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Ecobrick Making Assistance Towards Sustainable Environmental Health in Lumajang East Java through Asset-Based Community Development

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Abstract

Tempeh Tengah village is one of the Lumajang district villages with a waste problem, especially plastic waste. This service activity aims to overcome this problem by turning plastic waste into eco-bricks because it is relatively easy and can be done by anyone, both children and adults. This community service uses the Asset Based Community Development (ABCD) approach, which views everyone has capacities and needs to be explored and mobilized. The results of this community service show that to execute the expectations above, the subsequent activities are conducted in environmental sanitation (Source Tiyo), enhancing the environment, creating trash bins from bamboo, and management of waste banks. There has been a significant change in the community, especially in changing the mindset of viewing waste as an asset by processing it into eco-bricks. To ensure the continuity of the program in the community, the KKN team formed a core group by training students at Islamic boarding schools about the importance of maintaining environmental health. Hopefully, this program will be expanded on a larger scale to maximize its benefits and positively impact environmental sustainability.

Keywords Ecobricks; Environmental Health; Plastic waste

1. INTRODUCTION

The issue of plastic waste has become a critical global concern over the past five years, driving extensive research and policy discussions. During this period, there has been a significant rise in scientific studies on plastic waste management, underscoring the urgent need for effective strategies to mitigate its environmental impact. The following section highlights key aspects of this issue, including research trends, environmental consequences, and regulatory responses. Recent analyses have shown a substantial increase in publications on plastic waste management, with over 13,000 papers published between 1992 and 2022, demonstrating growing academic interest in the field. Additionally, Chinese researchers have emerged as leading contributors, reflecting a global shift toward addressing plastic pollution through international collaboration (Rinanda et al., 2023). Studies have also revealed that plastic waste in municipal landfills contributes to soil and air contamination, with hazardous chemicals detected that pose significant risks to human health (Redko et al., 2024).

Data from the Ministry of Environment and Forestry indicates that the plastic generated by 100 shops or members of the Indonesian Retail Entrepreneurs Association (APRINDO) in merely 1 year has reached 10.95 million pieces of plastic bag waste. This volume is equivalent to an area of 65.7 hectares of plastic bags. The volume of plastic waste in Indonesia rises by 15% every year (Nofiyanti, E., 2020). The rise in plastic waste poses a threat to the environment and will turn into a significant issue if a solution is not found to address it (Fauzi et al., 2019). Plastic is produced from petrochemical substances that are extremely hazardous if they re-enter the environment. Research indicates that these chemicals are harmful to life, particularly humans (Nuruzzaman et al., 2021)

Plastic waste dispersed, incinerated, or discarded will generate harmful chemicals. Consequently, plastic needs to be eliminated or processed as effectively as possible or deposited in the appropriate location (Suminto, 2017). This is because Indonesia continues to encounter numerous obstacles, including insufficient recycling facilities, poor enforcement of waste management regulations, and low community awareness concerning waste segregation and recycling (Fadjarenie et al., 2024). One method to handle plastic waste is to employ the Ecobrick technique for repurposing it. Ecobricks represent a recycling method that is eco-friendly and relatively inexpensive (Fatchurrahman, 2018). In addition to this, small plastics that are thrown away can also harm the environment. Storing plastic waste in eco-friendly bottles can help avoid the

accumulation of harmful gases that generate methane. The purpose of eco-bricks is not to eliminate plastic waste but instead to prolong the lifespan of these plastics and transform them into something beneficial, which can be utilized for the good of humanity as a whole (Suminto, 2017).

Ecobricks were developed by Maier, Russell (2017), an artist from Canada living in the Philippines. Ecobricks represent a groundbreaking innovation designed to address the issue of plastic waste. Derived from the combination of two terms, eco and brick, an Ecobrick is defined as an environmentally sustainable brick. At present, eco-bricks enjoy significant popularity globally. Additionally, ecobricks are frequently referred to by other names such as Bottle Brick or Ecoladrillo. Waste management, or plastic waste, is one of the most significant global issues. Due to its inability to decompose, this plastic waste frequently contaminates various objects and poses a risk to every aspect of our cherished planet. Although production is now being increasingly reduced, plastic waste is still perceived as a danger to the existence of life. In light of this issue, an alternative solution has been proposed to handle plastic waste in the contemporary age. The solution involves transforming it into eco-bricks. There are numerous methods to handle plastic waste to prevent it from harming the ecosystem. This management can encompass providing trash bins, creating a community rubbish bank, and recycling waste into other valuable materials (Safitri, 2018).

Lumajang Regency is among the regions in East Java that are affected by the waste issue; the amount of waste is projected to rise by approximately 5 to 6 percent daily during 2022 (East Java Today), prompting the KKN group to collaborate with the community to collectively tackle the waste challenge by producing eco-bricks in Tempeh Tengah village, Placeh subdistrict, Lumajang Regency, East Java.

2. METHODS

This community service employs the Asset-Based Community Development (ABCD) approach, representing a fresh, more innovative, and comprehensive perspective on reality. This method is compared to a glass containing half water, which can be perceived as either half full or half empty. ABCD interprets the half-filled water in a glass as indicative of the potential or assets present within a community, suggesting that the existing assets can be mobilized or utilized to achieve objectives (Dureau, 2013). There are undoubtedly potential assets associated with an individual or a community, no matter who the person is or which society is considered. “Everyone has capacities, abilities, gifts, and ideas, and living a good life depends on

whether those capacities can be used, abilities expressed, gifts given, and ideas shared." (Ritzer & Goodman, 2012)(Alison Mathie and Gord Cunningham, 2008).

Among the ABCD principles is "nobody has nothing"; everyone possesses something, regardless of how insignificant it may seem. Everyone certainly has potential, including the residents of Tempeh Tengah village at the base of Mount Lawu. Even though the eruptions of Mount Semeru frequently impact their village, they indeed have several potentials or assets. Therefore, it is essential to identify and optimize these assets. When the students arrived in the village for the first time and engaged in discussions with the locals, they found that one of the issues that emerged was the problem of garbage. Therefore, students and community members are committed to addressing the waste issue with various solutions, including creating eco-bricks because the initiative is seen as applicable and doesn't take a long time, plus anyone can undertake it. Ecobricking is a method of transforming waste, particularly plastic waste, which initially posed a significant challenge, as plastic waste becomes an extremely beneficial product for the community's needs.

Based on these conditions, the KKN team presented the ABCD approach to attempt to shift the mindset that anything in our surroundings, which was first regarded as a problem, can be viewed from an alternative perspective by focusing on the positive aspects. ABCD begins with recognizing assets, potential strengths, and their independent utilization, which may have been previously possessed but need more effective mobilization and organization. (Nadhir Salahuddin, 2015).

2.1 Community Facilitation Techniques

One of the approaches utilized in community service is Appreciative Inquiry (AI). This method involves identifying the strengths and possibilities that the community possesses through appreciative interviews, which are designed to elicit positive recollections in people and communities through stages, namely 1) discovery, which is the phase of recognizing community strengths, including positive aspects; the finest achievements that have ever been realized are accomplished through appreciative interviews; 2) dream, drawing from insights gathered from the prior stage, people then start to envision the anticipated future; 3) design: at this phase, individuals begin to create strategies, processes, and systems, make choices, and foster collaboration that aids in the achievement of the anticipated changes; 4) destiny: this phase is where everyone in the organization puts into action the various elements that were developed during the design stage.

The stages of the student community service process in Tempeh Tengah village, Tempeh sub-district, Lumajang district can be outlined as follows:

Table 1. ABCD Implementation

Stage	Goal	Activities	schedule	Documentary evidence
Inculturation	The community is aware of the goals of the service team.	Visiting the Village Chief, spiritual authority and community representative, PKK officials, study groups, Muslimat, NU, prayer room attendees, and community leaders.	Fourth week of June 2024	Field notes and photos
	The development of community trust with the KKN team	Following the table assembly, teaching at TPQ, teaching BTQ, join in community service	fourth week, first of July 2024	Field notes and photos
	Facilitate the community to form a core group	FGD to achieve a meeting of minds	The first week of July 2024	Field notes and photos
Discovery	mapping village community assets	Mapping assets with FGDs and interviews	The first week of July 2024	Field notes and photos
Design	Know community assets	Disseminate the results of asset mapping to the community	The second week of July 2024	Field notes and photos
	Identify opportunities	Low-hanging fruit, identifying opportunities and	The second week of	Field notes and photos

		priority scales	July 2024	
Define	Implementation of priority programs	Facilitate the implementation of community choice programs	Third week of July 2024	Field notes and photos
Reflection	Knowing the extent to which the program has had an impact on change	Monitoring activities	Fourth week of July 2024	Monitoring results and reflection journal

The stages above describe the process of KKN student and community activities, which contain the stages of activities, the objectives of each stage, activities carried out, the specified time, and evidence of reports as activity documents. This activity table is important to design because it implements the ABCD approach according to the context in the field. These stages are a process full of useful experiences for students and the community.

3. FINDINGS AND DISCUSSION

KKN students of UIN Sunan Ampel Surabaya as a community service team in Tempeh Tengah Village, Tempeh District, Lumajang Regency, while the partners are the village community and students of Annur Islamic boarding school. The activity began in early July 2004. The stages of the activity began with inculturation. Namely, students adapt to the community by introducing themselves by visiting residents' homes in the area where the KKN team lives, followed by visits to residents' homes in other hamlets. This process begins with visiting stakeholders from various organizations or community groups and continues to its members, with *tokoh agama (TOGA)* (religious figures) and *tokoh masyarakat (TOMAS*) (community leaders). The four stages in the ABCD approach to community service consist of the following activities:

Discovery: This phase aims to recognize the resources within the village, beginning with the earlier process of engaging with the community. Identifying the potential in the village can utilize several methods, including conversations with the community. The discussions lead to the emergence of potential, including physical assets, natural resource assets, institutional assets, social assets, and others. The

community's significant asset is a waste bank, crucial in maintaining a clean and healthy village environment.

Dream: This phase is still connected to the earlier phase, as the community's aspirations surface after recognizing the potential. From conversations held with the community, it has been determined that waste banks consist of different kinds and categories, including organic and inorganic materials, all of which remain as waste without any attempts to process or transform them into something beneficial. Therefore, it is time for the community to unite and collaborate to convert the disorganized waste into something valuable, specifically by creating eco-bricks.

In this phase, plans are developed to meet the expected outcomes. The program development was conducted collaboratively by the community and the KKN team. This development process progressed smoothly with the theme *"Embroidering the Hope of Tempeh Tengah Village with Ecobricks towards Sustainable Environmental Health."* There are certainly several reasons and justifications for the selection of this program. The primary aim of this initiative to preserve a healthy and clean environment is in the initial series of collective action activities to clean the environment, create bamboo waste bins, revitalize waste banks, and culminate in education on creating eco-bricks. So, to execute the expectations above, the subsequent activities are conducted :

a) Environmental sanitation (Source Tiyo)
b) Enhancing the Environment
c) Creating trash bins from bamboo
d) Management of waste banks
e) Instruction on constructing eco-bricks

Destiny, this phase represents the execution process of the plan that was developed during the design phase. In the phase of ensuring community participation, Tempeh Tengah village is made up of seven hamlets, including Krajan Tengah, Krajan Timur, Kebonsari, Kampung Baru, Sukorejo, Ateran, and Kebonan, collaboratively striving to ensure the success of the primary activities aimed at maintaining the village's environment as clean and healthy, along with addressing the issue of waste, particularly plastic waste

3.1. Cleaning and Greening Sumber Tiyo (Water Sources)

Sumber Tiyo can be found at Gg. Sumber No. 141, East Krajan Hamlet, Tempeh Tengah, Tempeh District, Lumajang Regency; the activity occurred on July 1, 2024. It was joined by all members of the KKN team and community, along with several communities who came to assist. The cleaning of the Tiyo source begins with collecting

the scattered waste found in the source, after which the waste is sorted and categorized by type; inorganic waste that is still usable is set aside to be made into eco-bricks, while organic waste is buried in the ground. This cleaning is performed to maintain the cleanliness of the water resources at the Tiyo source and prevent contamination from trash, as one of the roles of the Tiyo source is to irrigate the rice fields in the nearby area. On July 2, 2024, the reforestation of Sumber Tiyo took place, conducted by the KKN team and the local community, using vacant land in the center of Sumber Tiyo to plant decorative plants to enhance the environment's beauty and appeal to visitors. This initiative commences with planting ornamental plants appropriate for cultivation in the central region of Sumber Tiyo.

Figure 1. Cooperation in cleaning and reforesting Tiyo resources

3.2. Creating Trash Cans from Bamboo

Creating trash cans from bamboo is achieved by cutting down multiple bamboo trees in the Tiyo source area, after which the cleaned bamboo is assembled into a box and subsequently painted with wood polish. Next, a support made of wood is constructed and placed over the trash can. Sumber Tiyo appears tidier because visitors perceive that the requirement for rubbish bins has been fulfilled. Bamboo trash cans also draw considerable interest from residents due to their distinctive shape.

Figure 2. Trash Cans from Bamboo

The waste bank in Ateran Hamlet, Tempeh village, is organized by the Hamlet

leader and RT/RW. The KKN group and the local community are collaborating to sort the collected waste. Recyclable waste is separated, including plastic bottles, food wrappers, etc. On the other hand, waste that cannot be recycled, like food waste, will be sent to the TPA (final disposal site). In Ateran Hamlet, the author established a Waste Bank program upon the recommendation of the Ateran Hamlet leader. A significant portion of the assets in the hamlet consists of plastic waste. The goal of the waste bank program is to decrease the amount of waste dispersed throughout the area by recycling and managing waste into more efficient and environmentally friendly items. The waste bank operates on Monday and Friday nights by visiting residents' houses in Ateran Hamlet to collect trash. The storage site for the Waste Bank is situated away from residential zones, where organic and inorganic waste is sorted.

3.3. Education on Producing Ecobricks

To achieve the theme mutually agreed upon by the residents and the KKN team, specifically embracing the aspirations of Tempeh Tengah village with eco-bricks towards sustainable environmental health, it is essential to provide education concerning environmental health. In this initiative, participants receive theoretical insights into the positive effects of waste management. Still, they also actively create eco-bricks, allowing them to comprehend and implement this concept daily. With this initiative, it is anticipated that a more environmentally conscious generation with sustainable, practical skills that are beneficial for the future will be formed. Educational activities focused on making eco-bricks took place in Ateran Hamlet on July 9, 2024, from 08:00 to 12:00 WIB. This event was attended by the leaders of Ateran Hamlet and RT/RW, along with the community, totaling approximately 30 people.

3.3.1 Exposure to Ecobrick Material

Members directly delivered the material of the KKN group to offer valuable education for children in Ateran Hamlet. The information shared encompasses several crucial aspects of eco-bricks, ranging from the fundamental understanding of eco-bricks to the proper manufacturing process. The speaker elaborates on the steps that need to be taken to create high-quality eco-bricks, including selecting the appropriate type of waste and how to package it correctly. Additionally, it describes the role of eco-bricks in daily life, such as how eco-bricks can serve as eco-friendly building materials or sustainable decorative items. With this clear and thorough explanation, it is anticipated that participants will be able to grasp the ecobrick concept thoroughly and be inspired to implement it in efforts to maintain a clean environment.

3.3.2 The Practice of Creating Ecobricks

To impart comprehensive knowledge and guarantee that attendees can perform it independently, the practice of creating eco-bricks is conducted. Attendees are split into four small groups to ensure every individual acquires hands-on experience and a thorough understanding of the ecobrick creation process. Each group comprises multiple participants who collaborate to produce eco-bricks with targeted objectives. To enhance the effectiveness of this practice, each group is supported by one KKN student who serves as a facilitator and guide.

These KKN teams are responsible for offering guidance and technical support to participants, ensuring that each phase of the ecobrick manufacturing process is executed properly. The eco-bricks created during this session will be transformed into attractive and practical flower pots, which will subsequently be utilized to enhance the surroundings of Ateran Hamlet. In this manner, participants not only gain knowledge on how to convert waste into a valuable product but also play an active role in enhancing the beauty and hygiene of their village. This procedure is anticipated to cultivate a sense of pride and accountability towarrd the environment within each participant. Making eco-bricks (Widiyasari, 2021) can be done by all groups, including adults such as fathers, mothers, teenagers, and children. You can use plastic bottles and packaging materials to make an eco-friendly product. This product can be used personally or as a business opportunity for the community.

The method for making it is:

a) Sort and clean plastic waste.
b) Provide large quantities of used mineral water bottles.
c) Use a stick to insert the plastic.
d) Cut a 1.5-liter bottle to the size of a 600-ml bottle.
e) Put plastic waste into bottles.
f) Compact plastic waste.
g) Make a hole in the bottom of the bottle with a nail so water can flow when used as a pot.
h) Store ecobricks in a shady place.
i) Arrange all ecobricks.

Through demonstrations and hands-on practice, they impart knowledge by illustrating the phases of creating eco-bricks. Based on the outcomes achieved in this instruction, individuals—adults, teenagers, and children alike—can better understand the tools and materials required and the procedures for crafting eco-bricks. This understanding can be observed proficiently repeating the steps or phases of making

clarified during the practical creation.

Figure 3. The process of making eco-bricks and the results of eco-brick products

3.3.3 Waste Care Generation Movement

The activities of the waste care generation movement took place on July 16, 2024, at the An-Nur Islamic boarding school situated in Kebonsari Hamlet. This education was provided to students in the seventh grade, and members of the KKN team had the chance to serve as presenters at the event. This education aims to enhance students' awareness and concern regarding environmental conditions affected by waste. The educational content for the waste-conscious generation encompasses several discussion points, including the definition of waste, the origin or source of waste, categories of waste, methods for waste management, and environmental ethics. Before presenting the material, students were requested to complete a pre-test sheet. The session then proceeded with a presentation of the material, concluding with a quiz for the participants.

Figure 4. Education at the An-Nur Islamic Boarding School

3.3.4 Monitoring Evaluation

The effectiveness of community service initiatives, particularly in Tempeh Tengah village, is evidenced by both the activity and post-activity procedures. The activity procedure shows that the community demonstrates high enthusiasm, beginning with the inculturation process, FGD, and establishing a consensus between the community and the KKN team to implement the primary training and hands-on activities directly in the field. During the training and simulation phase, they successfully followed the steps for creating eco-bricks, adhering to the techniques and methods the community had learned the prior day with significant enthusiasm.

Table 2. Of indicators changes

Change	**Examples**
Skill	Increased environmental sensitivity
	Increased waste sorting skills
	Increased skills and creativity
	Increased skills in the production process of goods
Organizational Capacity	Increase the value of cooperation
	Increasing the value of inclusiveness
	Increased relations with external actors
	Increased leadership
Attitudes	Positive value appreciation
	Increased self-confidence
Assets	Increasing the amount of ecobrix production
	Increasing healthy environment
	Increased income from the selling value of eco-bricks
Income	Increased income from the selling value of ecobrik

The table above shows that this community service activity was successful and positively impacted the community. This can be seen from the testimonies of the participants. According to them, by participating in this activity, participants felt an increase in understanding and a change in the mindset of the community who care about improving the environment. An increased initiative from the surrounding

community in making simple trash bins, adding healthy and clean public facilities, and increased awareness of the importance of cooperation, mutual respect, and experience in making eco-bricks, which are very useful for them.

4. CONCLUSION

Tempeh Tengah village Tempeh district Lumajang Regency is one of the villages that struggle with waste issues, especially since various tourist spots attract many visitors, consequently increasing the amount of waste in the village. To address this issue, the community, in collaboration with the student's KKN team, transformed waste identified and sorted based on its type into eco-products utilizing the Asset-Based Community Development (ABCD) approach. Transitioning from waste to eco-bricks resolves the waste dilemma and can yield economic benefits. The initiative began with environmental clean-up efforts and the establishment of a waste bank. It culminated in educating the community about creating eco-bricks, particularly focusing on children and teenagers. The effectiveness of this initiative starts with a shift in the community's perspective that everyone possesses something valuable; it's merely a matter of how it can be recognized and harnessed. Hopefully, this program will continue on a larger scale by collaborating with relevant stakeholders to maximize its benefits for the local community.

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