

PLASTIC WASTE POLLUTION AND ITS IMPLICATIONS FOR COASTAL MARINE ECOSYSTEMS (An Educational Study at SMPN 2 Semau)

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Abstract - Waste management issues are a global problem that continue to have negative impacts on the environment. One factor contributing to the increasing amount of waste is the growing diversity of human activities. Coastal areas are highly vulnerable to waste pollution, particularly plastic waste. Plastic waste pollution in coastal marine areas is one of the fastest-growing environmental issues, causing significant negative impacts on marine ecosystems, including the destruction of marine habitats, disruption of the food chain, and the decline in coastal environmental quality. This problem is not only ecological in nature but also has social and economic impacts on coastal communities. This study aims to analyze the understanding and awareness of students at SMPN 2 Semau regarding plastic waste pollution and its implications for coastal marine ecosystems, as well as to examine the effectiveness of educational approaches in improving students' knowledge and positive attitudes toward plastic waste management. The research method used is descriptive quantitative, with data collected through questionnaires, observations, and environmental outreach activities involving students as the main subjects. The results reveal that although most students already possess basic knowledge about the negative impacts of plastic waste on marine ecosystems, their awareness and involvement in waste management remain relatively low. Environmental education programs in schools can serve as one effective strategy to reduce plastic waste pollution in coastal areas, thus preserving marine ecosystems to support the sustainability of natural resources and the welfare of coastal communities.

Keywords: Plastic waste, marine ecosystem, environmental education.

I. INTRODUCTION

Plastic waste pollution has become a pressing global issue with serious impacts on marine ecosystems and the lives of coastal communities. Marine debris refers to solid materials that are produced or processed, then discarded or abandoned in the sea and coastal areas (Laagimo & Atika, 2024). Oceans and coastlines play a vital role in maintaining the balance of the global ecosystem and supporting the lives of millions of people who depend on marine resources for their livelihoods. However, marine debris pollution has increasingly become a

serious threat to the sustainability of marine ecosystems. Marine debris, particularly plastic waste, not only damages underwater ecosystems but also disrupts the well-being of coastal communities whose livelihoods depend on the sea. Plastics used in daily life—such as plastic bags, beverage bottles, and food packaging—are often carelessly discarded and eventually end up in the ocean. The accumulation of plastic waste along coastlines can degrade seawater quality, pollute marine habitats, and negatively affect the economic activities of coastal communities, such as fisheries and tourism (Devy, 2019).

Several studies have shown that the high volume of marine debris is caused by mismanaged plastic waste on land (Wahyuni & Eliyanti, 2024). Kupang Regency, particularly the Semau area, as an island region with significant marine potential, is highly vulnerable to this pollution. Along the coastline, plastic waste is easily found, even carried by currents that damage coral reef ecosystems and threaten marine life. The increasing production of plastics and the slow degradation process of plastic are major factors contributing to environmental problems and the presence of microplastics in the ocean. It is estimated that 500 million to 1 billion plastic bags are used worldwide each year. More than 17 billion plastic bags are distributed by supermarkets around the world annually, driving increased plastic consumption. The impact is not only on the environment but also on marine animals such as dolphins, seals, and turtles that are tempted to consume plastic. Mammals that ingest plastic often die, and the plastic remains undecomposed, with the potential to poison other animals (Ningsih, 2018).

One important approach to addressing this issue is through environmental education, particularly at the junior high school level. SMPN 2 Semau, as an educational institution in a coastal area, holds a strategic role in shaping students' character to be environmentally conscious. Educational studies in schools can help enhance

students' understanding of the impacts of plastic waste and ways to reduce it. Through educational activities, students are expected to comprehend the consequences of plastic pollution and actively contribute to protecting marine ecosystems.

This study aims to examine, from an educational perspective, how plastic waste pollution affects coastal marine environments and to what extent students at SMPN 2 Semau understand and participate in environmental conservation efforts.

II. RESEARCH METHODS

This study employs a descriptive qualitative approach with a case study conducted at SMPN 2 Semau. The qualitative approach was chosen to obtain an in-depth understanding of the phenomenon of plastic waste pollution and the educational responses of students and the school environment. Descriptive means that the study aims to systematically and factually describe existing conditions without applying experimental treatments. The research was carried out at SMPN 2 Semau, located in the coastal area of Kupang Regency, during April 2025. The research subjects included Grade VII and VIII students of SMPN 2 Semau as well as teachers. The selection of subjects was conducted purposively to obtain data relevant to the focus of the study.

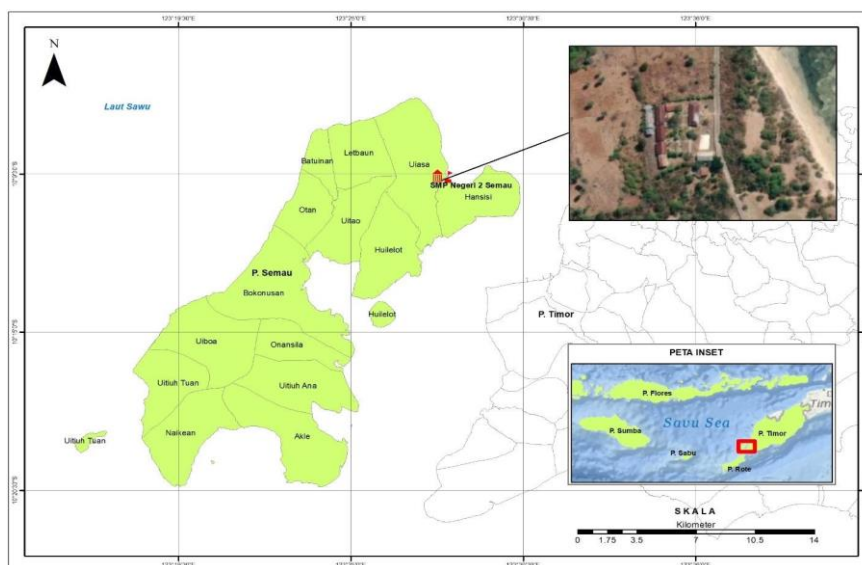


Figure 1. Research Location Map

III. RESULTS AND DISCUSSION

Students' Knowledge and Attitudes toward Plastic Waste Based on the questionnaire distributed to 44 students:

- 78% of students know that plastic waste pollutes the ocean.
- 60% of students do not know that plastic can contaminate the marine food chain.
- 82% of students have never participated in direct environmental education activities.
- 90% of students agree that environmental education is important to be implemented in schools.

Through interviews and questionnaires, it was found that most students were aware of the dangers of plastic waste to the marine environment. However, their knowledge of proper waste management practices remained limited. Environmental education provided at school helped raise awareness, but more practical activities and direct student involvement in environmental actions are needed. Effective educational strategies include integrating environmental topics into the curriculum, conducting regular beach clean-up activities, and developing

environmental clubs within the school. In addition, collaboration between schools, families, and communities is essential to support sustainable behavioral change. The cognitive domain plays a crucial role in shaping a person's behavior, as behavior based on knowledge is generally better than behavior not supported by knowledge (Gusti et al., 2015).

Knowledge about waste has a significant relationship with waste management, and there is a significant correlation between knowledge and behavior in managing plastic waste (Setyowati & Mulasari, 2013). In line with research by Bahtiar et al. (2022), which stated that students' knowledge about the negative impacts of plastic waste on aquatic ecosystem damage is still lacking, the cognitive domain related to the properties of plastic waste, its negative impacts on aquatic ecosystems, and the dangers of microplastics still needs to be developed in students. The impact of plastic waste pollution on marine biota is influenced by the size of the waste. Larger plastic waste can disrupt the organ function system in organisms, while smaller plastic waste can be ingested by aquatic organisms, causing intestinal blockages and potential

chemical poisoning (Jamika, 2023). A similar study by Sarkity et al. (2023) stated that science learning makes a significant contribution to providing students with knowledge about the ocean. This contribution includes the development of teaching materials with a maritime context. Utilizing local wisdom of island communities as a learning medium can also increase students' knowledge about the ocean.

IV. CONCLUSION AND RECOMMENDATIONS

Most students are aware of the dangers of plastic; however, many still do not fully understand the deeper ecological implications, such as the bioaccumulation of microplastics in the food chain. This highlights the importance of implementing Education for Sustainable Development (ESD) in the school environment, particularly at SMPN 2 Semau. Educational recommendations for the school include: integrating marine pollution topics into the learning materials, providing teacher training in environmental education, and conducting practical activities related to the conservation of marine and coastal ecosystems.

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