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RESEARCH ARTICLE

Ecobrick: A Creative Strategy for Transforming Plastic Waste into Valuable Products

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ABSTRACT

The problem of plastic waste in Indonesia continues to increase and has an impact on the environment and health. This community service activity aims to introduce ecobricks as a creative, inexpensive, and applicable strategy for managing plastic waste while opening up local economic opportunities in Gampong Lampaseh Krueng, Aceh Besar. The methods used included socialization (increasing knowledge and awareness), technical training (skills in sorting, cleaning, drying, and compacting plastic into bottles to meet ecobrick standards), and participatory discussions (planning the utilization and marketing of products). The results showed an increase in residents' understanding of waste management and ecobrick principles, the ability to produce dense and uniform ecobricks, and the emergence of initiatives to form creative village groups and ideas for community-based and social media marketing. These findings confirm that ecobricks are not only an environmental solution but also have the potential to become a creative economic product for villages, with sustainability prerequisites including guidance, simple standard operating procedures (SOPs), and stakeholder support.

KEYWORDS

Ecobrick; plastic waste; community service; creative economy; community empowerment

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1. Introduction

The existence of plastic waste in Indonesia is one of the most serious environmental problems today. Based on data from the Ministry of Environment and Forestry (KLHK, 2023), national waste accumulation has reached 68.5 million tons per year, with around 17% or more than 11 million tons being plastic waste (Anwar M 2025). This amount continues to increase in line with consumption patterns that tend to rely on single-use plastics, such as shopping bags, beverage bottles, and instant food packaging.

Plastic is known as a material that is difficult to break down naturally. It takes hundreds to thousands of years for plastic to degrade completely (Zhang, K, 2021). The impact is widespread: soil pollution, clogged waterways, and even ocean pollution that

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threatens ecosystems. Recent research shows that microplastics originating from plastic degradation have now been detected in drinking water, sea salt, and even human tissue (Zhang, 2021). This situation indicates that the issue of plastic waste is not only an environmental problem but has also entered the realm of public health.

In the socio-cultural context of Aceh, the term *Gampong* is used to refer to a village. This territorial unit is not merely an administrative division, but also has a social meaning that is closely related to kinship identity, customs, and the local government structure led by *the keuchik.* Gampong Lampaseh Krueng, Montasik District, Aceh Besar, is one of the areas facing similar problems. With a relatively dense population and household-based economic activities, the volume of plastic waste has increased over time. The lack of integrated waste management facilities means that most waste ends up being burned, buried, or dumped indiscriminately into waterways. This practice not only causes air pollution due to open burning, but also causes water flow obstructions during the rainy season due to clogged drainage channels, thereby impacting the quality of the village's environmental hygiene.

Figure 1. Waste Piles at the Lampaseh Krueng Village Waste Collection Point

In the context of community service, a creative and sustainable approach is needed that not only solves the problem of plastic waste but also builds awareness and active community participation. One solution that is beginning to develop in various regions in Indonesia and around the world is ecobricks. According to Ardan, G (2024), ecobricks are a simple technique that utilizes used plastic bottles filled tightly with non-organic plastic waste, such as food packaging, shopping bags, and straws, until the bottles become hard and solid, resembling bricks.

This method was chosen for several reasons. First, ecobricks are a low-cost technology that can be easily implemented by village communities without the need

for complex machinery or facilities. Second, ecobricks can transform plastic waste that was previously worthless into functional products, such as chairs, tables, shelves, garden decorations, and even alternative building materials. Third,

A number of case studies in other regions have demonstrated the success of ecobrick programs. For example, the "Ecobrick Movement" community in Central Java successfully reduced household plastic waste by 40% in six months by involving housewives and schools. Internationally, the Philippines has become one of the pioneers in the use of ecobricks in the construction of simple public facilities, such as school walls and playgrounds. This proves that ecobricks have great potential for widespread application, including in Gampong Lampaseh Krueng.

2. Literature review

2.1. Basic Concepts of Waste Management in the Context of Society

Waste management is one of the crucial issues in sustainable development efforts that heavily depend on the active role of the community. One of the approaches often used is the 3R principle (Reduce, Reuse, Recycle) (Hapuarachchi, H., 2024). Reduce encourages the community to minimize waste generation at the source. Reuse encourages the community to get used to reusing items that are still usable. Meanwhile, Recycle emphasizes the importance of processing used materials into new, useful products. The 3R principle is not only oriented towards environmental sustainability, but also builds environmentally friendly habits in everyday life.

2.2. History of Waste Management and the Role of the Community

Historically, the way communities manage waste has undergone significant changes over time. In ancient times, waste was usually simply burned or dumped into rivers, which was later found to cause pollution (Maalouf & Agamuthu, 2023). As the population grew, governments began to introduce various methods, such as final disposal sites (TPA), sanitary landfills, and modern recycling technologies. However, the success of modern waste management systems still depends on community participation. Community involvement in sorting waste, reducing the use of single-use plastics, and participating in innovative programs (Fitriani, 2024) are determining factors. Therefore, a community-based approach is essential to creating sustainable solutions.

2.3. Ecobricks as a Creative Community-Based Strategy

Ecobricks were first introduced in the Philippines in the early 2000s and then spread to various countries, including Indonesia. Syukri (2023) explains that ecobricks are made by stuffing non-biodegradable plastic waste into used bottles until they are compact, forming "environmentally friendly bricks." The advantages of ecobricks lie not only in their ecological benefits, but also in their educational and community empowerment aspects. The manufacturing process can be done together, whether by residents, schools, or communities. Thus, ecobricks serve as a means of learning while strengthening environmental awareness. In addition, ecobricks can be processed into various simple products such as chairs, tables, or non-structural building materials that have economic value.

2.4. Ecobricks and the 3R Principle in Empowerment

Ecobricks are very much in line with the 3R principle (Reduce, Reuse, Recycle). In terms of reduce, the manufacture of ecobricks helps reduce plastic waste accumulation in the environment by locking plastic waste that is difficult to decompose into used bottles, thereby preventing it from polluting the soil and water (Rancaputra, 2024). In terms of reuse, used plastic bottles and non-biodegradable waste are reused to make useful products, such as chairs, tables, or alternative building materials (Nazha, 2025). Meanwhile, in terms of recycle, even without a chemical process, ecobricks transform used plastic into new products that are useful and can be used in the long term (Yani, 2024).

In addition to environmental benefits, ecobrick production also provides educational and economic impacts for the community. This activity increases residents' awareness and skills in waste management and opens up opportunities for creative businesses based on plastic waste, such as crafts or building products that can be sold (Maulida, 2025). Thus, communities that make ecobricks not only contribute to protecting the environment but also have the potential to reap economic benefits from the products they produce (Purnamasari, 2023).

2.5. Previous Research Findings in the Context of Community Service

Previous studies have shown that *ecobricks* are not only a solution for reducing plastic waste, but also have great potential as a strategy for community economic empowerment. Nurul Islami (2023) asserts that the production of ecobricks in the Ciliwung River Basin can reduce waste polluting the river while also opening up business opportunities for residents through community empowerment. This finding is

reinforced by Siti Alifa (2023), who shows that ecobrick crafts can be developed as a form of creative economy based on Islamic economic principles, so that waste management not only has an impact on the environment but also provides benefits for the community. Furthermore, Alfian Syahbana (2025) examined the use of ecobricks in Gampong Kresnomulyo in the Community Service Program (KKN) of Muhammadiyah University Pringsewu, where the community was given information, training, and assistance to process plastic waste into useful products, one of which was a village signboard, which also had economic potential and symbolized a commitment to the environment. Meanwhile, Muhamad Bai'ul Hak (2022), through an empowerment program at the Al Wasath Entrepreneurship Vocational School in West Lombok, showed that education and practice in making ecobricks can replace the habit of burning plastic waste, while also fostering awareness of waste management and providing economic added value.

2.6. Limitations and Challenges in Community Implementation

Although ecobricks offer various environmental and social benefits, their implementation still faces a number of technical and practical obstacles. From a technical perspective, ecobricks have relatively lower durability and compressive strength compared to conventional bricks, making them more suitable for non-structural applications such as partition walls or furniture than for main construction (Ting, 2025). In addition, the manufacturing process takes a long time, community skills in processing are still limited, and there are no standard operating procedures (SOPs) that can guarantee product quality and safety (Asih, 2015). From a social perspective, the sustainability of the ecobrick movement is largely determined by consistent community participation. Lestari (2025) found that active community involvement in ecobrick production can indeed increase environmental awareness and reduce the volume of plastic waste, but its long-term success is highly dependent on continued support from the government and related parties. Without facilitation in the form of training, mentoring, monitoring, and incentives, the ecobrick program risks not lasting long

3. Methods

3.1. Socialization

The initial stage of the community service activity was carried out through socialization and outreach to the community of Gampong Lampaseh Krueng. This socialization aimed to build a shared awareness of the importance of plastic waste management

and to introduce ecobricks as a creative solution that can be implemented at the household and community levels. The activities were carried out using interactive lectures, group discussions, and short videos about the impact of plastic waste. With this approach, the community did not just become passive listeners, but also participated in question and answer sessions and shared their daily experiences in dealing with waste issues.

The material presented covered several important aspects, namely:

a. Facts and data on plastic waste generation in Indonesia. Participants were given a realistic picture of the amount of plastic waste that continues to increase every year and its impact if not addressed immediately. This data was presented in simple language so that it was easy for the community to understand.
b. The negative impact of plastic on the environment, health, and socio-economics. The explanation covers how plastic waste can pollute the soil, water, and sea, and potentially cause health problems due to microplastics. In addition, the socio-economic losses caused by poor waste management are also discussed.
c. The importance of sorting waste from households. Participants are educated to get used to sorting organic and inorganic waste from their homes. Simple practices such as providing separate containers are the first steps that are crucial to the success of waste management.
d. Introduction to the concept of ecobricks. At this stage, the community was introduced to the concept of ecobricks as a simple yet creative solution. Ecobricks are understood not only as a way to reduce plastic waste, but also as an opportunity to produce products that are useful for households and the community in general.

Figure 2. Plastic waste management socialization at Meunasah Yard

3.2. Technical Training

After the community gained an understanding of the basic concepts of plastic waste management and ecobricks, the activity continued with technical training on how to make ecobricks. This stage was designed to provide practical skills so that the community would not only know the theory but also be able to apply it independently at home and in groups. To that end, the training series began with a live demonstration so that the community could see and understand the ecobrick-making process step by step, as follows:

a. Demonstration of the steps for making ecobricks. At this stage, the implementation team and KKN students demonstrated the process of making ecobricks, starting from sorting usable plastics, cleaning and drying them, to compacting the plastics into used bottles using wood or sticks. The demonstration was carried out in detail so that the community could clearly understand each stage.
b. Emphasis on ecobrick production standards. Participants were given an explanation of the characteristics of a good ecobrick, namely that the bottle must be compact, hard, not easily deformed, and filled to the bottom. This standard is important so that the ecobricks produced are of consistent quality and safe to use for various needs.
c. Hands-on practice by the community. After the demonstration, the community, especially housewives and young people from the village, were involved in the practice of making ecobricks directly. They tried each stage with the assistance of students from the University of Gadjah Mada Community Service Program (KKN) and the implementation team. This approach aimed to ensure that participants not only understood the theory but also had practical skills in making ecobricks.
d. Discussion on the sustainability of ecobrick production. In the final stage, a discussion was held with participants on how to maintain the consistency of ecobrick production in the long term. The community was invited to develop sustainability strategies, such as forming ecobrick advocacy groups, setting a regular production schedule, or designing ways to utilize ecobricks into economically valuable products. This discussion was expected to foster a shared commitment so that the ecobrick movement could continue independently.

Figure 3. Technical training on *ecobrick* production

3.3.Participatory Discussion

To conclude the series of activities, a participatory discussion forum was held with the community *of Gampong* Lampaseh Krueng. The forum aimed to explore ideas and opportunities for developing *ecobricks* not only as an environmental solution but also as a creative economic product that could become a specialty *of the village*. The discussion was interactive, involving various elements of the community, from housewives *and village* youth to *village* officials*,* creating a warm and constructive atmosphere. The topics discussed in the forum included:

a. Local market potential. The community was invited to map out simple needs that could be met with *ecobrick* products, such as chairs, tables, bookshelves, or plant pots. These products were considered realistic because they could be directly used for household needs and *village* facilities.
b. Community-based marketing strategies. Participants discussed simple steps in marketing *ecobrick* products, such as through *village* bazaars, cooperation with cooperatives, and utilizing social media as a means of promotion. This strategy is considered important to introduce *ecobrick* products to a wider community.
c. The role of the *village* government and youth groups. The importance of support from the *village* government in the form of regulations and facilitation was emphasized, as well as the involvement of youth groups as the main

driving force to ensure that the *ecobrick* program remains consistent and sustainable.

d. Plan to establish a creative *village* group. As a follow-up, the community plans to form a small group focused on developing *ecobricks* as a leading environmentally-based product. This group is expected to become a forum for coordination, production, and innovation for residents who want to be actively involved.

4. Results of the Activity

4.1. Increased Community Understanding

The results of the socialization and training activities show a significant increase in the understanding of the Gampong Lampaseh Krueng community regarding plastic waste management. Based on initial and final evaluations, the community, which previously lacked understanding of the concept of waste sorting, is now more skilled in sorting plastic that can be used for ecobricks. In addition, more than 80% of participants were able to explain the benefits of ecobricks as a creative solution that not only has an impact on the environment but also opens up economic opportunities.

4.2.Practical Ecobrick Making Skills

Through technical training, the community acquired practical skills in making ecobricks. Participants, especially housewives and young people, were able to produce ecobricks that met the standards, namely dense, hard, and not easily deformed. On average, each participant successfully made at least one ecobrick during the practice session. These results show that the transfer of skills was effective and can be adopted by the community for independent application.

4.3.Participation in Marketing Discussions

The participatory discussion forum held at the end of the activity showed the community's enthusiasm in exploring the marketing potential of ecobricks. The community successfully formulated several ideas, such as the use of ecobricks for household products (chairs, tables, bookshelves, plant pots), marketing strategies through social media and village bazaars, and plans to form village creative groups that will manage ecobrick production in a sustainable manner. These findings indicate that there are opportunities for ecobricks to develop into local products with economic value.

5. Discussion

5.1. Relevance to Previous Community Service Activities

The results of this community service activity are in line with the findings of Nurul Islami (2023) and Siti Alifa (2023), which show that ecobricks not only serve as a solution for reducing plastic waste, but also as a means of economic empowerment for the community. The training in Gampong Lampaseh Krueng showed an increase in community knowledge, awareness, and skills, reinforcing the view that community participation is key to the success of ecobrick-based waste management in community service activities.

5.2. Social and Economic Implications

This activity confirms that ecobricks have great potential to be developed as environmentally friendly creative economic products. Communities that were previously unfamiliar with sorting and utilizing waste are now able to produce good quality ecobricks. This opens up opportunities for the formation of small ecobrick-based businesses, both for internal village needs such as simple furniture and plant pots, as well as for wider marketing. Additionally, participatory discussions revealed the emergence of collective awareness to make ecobricks a village identity in supporting sustainable development based on local wisdom.

5.3. Challenges and Direction for Program Sustainability

Despite showing positive results, this community service activity also faces several challenges. Some participants feel that making ecobricks takes a long time and requires high discipline to ensure that the bottles are completely compacted. In addition, limited technical knowledge of quality standards and the risk of declining community participation in the long term are also concerns. To maintain sustainability, synergy between the village government, youth groups, and universities is needed in the form of mentoring, advanced training, quality monitoring, and marketing strategy development. With continuous support, ecobricks can develop into a flagship village program that is not only beneficial to the environment but also improves the welfare of the community.

5.4. Recommendations for Future Service Activities

Based on the results of the activities, there are several recommendations for future community service programs. First, it is necessary to develop simple Standard

Operating Procedures (SOPs) for making ecobricks so that the community has clear practical guidelines and can produce products of consistent quality. Second, it is important to form village creative groups that specifically manage the production and marketing of ecobricks to ensure the sustainability of the program. Third, there needs to be intensive support from the village government and external partners, whether in the form of facilities, funding, or market access. Fourth, it is recommended that similar activities involve more parties, including schools and youth communities, so that the ecobrick movement can develop into a local culture of (reuse, reduce, recycle) that is passed down from generation to generation. With these recommendations, it is hoped that future efforts will be able to take ecobricks to a more advanced stage, not only as an environmental solution, but also as a driving force for the creative economy of the village community.

6. Conclusion

6.1. Conclusion

Community service activities through the ecobrick-making program in Gampong Lampaseh Krueng show that plastic waste management can be done in a simple, creative, and useful way. The results of the activity show an increase in community knowledge about the importance of sorting and managing plastic waste, practical skills in making ecobricks that meet standards, and the growth of collective awareness to make ecobricks into products with economic value. The participatory discussion forum also succeeded in exploring marketing potential and producing plans to form a village creative group as a driving force for program sustainability.

The implications of this activity not only impact the environment but also open up opportunities for social and economic empowerment of the community. Ecobricks have proven to be an educational medium, a means of improving skills, and a creative product with the potential to increase residents' income. With the synergy between the community, the village government, and universities, the ecobrick program has the potential to develop into a sustainable movement that supports the realization of environmentally friendly villages while strengthening community welfare.

6.2. Recommendations

It is advised that the community keep making ecobricks, either on its own or in groups, and develop this habit as a constructive way to handle household waste. For village governments, it is necessary to provide support in the form of regulations, facilities, and incentives so that the ecobrick movement can be more structured and sustainable.

For youth groups, it is important to take on the role as the main driving force in the production and marketing of ecobricks, while also becoming agents of change in the community. For universities, it is recommended to continue providing assistance, conducting research, and developing innovations related to ecobricks, including the formulation of Standard Operating Procedures (SOPs) to ensure product quality. For external parties/partners, such as NGOs and businesses, it is hoped that they can support the marketing of ecobrick products through business networks, exhibitions, and digital platforms, thereby increasing the economic value of ecobricks.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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