



Perceptions of Industrial Waste Management in Coastal Communities

Zulfan Nahrudin¹, Ahmad Firdaus²

¹Public Administration Science, STISIP Bina Generasi Polewali Mandar

²Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA

*Corresponding Author: Zulfan Nahrudin

E-mail: zulfannahrudin@gmail.com

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Abstract

This study examines how economic development and its social impacts are perceived across different socio-economic groups in Palu, Central Sulawesi, a post-disaster urban context. It aims to assess whether economic growth promotes inclusive development or reinforces inequality. A quantitative cross-sectional survey was conducted with 150 respondents selected through stratified random sampling. Data were collected using structured questionnaires with a five-point Likert scale and analyzed using descriptive statistics, ANOVA, correlation, and regression techniques to evaluate relationships between socio-economic status and development perceptions. The findings show that economic development is generally perceived positively, particularly in infrastructure and employment. However, significant disparities exist across income groups, with higher-income respondents reporting more favorable perceptions. The results also indicate moderate levels of perceived inequality and declining social cohesion, especially among lower-income groups. Regression analysis confirms that income and education significantly influence perceptions, while economic development is negatively associated with social cohesion. Economic development supports recovery but may exacerbate inequality without inclusive policies and social integration strategies.

INTRODUCTION

Industrialization has significantly accelerated economic development across many developing countries, contributing to increased employment opportunities, urban expansion, and technological progress. However, this growth has also generated substantial environmental challenges, particularly in the management of industrial waste. Industrial waste, which includes hazardous solid, liquid, and gaseous by-products, poses serious risks to ecosystems and human health when not properly managed. In coastal regions, the impacts are even more severe due to the ecological sensitivity of marine environments and their direct connection to human livelihoods. Studies have shown that improper waste disposal contributes to water pollution, biodiversity loss, and ecosystem degradation (Dubey et al., 2024; Häder et al., 2020). These environmental changes are especially critical in regions where communities rely heavily on natural resources for survival.

Coastal ecosystems function as transitional zones between terrestrial and marine environments, making them particularly vulnerable to anthropogenic pressures. The influx of industrial pollutants into coastal waters can disrupt ecological balance and reduce the resilience of these ecosystems (Andersen et al., 2020; Lu et al., 2022). In many developing countries, including Indonesia, the rapid expansion of industrial activities has not been matched by adequate environmental governance and waste management infrastructure. Weak regulatory enforcement and limited monitoring mechanisms often result in the discharge of untreated industrial waste into rivers and coastal areas (Batista et al., 2021; Gollakota et al., 2020). Consequently, environmental degradation has become a persistent issue, with long-term implications for both ecological sustainability and human well-being.

One of the major challenges associated with industrial waste management is its uneven impact on vulnerable populations, particularly coastal communities. These communities are often dependent on fishing, aquaculture, and small-scale agriculture, making them highly susceptible to environmental changes. In areas such as Biringkanaya, Makassar, industrial expansion has led to increased waste generation, which directly affects water quality, soil fertility, and marine biodiversity. Previous studies indicate that pollution from industrial activities reduces fish stocks, contaminates agricultural land, and threatens food security (Shakti & Pandey, 2024; Ogidi & Akpan, 2022; Haris, 2022). Despite these challenges, policy responses and institutional interventions have often been insufficient to address the complexity of the problem.

To address the issue of industrial waste management, governments and international organizations have proposed various strategies, including stricter environmental regulations, improved waste treatment technologies, and enhanced monitoring systems. These approaches aim to reduce pollution levels and promote sustainable industrial practices. However, the effectiveness of such measures largely depends on the level of compliance by industries and the capacity of governments to enforce regulations. In many cases, environmental policies are poorly implemented due to limited resources, weak institutional coordination, and conflicting economic interests (Zhang et al., 2020; Awewomom et al., 2024; Waheed et al., 2023). As a result, the gap between policy formulation and practical implementation remains a critical concern in environmental governance.

Recent literature emphasizes the importance of incorporating community perspectives into environmental management strategies. Community-based approaches have been shown to improve policy effectiveness by fostering local participation, increasing awareness, and enhancing accountability (Dushkova & Ivlieva, 2024; Abid et al., 2024). In the context of industrial waste management, engaging local communities can provide valuable insights into the real impacts of pollution and the effectiveness of existing policies. Participatory governance models encourage collaboration between stakeholders, including government agencies, industries, and civil society, to develop more inclusive and sustainable solutions (Liu et al., 2020; Sánchez-Soriano et al., 2024). Such approaches are particularly relevant in coastal areas, where local knowledge plays a crucial role in resource management.

In addition to participatory approaches, technological and institutional innovations have been proposed as solutions to industrial waste problems. For example, integrated waste management systems, circular economy models, and sustainable production practices have gained attention in recent years. These approaches aim to minimize waste generation, promote recycling, and reduce environmental impacts (Torkayesh et al., 2022; Okuh et al., 2023). However, the successful implementation of these solutions requires not only technical capacity but also strong governance frameworks and community engagement. Without addressing social dimensions such as trust, awareness, and participation, technical solutions alone may not be

sufficient to achieve sustainable outcomes (Bhambri & Bajdor, 2024; Kiss et al., 2022).

Despite the growing body of research on industrial waste management, there remains a significant gap in understanding how local communities perceive and respond to environmental pollution, particularly in developing country contexts. Most existing studies focus on environmental indicators and policy analysis, with limited attention to the lived experiences and perceptions of affected populations. In coastal areas like Biringkanaya, community perceptions are shaped by direct interactions with environmental changes, such as declining fish catches, polluted water sources, and reduced agricultural productivity. Understanding these perceptions is essential for designing policies that are not only effective but also socially acceptable and inclusive.

Therefore, this study aims to examine the perceptions of coastal communities in Biringkanaya, Makassar, regarding industrial waste management and its socio-economic and environmental impacts on livelihoods. The novelty of this research lies in its focus on community narratives as a central analytical lens, providing a bottom-up perspective on environmental governance. By integrating local experiences with broader policy discussions, this study seeks to contribute to the literature on industrial waste management and coastal sustainability. The scope of the study is limited to selected communities within Biringkanaya, with a focus on how perceptions influence participation, resilience, and responses to environmental challenges. The findings are expected to inform more inclusive and context-sensitive policy interventions aimed at improving environmental management and supporting sustainable livelihoods.

METHODS

This study adopts a qualitative research approach using a case study design to explore community perceptions of industrial waste management and its socio-economic and environmental impacts in coastal areas. A qualitative approach is considered appropriate for this research because it enables an in-depth understanding of participants' lived experiences, perceptions, and social realities, particularly in contexts where environmental issues are closely intertwined with daily livelihood practices (Creswell, 2014). The case study design allows the researcher to investigate the phenomenon within its real-life context, capturing the complexity of interactions between industrial activities, environmental degradation, and community responses (Yin, 2018). This approach is particularly relevant in coastal settings, where environmental and socio-economic dimensions are highly interconnected.

The research was conducted in Biringkanaya District, Makassar, Indonesia, an area characterized by rapid industrial development and a high concentration of coastal communities. The selection of this site was based on its relevance to the research problem, as the district hosts various manufacturing, processing, and fisheries-related industries that contribute to the generation of industrial waste. At the same time, local communities in this area are heavily dependent on natural resources such as fisheries and small-scale agriculture, making them particularly vulnerable to environmental changes. The contextual specificity of Biringkanaya provides a suitable setting for examining how industrial waste management practices are perceived and experienced at the community level.

The target population of this study consists of residents living in coastal communities within Biringkanaya who are directly or indirectly affected by industrial activities. Participants were selected using purposive sampling, a technique commonly employed in qualitative research to identify individuals with relevant knowledge and experience related to the research topic (Douglas, 2022). The inclusion criteria

required participants to have resided in the area for at least five years and to possess direct experience or awareness of industrial waste and its impacts. A total of twenty participants were involved in the study, including fishermen, small-scale farmers, community leaders, and environmental activists. This sample size is considered sufficient to achieve data saturation, a condition in which no new themes or insights emerge from additional data collection (Chitac, 2022).

Data collection was carried out through semi-structured interviews and focus group discussions (FGDs), which are widely recognized as effective methods for exploring perceptions and social experiences in qualitative research. Semi-structured interviews were conducted with twelve participants, allowing for flexibility in exploring individual perspectives while maintaining consistency in key topics. The interview guide included questions related to sources of industrial waste, perceived environmental impacts, effects on livelihoods, and levels of community participation in waste management. Each interview lasted between 45 and 60 minutes and was conducted in a setting convenient for the participants. With their consent, all interviews were audio-recorded to ensure accuracy in data capture.

In addition to individual interviews, two focus group discussions were conducted, each involving four participants. FGDs were employed to facilitate interactive discussions and to capture shared experiences and collective perspectives within the community. This method allows participants to reflect on each other's responses, thereby generating richer and more nuanced data (Dahal et al., 2024). Each FGD session lasted approximately 90 minutes and was moderated by the researcher. The discussions were also audio-recorded and subsequently transcribed verbatim. The combination of interviews and FGDs enabled methodological triangulation, enhancing the depth and credibility of the data collected.

The data obtained from interviews and FGDs were analyzed using thematic analysis, following the six-phase framework proposed by Dehalwar & Sharma (2024). This analytical method is suitable for identifying, analyzing, and reporting patterns within qualitative data. The first phase involved familiarization with the data through repeated reading of the transcripts. In the second phase, initial codes were generated to capture meaningful segments of the data related to participants' perceptions and experiences. These codes were then organized into broader themes in the third phase, reflecting recurring patterns across the dataset. The fourth phase involved reviewing and refining the themes to ensure coherence and consistency. In the fifth phase, themes were clearly defined and named, while the final phase involved producing a narrative that integrates the themes with relevant literature and research objectives.

Several key themes emerged from the analysis, including community awareness of industrial waste, perceived environmental degradation, impacts on livelihoods, and levels of community participation in waste management. These themes provide a structured framework for interpreting the findings and linking them to broader discussions on environmental governance and sustainable development. The thematic analysis also allows for the inclusion of direct quotations from participants, which serve to illustrate and support the identified themes while preserving the authenticity of participants' voices.

To ensure the trustworthiness of the study, several strategies were employed, following the criteria of credibility, transferability, dependability, and confirmability (Enworu, 2023). Credibility was enhanced through data triangulation by using multiple data collection methods, namely interviews and FGDs. Member checking was also conducted by sharing preliminary findings with selected participants to verify the accuracy of interpretations. Transferability was addressed by providing detailed descriptions of the research context, participants, and data collection

procedures, allowing readers to assess the applicability of the findings to similar contexts.

Dependability was ensured by maintaining a clear audit trail of the research process, including documentation of methodological decisions, data collection procedures, and analytical steps. This transparency enables other researchers to understand and potentially replicate the study. Confirmability was achieved by practicing reflexivity, in which the researcher critically examined personal assumptions and potential biases throughout the research process. This approach helps to ensure that the findings are grounded in the data rather than influenced by the researcher's subjective perspectives.

RESULTS AND DISCUSSION

The increasing pressure of environmental degradation in coastal areas has positioned industrial waste as a critical issue affecting both ecological sustainability and community livelihoods. In Biringkanaya, Makassar, the findings reveal a complex interaction between environmental change, socio-economic vulnerability, and institutional limitations. Drawing from in-depth interviews and focus group discussions, this section presents key themes emerging from community experiences, supported by extended participant narratives to reflect the depth of local perspectives.

Community Perceptions of Industrial Waste

The findings indicate that coastal communities in Biringkanaya perceive industrial waste as a persistent and tangible threat that directly affects their environment and daily livelihoods. These perceptions are largely shaped by long-term interaction with coastal ecosystems, where environmental changes are experienced in practical and immediate ways. Across interviews and focus group discussions, participants consistently described visible signs of environmental deterioration, particularly in water quality and marine conditions.

A fisherman (P3) explained in detail:

“We used to rely on the sea not only for income but also for daily food. Every morning, we could go out and return with enough fish for our families and to sell in the market. But now, everything has changed. The fish are harder to find, and sometimes when we catch them, they look unhealthy. Some have unusual spots, some are smaller than usual, and others even smell different. Buyers at the market often reject them, so we lose income. This never happened before, and it is getting worse each year.”

This statement reflects how environmental perception is closely tied to economic consequences. The decline in fish quality and quantity is not only interpreted as ecological degradation but also as a disruption to local market systems and household income. This supports the argument that perception in coastal communities is strongly linked to livelihood dependency (Andrews et al., 2021).

Participants in Focus Group Discussion 1 (FGD1) similarly emphasized shared experiences of environmental change:

“The sea is no longer the same for all of us. We all see the difference, whether we are fishermen or not. The water is darker, sometimes oily, and it smells. These changes affect everyone, not just those who work at sea.”

This collective narrative indicates that industrial waste is perceived as a community-wide issue rather than an individual concern. However, not all participants demonstrated the same level of understanding. An environmental activist (P8) stated:

“Most people here know that the waste is harmful because they see the impact directly. But they do not always understand how pollution spreads or how it damages ecosystems in the long term.”

This suggests a gap between experiential awareness and scientific understanding, which may limit effective community engagement in environmental governance (Liu et al., 2020).

Perceived Environmental Degradation

Participants described environmental degradation as a gradual yet increasingly severe process affecting marine ecosystems, coastal vegetation, and water resources. These changes are perceived through direct observation over time, reinforcing a sense of ecological decline.

A fisherman (P1) described the transformation of coastal waters:

“Before, the water was clear, and we could see fish swimming even from the surface. Now, the water is cloudy, sometimes even blackish in certain areas. There are times when the smell is very strong, like chemicals. When we throw our nets, sometimes we catch waste instead of fish. It is very different from what we experienced years ago.”

This statement reflects a temporal comparison between past and present conditions, highlighting a perceived trajectory of environmental degradation. The presence of chemical odors and visible waste indicates ongoing pollution, consistent with findings on industrial contamination in coastal areas (Siddiqua et al., 2022).

A community leader (P5) further emphasized the degradation of mangrove ecosystems:

“Mangroves used to be strong and dense. They protected our coast and were home to many small fish and crabs. Now, many of them are damaged or gone. Without mangroves, the sea feels more open and more dangerous.”

This highlights the ecological and protective functions of mangroves, as well as their importance for coastal resilience. The perceived loss of mangroves suggests increased vulnerability to environmental risks (Andersen et al., 2020).

A farmer (P6) provided a land-based perspective:

“The water we use for irrigation is no longer the same. Sometimes it smells, and sometimes it looks dirty. Our crops do not grow as well as before. The leaves turn yellow, and the harvest is smaller. We believe this is because of waste entering the water system.”

This finding suggests that industrial waste impacts are not limited to marine ecosystems but also affect agricultural systems, reflecting the interconnected nature of environmental degradation. Pollutants likely spread through shared water systems, contaminating irrigation sources and reducing soil quality. Critically, this indicates not only ecological linkage but also governance gaps, where weak regulation allows pollution to cross environmental boundaries. As a result, communities face compounded livelihood pressures from both declining fisheries and reduced agricultural productivity, highlighting the need for more integrated and cross-sectoral environmental management.

Impact on Livelihoods

The findings reveal that industrial waste has significantly disrupted traditional livelihood systems, particularly fishing and small-scale agriculture. Participants reported declining income, increased economic uncertainty, and the need to adapt to changing environmental conditions.

A fisherman (P2) explained:

“Fishing used to be enough for us. We did not need other jobs because the sea provided everything. But now, it is different. We spend more time at sea, more money on fuel, and face more danger, but the results are not the same. Sometimes, we earn nothing in a day. It is very difficult because we still have to provide for our families.”

This reflects a shift from stable to uncertain livelihoods, where environmental degradation increases both costs and risks. This finding aligns with previous research linking environmental decline to livelihood vulnerability (Nguyen et al., 2023).

Another fisherman (P4) added:

“In the past, we did not need to go far from the shore. Now we must travel farther, and even then, the catch is not guaranteed. It feels like we are working harder for less.”

This indicates that resource depletion in nearshore areas has intensified, forcing local fishers to operate further from the coastline and thereby increasing both economic and physical burdens. As accessible fishing zones become less productive, fishers must invest more time, fuel, and effort to maintain their catch levels, which raises operational costs and reduces overall efficiency. Critically, this shift not only reflects ecological decline but also exposes fishers to greater risks at sea, including unpredictable weather and safety challenges. Consequently, the depletion of nearshore resources does not merely affect environmental conditions but also restructures livelihood practices, amplifying vulnerability among small-scale fishing communities.

A farmer (P7) similarly explained:

“Our crops are not as productive as before. The soil is not as fertile, and the water is not clean. We try different methods, but the results are still poor. Some farmers have stopped farming because it is no longer profitable.”

Participants in FGD2 also highlighted collective economic challenges:

“Many of us are now looking for additional work because our main jobs are no longer reliable. Fishing and farming cannot fully support our families anymore.”

These findings indicate that environmental degradation extends beyond ecological impacts to induce broader socio-economic transformations, particularly in livelihood structures. As traditional occupations such as fishing and farming become increasingly unreliable, households are compelled to diversify their income sources. However, this diversification is often not a strategic adaptation but a constrained response to environmental decline. Consequently, emerging livelihood options tend to be less stable and more vulnerable, leading to increased economic uncertainty and reduced overall resilience at the household level.

Community Participation and Constraints

The study found varying levels of community participation in environmental management. While some residents actively engage in environmental initiatives, others are constrained by economic pressures and perceived inefficacy.

An environmental activist (P9) stated:

“We try to organize clean-up activities and raise awareness among the community. But it is difficult because the waste keeps coming. It feels like we are solving a small part of a much bigger problem.”

This reflects the inherent limitations of grassroots efforts in addressing systemic environmental issues, particularly when the scale of pollution is driven by industrial actors operating beyond community control. While local initiatives such as clean-up activities and awareness campaigns demonstrate a strong sense of environmental responsibility, their impact remains constrained by the absence of structural support, regulatory enforcement, and institutional coordination. In this context, community actions tend to function as reactive and short-term responses rather than sustainable solutions to the root causes of pollution. Critically, this imbalance highlights a mismatch between the scale of the problem and the capacity of local actors, where community-driven efforts alone are insufficient to counteract continuous and large-scale industrial waste discharge. As a result, without stronger institutional intervention and multi-level governance, grassroots initiatives risk becoming symbolic rather than transformative in addressing environmental degradation.

However, not all participants are equally engaged. A fisherman (P10) expressed frustration:

“Sometimes we feel like there is no point in trying. Even if we clean the beach or report the problem, the factories continue to operate. It feels like our efforts do not make a difference.”

This perception of powerlessness reduces motivation for participation.

Economic constraints also play a role. A farmer (P6) explained:

“We want to help protect the environment, but we need to focus on earning money to support our families. We do not always have time to participate.”

These findings suggest that community participation is shaped by both structural constraints and perceived effectiveness of engagement. Limited resources, time constraints, and economic pressures restrict individuals’ capacity to participate in environmental initiatives, while skepticism regarding the impact of such efforts further reduces motivation. Consequently, participation is not solely determined by awareness or willingness but is mediated by broader socio-economic conditions and perceptions of institutional responsiveness.

Trust in Institutions and Environmental Governance

A dominant theme across the findings is the low level of trust in government institutions and environmental governance systems. Participants frequently expressed skepticism regarding the enforcement of environmental regulations.

A community leader (P5) stated:

“We often hear about regulations, but nothing changes. The factories continue to pollute, and we continue to suffer. It feels like the rules are only on paper.”

This reflects a perceived gap between policy and implementation.

Another participant (P11) added:

“We expect the government to protect us, but we do not see strong action. Sometimes it feels like they prioritize industry over the community.”

Participants in FGD1 also expressed similar concerns:

“There are rules, but enforcement is weak. Without strict action, the problem will continue.”

However, some participants acknowledged limited government efforts. An environmental activist (P8) noted:

“There are inspections and programs, but they are not consistent. We need stronger and more continuous action.”

These findings highlight persistent institutional challenges in environmental governance, particularly in reconciling the competing priorities of economic development and environmental protection (Zhang et al., 2020). Weak enforcement, regulatory inconsistencies, and perceived bias toward industrial interests suggest that governance mechanisms remain insufficient to manage environmental risks effectively. As a result, environmental protection efforts are often subordinated to economic agendas, undermining both ecological sustainability and public trust in institutions.

The findings of this study demonstrate that industrial waste management in coastal areas such as Biringkanaya must be understood as a socio-ecological issue rather than a purely environmental problem. Community perceptions reveal that environmental degradation is experienced directly through changes in water quality, declining fish stocks, and reduced agricultural productivity, which confirms that environmental impacts are closely tied to everyday livelihood practices. This aligns with previous research emphasizing that environmental challenges in coastal regions are deeply interconnected with socio-economic conditions, particularly in communities that rely heavily on natural resources (Andrews et al., 2021). In this context, environmental degradation is not perceived abstractly but as a tangible disruption to economic stability and social well-being.

A key contribution of this study lies in highlighting the role of experiential knowledge in shaping environmental perceptions. Although community members may not possess formal scientific understanding of pollution processes, their observations reflect a grounded and consistent awareness of ecological change. This supports the argument that local ecological knowledge constitutes an important foundation for environmental governance (Hügel & Davies, 2020). However, the findings also reveal a limitation in the depth of this knowledge, as participants often lack the conceptual tools to fully understand the broader mechanisms and long-term implications of environmental degradation. This gap between experiential awareness and scientific literacy is significant, as it may constrain effective participation in environmental decision-making processes (Liu et al., 2020). Therefore, strengthening environmental education becomes essential to enhance the capacity of communities to engage meaningfully in governance.

The study further demonstrates that environmental degradation produces significant socio-economic consequences, particularly through the transformation of livelihood structures. The decline in fisheries and agricultural productivity has forced households to diversify their income sources, but this diversification often occurs under conditions of constraint rather than opportunity. While diversification is commonly interpreted as an indicator of resilience, the findings suggest that it may instead reflect a coping strategy driven by necessity. This observation supports Nguyen et al. (2023), who argue that environmental degradation can increase livelihood vulnerability rather than promote sustainable adaptation. In Biringkanaya, alternative income sources are often less stable and provide lower returns, leading to increased economic uncertainty and reduced household resilience. Moreover, the shift away from traditional livelihoods has broader social implications, as fishing and farming are not only economic activities but also integral components of community identity and cultural continuity.

Another important finding concerns the interconnected nature of environmental degradation across ecological systems. The study shows that industrial waste

impacts are not confined to marine environments but extend into agricultural systems through shared water resources. This confirms that environmental degradation operates as a cross-sectoral process, affecting multiple domains simultaneously. Such findings are consistent with Siddiqua et al. (2022), who highlight that industrial pollutants often spread beyond their original source, creating cumulative environmental impacts. The degradation of mangrove ecosystems further illustrates this interconnectedness, as the loss of these ecological buffers reduces biodiversity, weakens coastal protection, and increases vulnerability to environmental risks (Andersen et al., 2020). These results suggest that fragmented approaches to environmental management are insufficient, and that integrated governance frameworks are required to address the complexity of industrial pollution.

The findings also reveal significant constraints on community participation in environmental management. Although awareness of environmental issues is relatively high, participation is limited by both structural and perceptual factors. Economic pressures, limited resources, and time constraints reduce individuals' ability to engage in environmental initiatives, while perceptions of inefficacy further discourage participation. This highlights a critical gap between theoretical models of participatory governance and practical realities. As noted by Hgel and Davies (2020), effective participation requires enabling conditions, including institutional support and visible outcomes. Without these conditions, participation risks becoming symbolic rather than substantive. The study therefore suggests that increasing participation requires not only raising awareness but also addressing structural barriers and improving the perceived effectiveness of community engagement.

Institutional trust emerges as a central issue in this study, reflecting broader challenges in environmental governance. Participants consistently expressed skepticism regarding the enforcement of environmental regulations, indicating a perceived gap between policy and practice. This finding is consistent with Zhang et al. (2020), who identify weak regulatory enforcement as a key factor contributing to environmental degradation. However, this study extends the literature by demonstrating how institutional distrust affects not only environmental outcomes but also social dynamics. The perception that authorities prioritize economic interests over environmental protection undermines public confidence and reduces community willingness to engage in governance processes. In this context, environmental governance must be understood not only as a technical issue but also as a matter of trust, accountability, and institutional legitimacy.

From a policy perspective, the study highlights the need for more effective and integrated approaches to industrial waste management. Strengthening regulatory enforcement is essential to ensure that environmental policies are implemented consistently and transparently. At the same time, enhancing community participation requires targeted interventions that address both structural constraints and perceptual barriers. This includes providing access to information, building local capacity, and creating meaningful opportunities for engagement. Furthermore, the interconnected nature of environmental impacts underscores the importance of cross-sectoral policy coordination, where marine and terrestrial management strategies are integrated rather than treated separately. Building trust between communities and institutions is also critical, as effective governance depends on transparent decision-making and consistent policy implementation.

Despite its contributions, this study has several limitations. The qualitative design provides in-depth insights but limits the generalizability of the findings to other contexts. Additionally, the study relies on community perceptions, which may not fully capture objective environmental conditions. Future research could adopt

mixed-method approaches to integrate qualitative and quantitative data, providing a more comprehensive analysis of industrial waste impacts. Comparative studies across different coastal regions would also help to identify broader patterns and contextual differences.

CONCLUSION

This study examined community perceptions of industrial waste management in the coastal area of Biringkanaya, Makassar, and found that industrial waste is perceived as a significant and persistent threat affecting both environmental and socio-economic conditions. The impacts extend beyond marine ecosystems to agricultural systems, demonstrating the interconnected nature of environmental degradation through declining water quality, reduced fish stocks, and decreased agricultural productivity. These environmental changes have led to broader socio-economic transformations, particularly through forced livelihood diversification and increasing economic instability, indicating that such shifts are driven more by necessity than resilience. Although community awareness of environmental issues is relatively high, participation in environmental management remains limited due to structural constraints and perceptions of inefficacy, highlighting that engagement is shaped by both socio-economic conditions and institutional responsiveness. Furthermore, weak regulatory enforcement and low levels of trust in government institutions reflect broader governance challenges, where environmental protection is often subordinated to economic priorities. Overall, the study underscores the importance of integrating community perspectives into environmental governance and calls for more effective, transparent, and cross-sectoral policy approaches to address the complex and interconnected impacts of industrial waste in coastal areas.

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