick solution not only addresses the plastic waste issue but also acts as a catalyst for positive and sustainable changes in the social and economic structure of Dringu village.

This community service is focused on Dringu village, a strategically located area in Probolinggo Regency, Indonesia, facing the negative impacts of the plastic waste problem. Program participants include cadre members, PKK (Family Welfare Empowerment), and village officials who play a central role in implementing the ecobrick training program. The decision to involve cadres, PKK, and village officials is closely tied to their strategic roles in the village's institutional structure. Cadres play a significant role in empowering the community regarding environmental issues and welfare. Meanwhile, PKK, as an organization evolving at the village level, has extensive reach and plays a crucial role in the participatory approach. The involvement of village officials in the program emphasizes the local government's engagement in addressing environmental issues. They serve not only as organizers but also as facilitators and active participants in driving ecobrick initiatives. The synergy between cadre members, PKK, and village officials creates a robust framework for addressing plastic waste issues comprehensively. Their active participation in the ecobrick training program is not just a responsive action but a proactive step towards maintaining the environmental sustainability and well-being of the Dringu village community. This establishes a solid foundation for positive changes in the village structure, where plastic waste management becomes not only an individual task but a collective responsibility towards achieving a clean and sustainable environment.

RESULTS AND DISCUSSION

To support the success of the ecobrick training in Dringu Village, participants in the community service made careful preparations. Their initial step was to compile a list of tools and materials needed, demonstrating their commitment to systematic and organized training. The prepared tools and materials included scissors, a cutter, hot glue, wood, plastic bottles, plastic packaging plywood, and plastic bags. The diversity of these tools and materials reflects thoughtful planning to address diverse needs in the implementation of the activity. The importance of this preparation goes beyond providing equipment; it also involves meticulous

waste sorting. Participants and their community differentiated waste into three main categories: plastic bags, bottle waste, and other waste. This structured sorting is a strategic initial step to ensure that the materials used in training are the most suitable and beneficial. With complete tool and material preparation and structured waste sorting, participants establish a solid framework for the success of the training. This approach not only creates a strong foundation for participants' understanding of sustainable plastic waste management but also establishes a structured and efficient training environment. The process of making ecobricks begins by establishing a frame using plastic bottles as the main material. Participants collect a total of 8 plastic bottles to form a strong and sturdy ecobrick frame structure. Each plastic bottle will be filled with small-cut plastic waste. The selection of different types of plastic waste, such as bags and other types, is a separate consideration, where these pieces are prepared and placed in a container, such as a bucket or another suitable container. The process of cutting plastic waste aims to ensure that the material can be processed efficiently and easily filled into the plastic bottles.



Figure 1. Preparation of Plastic Waste for Ecobrick

The next step involves placing the pieces of waste into the plastic bottles. Participants carefully carry out the filling process while continuously pressing down on the waste using tools such as small pieces of wood. The purpose of this action is to ensure that the waste can be compacted optimally inside the plastic bottle. This pressing process plays a crucial role in producing a strong and dense ecobrick. Through consistent pressure, participants achieve the desired density, turning the plastic bottle not only into a container for plastic waste but also into a sturdy structure. Ultimately, when the plastic bottle is fully filled and compacted, the resulting ecobrick becomes robust and can be effectively used as an alternative construction material. This step reflects participants' efforts not only to create an innovative plastic waste management solution but also to ensure that the final product meets the required quality standards. By carrying out this process meticulously, community service participants successfully create ecobricks that are not only environmentally friendly but also durable, making a positive contribution to solving the plastic waste issue in Dringu Village.



Figure 2. Compression Process of Plastic Waste Until Compact

After successfully filling and compacting 8 plastic bottles with processed plastic waste, the next step in ecobrick creation involves adding an aesthetic touch through the painting process. The eight fully-filled and compacted plastic bottles are painted according to preference, using green-colored paint. The decision to use the color green is made with aesthetic considerations to make the resulting shoe rack more visually appealing. The painting process goes beyond merely adding color; it also aims to add value to the final product. By consistently applying a touch of color, community service participants create a product that not only serves a practical function as an ecobrick-based shoe rack but also possesses visual allure that enhances the aesthetics of the space it occupies. The chosen green color can also convey a sense of freshness and sustainability, reflecting the environmentally friendly nature of the materials used. This step reflects the holistic approach of the participants in managing plastic waste. In addition to producing an environmentally friendly and functional product, they also pay attention to aesthetic aspects, creating a sustainable solution that not only provides practical benefits but also aligns beauty with sustainability. Viewing plastic waste as a potential resource, community service participants successfully create an ecobrick-based shoe rack that is not only functional but also aesthetic. After the painting process of the plastic bottles filled with plastic waste, the attention of community service participants turns to preparing plywood (triplek), a key part of the ecobrick-based shoe rack structure. The previously prepared plywood is cut to the desired size to create parts that align with the planned design. Subsequently, these plywood pieces are also painted according to preference, using the same green color as the plastic bottles processed earlier. The painting process of the plywood with the green color aims not only to create a uniform impression but also as an effort to coordinate and unite the construction elements of the shoe rack. Consistently using the chosen green color creates visual coherence among the rack's components, providing a harmonious and aesthetic overall appearance. After the painting process, the painted plastic bottles and plywood pieces are placed to dry. This stage aims to allow sufficient time for the paint on the bottles and plywood to dry perfectly. The choice of the green color serves not only as an aesthetic element but also reflects a spirit of sustainability, creating an environmentally friendly product that is visually appealing.



Figure 3. Painting Process

After everything has dried, community service participants proceed to the next stage in creating an ecobrick-based shoe rack. Once all components are dry, they form the shoe rack frame by utilizing plastic bottles as the main structural elements. This forming process involves carefully and systematically placing plastic bottles to create a sturdy and durable frame. The next step is to shape the shoe rack into 2 levels, showcasing innovation and design thinking in utilizing plastic waste as a construction material. Forming the shoe rack into 2 levels results in a more functional end product that optimally utilizes space. After assembling the shoe rack frame, the painted plastic bottles and plywood pieces are once again left to dry to ensure stability and complete drying before implementation or use. The drying process also signifies the participants' commitment to creating a high-quality and durable final product. Thus, the entire process reflects the dedication of community service participants in presenting innovative and sustainable solutions in managing plastic waste. The ecobrick-based shoe rack produced not only reflects practical functionality but also emphasizes aesthetic value, creativity, and sustainability in the use of plastic waste. By considering plastic waste as a potential resource, community service participants successfully create an ecobrick-based shoe rack that is not only functional but also aesthetic.



Figure 4. Ecobrick Results

With the successful implementation of ecobrick training in Dringu Village, significant opportunities arise for the development of independent economic ventures within the local community. Through active participation in creating ecobrick-based shoe racks, the community has now acquired skills in utilizing plastic waste as a resource to create innovative products. The promising business opportunities extend beyond shoe rack production alone; instead, the community can broaden their creativity by developing various models of attractive and high-

demand products. These products may include household furniture, decorative accessories, or even ecobrick-based art pieces. With the skills and creativity gained through training, the Dringu Village community has immense potential to market these products locally and regionally. This approach not only provides a sustainable solution for plastic waste management but also economically empowers the community. By combining their skills and creativity, the Dringu community can pioneer businesses that not only provide financial benefits but also enhance their overall well-being.

CONCLUSION

In addressing the plastic waste issue in Dringu Village, the community service initiative successfully achieved its goals by introducing the ecobrick method. Through active involvement of the community and local stakeholders, the program not only enhanced understanding and skills in plastic waste management but also unearthed new economic potentials from plastic waste. Through intensive training, the residents of Dringu can now produce ecobricks that serve not only as tools for waste management but also as innovative products like ecobrick-based shoe racks. This success opens up local business opportunities, fostering economic self-sufficiency, providing a sustainable solution to the plastic waste problem, and creating a positive impact on the overall well-being of the Dringu community.

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