ECOBRICK WORKSHOP AS PLASTIC WASTE PROCESSING TRAINING IN GUNUNG KUKUSAN VILLAGE

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Abstrac - *The issue of plastic garbage has become a global issue that continues to increase as the population increases and the use of plastic in everyday life. Plastique, which is a synthetic product of polymerization, is biodegradable and often ends up polluting the environment, both soil, air, and water. The confirmation of Mount Kukusan is facing a similar problem, in which poor waste management facilities and low awareness of the treatment of plastic garbage are causing a habit of burning or stockpiling garbage. In order to provide solutions, ecobrick's workshop programs have been initiated to train communities in the use of plastic waste through the creation of ecobricks. Ecobricks were a simple method of turning plastic waste into useful materials such as tables and chairs. The program aims to increase environmental awareness and promote a circular economy in Gunung Kukusan. Community participation, especially PKK, is very enthusiastic, demonstrating the potential sustainability of the initiative.*

Keywords: *Ecobriks, Plastic, Waste Processing*

1. INTRODUCTION

Over the past few decades, the problem of plastic waste has become a global problem that continues to increase every year. This goes hand in hand with the increase in the use of plastic itself. The increase in plastic use is an absolute consequence of the development of technology, industry, and population, which also continues to increase. Today, plastic is widely used by humans to meet their daily needs, such as food packaging to household electronic equipment. Referring to the assumptions published by the Ministry of Environment (KLH) in Indonesia in 2011, the Indonesian population produces approximately 1 kg of waste per person and a total of 189 thousand tons of waste with a percentage of 15% being plastic waste. [1]The increase in the amount of plastic use is inversely proportional to the lack of public awareness regarding how to dispose of and manage plastic waste in the environment which is inadequate.

Plastic is a synthetic material from the polymerization of various monomers (styrene, vinyl chloride buta diene, and acrylonitrile) 2. The plastic polymer is what makes the plastic material stable so that it can last for a long time in an intact condition, even though it takes a very long time to be decomposed by nature. This type of plastic also contains toxic substances and is harmful to humans and the environment. First , the habit of people burning plastic waste can cause air pollution. In fact, basically, burning plastic cannot completely destroy plastic, but only causes plastic to decompose into small crumbs. Incomplete burning of plastic, namely below 800 ° C 34, will produce dioxin compounds that can trigger cancer, hepatitis, liver swelling, and nervous system disorders.5

Second, there is a habit of people to pile up plastic waste. The habit of piling up plastic on the ground can also damage the soil. Plastic waste piled up in agricultural and plantation areas will make the land infertile for planting plants and trees. In addition,

plastic waste scattered on the ground also endangers animals that consume plastic waste because they cannot distinguish between plastic waste and their food. This can have a significant impact on animal digestion and health, and can even cause death. 6Not to mention the problem of natural disasters caused by the accumulation of waste in the sea, rivers, and gutters. In addition to causing water pollution, clogged water channels by piles of garbage can cause water to overflow and cause flooding.

Nowadays, developments regarding how to process plastic waste are increasingly diverse. In fact, processing plastic waste can not only be done by certain parties, but can also be done by individuals or small groups. *Ecobrick* is one method that can be done to deal with the problem of plastic waste, although this method may not have been used

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[1] Fajar, P., & Nurjasmin, R. (2021). Kuat Tekan Dan Kuat Lentur Beton Dengan Agregat Kasar Limbah Plastik Jenis Low-Density Polyethylene (LDPE) (Disertasi doktoral, Politeknik Negeri Ujung Pandang).

[2] *Sifat dan Karakteristik Bahan Plastik dan Bahan Aditif* oleh Mujiarto, I. (2005). Traksi, 3(2):1-9 dalam Fauzi, M., Sumiarsih, E., Adriman, A., Rusliadi, R., & Hasibuan, IF (2020). *Pemberdayaan Masyarakat Melalui Pelatihan Pembuatan Ecobrick sebagai Upaya Mengurangi Sampah Plastik di Kecamatan Bunga Raya* . Jurnal Pemberdayaan Riau, 3(2), 87-96.

[3] Sunandar, AP, Chahyani, RQC, & Farhana, FZ (2020 *). Ecobrick sebagai Pemanfaatan Sampah Plastik di Laboratorium Biologi dan Foodcourt Universitas Negeri Yogyakarta* . Jurnal Pengabdian Masyarakat MIPA dan Pendidikan MIPA, 4(2), 113-121.

[4] Sunandar, AP, Chahyani, RQC, & Farhana, FZ (2020 *). Ecobrick sebagai Pemanfaatan Sampah Plastik di Laboratorium Biologi dan Foodcourt Universitas Negeri Yogyakarta* . Jurnal Pengabdian Masyarakat MIPA dan Pendidikan MIPA, 4(2), 113-121.

[5] *Ibid.*

[6] Dalilah, EA (2021). *Dampak Sampah Plastik terhadap Kesehatan dan Lingkungan.*

massively by the community. *Ecobrick* is one way to manage and reuse plastic waste. This is certainly in line with and closely related to the 3R principle, namely *Reduce*, *Reuse,* and *Recycle* plastic waste in the environment. *ecobrick* method is a simple method that can be practiced by the wider community in the process of reusing plastic waste, even to the point of having high utility and sales value. In this case, ecobricks can be formed into various simple items that have utility value such as tables, chairs, and happy bricks in making houses.[7]

The background of the implementation of the Ecobrick Workshop Work Program in Gunung Kukusan Hamlet, Hargorejo Village, Kokap, Kulon Progo, is one of our community service efforts in terms of handling plastic waste in the area. Moreover, in Gunung Kukusan there are no adequate environmental cleaning facilities such as the lack of a Final Disposal Site (TPA) and the lack of public awareness of plastic waste management. This results in the community still having conventional waste disposal habits, namely by burning and burying it in the ground. This habit certainly can cause environmental pollution problems as mentioned above. Thus, the Ecobrick Workshop in the Gunung Kukusan hamlet community is expected to increase public insight and awareness in plastic waste processing, which can even have an impact on improving the economy of the Gunung Kukusan community through the making of this ecobrick.

2. RESEARCH METHODS

The Ecobrick Workshop was held on August 30, 2024 at the Gunung Kukusan Hamlet Hall, Hargorejo Village, Kokap District, Kulon Progo Regency. The Ecobrick Workshop began with planning a work program, namely collecting plastic waste to make models that would be used in the practical implementation of the workshop. The methodology for implementing the Ecobrick Workshop is as follows:

a. Observations on the Condition and Potential for Environmental Cleanliness of Mount Kukusan

Before implementing ecobrick socialization, we conducted observations on the disposal and management of waste in the Gunung Kukusan environment. The results of the observation stated that the management of organic waste in Gunung Kukusan is often used as animal feed. While the management of inorganic waste is often done by burning. This is due to the unavailability of a final waste disposal site in the environment. With this background, we took the initiative to implement the Ecobrick Workshop work program as our effort to invite the community to utilize inorganic waste into simple items that have utility value such as tables and chairs.

b. Lecture Method (Presentation of Material)

In this stage we try to present the material on how to utilize inorganic waste by making *ecobricks*. The presentation of the material delivered also concerns the types and codes of plastic, dangers and symbols and their meanings on plastic packaging according to certain standards.

c. *Ecobrick* Making Practice

After delivering the material related to the types and codes of plastic and how to make *ecobricks* , we conducted a direct practice of making *ecobricks* by first preparing the cleaned plastic waste as a material for making *ecobricks* . In addition, we also

[7] Fatimatus, S. (2024). *Pengembangan Modul Pembelajaran Ecobrick Eco Design terhadap Pengembangan Diri Materi Pencemaran Lingkungan Kelas VII di MTS Al-Hikmah Bandar Lampung* (Disertasi Doktoral, UIN Raden Intan Lampung).

exhibited prototypes and table *ecobricks* that had been made previously as examples of results and works in the utilization of plastic or inorganic waste.

3. RESULTS AND DISCUSSION

a. Explanation of Plastic Types and Codes

In the implementation of the Ecobrick Workshop work program in Gunung Kukusan hamlet, in the first stage we conducted an explanation of the codes and types of plastic commonly used by the community. The explanation of the codes and types of plastic is based on the background that the general public does not yet have consent to the behavior of using plastic in everyday life. Even so, according to the results of a researcher's observation conducted on several supermarkets and sellers of plastic products, many products were found that did not include codes on their products. 8In fact, specifically, knowledge and insight into plastic codes are important things to know regarding the prevention of the dangers of using plastic in everyday life.

The use of plastic nowadays is indeed unavoidable. Nowadays, plastic is widely used in various human life needs. In the past, people did not use much plastic but still used organic materials made from rattan and bamboo. While now, the use of plastic can be found in all lines of household needs. On the one hand, plastic brings quite large benefits, but its use also has a bad effect on human health and the environment.

Plastic is one type of macromolecule whose formation is through the polymerization process. Polymerization is the process of combining several simple molecules (monomers) through a chemical process into larger molecules or macromolecules or polymers . 9Among its main components are carbon and hydrogen. In the manufacture of plastic, one of the raw materials used is naphtha, which is produced from the distillation of natural gas or petroleum. In the manufacture of plastic with a certain weight size requires almost twice the weight of petroleum.

Based on the materials used in making plastic, the types of plastic can be divided into two types, namely thermoplastic and thermosetting 10. Thermoplastic forgets plastic materials that can be recycled by heating at a certain temperature and will make it liquid and can be reshaped into a new shape as desired. Meanwhile, thermosetting is a type of plastic material that cannot be remade by heating. Between the two types of plastic, it can be seen that the type of plastic that can be recycled is *thermoplastics*. This type of plastic is usually given a code in the form of a number as a special reference in how to use it.

With the background explained above, knowledge and insight into plastic codes are very important to know in order to prevent mistakes in the use of plastic in everyday life, especially in its use as a food and beverage container. These codes are plastic product codes set by The Society of the Plastic Industry in the United States in 1988 which were later adopted by ISO, the International Organization for

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[8] Tanty, H., Bekti, RD, & Rahayu, A. (2013). *Metode Nonparametrik Untuk Analisa Hubungan Perilaku dan Pengarahan Masyarakat Tentang Kode Plastik* . Statistik Mat, 13(2), 97-104.

[9] Surono, UB (2013). *Berbagai Metode Konversi Sampah Plastik Menjadi Bahan Bakar Minyak* . Jurnal teknik, 3(1).

[10] Purwaningrum, P. (2016). *Upaya Mengurangi Timbulan Sampah Plastik di Lingkungan* . Jurnal Teknologi Perkotaan dan Lingkungan Indonesia, 8(2), 141-147.

Standardization, and made a fixed standard by the Ministry of Health of the Republic of Indonesia [11].

Among the codes that have been set are the following:[12]

a) Number 1 with the code PET/PETE stands for *poly ethylene terephthalate* , is a type of plastic commonly used as transparent beverage bottles. This material is clear, hard, and not heat resistant (melting point 85°). This material should not be used repeatedly, especially to store hot water because the polymer layer in the bottle will melt and release carcinogenic substances that can cause cancer. PT is usually used as a wrapper for mineral water, soda and packaged juice, bedding, and textile fibers.
b) Plastic code number 2 is HDPE or *high density poly ethylene* , a type of plastic that has hard, rigid, and high temperature resistant properties. This type is also commonly used as milk and juice bottles, water gallons, making hoola hoops, and containers. This type of plastic is quite safe to use, but is not recommended for repeated use.
c) Type of plastic with PVC code or *polyvinyl chloride* which is a type of plastic with a tough and hard resin. It is hard, stiff and can be combined with solvents, has a melting point of 70°-140°C usually used as plastic wrapping or wrapping packages, paralon pipes, electrical equipment, and others. This type of plastic is the most difficult to recycle and is prohibited for use as food or beverage containers.
d) Plastic number 4 is LDPE or low density *poly ethylene* which has soft and flexible properties. Usually used for pasta packaging bottles, honey, garbage bags, and disposable gloves. This plastic can be used repeatedly.
e) Plastic with the code PP or *poly propylene* which is the best type of plastic used for food and beverages, even in hot conditions, and can be used repeatedly (melting point 165°C). This plastic is usually also used for making toy buckets, and automotive components.
f) Plastic code number 6 is PS or *poly styrene* which is usually used for items such as CD cases, egg cartons, and styrofoam. This material should not be used as a food container, especially when hot because it is dangerous for the health of the brain and nervous system.
g) Plastic code number 7, OTHER or others, consisting of poly carbonate (PC), styrene acrylo nitrile (SAN), and acrylonitrile butadiene styrene (ABS) plastics. This type of plastic is usually used as beverage bottles, baby bottles, and electronic goods.

b. **Explanation of Ecobricks and Ecobrick Making**

After explaining the types and codes of plastic, the socialization continued with a discussion on the brief definition of *ecobrick. Eco* means environmentally friendly and *brick* is brick. *Ecobrick* is an environmentally friendly item that is used as a substitute for bricks for simple items. Continued with the presentation of materials that can be used as *ecobricks* such as bottles and plastics that will be put into the bottle such as used food plastic, used soap plastic, used tissue plastic, and so on. The plastic and

[11] Arbintarso, ES, & Nurnawati, EK (2022). *Peranan Keluarga dalam Upaya Meningkatkan Kualitas Lingkungan melalui Daur Ulang Limbah Plastik Rumah Tangga. Jurnal Berdaya Mandiri,* 4(3), 300-318.

[12] Suminto, S. (2017). *Ecobrick: Solusi Cerdas dan Kreatif untuk Mengatasi Sampah Plastik. Produktum: Jurnal Desain Produk (Pengetahuan dan Perancangan Produk) , 3* (1), 26-34.

bottles must be clean and dry. Then the plastic is cut into pieces to make it easier to put the plastic into the bottle. We also provide examples of items that can be made from *Ecobrick.* We prepare a table that we made from *ecobrick* and plywood as an example. Some of the series of ways to make *ecobricks* in the implementation of the Ecobrick Workshop work program are as follows:

First, ecobricks made from plastic waste have other main materials, namely used plastic bottles for beverage packaging such as mineral water. Used plastic bottles function as a place to put the collected waste. Used plastic bottles also function as supports for items that will be made from ecobricks. Used plastic bottles that can be used have various sizes and brands. Generally, the size that is often used to make ecobricks is mineral water. 600 ml and 1500 ml sizes.

The selection of plastic bottles used for ecobricks in the form of tables, chairs, bookshelves, etc. can be adjusted or matched both in size and brand to be used. The plastic bottles we use are AQUA brand plastic bottles with a size of 600 ml. This is considering the amount of bottle waste with that size and brand. The use of ecobrick plastic bottles must be clean and dry so that they do not become moldy.

Figures 1 and 2: Examples of sizes and brands of plastic bottles that can be used to make ecobricks.

The basic material in making ecobricks is plastic waste. However, not all plastic waste can be used in making ecobricks. In general, plastic waste used for ecobricks includes snack packaging, detergent packaging, washing soap packaging, plastic wrap, and so on. Plastic waste that will be put into the ecobrick bottle must be dry and ensured that there is no food or soap left in it. The dry waste is then cut into small pieces. Before putting plastic waste into the plastic bottle, make sure the bottle used is not slack, if it is slack it can be pressed using wood.

Making ecobricks is by inserting cut plastic waste into a dry plastic bottle using wood or a dry cassava tree trunk. The way to insert plastic waste into the bottle is by pressing down the plastic waste that has been inserted using wood. The waste is pressed continuously until the bottle is full and solid, then close the bottle. Generally, the weight of an ecobrick is at least 200-300 grams. This is intended so that the ecobrick does not dent if pressed by other objects.

Second, ecobricks that are ready and weigh approximately 200-300 grams can be assembled or changed into other objects. Ecobricks are basically just bottles filled with plastic waste that are pressed until full. Ecobricks can generally be created into tables, chairs, bookshelves, and other decorations. In this activity, we decided to make a mini table from the ecobricks that we had prepared. We prepared four ecobrick bottles and one plywood to make a mini table. We attached the four ecobricks to the plywood using hot glue/wax glue plus G glue or Korean glue to make it stronger.

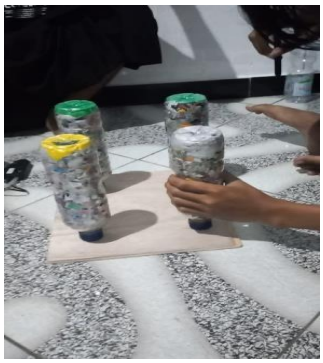

Figure 3: Making a mini table from Ecobricks

After the presentation of the material, it was continued with a workshop activity, namely practicing making ecobricks with PKK cadres. In this activity, we prepared several bottles and cut waste to practice making ecobricks. The bottles that had been prepared were then practiced alternately by the PKK cadres. The enthusiasm of the cadres can be assessed as very good in this activity, seeing from the enthusiasm of the PKK cadres when practicing making ecobricks.

Figure 4: Ecobrick making practice

4. CONCLUSION

The problem of plastic waste is a global problem that continues to increase every year. The increase in the amount of plastic use is inversely proportional to the lack of public awareness regarding how to dispose of and manage plastic waste in the environment that is not yet adequate. First, the habit of people burning plastic waste can cause air pollution. Second, there is a habit of people hoarding plastic waste. The background to the implementation of the Ecobrick Workshop Work Program in Gunung Kukusan Hamlet, Hargorejo Village, Kokap, Kulon Progo, is one of our community service efforts in terms of overcoming plastic waste in the area. Moreover, in Gunung Kukusan there are no adequate environmental cleaning facilities such as the unavailability of a Final Disposal Site (TPA) and the lack of public awareness of plastic waste management.

The presentation of the material began by providing knowledge about the types and codes of plastic, followed by a brief explanation of the meaning and how ecobricks are implemented. Then an explanation of why it is important to process waste in Dusun Gunung Kukusan, Hargorejo Village, Kokap, Kulon Progo. The next material is the core material which begins with an explanation of how to make ecobricks and the practice of making ecobricks with residents. The enthusiasm of residents in participating in the ecobrick workshop activities was very good.

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