

## The Analysis of the Utilization Of Inorganic Waste as a Material for Making Environmentally Friendly Materials

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### ABSTRACT

The problem of inorganic waste is a growing environmental issue due to the high use of materials such as plastic, glass, and metal in everyday life. Inorganic waste is difficult to decompose, and therefore can pollute the environment if not managed properly. This study aims to determine the use of inorganic waste as a raw material for making environmentally friendly materials and the public's perspective on inorganic waste management. This study used a qualitative method with a descriptive approach through direct interviews with six respondents selected using purposive sampling. The results showed that most respondents understood the meaning of inorganic waste and recognized that it can be reused to create useful products, such as plant pots, handicrafts, tissue holders, and ecobricks. Utilizing inorganic waste is considered capable of helping reduce waste accumulation and maintain environmental cleanliness. However, obstacles remain in waste management, such as low public awareness, lack of education, and limited recycling facilities. Based on the research results, it can be concluded that the use of inorganic waste as an environmentally friendly material has good potential to reduce environmental pollution, thus requiring public support and participation in sustainable waste management.

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### INTRODUCTION

The waste problem is a global environmental issue that has yet to be optimally resolved, especially in developing countries like Indonesia. Population growth, urbanization, and increasingly high consumption patterns have led to a continuous increase in the volume of waste, particularly inorganic waste, each year. Inorganic waste, such as plastic, metal, and glass, is difficult to decompose naturally, thus potentially polluting the environment for long periods. According to the WHO, waste is defined as unused, unwanted, or discarded material resulting from human activity (Maulitia et al., 2022; Jayadi, 2022).

According to Law of the Republic of Indonesia Number 18 of 2008, waste is defined as the solid residue of daily human activities and/or natural processes. Waste is generated from various activities, such as households, commerce, offices, industry, and other daily activities. Along with population growth and evolving consumption patterns, the volume of waste generated also continues to increase over time. This increase in waste volume, if not accompanied by proper management, can lead to various environmental problems.

Therefore, public awareness and participation in waste management are needed to create a clean, healthy, and comfortable environment. (Law No. 18 of 2008).

Inorganic waste is a type of waste derived from non-biological or man-made materials, such as plastic, glass, metal, cans, and Styrofoam, which are difficult for microorganisms to decompose naturally. This waste is largely generated from households, industry, commerce, and various other human activities. Unlike organic waste, which can decompose in a relatively short time, inorganic waste takes a very long time to degrade, potentially causing various environmental problems if not managed properly. The accumulation of inorganic waste can cause soil, water, and air pollution. Plastic waste and other inorganic waste buried in the ground can reduce soil fertility and pollute the environment through hazardous chemicals that seep into the soil. Furthermore, waste dumped into rivers, lakes, and the sea can damage aquatic ecosystems, disrupt aquatic life, and reduce the quality of water used by the community. Open burning of plastic waste also produces toxic fumes such as dioxins and carbon monoxide, which are harmful to human health, particularly the respiratory system. Moreover, waste accumulation in drainage channels can block water flow, triggering flooding and increasing the risk of various environmental diseases such as diarrhea and dengue fever (Elfira et al., 2024; Nadjib, 2022).

These various negative impacts demonstrate the importance of proper and sustainable inorganic waste management. Waste management focuses not only on final disposal but also includes sorting, reuse, and recycling to reduce waste generation. According to the Indonesian National Standard (SNI) 3242:2008 concerning Waste Management in Residential Areas, waste management must consider legal and regulatory aspects, institutional aspects, operational techniques, financing, and community participation. One approach widely applied in inorganic waste management is the 3R concept (Reduce, Reuse, Recycle), developed within modern environmental management concepts and supported by the United Nations Environment Programme. The "Reduce" concept is implemented by reducing the use of single-use items that have the potential to become waste. "Reuse" is implemented by reusing items that are still usable, while "Recycle" is carried out through the process of recycling waste into new, useful products. The implementation of the 3R concept is considered effective in reducing the burden on final disposal sites (TPA), preserving the environment, and supporting the creation of an efficient and sustainable waste management system (Maulitia et al., 2022; Bashri et al., 2022).

In addition to providing environmental benefits, utilizing inorganic waste also has a positive impact on the economic and social aspects of society. Inorganic waste can be processed into various useful products such as handicrafts, plant pots, alternative building materials, composite materials, and even environmentally friendly ecobricks. Ecobricks are one form of plastic waste utilization by packing plastic waste into plastic bottles until it solidifies, allowing it to be used as a simple construction material, such as chairs, tables, fences, and other facilities. Utilizing inorganic waste into creative products not only helps reduce environmental pollution but also opens up opportunities for micro, small, and medium businesses.

## **METHOD**

This research is a qualitative study with a descriptive approach. The focus of this study is the utilization of inorganic waste as a raw material for making environmentally friendly materials. Six respondents were selected using purposive sampling techniques, selecting respondents who were considered knowledgeable about the utilization of inorganic waste in their local environment.

The research was conducted in the community surrounding the respondents' residences. Data collection techniques included direct interviews and documentation. Interviews were conducted to determine the community's understanding of inorganic waste, the obstacles they face, and their expectations regarding inorganic waste management. The data obtained were then analyzed descriptively and qualitatively by grouping the interview results based on similar themes. Then, conclusions were drawn based on the research findings.

## RESULTS AND DISCUSSION

Based on interviews with six respondents in the surrounding community, several themes emerged regarding the use of inorganic waste as a raw material for making environmentally friendly materials. These themes include:

### Public Understanding of Inorganic Waste

Most respondents understood that inorganic waste is difficult to decompose and comes from materials such as plastic, glass, cans, and used bottles. Respondents stated that inorganic waste differs from organic waste because it takes a long time to decompose naturally. One respondent answered:

"Inorganic waste is like plastic and used bottles that are difficult to decompose."

Furthermore, some respondents stated that inorganic waste is used items that can be reused to make other useful items. This indicates that most respondents have a basic understanding of the types and characteristics of inorganic waste. Public knowledge about inorganic waste is a crucial factor in supporting environmental waste management. The better the public's understanding of waste management, the greater their awareness of maintaining a clean environment (Maulitia et al., 2022).

#### 1. Utilization of inorganic waste into useful items

The research results showed that most respondents had utilized inorganic waste to create useful items, such as ecobricks, plant pots, tissue holders, and other handicrafts. One respondent stated:

"Used bottles can still be made into plant pots."

Another respondent stated that plastic waste can be used to make ecobricks, which are useful as simple building materials. However, some respondents had never directly processed waste, despite knowing that inorganic waste can be recycled. Utilizing inorganic waste is considered to help reduce the amount of waste accumulating in the environment. Furthermore, recycling activities can also increase community creativity and provide economic benefits by processing waste into products with market value (Mukramin, 2022; Elfira et al., 2024).

#### 2. Benefits of Inorganic Waste Reuse for the Environment

All respondents stated that inorganic waste utilization has a positive impact on environmental cleanliness and health. Respondents stated that the environmental cleanliness and health. Respondents stated that the environment becomes cleaner when waste is reused and not disposed of carelessly. One respondent stated:

"If waste is reused, the environment becomes cleaner."

Furthermore, respondents also stated that waste utilization can help reduce environmental pollution and waste accumulation around residential areas. The results of the study indicate that the community understands the importance of waste management in maintaining environmental quality. Proper waste management can help create a healthy, comfortable, and clean environment for the community (Bashri et al., 2022).

#### 3. Kendala dalam pengelolaan sampah anorganik

Most respondents stated that low public awareness remains a major obstacle to inorganic waste management. People often litter and fail to separate their waste properly. One respondent stated:

"Many people still litter because they lack awareness of the importance of protecting the environment."

Furthermore, several respondents stated that a lack of education and outreach regarding waste management prevents people from understanding proper waste management methods. Limited waste processing facilities also hinder the implementation of recycling within the community. The lack of waste collection sites and supporting facilities means that waste management is not yet optimal (Nadjib, 2022; Maharany et al., 2022).

#### 4. Harapan masyarakat terhadap pengelolaan sampah anorganik

Most respondents hoped for education and outreach from the government and relevant parties regarding inorganic waste management. They also hoped for more adequate waste processing facilities in the community. One respondent stated,

"I hope the community will be more aware and receive training on how to process waste."

Some respondents hoped the community would be more active in maintaining environmental cleanliness through proper waste management. According to respondents, public awareness of waste sorting and recycling still needs to be improved to maintain a clean and healthy environment. Respondents also hoped

that inorganic waste would not simply be thrown away but could be recycled into useful items such as ecobricks, plant pots, and handicrafts. Furthermore, they hoped the community would cooperate in maintaining environmental cleanliness and supporting waste recycling activities. With increased public awareness of waste management, it is hoped that environmental pollution will be reduced and the environment will become more comfortable to live in.

Research results show that the majority of the public understands the meaning of inorganic waste and the benefits of reusing it into environmentally friendly materials. Public knowledge about waste is a crucial factor in supporting successful waste management in the environment (Maulitia et al., 2022).

Utilizing inorganic waste into ecobricks, plant pots and handicrafts is a form of application of the Recycle concept in the 3R principle (Reduce, Reuse, Recycle). These activities not only help reduce environmental pollution but can also provide economic benefits for the community. However, there are still several obstacles in managing inorganic waste, such as low public awareness, lack of education, and limited waste processing facilities. This condition means that waste management in the community is not running optimally. Therefore, support from the government and the community is needed through education, outreach, and the provision of waste management facilities so that the use of inorganic waste can be carried out in a sustainable manner and provide benefits to the environment and society. (Christian, 2024; Lubis & Erizal, 2021).

## CONCLUSION

Based on the results of a study conducted with six respondents, it can be concluded that most respondents were familiar with the definition of inorganic waste, such as plastic, used bottles, glass, and cans, which are difficult to decompose. Furthermore, some respondents also understood that inorganic waste can be reused to create useful items.

The research results show that some respondents have used inorganic waste to make eco-bricks, plant pots, tissue holders, and other handicrafts. According to respondents, utilizing inorganic waste can help reduce waste accumulation and maintain environmental cleanliness. However, several obstacles remain in inorganic waste management, such as a lack of public awareness, a lack of education about waste management, and limited waste processing facilities in the community. Therefore, education and outreach to the community regarding the importance of inorganic waste management are needed so that people are more concerned about environmental cleanliness and can utilize waste into more useful items.

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