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Waste Characteristics And Environmental Perceptions Among Lake Communities: A Case Study Of Plastics Waste Management In Yoboi Village, Lake Sentani

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Abstract

Plastic waste has become a growing environmental challenge for lake communities, particularly in water-based settlements that depend on aquatic ecosystems for their livelihood and tourism activities. This research examines the characteristics of waste and environmental perceptions among the community of Yoboi Village, Lake Sentani, Jayapura Regency, Indonesia. Utilizing a qualitative case study approach, the research explores how plastic waste generated, managed, and perceived within the socio-ecological context of a water-based tourism village. Data were collected through non-participant observations, semi-structured interviews, and document analysis. The result shown that thin plastic packaging, plastic shopping bags, beverage bottles, and food packaging were the most commonly observed types of plastic waste in residential areas and along the lakeshore. Although community members generally demonstrated a good understanding of the environmental impacts of plastic waste, this awareness was not consistently reflected in everyday waste management practices. The persistence of plastic waste was influenced by daily consumption patterns, limited waste management infrastructures, established disposal habits, and the capacity of community institutions to organize collective waste management initiatives. In conclusion, plastic waste management in Yoboi Village should be understood as a socio-ecological issue requiring integrated, community-based strategies that combine environmental education, improved waste management services, and active local participation to protect the sustainability of the Lake Sentani ecosystem.

Key words: *Environmental Perceptions, Sentani Lake, Yoboi Village, Plastic Waste Management,*

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INTRODUCTION

The village of Yoboi in the Lake Sentani area presents a distinctive socio-ecological paradox: on the one hand, it is known as the living space of a lakeside community with cultural, tourism, and economic value: on the other hand, this living space faces real pressure from plastic waste including plastic bags, mineral water bottles, food packaging, and household products that floats or settles around the residents. Floating plastic debris can accumulate in lakes, and wetlands, affecting water quality, aquatic organisms, and

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communities whose livelihoods depend on these ecosystems (Kelana et al., 2025). Preliminary research findings indicate that the growth of tourism and community activities in Yoboi Village has not been fully supported by an adequate waste management system, so plastic waste has become not only a sanitation issue but also affects tourism aesthetics, public health, and the sustainability of fish stocks. Previous study in Yoboi Village by (Purba et al., 2023) have demonstrated that plastic waste management is closely linked to environmental health, including efforts to reduce malaria transmission through community-based environmental maintenance. This suggests that unmanaged plastic waste may have broader implications not only for ecosystem quality but also for public health in lakeside communities.

For the people of Yoboi Village, Lake Sentani is not merely a body of water, but a living space, an economic space, a social space, a cultural space, and a source of daily life. Lake Sentani is the largest lowland lake in Papua and is ecologically, economically, and culturally significant to the Sentani people, as its water and the organisms within it are utilized in daily life, economic activities, and socio-cultural practices. When plastic waste appears around homes, boat routes, tourist areas, and sago forests, this issue cannot be viewed merely as a visual nuisance but also as sign of disruption in the community's relations with lake where a living a pace that is collectively inherited, used, and interpreted. Globally, plastic pollution in freshwater ecosystems is increasingly recognized as a critical issue because lakes and reservoirs are no longer viewed as passive spaces that merely receive waste from land, but rather as active participants in the cycle of plastic pollution. (Nava et al., 2023) found plastic debris in all 38 lakes and reservoirs studies across multiple countries, indicating that lake ecosystems should be recognized as a critical node in the global plastic pollution cycle. (Bexeitova et al., 2024) also emphasize that microplastics in freshwater ecosystems are a multidimensional issue because they involve pollution sources, transport mechanisms, impact on aquatic organisms, food webs, biodiversity, detection methods, and mitigation strategies.

The urgency of this research is further underscored by the fact that the characteristics of tropical lakes such as Lake Sentani cannot be fully understood through a uniform ecological approach. (Nomosatryo et al., 2021) demonstrates that Lake Sentani exhibits geochemical variations in its sediments influenced by spatial differences in the geology of its watershed and the stratification of its water column, consequently environmental pressures in this lake must be interpreted contextually. A recent study by (Tanjung et al., 2025) also implies that Lake Sentani faces ecological and human health risks related to heavy metals in sediments and certain fish species. (Ikanubun & Tatipata, 2024) confirms that 22 fish species exist nearby Yoboi Village, Sentani District. This is suggesting that the disturbances on this lake are multifaceted and require an interdisciplinary approach.

In the local context of Yoboi Village, the issue of plastic waste is not only related to the physical presence of waste but also to behaviour, habits, limited facilities, and environmental governance. The plastic waste problem is exacerbated by a lack of waste management facilities, low public awareness regarding plastic sorting and reduction, and weak enforcement of environmental policies at the local level. These conditions point out that plastic pollution in Kampung Yoboi needs to be analysed as a socio-ecological issue, which is a problem shaped by the interaction between the material characteristics of the waste, daily consumption practices, limited service systems, and the way community understands and treats the lake environment.

Studies of environmental behaviour have largely explained about waste management through the relationship between knowledge, attitudes, social norms, and behavioural intentions. (Widayat et al., 2022) show that attitudes, norms, and awareness play a role in predicting pro-environmental behavioural intentions regarding post-consumer plastic

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packaging. However, an approach that emphasized only individual factors is insufficient to explain why people continue to discard, burn, hoard, or leave waste lying around when collection schedules, institutional support, and sorting systems are not yet functioning reliably.

The limitations of such individual-focused can be understood through Social Practice Theory, which views waste management behaviour as a social practice shaped by the interplay between material, competencies, meanings, infrastructure, and social structures, and daily routines. Consequently, the behaviour of the Yoboi Village community toward plastic waste cannot be interpreted solely as a reflection of high or low levels of awareness but must be understood as the result of the interplay between knowledge, habits, availability of facilities, waterfront residential spaces, tourism activities, and local social norms.

The importance of the facility dimension and household interventions is also evident in a study of (Sembiring et al., 2024), which shows that labels, visual cues, and campaigns can improve knowledge and practices regarding household waste sorting in Indonesia. These findings are relevant to Kampung Yoboi because the plastic waste discovered in the lake environment is closely linked to household consumption and the community's daily activities. However, the context of Kampung Yoboi is more complex than that of many land-based settlements because resident's homes are built on the lake, mobility occurs via waterways and bridges, and unmanaged waste can directly enter the water body.

Research on communities living on the water provides a significant point of comparison for the context of Kampung Yoboi. (Habuer et al., 2024) shows that residents of floating villages on Tonlé Sap Lake in Cambodia face plastic waste issues amid limited public services. Therefore, resident's perceptions of plastic must be analysed in conjunction with the composition of waste from houseboats and daily disposal practices. These conditions share conceptual similarities with Kampung Yoboi, as the village is both a traditional community and a tourist village where homes are situated on the lake and connected by bridges between houses.

In a study on (Vriend et al., 2021) showed that research on plastic pollution in Indonesia remained biased toward marine studies and certain environmental compartments that are easier to study. Hence, it is necessary to broaden the focus to include other perspectives, such as locations and environmental systems. This gap is significant because Lake Sentani, particularly Yoboi Village has not been exclusively examined as a socio-ecological space where the characteristics of plastic waste intersect with the behaviours the lake community, tourism activities, and the limitations of local environmental governance.

The objectives of this research are to analyse the characteristics of plastic waste in the aquatic environment of Yoboi Village, to understand how the community perceives the presence of plastic waste in their daily lives, to interpret the community's social practices in handling and managing plastic waste, and to identify the social, cultural, economic, infrastructural, and institutional factors that shape community behaviour toward plastic waste. The scope of the study is limited to Yoboi Village, Sentani Kota District, Jayapura Regency, with a focus on communities living and carrying out activities around Lake Sentani. The theoretical contribution of this study lies in strengthening the analysis of environmental behaviour through the lens of the lake community's social practices, while its practical contribution lies in providing a contextual foundation for educational programs, the reduction of single-use plastics, the improvement of facilities, and community-based waste management.

METHOD

This study employed a qualitative case study approach to explore plastic waste management in Yoboi Village, Lake Sentani. The case study method facilitates an in-depth

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and holistic examination of complex social and environmental phenomena within their real-life context, enabling a comprehensive understanding of community environmental perceptions, waste management practices, and the socio-ecological factors shaping plastic waste management (Chowdhury & Shil, 2021). The researchers chose to use a qualitative case study approach to provide the characteristics of plastic waste and the environmental perceptions of the lake community in Yoboi Village, Lake Sentani, Jayapura Regency, Indonesia. A qualitative case study was selected because it enables an in-depth understanding of a contemporary environmental issue within its real-life practices, and the socio-ecological conditions of a water-based settlement. Yoboi Village was purposively selected as the study site due to its status as a tourism village located on Lake Sentani, where increasing plastic waste has become an environmental concern affecting both the lake ecosystem and the local community.

Data were collected through non-participant observations, semi-structured interviews, and document analysis. A combination of these techniques is used to gain a comprehensive understanding of the phenomenon, as waste management practices cannot always be fully understood based solely on participant's verbal responses. In community-based waste management study (Ulum et al., 2024), observation, interviews, and document analysis are used to capture the social, economic, environmental, and institutional complexities that influence the success of plastic waste management. Semi-structured interviews were carried out with purposively selected participants, including community leaders, local residents, and stakeholders involved in waste management, to explore their knowledge, attitudes, and perceptions regarding plastic waste. Relevant government documents, village records, and previous reported were also reviewed to provide contextual information. The collected data were analysed using the interactive model of (Miles et al., 2014), involving data condensation, data display, and conclusion drawing and verification. Data triangulation across observations, interviews, and documentary sources was employed to enhance the credibility and trustworthiness of the findings, allowing for a comprehensive interpretation of plastic waste management as a socio-ecological phenomenon within the Lake Sentani community.

RESULT & DISCUSSIONS

Plastic Waste Characteristics in Yoboi Village

Plastic waste was widely distributed throughout Yoboi Village, particularly around residential areas constructed above Lake Sentani, wooden walkaways, boat docking areas, and sections of the lakeshore. The accumulation of plastic debris was closely associated with species where daily household activities, transportation, fishing, and tourism intersect. Rather than being concentrated at specific disposal sites, plastic waste was dispersed throughout the settlement reflecting the close interaction between human activities and the lake environment. This distribution suggests that plastic pollution has become embedded within everyday landscape of the village, where the boundaries between residential spaces and the aquatic ecosystems are virtually inseparable.

The dominant types of plastic waste consisted of thin plastic packaging, shopping bags, beverage bottles, food wrappers, and household plastic containers. These materials are primarily single-use plastic products generated through routine household consumption and tourism-related activities. Their lightweight characteristics allow them to be easily transported by wind and water currents, causing waste to accumulate beneath stilt houses around boat moorings, and among aquatic vegetation along the shoreline. Consequently, the physical properties of these materials, combined with the hydrological dynamics of Lake Sentani, contribute to the persistence and redistribution of plastic waste throughout the village.

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The distribution of plastic waste in Yoboi Village is further influenced by the unique physical configuration of the settlement. House constructed on stilts above the lake, interconnected by wooden bridges, create enclosed spaces where floating debris can become trapped and accumulate over time. Water currents and seasonal fluctuation in lake level continuously redistribute plastic materials across residential areas, making waste accumulation a recurring environmental issue rather than an isolated event (Suyatno et al., 2024). This result illustrated that the spatial pattern of plastic pollution is shaped by the interaction between settlement design and the ecological process of the lake.

These observations are consistent with previous study describing Lake Sentani as an ecologically and culturally significant freshwater ecosystem that supports settlement, fisheries, transportation, and tourism while simultaneously experiencing increasing environmental pressure from human activities (Indahyani et al., 2025). As a water-based tourism village, Yoboi faces additional challenges because environmental quality directly influences both community well-being and visitor perceptions. Meanwhile, the characteristics of plastic waste observed in this study extend beyond the physical composition of discarded materials and represent the interaction between consumption practices, settlement morphology, and environmental processes within lake-based socio-ecological system.

Community Environmental Perceptions and Waste Management Practices

The results show that residents of Yoboi Village generally possess a strong awareness of the environmental impacts of plastic waste and recognize the importance of maintaining the ecological integrity of Lake Sentani. Community members perceive the lake not only as a natural resource but also as the foundation of their lives, providing space for housing, transportation, cultural activities, and tourism. Nonetheless, environmental quality is closely associated with community well-being, local identity, and economic sustainability. Plastic waste is therefore perceived as more than a source of pollution, as it represents a disturbance to the living environment upon which the community depends.

Environmental perceptions are strongly influenced by the socio-ecological setting of Yoboi Village, where the boundaries between the built environment and Lake Sentani are largely indistinguishable. Homes, public spaces, and tourism facilities are directly connected to the lake, making floating plastic waste a persistent and highly visible feature of everyday life. As a result, it is reinforcing communities' awareness of its ecological, social, and economic consequences.

Despite this relatively high level of environmental awareness, waste management practices remain inconsistent. The research discovered that community members generally understood the consequences of improper plastic waste disposal; yet, this understanding was not always reflected in daily behaviour. Plastic waste continued to accumulate around residential areas and waterways due to limited waste disposal facilities, irregular waste collection services, and the widespread use of single-use plastic products. Furthermore, the redistribution of floating plastic waste by lake currents underscores the importance of community-based waste management and environmental education in fostering collective responsibility for maintaining environmental cleanliness (Nurhidayah et al., 2026; Pusmiati et al., 2025).

Community participation nevertheless represents an important strength within the local waste management system. Residents periodically organize collective clean-up activities around residential areas, public facilities, and tourism sites to maintain environmental cleanliness and preserve the village's image as a tourism destination (Astina Wati Silitonga et al., 2025). Such initiatives demonstrate a shared sense of responsibility for protecting Lake Sentani and indicate the presence of social capital that

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can support future environmental programs. However, these activities remain largely voluntary and event-based, limited their long term effectiveness in addressing the continuous generation and redistribution of plastic waste.

Plastic Waste Management as a Socio-Ecological Challenge

The result demonstrates that plastic waste management in Yoboi Village extends beyond a conventional waste disposal issue and should be understood as a socio-ecological challenge shaped by the interaction between human behaviour, environmental processes and institutional capacity. The widespread presence of single-use plastic waste, together with the community's generally positive environmental awareness, implies that plastic pollution cannot be explained solely by individual disposal practices. Instead, waste accumulation results from the combine's influence of changing consumption patterns, the hydrological dynamics of Lake Sentani, and the limited capacity of existing waste management systems.

From a socio-ecological perspective, plastic waste management in Yoboi Village illustrates the reciprocal relationship between human activities and ecosystem processes. Daily consumption patterns influence the quantity and type of plastic entering the environment while the ecological characteristics of Lake Sentani determine how waste is transported, accumulated and redistributed. At the same time, institutional arrangements and community participation shape the community's capacity to respond environmental pressures.

The research also highlights the interconnected relationship between environmental quality and community livelihoods. As a water-based tourism village, Yoboi depends on the ecological condition of Lake Sentani to support fisheries, transportation, and tourism activities, particularly the village's sago forest ecotourism, which attracts visitors seeking both natural and cultural experiences. The attractiveness of this ecotourism destination relies on the environmental quality of the surrounding lake and forest ecosystem. Plastic pollution has implications that extend beyond environmental degradation by diminishing local ecotourism revenue and the social identity of the community, which is deeply rooted in sago as a sacred symbol of life (Putri & Suroto, 2023).

These findings support the perspective that effective plastic waste management requires a socio-ecological approach that recognizes the reciprocal relationship between communities and their environment. Waste management should be viewed as a collaborative process involving local communities, village institutions, government agencies, tourism stakeholders, and environmental organizations. Strengthening this collaboration can improve environmental stewardship while acknowledging the unique physical and social characteristics of lake-based settlements (Mangiri et al., 2020). Such an approach aligns with the principles of community-based environmental management, which emphasize shared responsibility, local participation, and adaptive governance as key elements of sustainable resource management.

CONCLUSION

This study highlights that plastic waste management in Yoboi Village is a socio-ecological challenge closely influenced by consumption patterns, the characteristics of a lake-based settlement, and limited waste management capacity. Plastic waste, particularly single-use plastics such as packaging, bottles, and food wrappers, was widely observed around residential areas, waterways, and tourism spaces, demonstrating the close interaction between human activities and the Lake Sentani ecosystem. Although, the community generally recognized the environmental impacts of plastic pollution and the importance of protecting Lake Sentani, awareness has not always resulted in consistent waste management practices due to infrastructural and institutional limitations. Overall,

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sustainable plastic waste management in Yoboi Village requires an integrated community-based approach that combines environmental education, improved waste management systems, and collaboration among local stakeholders to protect the ecological, cultural, and economic values of Lake Sentani.

Future research is encouraged to adopt mixed-methods approaches by integrating qualitative findings with quantitative assessments of plastic waste generation and community behaviour. Such approaches would provide a more comprehensive understanding of the relationships between waste characteristics, environmental perceptions, and waste management practices in freshwater ecosystems.

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