

## Utilization of plastic waste using the ecobrick method in Nagari Tanjung

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### ABSTRACT

Pollution caused by the continued practice of dumping waste into the river and burning it has become a serious problem in Nagari Tanjung, Koto VII Subdistrict, and Sijunjung Regency. The community and village government have not felt sufficiently supported by the existence of a final disposal site (TPA), so residents—especially housewives—dispose of waste around the river, and some residents burn it. This has led to pollution and negative health and environmental effects. Therefore, a community service program was implemented that involved educating the community on waste management and hands-on practice in making ecobricks as a practical approach to utilizing plastic waste. The program ran for three weeks, from June 19, 2025, to July 10, 2025, in Jorong Ujung Padang, involving 44 participants from the beneficiary community members, nagari officials, and students. Throughout the implementation, the activities were guided and facilitated by two supervising lecturers. The stages included delivering material on the importance of waste management, training on Ecobricks production, and mentoring in applying environmentally friendly concepts. The results showed increased community awareness in managing plastic waste and the successful production of 100 ecobricks, which were used as garden elements.

**Keywords:** Environmental Education; Ecobrick; Waste Management; Good Health and Well-Being; Nagari Tanjung

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RESEARCH & PUBLISHING



## 1. INTRODUCTION

Waste management has been one of the most pressing environmental issues in Indonesia over the past decade, particularly in areas that lack a Final Processing Site (Tempat Pemrosesan Akhir/TPA) as basic infrastructure for a functioning waste management system. The absence of such facilities reflects weak institutional capacity at the local government level and signals structural challenges in providing adequate public services to communities. Law of the Republic of Indonesia No. 18 of 2008 explicitly states that local governments are obligated to provide waste management facilities and infrastructure that meet technical, health, and environmentally friendly requirements (Indonesia, 2008). This regulation underscores that waste management is not merely a technical matter but an integral component of sustainable development and of ecological protection. However, field conditions reveal a gap between regulatory mandates and their implementation at the local level, including in Nagari Tanjung, Koto VII Subdistrict, Sijunjung Regency.

The lack of a TPA in Nagari directly affects household waste disposal. Limited facilities for waste collection, sorting, and processing encourage residents to choose practical and easily accessible disposal methods, such as burning waste in their home yards or dumping it into rivers. These habits have persisted for a long time and have become “normal” practices because no better alternatives are available to replace them. However, these practices have serious implications for environmental quality and public health. Burning household waste—especially plastic waste—produces hazardous emissions such as dioxins and furans, which are carcinogenic and may cause respiratory disorders, hormonal disruption, and increased cancer risk with long-term exposure (WHO, 2024; US EPA, 2024). Meanwhile, dumping waste into rivers leads to water pollution, ecosystem disruption, deterioration of raw water quality, and accelerated accumulation of microplastics in aquatic environments, which can re-enter the human food chain.

Waste problems are not only local; they pose complex national challenges. Data from the National Waste Management Information System (SIPSN) show that Indonesia’s waste generation in 2023 reached 56.63 million tons, while only approximately 39% of the total waste was managed (KLHK, 2025). This indicates that most waste remains improperly handled and has the potential to contaminate the environment. Plastic waste is one of the largest contributors to environmental pollution owing to its durability, slow natural decomposition, and tendency to form microplastics, which pose ecological and human health threats. Research has also shown that the open burning of plastic waste significantly contributes to air pollution, worsens environmental quality, and increases greenhouse gas emissions, which intensify global climate change (Velis & Cook, 2023; Verma et al., 2021). The WHO (2018) further emphasized that mismanaged waste in developing countries can create long-term health risks that are difficult to reverse.

In Nagari Tanjung, the problem is exacerbated by limited education on waste management, low public awareness of the long-term impacts of plastic waste, and the absence of household waste sorting systems. This situation requires solutions that are not only technical but also capable of building collective awareness and encouraging community participation. Therefore, a community-based approach is crucial because the success of waste management in areas without a TPA depends heavily on behavior change, social collaboration, and locally appropriate innovations that can be implemented at low cost.

The ecobrick method is effective in reducing plastic waste at the community level. An ecobrick is a used plastic bottle densely packed with clean and dry plastic waste to a certain density, enabling it to be reused as a simple construction material, for example, in chairs, tables, plant pots, garden walls, and public-space ornaments (Global Ecobrick Alliance, 2025). This method emerged as a creative way to utilize plastics based on circular economy principles, where waste is not immediately discarded but transformed into a functional product. International standards state that an ideal ecobrick should have a minimum density of 0.33 g/ml to ensure structural stability and safety in small-scale construction (SHS Conferences, 2022; Atlantis Press 2023).

Beyond serving as a plastic waste reduction solution, ecobricks function as an environmental education tool that fosters ecological awareness. The ecobrick-making process involves sorting, cleaning, drying, cutting, and densely packing plastic waste into bottles. This activity implicitly teaches communities

that waste should be separated, managed, and utilized instead of being discarded. This concept aligns with community-based waste management theory, which emphasizes that sustainable waste management must actively involve communities to build ownership and collective responsibility.

The ecobrick program was then integrated into the Community Service Program (*Kuliah Kerja Nyata/KKN*) as a form of student involvement. In Nagari Tanjung, KKN activities were designed to provide education on the importance of waste sorting, the health risks associated with burning plastic waste, and ecobrick-making procedures that meet relevant standards. In addition, the program included the use of ecobricks as materials to build public garden elements so that the benefits could be directly experienced by the community.

The KKN program is strongly relevant to the global development agenda through Sustainable Development Goals (SDGs). It supports SDG 3 (Good Health and Well-Being) by reducing exposure to pollution; SDG 6 (Clean Water and Sanitation) by limiting river contamination; SDG 11 (Sustainable Cities and Communities) by improving residential environmental quality; SDG 12 (Responsible Consumption and Production) through reduce–reuse–recycle practices; and SDG 13 (Climate Action) by reducing emissions from waste burning (UN DESA, 2025; United Nations, 2025).

KKN activities were conducted over three weeks, from June 19 to July 10, 2025, in Jorong Ujung Padang, Nagari Tanjung, West Sumatra. The program involved 44 participants, including Nagari officials, students, and members of the general public. Through a series of educational sessions, technical training, and direct ecobrick implementation, the community is expected to understand the hazards of plastic waste and gain practical skills to manage it and utilize ecobricks as useful products. Ultimately, this program is expected to build a more responsible environmental culture, strengthen community capacity, and make tangible contributions to local pollution-mitigation efforts.

## 2. METHOD

### 2.1 Location and Time

This Community Service Program *Kuliah Kerja Nyata* (KKN) was carried out in Jorong Ujung Padang, Nagari Tanjung, Koto VII Subdistrict, Sijunjung Regency, for three weeks, from 19 June to 10 July 2025. The site was selected based on preliminary observations and communication with the *Nagari* government, which indicated that residents faced serious household waste management issues. The absence of a Final Processing Site (TPA) and a structured waste collection system has led residents to commonly burn waste in their yards or dispose of it into the river, threatening environmental quality and public health. The geographic conditions of Jorong Ujung Padang, which is densely populated and located near waterways, further highlight the urgency of implementing education- and mitigation-based plastic waste programs in this area. Therefore, KKN activity was positioned not merely as a routine student program, but as a social intervention aimed at behavior change and the development of a sustainable ecological culture at the community level.

### 2.2 Target Participants

The program involved 44 participants from diverse community groups, including *nagari* officials, primary and junior secondary school students, PKK women's group members, and the general public. The selection of these target groups was based on their varied social roles and potential contributions to environmentally oriented behavioral changes. *Nagari* officials serve as local decision-makers and policy drivers. Students are viewed as agents of change with the capacity to internalize ecological values from an early age. PKK members are key actors in household waste management and environmental education. The KKN activities were facilitated by students from Universitas Negeri Padang, who served as facilitators and technical assistants and were supervised by two academic advisors to ensure that the program met the academic standards and community service principles. This multi-stakeholder approach

aligns with [Yuliani and Rahayu \(2020\)](#), who emphasized the importance of building an environmentally friendly culture through the involvement of multiple layers of society.

### **2.3 Community Service Approach**

The community service method applied in the KKN program was educational, participatory and practical. In the initial stage, socialization sessions were conducted to explain the negative impact of plastic waste on health and the environment. The materials covered the hazards of dioxins from waste burning, microplastic pollution, and the Reduce, Reuse, Recycle (3R) framework as the main foundation for modern waste management practices ([Pramono and Hidayati, 2022](#)). A key focus at this stage was to build community awareness through a dialogic approach so that participants not only understood the problem but were also motivated to engage in mitigation efforts to address it. The next stage involved collecting non-biodegradable plastic waste from households, particularly single-use packaging, snack wrappers, and plastic bags. The collected waste was then cleaned and dried as a primary requirement for producing ecobricks. Subsequently, technical training was conducted on making ecobricks using used plastic bottles with capacities ranging from 600 ml to 1.5 L. During the training, participants learned how to cut plastic waste, compact it using bamboo sticks, and calculate ecobrick density to meet the minimum standard of 0.33 g/ml, as recommended by the [Global Ecobrick Alliance \(2025\)](#) and supported by other research findings ([SHS Conference, 2022](#)). The final stage was the utilization of the produced Ecobricks. Ecobricks were assembled into plant pots and small public garden elements using simple locally accessible adhesive materials. This utilization not only produced functional outputs but also served as a tangible community product that encouraged the continuity of ecobricks practices after the program ended.

### **2.4 Success Indicators**

Program success was assessed using several indicators that reflected knowledge, participation, and the tangible outcomes. First, increased participant knowledge of plastic waste issues and the application of the 3R method was a key indicator for evaluating the effectiveness of the educational component of the campaign. Second, active participation throughout the socialization, training, and Ecobricks-making processes indicates sustained community engagement. Third, the number of ecobricks produced that met the density standard served as a quality indicator of the program's technical output. This standard is essential for ensuring that ecobricks are safe and durable. In addition, success was measured by the continued use of ecobricks in public spaces, particularly in *Nagari* Garden. Community involvement in maintaining ecobrick-based products serves as evidence that the KKN program did not stop at training but evolved into a new waste management culture. These indicators align with national plastic waste reduction policies and the concept of Extended Producer Responsibility (EPR) regulated under Ministerial Regulation of the Ministry of Environment and Forestry (Permen LHK) No. P.75/2019 ([KLHK, 2019](#); [WWF Indonesia, 2023](#)), which emphasizes collaboration among communities, the government, and waste management stakeholders in waste reduction.

### **2.5 Evaluation Method**

The KKN implementation was evaluated in stages using a combination of qualitative methods and simple quantitative measurement. Direct observation was used to assess participant engagement and the effectiveness of field training, including the accuracy of ecobrick-making techniques. Photo and video documentation served as evidence of activities and as the basis for analyzing progress over time. In addition, a simple questionnaire was administered to the participants to measure their satisfaction, understanding of the materials, and willingness to continue waste management practices. As a follow-up step, post-program monitoring was conducted through communication with *nagari* officials and mentoring visits to ensure that the main outputs, especially the installed ecobricks, were maintained and

utilized by the communities. This monitoring also functions as a sustainability evaluation and input for developing similar programs in the future.

### 3. RESULT AND DISCUSSION

The KKN activities in Jorong Ujung Padang, Nagari Tanjung, successfully engaged 44 participants, including *Nagari* officials, students, PKK women's group members, and the general community. Attendance at each session exceeded 90%, and in several practical sessions, the number of attendees surpassed the initial participant list because additional residents joined voluntarily. This high level of participation indicates that the community is concerned about waste issues and is open to new waste management innovations. Participant interaction during discussions, Q&A sessions, and hands-on practice was highly active, suggesting that the participatory approach effectively created an inclusive and empowering learning environment. This finding supports [Yuliani and Rahayu \(2020\)](#), who reported that hands-on training significantly improves residents' understanding and encourages collective participation in environmental programs.

In the initial stage, the KKN team conducted socialization sessions and delivered materials on the hazards of plastic waste, the impacts of open burning, microplastic pollution, and household waste management strategies based on the 3R principle. Photo documentation shows strong enthusiasm among the participants, as reflected in their attention to the presenters and active engagement in the discussion sessions. Several participants, particularly PKK members, raised questions about the health risks of burning waste and practical ways to reduce plastic waste from daily household activities. Meanwhile, students demonstrated strong curiosity about biodegradation processes and the impact of plastic waste on rivers near residential areas. This enthusiasm indicates that the delivery of material was effective in increasing understanding while strengthening the community's critical awareness of the urgency of responsible waste management.

During the program, approximately 5 kg of household plastic waste was collected, consisting of multilayer plastics, snack packaging, plastic bags, and other single-use plastic residues. This waste was then sorted, cleaned, and dried as a preliminary step before being used as raw material for the ecobricks. The waste collection process was conducted collaboratively, serving as a concrete example of community-based cooperation in reducing waste. Additionally, residents began sorting waste by plastic type, an environmentally beneficial practice that had not previously been widely implemented at the household level.

As a result of the training, the community successfully produced 100 ecobricks with an average density close to the minimum standard of 0.33 g/ml, as recommended by the Global Ecobrick Alliance (2025). This indicates that the participants not only followed the instructions but also understood and applied the compaction techniques appropriately. The activity documentation shows that the participants gradually filled plastic bottles with plastic pieces using bamboo sticks, checked the ecobrick density, and ensured that each bottle was filled to its maximum capacity. The participating students demonstrated high accuracy and enthusiasm in weighing the ecobricks, while the housewives became increasingly skilled in cutting and compacting plastic waste.

The ecobrick-making process not only produced tangible outputs but also instilled practical skills that could be replicated at home by the participants. Participants gained a new understanding that plastic waste does not have to be burned or discarded; instead, it can be managed creatively and safely through upcycling. This method also fosters environmental responsibility because residents can directly observe how plastic remnants—previously considered useless—are transformed into functional products. Therefore, ecobrick training served not only as a one-off activity but also as a sustainable learning medium that can strengthen environmentally friendly behavior at both the household and community levels. See Figure 1



**Figure 1. Waste Collection and Ecobrick Production**

The ecobricks were assembled into ten plant pots. Photos of the final outputs showed that the ecobrick pots were neatly arranged and placed in several public locations, such as the *nagari* office garden, elementary school, and neighborhood green spaces. Using ecobricks as plant pot media has proven to reduce the volume of plastic waste while enhancing the aesthetics of open public spaces, in line with SDG 11: Sustainable Cities and Communities (UN DESA, 2025). The presence of these ecobrick pots provides concrete evidence that plastic waste—previously considered worthless—can be transformed into functional, aesthetic, and durable products when managed properly. The community also began to view ecobricks not merely as outputs of the KKN program but as a local innovation that can be applied in daily life to improve environmental quality.

The installation of Ecobrick pots in public spaces has created significant social effects. Children and students passing through these areas became more curious and interested in learning how ecobricks are made, while adults saw a practical example of how waste can be reused without requiring expensive technology. This reinforces ecobricks as both an educational tool and a behavior trigger, encouraging households to start sorting waste from the source and reducing open burning practices, which had previously been considered the easiest way to dispose of plastic.

Moreover, placing ecobrick pots in elementary schools has strategic value because it provides an opportunity for teachers to integrate ecobricks into environmental project-based learning. In this way, the KKN intervention not only generated physical outputs but also opened a pathway for sustainability through integration into formal education activities. The *nagari* government also expressed support for expanding ecobrick utilization in small-scale development projects at the *orong* level, such as garden arrangements, simple bench construction, and plant fencing. This indicates that ecobricks have been accepted as an alternative waste management solution that is relevant and feasible within the local context of Nagari Tanjung.

The aesthetic impact of the Ecobrick pots was also notable. Colorful plastic waste neatly compacted inside bottles adds new visual value to public spaces and creates an environment that is cleaner, more organized, and more welcoming for community activities. This not only improves spatial quality but also fosters pride in collective achievements. Each ecobrick pot symbolizes collaboration between students and residents and represents a collective effort to reduce plastic pollution through a simple yet meaningful innovation. See Figure 2



**Figure 2. Plant Pot Formation**

The impacts of this activity were reflected in increased community awareness of sorting waste, reducing plastic burning, and managing household waste more responsibly. A simple evaluation using questionnaires showed that participant satisfaction reached 85%, with most respondents stating that they were ready to continue with ecobricks independently. This success reinforces the findings of [Astuti and Pratiwi \(2021\)](#), who found that ecobricks are a simple yet effective solution for changing community behavior toward plastic waste.

However, the KKN programme also faced several constraints. Some ecobricks were insufficiently compacted and therefore less sturdy, the use of cement-based adhesives raised sustainability concerns, and rainy weather caused delays in garden arrangement. Photo documentation showed that several ecobricks appeared loosely packed, highlighting the need for improved technical standards. These technical challenges emphasize the importance of more systematic guidelines, the provision of efficient compaction tools, and the use of environmentally friendly binders, as recommended by the [WWF Indonesia \(2023\)](#) within the circular economy framework.

Overall, this KKN activity demonstrates that community participation-based programs can generate tangible environmental and social impacts. Ecobricks function not only as a plastic management method but also as a visual educational instrument that fosters a sense of ownership over the environment. With early signs of sustainability through residents' initiatives to replicate the activity, this program has strong potential to develop into a long-term collective movement in the *nagari*.

#### **4. CONCLUSION**

The KKN program in Jorong Ujung Padang, Nagari Tanjung, demonstrated positive impacts on increasing community awareness and skills in plastic waste management through an educational approach and direct implementation of ecobrick production. Over three weeks, the program successfully involved 44 participants from various community groups—*nagari* officials, students, PKK women's group members, and the general public—who actively participated in the full series of activities, from socialization and waste collection to technical training in producing ecobricks that met the density standards. This heterogeneous participation shows that environmental problems can be addressed collaboratively when communities are provided with knowledge, facilitation, and meaningful opportunities to participate.

The results indicate a behavioral change in waste sorting and handling, demonstrated by the community's ability to produce 100 ecobricks that were later assembled into 10 plant pots to beautify public spaces. These ecobrick products are not merely physical outputs of the KKN program but also symbols of the successful internalization of ecological values and more responsible waste management

practices. This change suggests that the community has begun to understand that plastic waste is not solely a burden but can be processed into useful products when handled correctly.

In addition to offering a practical solution to plastic waste problems, the program strengthened the spirit of *gotong royong* (mutual cooperation) and increased social cohesion in maintaining cleanliness and environmental aesthetic. The participants showed strong enthusiasm for working together—during waste collection, ecobrick production, and the utilization of outputs as public garden elements. This confirms that a community-based approach (*community-based environmental management*) is highly effective in promoting social change, especially for environmental issues that require collective participation in the community.

The program also contributes to the achievement of Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-Being), SDG 11 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production). By reducing waste-burning practices and transforming plastic into ecobricks, the program directly helped reduce potential air pollution, improve environmental cleanliness, and encourage more responsible consumption of single-use plastic products. Thus, KKN activities provided not only short-term benefits but also contributed to the global agenda of environmental protection and sustainable development.

Furthermore, the emergence of community initiatives to continue making ecobricks independently is an important indicator of sustainability. Residents' willingness to replicate these practices shows that the knowledge and skills delivered during the program were internalized and considered relevant to their daily needs. With the community's commitment to maintain and use Ecobricks, the program is expected to continue beyond the temporary KKN period and evolve into a growing collective movement that delivers long-term impacts for Nagari Tanjung.

Overall, this KKN implementation demonstrates that environmental education combined with hands-on practice is an effective pathway for creating behavioral change. Ecobricks, as a simple, low-cost, and easily adopted method, have proven to be a viable alternative for plastic waste management in areas without TPA facilities. The program's success provides optimism that, through participatory approaches and the utilization of local potential, communities can become empowered to independently and sustainably address environmental problems. Going forward, sustainability can be further strengthened through *nagari* government support, cross-community organization collaboration, and the development of follow-up innovations in community-based waste management.

### **Ethical Approval**

Ethical approval was not required for this study.

### **Informed Consent Statement**

All participants were informed of the purpose of the study, and informed consent was obtained prior to data collection. Participation was voluntary, and all responses were kept confidential and used solely for academic research purposes.

### **Authors' Contributions**

DN contributed to the conceptualization of the study, supervised the research process, and coordinated the overall manuscript preparation, including serving as the corresponding author. IA was responsible for data collection, literature mapping, and drafting the initial methodology sections. JL contributed to the analysis and interpretation of the findings, particularly in identifying patterns and challenges in Islamic financial inclusion. MDR assisted in data validation, source triangulation, and refining the discussion section to ensure clarity and academic rigor. NA contributed to the formulation of innovative strategies, reviewed policy-related literature, and strengthened the manuscript's theoretical framework. VTY supported the development of the research instruments and assisted in organizing the field implementation. KR contributed to documentation management and helped compile supporting materials for reporting. KA provided technical oversight, reviewed the final draft, and ensured overall consistency across the manuscript.

### **Disclosure Statement**

The Authors declare that they have no conflict of interest

### **Data Availability Statement**

The data presented in this study are available upon request from the corresponding author for privacy.

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