The Impact of Coastal Erosion on Fishing Activities in Tanzania: A Case Study of Mbweni and Kigamboni Coastal Areas in Dar es Salaam

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Abstract Coastal erosion has become an urgent global challenge, threatening ecosystems, infrastructure, and livelihoods, particularly in developing countries where communities depend heavily on marine resources. This study assessed the impact of coastal erosion on fishing activities in Mbweni and Kigamboni, two fishing communities in Dar es Salaam, Tanzania. Specifically, the study examined the causes of erosion, analyzed its socio-economic effects on fishing livelihoods, and explored mitigation strategies adopted by local communities. A case study design was employed, utilizing both quantitative and qualitative approaches. Data were collected from 61 respondents, including fishermen, community leaders, and traders, through questionnaires and interviews. Descriptive statistics, correlation analysis, and thematic methods were used to analyze the data. The findings indicate that erosion in Mbweni and Kigamboni is driven by climate change, sea-level rise, sand mining, and weak enforcement of coastal management policies. The effects on livelihoods are significant, including reduced fish catches, increased fishing costs, destruction of breeding grounds, displacement of households, food insecurity, and rising poverty levels. Communities have responded through mangrove replanting, banning of sand mining, sensitization campaigns, and livelihood diversification, though these efforts face challenges of limited resources and weak institutional support. The study concludes that integrated policy, ecosystem-based, and community-centered approaches are essential to strengthen resilience. It recommends stricter policy enforcement, ecosystem restoration, livelihood diversification, and alignment with global frameworks such as the Sustainable Development Goals.

Keywords: Coastal erosion, fishing livelihoods, and climate change.

INTRODUCTION

Coastal erosion has emerged as one of the most pressing environmental challenges facing coastal communities across the globe. Studies indicate that nearly 70 percent of sandy shorelines worldwide are undergoing erosion, with the problem intensifying due to climate change, sea-level rise, and human activities (Luijendijk *et al.,* 2018). The consequences of erosion are profound, ranging from the loss of infrastructure and ecosystems to threats to livelihoods that depend directly on marine and coastal resources. For instance, in the United States, the National Oceanic and Atmospheric Administration (NOAA, 2022) estimates that property losses attributable to erosion exceed USD 500 million annually. In Southeast Asia, particularly in Vietnam and Indonesia, extensive shoreline retreat has significantly affected the fishing and tourism sectors, displacing thousands of households and reducing food availability (Anthony *et al.,* 2019).

In the East African region, coastal areas are especially vulnerable to erosion because of rapid urbanization, unsustainable land-use practices, and limited adaptive capacity. Countries such as Kenya, Mozambique, and Tanzania are experiencing considerable shoreline retreat, with severe consequences for fisheries and other marine-based livelihoods (Mukhopadhyay *et al.,* 2020). Research by the Western Indian Ocean Marine Science Association (WIOMSA, 2021) highlights that more than 40 percent of mangrove forests in the region have been lost, reducing natural coastal defenses and degrading fish breeding habitats. In Kenya alone, coastal erosion accounts for economic losses of approximately USD 100 million annually, with the fishing and tourism industries being the most affected (Obura *et al.,* 2022).

In Tanzania, coastal erosion is particularly evident in Dar es Salaam, the country's largest city and economic hub with a population of over five million. Areas such as Kunduchi, Kigamboni, and Mbweni have been identified as erosion hotspots, with shoreline losses estimated at up to 10 meters per year (Makota *et al.,* 2017). Fishing communities in these locations are among the most affected groups, as habitat destruction, declining fish stocks, and increased operational costs undermine their livelihoods. The United Republic of Tanzania (URT, 2023) reports that fish yields in Dar es Salaam have declined by approximately 25 percent over the past decade, compelling fishers to travel farther offshore at greater expense. Although national efforts, including the Tanzania Coastal Management Partnership (TCMP) and the National Adaptation Programme of Action (NAPA), have been introduced, their impact has been constrained by weak enforcement, insufficient funding, and limited community engagement (UNEP, 2022).

Statement of the Problem

Coastal erosion poses a significant threat to fishing communities in Tanzania, affecting marine ecosystems and the livelihoods of small-scale fishers. Studies show that more than 75 percent of Tanzania's coastline is subject to varying degrees of erosion due to climate change, uncontrolled coastal development, and destructive human activities (Hinkel *et al.,* 2023; URT, 2023). Rising sea levels, increased storm surges, and deforestation of natural coastal forests such as mangroves have accelerated the rate of beach retreat, leading to habitat loss for fish species and reduced fishing grounds (Obura et al., 2022). This decline in fish stocks has led to reduced fish availability, increased fishing costs, and economic hardship for fishing communities (FAO, 2022).

Despite these challenges, various initiatives have been implemented to reduce coastal erosion and support affected communities. The Tanzania Coastal Environmental Management Strategy (TICEMS) and mangrove restoration projects have been established to control erosion and enhance marine biodiversity (URT, 2023). In addition, organizations such as WIOMSA (2021) and NOAA (2023) have promoted sustainable fishing practices and community-based conservation efforts. However, these interventions 2 are still insufficient, as many fishing communities continue to experience disruptions to their livelihoods, displacement, and increased risk of food insecurity (Ahmed *et al.,* 2022).

Furthermore, there is limited research on how coastal erosion specifically affects fishing activities in Dar es Salaam, leaving a gap in understanding the socio-economic consequences and the interventions needed. To address this issue, this study aims to assess the impact of coastal erosion on fishing activities in Dar es Salaam by examining its impacts on fish catch, fishing infrastructure and livelihoods. It will also explore strategies that can strengthen the resilience of fishing communities to coastal erosion. By filling this research gap, the study will contribute to developing evidence-based solutions that are consistent with Tanzania's Sustainable Development Goals (SDGs), particularly SDG 14 For Life Below Water and SDG 1 for No Poverty.

Research objectives

The study's general objective was the impact of coastal erosion on fishing activities in Tanzania.

Specific Objectives

i. To determine the causes of coastal erosion affecting fishing activities.
ii. To analyze the effects of coastal erosion on fishing activities.
iii. To propose strategies for mitigating the effect of coastal erosion on fishing activities.

RESEARCH METHODOLOGY

This study employed a case study design to provide an in-depth assessment of erosion impacts in Mbweni and Kigamboni, Dar es Salaam. The approach combined quantitative and qualitative methods. The quantitative strategy involved the use of structured questionnaire to gather numerical data on the effects of coastal erosion on fishing, including changes in fish catch, income levels, and community perceptions of coastal erosion. Meanwhile, the qualitative aspect involved the use of semi structured interviews with key stakeholders such as fishermen, community leaders, and local government officials. The study was conducted in Mbweni and Kigamboni coastal areas in Dar es Salaam which are highly affected by erosion and heavily dependent on artisanal fishing.

The target population included fishermen, fish traders, and community leaders. Using Cochran's formula, a sample of 96 respondents was selected (66 fishermen, 20 community leaders, and 10 traders). Purposive sampling technique were applied to select knowledgeable informants, while random sampling was used for general fishermen. Whereas structured questionnaires were used to captured quantitative data on causes, effects, and mitigation strategies. And semi-structured interviews with 10 key informants which includes fishers, leaders, and officials to provide qualitative insights. Also, Data Analysis for Quantitative data was done by using IBM Statistical Package for the Social Science (SPSS) version 27 and interpreted by using descriptive statistics, and correlations analysis. Qualitative data were analyzed thematically to identify recurrent themes.

Reliability and Validity was ensured by calculating Cronbach's Alpha α to ensure internal consistency of the survey instrument whereas Cronbach's Alpha were $\alpha = 0.705$, Indicating that the items used to measure the concept were sufficiently consistent for research purposes while validity was ensured using pilot test for both questionnaire and interview guides prior to the main data collection. Ethics was ensured by providing informed consent to respondents, and anonymity was maintained throughout the study.

RESULTS AND DISCUSSION

4.1 Causes of Coastal Erosion

There are various economic activities taking place on Indian Ocean and along the coast. Fishing activities, is one among of the economic activities taking place along the coastal area in Indian Ocean. The findings revealed that coastal erosion is cause by anthropogenic and natural factors such as human activities, Poor Environment policies, Construction along the coastline, Rising sea levels, Climate change and Natural Factors such as waves and tides. The findings are presented in Table 1

Table 1. Causes of Coastal Erosion

Variable	Mean	SD
Climate change	2.64	1.25
Natural factors	2.56	0.99
Rising sea levels	2.28	0.99
Construction along the coastline	2.16	1.02
Human activities	1.75	1.14
Poor environmental policies	1.70	0.69

Source: Data Analysis (2025).

According to the data presented in Table 4.3, The findings indicated that climate change had the highest mean score of 2.64, and standard deviation (SD) of 1.25, suggesting that respondents strongly recognize it as a leading cause of coastal erosion. This perception reflects the increasing impacts of global warming, including rising temperatures, more frequent storms, and unpredictable weather patterns. Such climatic variations intensify erosion by weakening shorelines and accelerating sediment loss. The relatively high mean score demonstrates consensus among respondents that climate-related processes are a major driver of shoreline retreat. According to the Intergovernmental Panel on Climate Change (IPCC, 2021), climate change has amplified coastal risks globally by altering rainfall patterns, sea surface temperatures, and storm surges. These changes weaken coastal resilience and increase the frequency of erosion events. Similarly, Vousdoukas *et al.*, 2020 projected that under high greenhouse gas scenarios, up to 50% of sandy beaches worldwide could face severe erosion

by 2100. These global patterns resonate with local experiences shared by respondents in Tanzania. This result suggests that fishing communities are increasingly vulnerable to the consequences of climate variability. For instance, stronger winds and storms often damage small-scale fishing vessels and disrupt traditional fishing schedules.

Natural factors, including tidal movements, wave action, and ocean currents, received a mean score of 2.56, and standard deviation (SD) of 0.99, showing that respondents perceive them as significant contributors to coastal erosion. The relatively high score close to that of climate change suggests that natural processes remain a dominant cause of shoreline retreat. Unlike human-induced factors, these processes are difficult to control, making their impacts persistent over time. Luijendijk *et al.*, (2018) confirmed that natural shoreline dynamics are responsible for widespread erosion globally, with approximately 70% of sandy coastlines showing retreat. Similarly, Mallya *et al.*, (2024) observed that in Zanzibar, tidal currents and seasonal monsoon winds are central drivers of erosion, resulting in the loss of beach areas critical to local livelihoods. These studies provide strong support for the perceptions of respondents in this research. The implication for fishing activities is that strong tidal waves and currents often damage traditional wooden boats, fishing nets, and landing sites. Moreover, erosion caused by natural processes reduces the availability of shallow water zones, which serve as breeding grounds for fish species. Respondents' recognition of these natural forces highlights the vulnerability of fishing communities that depend heavily on the stability of the coastal environment for their survival.

Rising sea levels were also reported as a significant cause of erosion by mean of 2.28, and standard deviation (SD) of 0.99. Respondents agreed that sea-level rise, often linked to melting glaciers and thermal expansion of oceans due to global warming, intensifies erosion in their local areas. The mean value, although lower than climate change and 29 natural factors, still indicates a moderate level of agreement that this phenomenon is an important driver. Empirical research shows that sea-level rise is one of the most critical long-term threats to coastal zones. Vousdoukas *et al.*, (2020) predicted that many low-lying coastal areas in Africa, including Tanzania, will face accelerated land loss due to higher sea levels. Friess *et al.*, (2022) also noted that sea-level rise contributes to the destruction of mangroves, which serve as natural buffers against erosion and as fish breeding grounds. This evidence resonates with the concerns raised by respondents in this study. For fishing communities, rising sea levels pose multiple challenges. Shoreline retreat not only destroys fishing grounds but also displaces landing sites and threatens the security of coastal villages. In some areas, respondents explained that they must travel longer distances to access viable fishing areas, which increases costs and reduces productivity. This suggests that sea-level rise is not just an environmental problem but also a major socio-economic burden for small-scale fishers.

Construction along the shoreline received a mean score of 2.16, and standard deviation of (SD) of 1.02, reflecting moderate agreement that it contributes to erosion. Respondents noted that building hotels, ports, and settlements interferes with the natural flow of sediments, destabilizing coastal areas. The standard deviation indicates diverse opinions, suggesting that while some communities experience severe impacts from construction, others are less affected. According to Kombo *et al.* (2022), unregulated coastal development in Kenya has significantly increased erosion risks by destroying natural vegetation and disrupting sediment transport. Similarly, UNEP (2023) warned that infrastructure expansion without adequate environmental assessments contributes to shoreline instability in many developing countries. This study suggests that the destruction of mangroves and beach areas are caused by construction activities has direct consequences on their livelihoods. Landing sites are often replaced by hotels or urban projects, limiting fishers' access to the sea. Moreover, sediment disturbance from construction reduces water quality, which can harm fish stocks. These findings suggest that unless coastal development is well managed, it will continue to undermine the sustainability of fishing activities. The study was also supported by a key informant who was quoted saying. *"They built the houses too close to the water. Without trees or bushes, the waves hit directly and destroy our fishing grounds."*

Also, the findings revealed that the human activities were rated at mean of 1.75 on a Likert scale indicates a relatively low level of agreements among respondents that human activities are a major cause of coastal erosion compared to other factors. Since this value is closer to "Disagree" than to "Agree", it shows that the majority of respondents do not strongly attribute erosion primarily to human activities. Meaning that perception differed some participants considered human action like sand mining and mangrove deforestation important, while others did not. And the relatively large standard deviation (SD) of 1.14 suggests varying perceptions across respondents, possibly reflecting differences in local experiences. UNEP (2023) highlighted sand mining as one of the leading drivers of erosion globally, particularly in Africa,

where weak enforcement of policies exacerbates the problem. Similarly, Kombo *et al.,* (2022) emphasized that in East Africa, local practices such as cutting mangroves and unregulated fishing gear use contribute significantly to erosion and habitat degradation. Despite this, respondents in Tanzania may have ranked these causes lower because natural and climatic changes are more visibly impactful in their daily lives. The implication for fishing is clear, that the destruction of coastal vegetation and habitats reduces fish breeding areas, lowers catches, and increases the vulnerability of fishing communities. Also, the removal of sand from beaches weakens the natural buffer zone that would otherwise protect the shoreline from wave action. This view is consistent with the findings of Mukhopadhyay *et al.,* (2020), who emphasized that illegal sand mining in Tanzania disrupts sediment transport and increases coastal vulnerability. The study findings were also supported by qualitative data which was collected from key informant respondents through interview. One of the key informants was quoted saying that: *"Dredging along the coast has eaten away at our beaches. When they remove the sand, the sea takes over more land."*

Finally, poor environmental policies were ranked lowest at mean of 1.70, and standard deviation (SD) of 0.69. This result suggests that respondents perceive weak governance and enforcement as a secondary cause of erosion compared to direct natural and human factors. The low standard deviation reflects consensus among participants that policy failure, while relevant, is not the most immediate driver of coastal erosion in their communities. The National Environment Management Council (NEMC, 2024) acknowledged that while Tanzania has environmental regulations in place, enforcement remains weak due to limited resources and institutional challenges. Similarly, the World Bank, 2023 stressed that without effective governance, even well-designed policies cannot prevent environmental degradation. This study suggests that if destructive practices such as sand mining, illegal construction, and mangrove clearing often continue unchecked. As a result, the long-term sustainability of fisheries is compromised. A key informant was quoted saying that: *"There are laws about sand mining, but no one stops the trucks. We report it, but it continues."*

4.2 Effects on Fishing Community Livelihoods

The aim of the study was to analyze the effects of coastal erosion on the livelihoods of fishing community. The findings indicates that respondents agreed that erosion negatively impacts fishing activities, contributed to increased poverty among fishing communities, Fishermen have been forced to relocate, increased cost of fishing operations and food insecurity. overall, the data suggests that respondents perceive significant socio-economic impacts, particularly poverty and displacement, due to coastal erosion.

Table 2: Effects of Community Livelihoods

Statement	Mean	SD
Food insecurity	3.03	1.18
Fishing activities more difficult and less productive	2.77	1.31
Cost of fishing operations	2.72	1.23
Displacement of Fishermen	2.38	0.95
Poverty among fishing communities	2.10	0.96
Breeding areas	1.90	1.06

Source: Data Analysis (2025).

The study findings presented in Table 4.4 indicates that food insecurity received the highest mean score of 3.03, and standard deviation (SD) of 1.18, indicating that respondents strongly recognize it as the most critical effect of coastal erosion. The high score suggests that erosion reduces fish availability, threatening the food security of households that rely heavily on fish as a staple protein. The standard deviation shows moderate variation, meaning that although the majority perceive food insecurity as a serious problem, the severity differs across communities. The results align with global concerns that climate driven erosion and habitat destruction are major threats to the nutritional and livelihood security of small-scale fishing communities (FAO, 2022). Similarly, Imani et al., 2023 highlight that coastal erosion and habitat loss directly undermine fish stocks, thereby heightening food insecurity in Tanzania. This study suggests that not every household may experience direct food shortages, those relying solely on fish for protein and income are significantly affected. The study was supported by qualitative data as one respondent shared, *"Sometimes we can't bring home enough fish to eat or sell."*

Furthermore, fishing activities were also rated highly as being negatively affected at mean of 2.77, and standard deviation (SD) of 1.31. The mean indicates that many respondents agreed erosion makes fishing less productive and more difficult, while the relatively high SD reflects diverse experiences among fishermen, likely due to variations in location and access to resources. Respondents reported challenges such as damaged landing sites, reduced fishing grounds, and longer travel distances to productive waters. These findings resonate with Yanda *et al.,* (2021), who found that Tanzanian fishers experience declining productivity due to shoreline retreat and loss of access points. Comparable results were observed in West Africa, where erosion reduced nearshore fishing grounds, forcing fishers into deeper and riskier waters (Mensah *et al.,* 2020). According to Allison & Ellis (2021), erosion driven habitat loss leads to declining marine biodiversity and fish yield. Therefore, fishing is becoming more expensive, less reliable, and less sustainable, pushing small-scale fishers to the brink. one fisherman explained, *"Our catches are decreasing. We have to travel more and use more fuel. Sometimes the nets come back almost empty."*

The findings further show that erosion significantly increases the cost of fishing operations at mean of 2.72, and standard deviation (SD) of 1.23. Fishermen reported higher expenses in terms of fuel, equipment repair, and longer fishing trips due to degraded coastal infrastructure and fishing grounds. The SD indicates that while the majority feel the burden of higher costs, some communities are more severely affected than others depending on their level of exposure to erosion. This result is supported by research in Ghana, where coastal erosion forced fishers to travel further offshore, leading to increased operational costs and declining profits (Codjoe & Atibila, 2021). Similarly, UNEP (2023) highlights that shoreline degradation increases economic pressure on small-scale fishers who already operate with limited capital

Displacement of fishermen was rated at mean of 2.38, and standard deviation (SD) of 0.95 also poverty was rated at mean of 2.10, and standard deviation (SD) of 0.96. which were also noted as important effects, though ranked lower compared to food insecurity. The mean values suggest moderate agreement among respondents that erosion has forced some fishers to relocate and increased poverty in coastal areas. This displacement disrupts community networks and reduces access to traditional fishing grounds, while income losses deepen household poverty. These findings are consistent with global research showing that erosion-induced displacement is rising in low-lying coastal regions. In East Africa, Mallya *et al.,* 2024 reported that erosion not only displaces fishers but also exacerbates poverty by cutting off access to key resources. The findings further were supported with qualitative data as one fisherman was quoted saying, *"A few families have already moved away from the coast when their boats had nowhere to launch."* As it aligns with WIOMSA, 2021 which documented cases of community displacement in Dar es Salaam due to shoreline loss. Also, this study aligns with FAO, 2022 and Ahmed *et al.,* 2022 who found that erosion results to income loss and significantly contributes to poverty in coastal Tanzania.

Loss of breeding areas received the lowest mean score of 1.90, and standard deviation (SD) of 1.06. While less immediate in perception, this result still highlights a significant long-term risk, as degradation of habitats such as mangroves, coral reefs, and seagrass beds reduces fish stock regeneration. The relatively high SD suggests that some respondents do not immediately associate erosion with habitat loss, although its ecological importance is undeniable. Friess *et al.,* 2022 emphasize that sea-level rise and erosion destroy mangroves, which are essential breeding and nursery grounds for many fish species. In Tanzania, ongoing loss of coral reefs and seagrass beds has already been linked to declining catches and biodiversity loss (NEMC, 2024). This underscores that even though fishers ranked breeding ground loss lower, it poses the greatest long-term threat to the sustainability of fishing livelihoods.

4.3.3 To Propose Strategies for Mitigating the Effect of Coastal Erosion on Fishing Activities.

The study aimed at suggesting strategies for mitigating the effects of coastal erosion. The findings indicates that respondents strongly supported community-level remedies such as Mangrove replanting has helped reduce erosion and banning illegal sand mining would significantly reduce erosion. Respondent also, agreed that the government has implemented some effective strategies and that fishermen should participate in policymaking.

Table 3: Mitigation Strategies for Mitigating the Effect of Coastal Erosion on Fishing Activities.

Statement	Mean	SD
Alternative income sources	2.89	1.34
Community involvement	2.79	1.52
Banning illegal sand mining	2.00	0.98
Government interventions	2.10	0.87
Mangrove replanting	1.92	0.78
policymaking	1.89	1.05

Source: Data Analysis (2025).

According to the data presented in Table 4.5, the finding revealed that One of the most widely supported mitigation strategies was alternative income sources had the highest mean of 2.89, and standard deviation (SD) of 1.34, indicating the least agreement. The relatively high standard deviation shows divided views, with some respondents supporting it while others remain skeptical. Diversification of livelihoods, such as aquaculture, eco-tourism, and small-scale enterprises, has been highlighted as a resilience strategy for coastal communities facing environmental pressures (World Bank, 2021). However, in interviews, several fishers expressed reluctance: *"Fishing is what we know; it's not easy to change to other businesses."* This suggests that while alternative livelihoods may reduce dependency on fishing, cultural, social, and economic barriers must be considered for successful implementation.

Furthermore, Community involvement scored a mean of 2.79 and standard deviation (SD) of 1.52, which is relatively high compared to other strategies, suggesting weaker support. The high variability indicates that while some respondents believe in community-led action, others doubt its effectiveness. A study on coastal management in Portugal highlights the importance of participatory involvement of stakeholders in governance, which leads to more effective and sustainable solutions to coastal erosion (Matos, 2022). Engaging communities ensures that interventions are context-specific and that local knowledge is integrated into management plans. The study acknowledges that community participation enhances ownership and sustainability of coastal management, but effectiveness often depends on training, resources, and external support. In interviews, a fisher noted: *"We can help by planting mangroves, but we don't have the knowledge or money to do it properly."* Also, some respondents mentioned forming beach committees or organizing cleanups, but others noted a lack of support. As one respondent said, "We formed a beach committee to report illegal miners, but no one follows up." This suggests enthusiasm exists but is limited by institutional barriers. For communities to be effective stewards, they need structured support, recognition, and resources.

The finding revealed that illegal sand mining should be banned, which was equally supported with a mean of 2.00, and a standard deviation (SD) of 0.98. This suggests that respondents perceive sand mining as a major contributor to erosion. Indeed, studies show that unregulated sand extraction destabilizes shorelines and accelerates erosion (Mensah, 2017). According to Mukhopadhyay et al. (2020 confirms that sand mining is a leading contributor to erosion in Tanzanian coastal zones. Therefore, in order to reduce coastal erosion related issues sand mining along the coastal areas should be strictly banned also rules and laws should be applied to the community members who will not abide by the laws. The finding suggests that stricter enforcement and monitoring mechanisms against illegal sand mining are urgently needed to protect fishing livelihoods. One community leader interviewed explained: *"Sand mining takes away our natural protection. We have reported it many times because it destroys fishing areas too"*

Moreover, the government's efforts to mitigate erosion were acknowledged, with a mean score of 2.10 and standard deviation (SD) of 0.87, indicating that respondents agree that government support is essential for coastal erosion management. This aligns with findings by Njogu, (2018) who emphasizes that government-led shoreline protection projects and infrastructure investments are critical in safeguarding vulnerable coastal communities. Also, Obura *et al.*, (2022) and Ahmed *et al*., (2022) found that government policies in East Africa are often sound in theory but weak in enforcement. This study suggests that respondents view the government as a key factor in coordinating and funding long-term erosion control measures. Therefore, greater accountability, funding, and policy integration are needed to make official interventions effective. Interviews reflected a demand for more active government involvement: *"We need the government to support us with seawalls and education, otherwise erosion will continue to take our homes and fishing grounds."*

Mangrove replanting also received strong support, with a mean of 1.92 and standard deviation (SD) of 0.78. The low standard deviation indicates strong consensus that mangrove ecosystems are vital for shoreline protection and sustaining fisheries. Literature confirms that mangroves act as natural barriers against wave action while providing nursery grounds for fish, thereby supporting both environmental stability and livelihoods (UNEP, 2020). Also, NOAA (2023) and WIOMSA (2021) emphasized the effectiveness of mangrove ecosystems in preventing erosion and supporting fish nursery habitats. This finding suggests that mangrove conservation and restoration programs should be prioritized as dual-purpose strategies benefiting both coastal ecosystems and fishing activities. Interviews with fishers highlighted this importance, with one respondent noting: *"Where mangroves are still healthy, the beach doesn't wash away so fast, and we also catch more fish."*

Policymaking was rated as the most important strategy with a mean score of 1.89 and a standard deviation (SD) of 1.05. This indicates that respondents strongly recognize the roles of effective policies in managing coastal erosion and protecting fishing livelihoods. This finding aligns with previous studies, which argue that integrated coastal zone management policies are essential for reducing erosion risks and ensuring sustainable fisheries (World Bank, 2016; FAO, 2019). Again, Kamau *et al.*, (2023) stress that participatory governance increases legitimacy, compliance, and effectiveness of environmental policies. Therefore, empowering local stakeholders enhances accountability, innovation, and sustainability in erosion response efforts. Interview responses further reinforced this, with one local government officer stating: *"Without strict coastal policies, people continue to build too close to the shore and damage the environment, which worsens erosion."* This suggests that policies must not only exist but also be enforced effectively.

Additionally, ecosystem services valuation also received a strong support from respondents which indicate that by implementing Payment for Ecosystem Services (PES) programs can incentivize communities to conserve coastal ecosystems that mitigate erosion. In Kenya, Uganda, and Tanzania, PES mechanisms have been identified as promising tools for raising funds for landscape management and securing ecosystem services, benefiting rural communities (Osewe *et al.*, 2023). These programs recognize the value of ecosystem services, such as coastal protection provided by mangroves, and compensate communities for their conservation efforts.

Furthermore, integration of science and technology is an important strategy required to be adopted in order to attain real-time information concerning weather events. by utilizing Geographic Information Systems (GIS), remote sensing, and drone mapping technologies enables precise monitoring of shoreline changes and identification of erosion hotspots. A review discusses the integration of open-access remote sensing technology in shoreline detection and coastal erosion monitoring, highlighting the role of GIS and UAVs in providing accurate data for decision-making (Christofi *et al.*, 2025). These technologies facilitate timely interventions and informed management of coastal resources.

Least but not least multi-stakeholder collaboration also received a strong support from respondents, whereas this indicates collaborative efforts among government agencies, non-governmental organizations, universities, and local communities can lead to comprehensive coastal management plans. Therefore, Tanzania is needed to adapt this strategy so as to improve fishing sector. A case study in China's Beibu Gulf demonstrates the effectiveness of a multi-stakeholder platform in balancing environmental protection and development in fishing communities (Chuang, 2023). Such collaborations ensure that diverse perspectives are considered, leading to more holistic and sustainable solutions to coastal erosion.

CONCLUSION AND RECOMMENDATIONS

This study demonstrates that coastal erosion in Mbweni and Kigamboni is both an environmental and socio-economic challenge that directly undermines fishing livelihoods. Driven by natural processes such as tidal forces, wave action, and sea-level rise, and intensified by destructive practices like sand mining, mangrove clearance, and unregulated coastal development, erosion reduces fishing grounds, degrades breeding habitats, and weakens the ecological base of fisheries. The socio-economic consequences include reduced catches, rising operational costs, displacement, food insecurity, and deepening poverty. These findings underscore that erosion not only threatens ecosystems but also erodes the economic and nutritional foundations of fishing households.

Addressing these challenges requires a combination of community action, ecosystem restoration, livelihood diversification, and stronger governance. Community-based approaches such as cooperatives, mangrove planting, and local monitoring are essential to build ownership and resilience. Environmental conservation, particularly mangrove replanting and strict regulation of sand mining, must be prioritized to restore natural defenses. At the same time, fishing households should be supported to diversify income through aquaculture, small-scale farming, or micro-enterprises, reducing dependence on increasingly fragile fish stocks.

Government action remains central. Stronger enforcement of coastal regulations, investments in shoreline protection, and targeted support such as fuel subsidies, vocational training, and microfinance are necessary to sustain fishing livelihoods. Effective policymaking must integrate poverty reduction, fisheries management, and environmental protection into a single coherent framework. Importantly, these policies should be participatory, ensuring that communities are not passive recipients but active partners in implementation.

In conclusion, coastal erosion is both an ecological and human development issue. Sustainable solutions lie in balancing community initiatives, environmental stewardship, and government accountability. By combining these elements, Tanzania can protect coastal ecosystems, secure fishing livelihoods, and build long-term resilience against climate and human pressures.

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Conflicts of Interest

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