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WHEN PLASTICS DOMINATE THE SEAS: A STUDY OF THE THREAT TO COASTAL COMMUNITY DEVELOPMENT FROM PLASTIC WASTE

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Abstract

Plastic waste has become a major threat to the sustainable development of coastal communities in the Riau Islands, Indonesia. This study investigates the ecological, health, and economic dimensions of this problem, focusing on how plastic pollution affects marine ecosystems and fishermen's livelihoods. A qualitative approach was employed using documentary analysis and visual observation in selected coastal areas. The results show that plastic waste contributes to severe ecological degradation, including coral damage, habitat loss, and biodiversity decline. Microplastic contamination in seafood poses chronic health risks to local communities dependent on marine resources. Economically, fishermen face reduced income due to damaged fishing gear and declining catches, reflected in a 12.35% drop in total fishery production from 174,800 tons in late 2023 to 153,218.99 tons in early 2024. These findings highlight the interconnected nature of plastic pollution's impacts. Addressing this crisis requires collaborative governance among government, industry, and coastal residents to strengthen waste management, reduce plastic dependency, and promote sustainable behavioral change for coastal resilience.

Keywords: Plastic Waste, Ecological Degradation, Health Risks, Economic Inequality, Riau Islands

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1 Introduction

The rapid increase in plastic waste has emerged as a critical environmental issue affecting the sustainability of coastal communities worldwide. In the context of Indonesia, particularly in the Riau Islands, the problem has become increasingly alarming as plastic waste continues to pollute marine and coastal ecosystems, threatening both ecological balance and community livelihoods (Isfarin et al., 2024). This issue is not merely an environmental concern but also a socio economic challenge that undermines the development and resilience of coastal communities. The urgency of this problem is heightened by multidimensional failures in waste management and limited mitigation efforts from local authorities, allowing plastic pollution to persist and accumulate in marine environments.

Plastic waste contributes significantly to ecological degradation, affecting biodiversity (Beaumont et al., 2019), damaging coral reefs, mangrove forests (Kumar et al., 2021), and seagrass beds (Khoaele et al., 2023). Its environmental and health impacts have been widely documented, including contamination of the marine food chain through microplastics (Nayanathara Thathsarani Pilapitiya & Ratnayake, 2024) and the persistence of plastic waste in aquatic ecosystems throughout its life cycle (Evode et al., 2021). Economically, the presence of plastic waste disrupts the livelihoods of fishing communities by reducing fish stocks and damaging fishing gear, thereby lowering fishermen's incomes and increasing operational costs (Llerena et al., 2025).

Previous studies have examined several aspects of plastic waste problems. For example, (Massiseng et al., 2022) analyzed the characteristics and socio economic impacts of plastic waste in mangrove ecotourism areas, while (Phelan et al., 2020) explored community knowledge, use, disposal behavior, and local consequences of single use plastic waste in remote island communities. Other studies have investigated the forms and distribution of plastic pollutants in coastal environments (Nayanathara Thathsarani Pilapitiya & Ratnayake, 2024) and public perceptions of waste dynamics in coastal regions (Herdiansyah et al., 2021). Furthermore, (Stoett et al., 2024) highlighted that plastic waste remains a major barrier to achieving sustainable development goals. However, much of the existing literature remains descriptive and repetitive, focusing on ecological or behavioral aspects without addressing the deeper structural issues related to the development vulnerability of coastal communities in archipelagic regions like the Riau Islands.

This study seeks to address this gap by analyzing the structural threat posed by plastic waste to coastal community development from ecological, health, and economic perspectives. Specifically, the research aims to answer three guiding questions: (1) How does plastic waste contribute to ecological inequality in the marine ecosystem? (2) How does plastic waste lead to public health problems in coastal communities? and (3) How does plastic waste create economic inequality among coastal fishermen? By addressing these questions, the study intends to provide a more comprehensive understanding of the multidimensional impacts of plastic pollution on coastal community development.

The threat posed by plastic waste stems from long-term environmental neglect, which exacerbates ecological degradation, public health risks, and socio economic inequalities. The continuous destruction of coral reefs, seagrass beds, and mangrove ecosystems reduces biodiversity and threatens marine habitats. Meanwhile, contamination of the marine food chain through microplastics exposes communities to chronic health risks. Finally, economic inequality intensifies as plastic waste disrupts fishing activities, reduces fish catches, and forces traditional fishermen to shift to lower-income livelihoods. Therefore, Understanding these interconnected threats is essential for developing integrated strategies to support sustainable coastal community development in the Riau Islands.

2 Methodology

This study adopts a qualitative descriptive approach based exclusively on documentary data available online (local and national news articles) and on visual material contained within those articles (Creswell & Poth, 2016). The method is therefore appropriate for mapping and interpreting media-reported evidence of how plastic waste is framed and reported as a threat to coastal community development in the Riau Islands (Jensen, 2002).

Data consist of online news items and accompanying visual material (photographs, infographics) that report on plastic waste and its impacts in coastal areas of the Riau Islands. The search and data-collection were carried out in Indonesian using the search phrase (in Indonesian) corresponding to “ancaman pembangunan masyarakat pesisir akibat sampah plastik di Kepulauan Riau” and equivalent terms, through the Google search engine. The temporal

window for data collection covered a three-month period: August–October 2025. From the initial search results, the researcher selected relevant items from both local (Riau Islands) and national online media outlets.

The selection of news articles was guided by a set of inclusion and exclusion criteria that emphasised relevance, credibility, and empirical content (Rachman et.al., 2024). Articles were included if they were published within the specified time frame of August–October 2025, explicitly discussed the problem of plastic waste in relation to coastal communities in the Riau Islands, and contained factual descriptions, reports, or quotations from credible actors such as local fishers, government officials, or NGO representatives. Articles that provided visual evidence or photographs related to ecological damage, health impacts, or economic losses were also considered. In contrast, articles were excluded if they consisted solely of opinion pieces or editorials without verifiable data, were duplicates or reposts lacking additional information, or discussed plastic pollution in general without a specific connection to the Riau Islands. After applying these criteria, a total of thirty (30) articles were selected as the primary data set for in-depth analysis (Kanazawa, 2023).

For each article, relevant information was systematically extracted and tabulated, including the publication title, media outlet, date of publication, URL, geographic focus, types of impacts reported, quotations, and descriptions of visual evidence. All data were then organised into thematic tables that aligned with the three primary analytical dimensions of this study: ecological inequality, public health problems, and economic inequality affecting fishers. This structured organisation enabled systematic comparison and synthesis across multiple sources.

The analytical process consisted of three main stages. The first stage involved compiling and grouping all selected articles based on the predefined analytical categories, allowing for an initial mapping of how plastic waste issues are represented in media reporting. The second stage involved detailed reading and coding of each article, during which specific themes such as coral reef damage, microplastic contamination, fishing gear damage, and government responses were identified and entered into the data extraction table. The third stage focused on the examination of visual evidence and direct quotations to strengthen textual findings, ensuring that reported impacts were corroborated by multiple types of evidence. The analysis followed a deductive approach, meaning that data were interpreted with reference to the predefined dimensions of ecological, health, and economic impacts.

3 Result and Discussion

The threat to coastal community development due to plastic waste reflects the failure of various dimensions in realizing the sustainable development of marine ecosystems in coastal areas. The current situation and conditions of coastal communities in the archipelago are often placed in marginalized positions, even though they always feel and bear the direct impact of plastic waste. The occurrence of discrimination against coastal communities due to the lack of attention from the government to the mitigation of plastic waste in the archipelago, needs to be reviewed on the repositioning of development that has been applied to coastal communities. These failures can be seen from the following three findings:

3.1 Ecological Inequality in the Marine Environment due to Plastic Waste

The presence of plastic waste in the Riau Islands has created a serious ecological imbalance that threatens the sustainability of marine ecosystems and coastal community development. Accumulated plastic waste disrupts the natural growth of coral reefs and other marine organisms because plastic debris covers marine substrates and inhibits coral regeneration. Over time, these plastics disintegrate into microplastics that persist in the aquatic environment, eventually surpassing fish biomass if unmanaged, thereby exacerbating ecosystem degradation. This situation reflects not only the growing ecological inequality experienced by coastal communities but also the lack of effective mitigation measures from local governments.

The ecological impacts are clearly illustrated in Figure 1, Figure 2, Figure 3, and Table 1, which document the degradation of marine environments in the Riau Islands. Plastic debris has been found polluting beaches, coral reefs, and coastal waters, indicating both local and transboundary pollution sources. The accumulation of used plastic bottles and packaging on Natuna’s beaches is one example of how international marine currents can carry waste across borders, worsening the ecological burden.

Figure 1



Figure 1. Is Plastic Waste on the Beachside (kompas.id)

Figure 2



Figure 2. Is Plastic Waste in the Marine Environment (waste4change.com)

Figure 3



Figure 3. It is plastic waste on the seabed. (yiari.or.id)

Table 1. Ecological Inequality in the Marine Environment due to Plastic Waste

Impact	Narrative Description	Source
Sustainable marine environment	Plastic waste can pollute the environment and transform into microplastics that harm ecosystems.	https://lintaskepri.com/wagub-kepri-tinjau-pengolahan-sampah-plastik-di-pt-free-the-sea-batam/
Marine Ecosystems	Plastic waste is a real threat to marine life and birds that seek prey on beaches and seas. Many of these birds and marine life die because they eat plastic.	https://darilaut.id/sampah-polusi/kegiatan-bersih-sampah-plastik-iskindo-kepri
Long-Term Environment	will result in sustainable environmental pollution throughout the life cycle of plastics, with estimates suggesting that by 2050, the ocean will contain more plastic waste than fish.	https://www.batamnews.co.id/berita-95262-musim-utara-banyak-sampah-plastik-asal-negara-asing-terdampar-di-natuna.html
Beach Environment	Waste in the form of used plastic bottles from Asian countries was found stranded on a number of beaches in Natuna Regency, Riau Islands (Riau Islands).	https://www.batamnews.co.id/berita-95262-musim-utara-banyak-sampah-plastik-asal-negara-asing-terdampar-di-natuna.html

The findings from the figures and tabulation indicate three main ecological impacts: (1) degradation of the marine environment caused by the accumulation of plastic waste, leading to microplastic pollution and destruction of marine habitats; (2) disruption of the coastal environment through plastic waste stranded along beaches; and (3) significant damage to coral reefs, where plastic waste inhibits coral growth and introduces harmful chemical contaminants. These three dimensions reveal a direct relationship between plastic waste and the collapse of ecological balance in coastal ecosystems.

The ecological damage is not only confined to environmental degradation but also affects the underwater food chain. The presence of microplastics disrupts the base of the food web, starting from plankton to fish populations, and eventually impacts human health through bioaccumulation. Such conditions highlight a clear linkage between environmental degradation, the decline of marine biodiversity, and the reduced quality of life for coastal communities that depend heavily on marine resources.

This situation suggests three key implications: First, loss of biodiversity occurs as plastic waste disrupts marine and coastal ecological balance. Second, habitat degradation results from plastic accumulation on coral reefs and coastal zones, causing long-term damage to breeding and feeding grounds. Third, economic vulnerability emerges within the fisheries sector, as declining fish populations and degraded ecosystems reduce the sustainability of local livelihoods. These interconnected implications underscore the urgent need for more robust waste management strategies and ecosystem-based coastal development policies..

3.2 The Emergence of Coastal Public Health Problems due to Plastic Waste

The accumulation of plastic waste in the Riau Islands has not only caused ecological degradation but also posed a serious threat to public health in coastal communities. When plastic waste breaks down into microplastics, it enters the marine food chain and eventually contaminates fish, shellfish, and other seafood commonly consumed by local populations. This contamination leads to bioaccumulation of toxic substances in the human body and disrupts metabolic functions. Health impacts include kidney and liver dysfunction, respiratory disorders, skin diseases, digestive problems, and potential endocrine system disruptions. These effects represent a growing public health burden in coastal areas where communities depend heavily on marine resources as their main protein source..

Figure 1



Figure 1. The threat of plastic waste to humans
(antaranews.com)

Figure 2



Figure 2. Is a pile of garbage that causes odors
(goodnewsfromindonesia.id)

Figure 3



Figure 3. Piles of plastic waste in the middle of children.

Tabel 2. The emergence of public health problems due to plastic waste

Impact	Narrative Description	Source
Public Health	Consuming seafood such as snails contaminated with microplastics has a negative impact on public health, as these particles can enter the human body through the marine food chain	https://www.antaranews.com/berita/810860/limbah-plastik-ancam-ekosistem-perairan-kepri-ujar-pengamat
Organ Damage	Toxic substances contained in plastic waste or its by-products can lead to serious health issues, including liver and kidney dysfunction, skin damage, respiratory problems, digestive disorders, as well as disturbances to the nervous and endocrine systems, such as thyroid disease.	https://pid.kepri.polri.go.id/dampak-buruk-sampah-plastik-bagi-kesehatan/
Poisoning	Academic studies have shown that plastic waste in coastal waters affects fish, coral reefs, and seagrass beds. For example, research on *Sembilang* fish commonly consumed by local communities revealed the presence of microplastics in their stomachs.	https://kepriprov.go.id/berita/pemprov-kepri/pengamat-aktivitas-perdagangan-ganggu-ekosistem-perairan-tanjungpinang
Food Chain	Plastic waste that degrades into microplastics can enter the seafood chain and eventually reach humans, posing significant health risks.	Dampak Sampah Terhadap Lingkungan Dan Kesehatan - Kompasiana.com
Seafood	Continuous exposure to microplastics has contaminated seafood products, including commonly consumed species such as fish, lobsters, and corals.	https://mongabay.co.id/2024/11/05/dampak-mengerikan-sampah-plastik-ekosistem-hancur-manusia-terancam/
Marine resources	To ensure the safety of marine and fishery products from plastic pollution, comprehensive inspection of fish bodies is essential, along with the implementation of the traceability principle in seafood production.	https://mongabay.co.id/2023/04/01/ancaman-sampah-plastik-pada-produk-perikanan/

The findings from Table 2 clearly show that the accumulation of plastic waste, particularly microplastics, contaminates marine ecosystems and seafood consumed by coastal communities. As a result, the health of coastal populations is compromised through exposure to toxic chemicals, which are transferred through the food chain. This contamination not only affects individual health but also creates broader public health challenges for communities dependent on marine resources. In addition to direct exposure through consumption, accumulated waste also produces unpleasant odours and degrades the living environment, further affecting the well-being of coastal populations.

From the data, three critical contexts emerge. First, the direct health impact on human organs caused by consumption of contaminated seafood, leading to kidney and liver dysfunction, respiratory issues, skin problems, and other metabolic disorders. Second, the disruption of the marine food chain by plastic waste, which causes indirect health problems through the bioaccumulation of toxic chemicals. Third, the declining quality of marine resources, which undermines food safety and nutrition security for coastal populations. This situation illustrates that plastic waste is not merely an environmental issue but also a significant public health concern.

The implications of these findings are multidimensional. First, chronic disease burdens are likely to increase in coastal communities due to prolonged exposure to microplastics through daily seafood consumption. This may exacerbate existing public health vulnerabilities. Second, food security risks emerge as the quality and safety of fishery products decline, potentially leading to malnutrition and reduced protein intake in communities that rely heavily on marine resources. Third, intergenerational health risks are a concern, as exposure to microplastics can affect maternal and child health, including fetal development during pregnancy. This condition, if left unmanaged, can perpetuate a cycle of health vulnerability that weakens community resilience and development.

3.3 Economic Inequality of Fishermen due to Plastic Waste

The economic inequality experienced by fishermen has become a significant consequence of plastic waste pollution in coastal marine ecosystems. This condition reflects a broader form of injustice, as local governments have failed to provide adequate mitigation measures for the economic losses suffered by coastal communities. Such inequality limits fishermen’s ability to access their primary livelihoods, as the coastal and marine areas on which they depend are increasingly polluted by accumulated plastic debris. Consequently, this situation directly threatens the economic stability and welfare of coastal fishing communities.

The extent of this inequality and environmental degradation is illustrated in Figures 1–3 and Table 3.

Figure 1



Figure 1. Damage to fishermen's fishing gear due to plastic waste. (mongabay.co.id)

Figure 2



Figure 2. Disruption of Fishing Boats due to plastic waste. (mongabay.co.id)

Figure 3



Figure 3. The death of fish is due to eating plastic waste. (mongabay.co.id)

Tabel 3. Economic Inequality of Fishermen Due to Plastic Waste

Impact	Narrative Description	Source
Declining Fish Catches,	Accumulated plastic waste in the sea and along coastlines not only damages marine ecosystems but also disrupts the livelihoods of local fishermen. Pollution reduces fish populations, forcing fishermen to sail further offshore, increasing both time and operational costs.	https://www.tribunnews.com/regional/2024/09/25/10-perahu-nelayan-dikerahkan-sisir-penumpukan-sampah-di-tanjung-uma-dalam-sehari-20-ton-diangkut
Reduced Income	Plastic pollution decreases fish and other marine animal populations, resulting in lower catches	https://rri.co.id/olahraga/1024759/dampak-

	and reduced income for fishermen. This further threatens local food security.	sampah-plastik-terhadap-lingkungan
Navigational Hazards	Floating waste causes fishing boats to become stuck or damaged, creating dangerous conditions at sea and increasing operational risks	https://daiatsu.co.id/tips-and-event/tips-sahabat/detail-content/7-dampak-sampah-plastik-di-laut-yang-berbahaya-bagi-kehidupan/
Damage to Fishing Gear	Nets and other equipment are frequently torn or entangled in plastic debris, leading to additional repair and replacement costs for fishermen..	https://dml.or.id/tumpukan-sampah-plastik-hambat-aktivitas-nelayan-di-pantai-dadap-indramayu/
Difficulty Operating at Sea	The accumulation of plastic waste in coastal waters obstructs fishing operations, trapping nets and reducing fish yields.	https://dml.or.id/tumpukan-sampah-plastik-hambat-aktivitas-nelayan-di-pantai-dadap-indramayu/

Figures 1–3 and Table 3 collectively illustrate the economic consequences of plastic waste for coastal fishermen in the Riau Islands region. Plastic accumulation in both marine and coastal environments not only degrades ecosystems but also undermines the livelihoods of those dependent on fishing activities. Increased uncertainty in fishermen’s economic conditions is exacerbated by frequent damage to fishing gear, as nets and engines often become entangled in floating waste. This situation reduces fish catches and imposes additional financial burdens for repairs and replacements.

Furthermore, the persistent buildup of plastic waste in underwater ecosystems makes it difficult for boats to operate safely, posing physical risks to fishermen. The deterioration of the marine environment caused by plastic waste has severely disrupted coastal community development, particularly for populations economically dependent on marine resources. Unless local governments take decisive and sustained action, the problem of economic inequality among fishermen will persist and worsen over time.

From Figures 1–3 and Table 3, three key dimensions of economic inequality emerge due to plastic waste in coastal areas. First, fish catches have declined as plastic pollution destroys marine habitats and fish populations, forcing fishermen to travel farther offshore and increasing operational costs. Second, plastic debris frequently damages fishing equipment, such as nets and rods, creating additional financial burdens. The time spent repairing damaged gear further reduces effective fishing hours, deepening financial strain. Third, these individual losses contribute to broader economic disadvantages in the fisheries sector. The absence of effective government mitigation strategies has resulted in extensive and multidimensional losses, affecting fishermen, coastal industries, and supply chains reliant on marine resources. In the long term, this threatens the sustainability of the fisheries industry and coastal community welfare.

The findings illustrated in Figures 1–3 and Table 3 underscore the enduring implications of plastic waste for economic inequality among coastal fishermen. First, plastic pollution intensifies structural poverty within fishing communities. Traditional fishermen, who rely on nearshore ecosystems, are disproportionately affected compared to larger fishing enterprises that operate in deeper waters, farther from plastic accumulation zones. Second,

contamination of seafood by microplastics undermines consumer confidence in domestic and international markets for Indonesian fish products. Given that plastic takes centuries to decompose in marine environments, this pollution represents a persistent ecological and economic threat.

In conclusion, without serious and sustained intervention from local governments, plastic waste will continue to exacerbate economic disparities among coastal fishermen, hinder sustainable coastal development, and endanger the long-term viability of marine-based livelihoods.

Discussion

This study examined the relationship between the threat to coastal community development and plastic waste in the Riau Islands. Plastic waste represents the second largest waste category in the region after organic waste, with an estimated 20% of total waste currently polluting the archipelago (Kepriprov.go.id, 2025, June 5). The findings reveal that plastic waste has multifaceted impacts—damaging marine ecology, threatening public health, and reducing fishermen’s income.

Based on the results, three primary forms of threat were identified. First, ecological degradation manifests as pollution and habitat destruction in the marine environment. Second, health risks arise from the contamination of the marine food chain with microplastics. Third, economic inequality intensifies among fishermen due to reduced catches and damage to fishing equipment. These findings demonstrate that plastic waste poses a systemic and long-term threat to coastal community sustainability, undermining both environmental resilience and socio-economic stability.

Cultural and Behavioral Dimensions of Plastic Pollution

The persistence of plastic waste in coastal areas is rooted in cultural habits and social behaviors. As noted by (Farage et al., 2024) and (Hartley et al., 2018), weak environmental norms and the entrenched practice of discarding waste into the sea have normalized marine pollution. This habitualization process has led to a critical accumulation of plastic debris in shallow waters, particularly during tidal recessions.

Moreover, the community’s heavy dependence on single-use plastics, such as plastic bags, bottles, and disposable packaging, has aggravated this condition (Chen et al., 2021). When these materials enter marine currents, they disperse widely and persist for decades, resulting in the destruction of fish habitats and coral ecosystems (Masiá et al., 2022). Consequently, the livelihoods of fishermen are directly impacted, with declining fish stocks and increased operational costs (Kwadzo et al., 2022).

At the same time, microplastic contamination in seafood has created indirect threats to public health (Neto et al., 2020). Despite the magnitude of this problem, responsibility for addressing plastic waste is often viewed solely as a governmental duty. In reality, sustainable solutions require shared responsibility among the government, private sector, and community members themselves. Without behavioral change at the community level, the vision of healthy coastal development remains unattainable.

Resistance and Social Inequality: A James C. Scott Perspective

The threat of plastic pollution can also be interpreted through James C. Scott’s (1985) Theory of Resistance, which highlights how marginalized groups respond to structural injustices that threaten their livelihoods. Fishermen in coastal communities exemplify this resistance, as they experience direct economic losses and environmental risks yet receive limited governmental support.

Plastic waste has damaged fishing gear and obstructed navigation routes, forcing fishermen to bear the additional

cost of repairs while endangering their safety at sea. These difficulties represent not only environmental degradation but also a form of social and economic marginalization. As a response, fishermen have begun to voice their grievances, urging local authorities to increase public awareness, enforce stricter waste disposal regulations, and provide educational campaigns on marine protection (Mensah, 2021).

This grassroots resistance indicates that the crisis of plastic waste extends beyond ecology and public health, it embodies a deeper struggle for environmental justice. The inadequate response from local governments has further alienated coastal populations, perpetuating the cycle of poverty and environmental decline.

Ecological and Public Health Implications

Plastic waste has severe ecological consequences for marine biodiversity and coastal sustainability. Coral reefs, which serve as vital habitats for marine life, are increasingly threatened by microplastic accumulation that inhibits coral growth and respiration. The resulting disruption to the marine food web leads to bioaccumulation of toxic substances, posing risks not only to marine species but also to human health through seafood consumption (Ottay et al., 2015).

Recent provincial data reinforce these findings. According to the Laporan Data Ekonomi Perikanan dan Kelautan Provinsi Kepulauan Riau Semester I Tahun 2024 (Dinas Kelautan dan Perikanan Provinsi Kepulauan Riau, 2025), the total capture fishery production in the first semester of 2024 reached 153,218.99 tons, a decline of 12.35% (or 21,581.01 tons) compared to 174,800 tons in the previous semester. Although various factors such as weather and overfishing may contribute to this decrease, environmental degradation and marine pollution particularly plastic accumulation are plausible stressors affecting fishery productivity. This evidence aligns with the study's argument that plastic waste has tangible economic repercussions for coastal livelihoods.

Fishermen, as the primary stakeholders of the marine economy, face significant losses as fish populations decline and fishing becomes more hazardous. This aligns with the broader literature that associates plastic pollution with declining fisheries productivity and socio-economic instability in coastal regions (Li et al., 2016). Therefore, addressing plastic waste is not merely an environmental issue but a socio-economic imperative for sustaining coastal livelihoods.

Governance and Policy Responsibility

The study underscores the necessity of integrated governance in addressing plastic waste pollution. Effective mitigation requires collaboration among central and local governments, private sector actors, and coastal communities. Recent regional data emphasize that, despite a decline in fishery production, the marine and fisheries sector continues to make a substantial contribution to local income and employment (Dinas Kelautan dan Perikanan Provinsi Kepulauan Riau, 2025). This suggests an urgent need for policies that simultaneously protect the environment and support the economic resilience of fishing communities.

The government should strengthen regulations on waste management, improve the availability of waste collection and landfill facilities, and enforce penalties for illegal dumping. Meanwhile, producers and industries that manufacture non-recyclable plastics must assume extended producer responsibility (EPR) by developing eco-friendly alternatives and managing post-consumer waste. Shipyards and maritime transport companies must also be held accountable for waste disposal practices at sea.

Most importantly, coastal communities must foster a sense of environmental stewardship by managing household waste responsibly and reducing dependence on disposable plastics. Sustainable coastal development can only be achieved when these three stakeholders, government, private sector, and community commit collectively to

environmental protection and behavioral transformation.

4. Conclusions

This study identifies three crucial dimensions of threats to coastal community development arising from plastic waste in the Riau Islands ecological, social, and economic that interact and reinforce one another. Ecological inequality manifests through severe and potentially irreversible degradation of marine ecosystems, including coral reefs, seagrass meadows, and mangrove forests. The long term accumulation of plastic waste has also led to microplastic contamination in the marine food chain, posing risks to public health through exposure to toxic substances. Meanwhile, economic inequality is reflected in the declining fish catches of coastal fishermen, as their boats and fishing gear often become entangled in plastic debris, resulting in financial losses and reduced livelihoods.

These interconnected dimensions highlight not only the threats to coastal community development but also weaknesses in local government management of coastal resources and waste governance. Analysis through James C. Scott's Theory of Resistance reveals that the marine ecosystem crisis caused by plastic pollution has triggered active responses from coastal communities. Rather than remaining passive, communities have voiced public criticism toward local authorities, demanding stronger mitigation measures and environmental education initiatives to curb marine littering. This indicates a growing awareness among coastal residents about the ecological and social consequences of unmanaged plastic waste.

Addressing this complex issue requires collaborative governance among the government, private sector, and local communities within a sustainable coastal development framework. Strategic efforts should include strengthening community based waste management, reducing single use plastic consumption, promoting widespread education on behavioral change, and enforcing stricter regulations against illegal dumping of plastic waste at sea. Achieving success in these efforts depends on strong governmental commitment, active community participation, and private sector involvement to ensure sustainable coastal development in the long term.

Despite these contributions, the study has several limitations. It focuses primarily on negative impacts without exploring comparative insights from other coastal regions affected by plastic waste. The methodological scope is limited to documentary analysis and visual observation; therefore, future research should employ intensive fieldwork, including in depth interviews and participatory observation, to deepen understanding. Moreover, as this study was conducted in a single location with specific pollution characteristics, further comparative case studies are recommended to examine adaptation models and management solutions implemented in other coastal areas.

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Ethical Considerations

Not Applicable

Conflict of Interest

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