Psychological and social consequences of environmental change on aquatic resource depletion and its impact on fishermen and coastal communities

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Abstract

Climate variability, coastal erosion, pollution, and the overexploitation of marine ecosystems have accelerated the depletion of aquatic resources worldwide. The consequences of this depletion for fishermen and coastal communities are tremendous, as marine productivity underpins their livelihoods, cultural identities, and social structures. The paper analyses the psychological and social impacts of deteriorating water resources, stress and anxiety, and intergenerational uncertainty on the livelihoods of fishing families. Social effects include poor community cohesion, economic vulnerability, migration pressures, resource scarcity, and emerging inequalities between traditional fishers and industrialized sectors. The analysis brings together empirical and theoretical insights to show how environmental change intersects with socio-economic systems, forming multifaceted, multidimensional issues. Knowledge of these effects is essential for designing adaptive strategies and building community resilience, as well as for policy interventions aimed at achieving sustainable resource management and protecting vulnerable populations in coastal areas.

Keywords: Environmental change, Aquatic resource depletion, Fishermen, Coastal communities, Livelihood insecurity, Psychological stress, Climate change, Marine ecosystem

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Introduction

Fisheries can be a source of livelihood for millions of fishermen, as well as an essential source of social networks, traditions, and community integration (Perry *et al.*, 2011; Atabey, 2021). Nevertheless, marine and freshwater resources have been worsened by rapid environmental change, climate variability, ocean warming, rising sea levels, deteriorating habitats, pollution, and overfishing. With declining fish stocks and increasingly unstable ecosystems, the traditional fishing population is under pressure like never before. The effects of depletion of aquatic resources are much deeper than monetary loss (Han and Chen, 2024). Environmental stresses interfere with everyday practices and bring about uncertainty concerning the future, leading to increased amounts of psychological distress, such as anxiety, depression, and helplessness, among fishermen whose livelihood directly depends on the health of the ecosystem (Gowsikraja, 2025; Larijani, 2016). Social implications also arise when declining catches drive competition, undermine community cooperation, and reduce available resources, thereby increasing the risk of conflict. There can be a change in household dynamics, with families struggling to adjust, leading to shifts in gender roles, the migration of young people, and the loss of the culture associated with the fishing heritage. In addition, environmental change exacerbates existing vulnerabilities, especially in communities with limited access to financial aid, alternative livelihoods, or institutional support (Mycoo, 2014; Seara, Pollnac and Jakubowski, 2020). The collision of the environmental loss and the socio-economic limitations leads to the development of the circle of misery not only of individual fishermen but of whole population groups along the coast. It is critical to understand the psychological and social impacts of environmental change, thus enabling a more comprehensive approach to adaptation, making it more resilient, and developing informed policy interventions in line with sustainable fisheries and community well-being (Adeyemo, 2003). This introduction lays the groundwork for the detailed analysis of the impact of environmental changes on mental health and social organization, as well as future perspectives of fishermen and the coastal communities they support.

Key Contribution

- The study brings together the environmental science and social and behavioral sciences by not only looking at the ecological implications but also the psychological strains and social disturbances that arise due to declining fish stocks.
- This combined approach has been neglected in separate fisheries and climate research. The issues of mental health, including anxiety, depression, and identity loss of livelihood and future uncertainty, mentioned in the study, are not well-reported in fisheries literature but greatly influence the adaptation ability of the people residing in the coastal areas.

- It reveals the environmental degradation effects at the community level, such as heightened competition, intracommunity conflict, migration pressures, and deteriorated traditional institutions, gender role changes, and cultural practices linked to fishing.
- In this way, the analysis of the relationship between the environmental change, resource scarcity, socio-economic instability, and mental health outcomes offers a conceptual framework that represents the ecological decline cascading between and within households and communities (Ghaforian *et al.*, 2025).

This research is covered in the following section. Section I introduces the topic, explains the psychological and social consequences of environmental changes affecting aquatic resources, and defines the impacts on coastal communities. Section II describes the literature review and explains previous work. Section III presents the overall architecture diagram, Section IV presents the results and discussion, followed by the dataset details, software, and hardware configurations, and Section V summarizes the main findings.

Literature Review

Environmental change is a contributing factor to the loss of aquatic resources, as climate variability, rising sea temperatures, ocean acidification, pollution, and habitat degradation have been known to cause the loss of fish and worsen marine ecosystems (Yanda *et al.*, 2019; Ismail, Haron and Yusof, 2018). Research across almost all parts of Asia, Africa, and the islands has demonstrated that small-scale fisheries are highly susceptible to these environmental shifts, leading to diminished catch, longer fishing excursions, increased operational expenses, and exposure to hazardous conditions (Al-Jame, Ali and Ashour, 2024). Since fishing is, in most cases, the primary source of livelihood and cultural identity for people living along coastlines, a loss of resources not only undermines the economic stability of the people but also the social fabric of the communities (Masalu, 2000). Studies indicate that fishermen experience significant psychological impacts as they experience increased stress, anxiety, depression, trauma, and lack of future perspectives, particularly when environmental dangers or weather catastrophes ruin boats, equipment, and houses (Dineshkumar and Geetha, 2026). Slow-onset transformations, such as declining fish stocks and salinity intrusion, produce chronic stress and a sense of loss. In contrast, acute distress and persistent mental health issues are created by sudden disasters. At the social level, scarcity of resources encourages competition, conflict, reduced cooperation, the loss of traditional norms, and changes in gender roles as families adjust to reduced incomes (Palanivelu and Raj, 2025). Migration, especially among youth, is becoming the norm, and women are increasingly taking on additional roles in response to unstable livelihoods. Community cohesion is also threatened when access to resources is perceived as unequal, or when industrial fleets surpass artisanal fishers, pushing them to the bottom and contributing to the development of social inequalities (Elisha and Felix, 2021). Despite efforts

by many communities to adapt by diversifying their livelihoods, changing their fishing activities, forming savings groups, engaging in seasonal migration, or taking part in conservation, the process of adaptation remains unequal, as they have limited access to financial capital, technical expertise, and institutions. In most of the coastal areas, the lack of mental health services and formal support systems is prominent, and the psychological effects are mainly left unresolved. Altogether, the literature demonstrates that environmental change and the depletion of aquatic resources have a domino effect on the psychological, social, and economic dimensions, and, in virtually every case, small-scale fishing communities are among the most vulnerable groups.

Research Gap

The existing literature covers the environmental and economic challenges faced by fishing communities; it largely overlooks the deeper psychological and social effects of the depletion of aquatic resources. The impact of livelihoods or general climate vulnerability is the primary focus of most studies; the mental health consequences of these changes, including chronic stress, loss of identity, and emotional resilience, are significantly understudied or conjectured rather than directly measured. In the same manner, the social consequences, such as changes in community, loss of cultural practices, and shifts in gender roles, are scarcely empirically studied and rarely incorporated into broader analytical models. Longitudinal studies that track how persistent environmental pressures enhance mental health and social cohesion over time are also insufficient, and there is a paucity of evidence on marginalized populations such as women, youth, and small-scale artisanal fishers.

Research Methodology

Overall Architecture Diagram

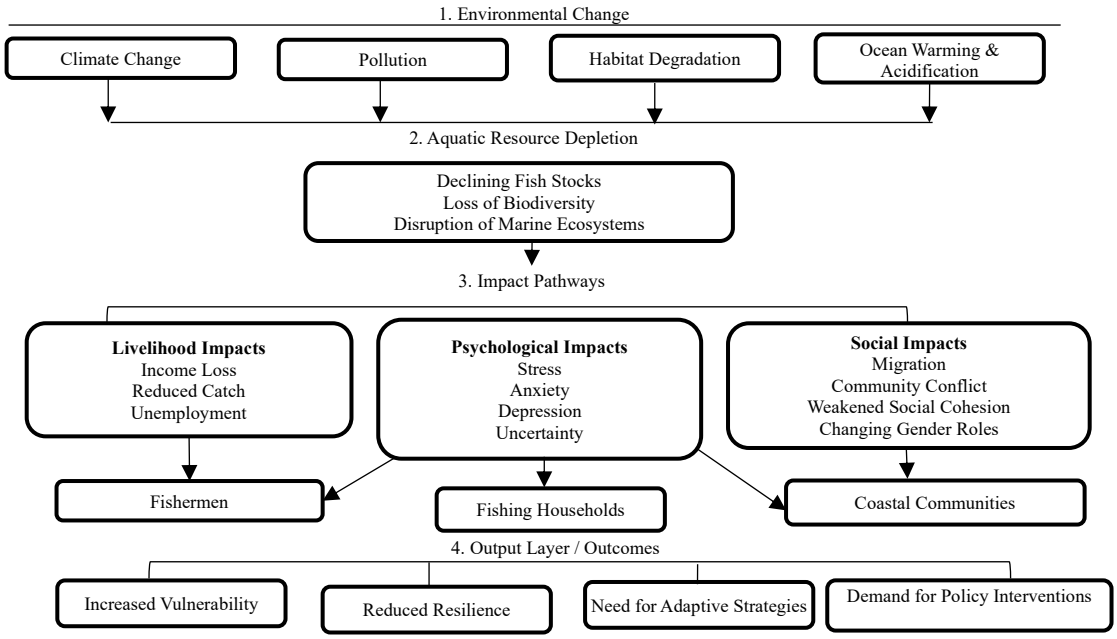

Figure 1: Overall architecture diagram.

To interpret the above diagram, Figure 1 illustrates how the various environmental stressors, such as climate change, pollution, habitat degradation,

and ocean warming, when combined, culminate in the depletion of aquatic resources, as seen in declining fish stocks, loss of biodiversity, and ecosystem disturbance. This drain is a key cause of action that impacts fishermen and coastal communities through three interrelated pathways: livelihood, psychological, and social. Economic instability is caused by livelihood effects, such as income loss, decreased catch, and unemployment, and the emotional cost is expressed in psychological effects, including stress, anxiety, depression, and uncertainty. The migration, loss of social cohesion, community conflict, and changes in gender roles all result in social impacts. This model shows that environmental change is not a single ecological problem but a multidimensional process redefining social structures, mental health, and livelihood security across coastal regions. The fact that it involves including the environmental changes is directly related to Aquatic Resource Depletion.

$$EC = F(CC, P, HD, OWA) \quad (1)$$

From the above equation, (1) represents the EC as Environmental change, CC as climate change, P as pollution, HD as Habitat Degradation, and OWA as Ocean Warming and Acidification.

Results and Discussion

Dataset Description

The dataset for this study consists of survey-based and observational data collected from fishermen and coastal households that were exposed to environmental change and the depletion of aquatic resources. It will record important variables on environmental conditions (climate variability, pollution, and habitat degradation), fish supply patterns, and livelihood aspects such as income, catch amounts, and employment stability. Psychological measures capture the levels of stress, anxiety, depression, and uncertainty, whereas social measures keep a record of the level of community cohesion, conflicts, migration, and evolving gender roles. There is also basic demographic information, such as age, education, fishing experience, and household size. Every piece of information will be presented in a table, where each row corresponds to a respondent and each column corresponds to a particular variable, allowing one to analyze in more detail the impact of environmental stress factors on the economic, psychological, and social performance of the coastal community.

Hardware and Software Configuration

Table 1: Hardware and software configuration.

Category	Specification
Hardware	Intel Core i5, 8 GB RAM, 256 GB SSD Storage, Windows 10
Software	SPSS Statistics, R Software, Tableau

Table 1 shows the hardware and software set-up to facilitate the analysis of psychological and social impacts of changing environment and depleting aquatic resources on fishermen and coastal communities. The hardware

configuration includes an Intel Core i5 processor, 8 GB RAM, and a 256 GB SSD with Windows 10 installed, which is fast and provides sufficient storage to effectively handle datasets, analytical programs, and quantitative and qualitative information. This structure guarantees consistent performance when coding, visualizing data, and generating statistics. The software environment includes SPSS Statistics, R, and Tableau, each of which serves an additional role in the analysis process. The SPSS enables organized statistical processing, R offers sophisticated modeling and graphic functions, and Tableau allows easy and interactive visualization of data. This hardware and software combination is a reliable and effective tool in carrying out a thorough research analysis and developing meaningful results.

Table 2: Aquatic resource depletion and its impacts on fishermen.

Year	Fish Stock Index	Fishermen Income Index
2015	80	100
2017	70	90
2019	55	75
2021	45	60
2023	35	50

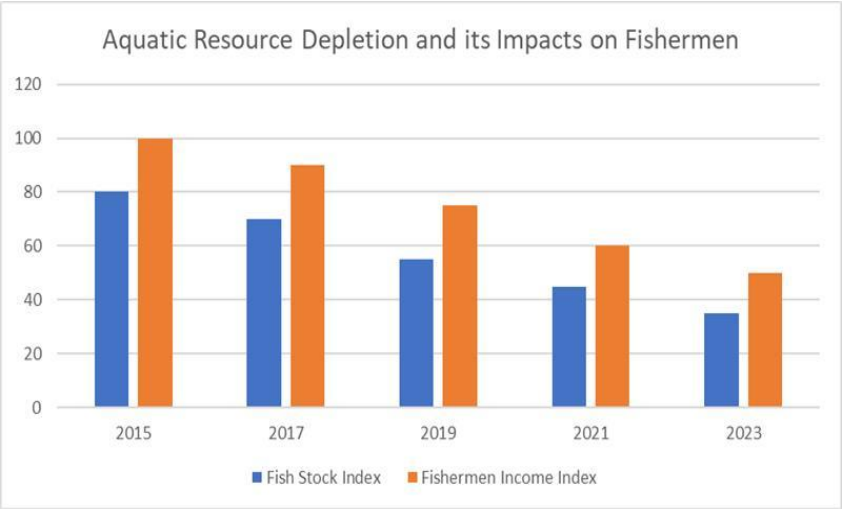

Figure 2: Aquatic resource depletion and its impacts on fishermen.

Table 2 and Figure 2 demonstrate that there was a steady decrease in the Fish Stock Index and Fishermen Income Index between 2015 and 2023, indicating a strong correlation between the depletion of aquatic resources and the economic limitations of fishermen. Fish Stock Index has decreased drastically in 2023 (35) compared to 2015 (80), and this indicates that the resources of fish that were available in the previous years have been drastically reduced due to the alterations that are taking place in the environment: climate variability, pollution, and habitat degradation. Such degradation has a direct effect on the livelihoods of fishermen, as evidenced by the Fishermen Income Index, which declined from 100 in 2015 to 50 in 2023. The fact that the trends of both are parallel, in a downward direction, signifies that as the stocks of fish

decrease, so do the incomes of fishermen and their economic status. This trend indicates a growing sense of vulnerability among fishing populations, as fewer catches in the industry lead to financial distress and a lack of livelihood, and to the added strain of having to either readjust or find alternative sources of income.

Discussion

The trends in Table 2 illustrate the depreciation of fishery development alone, as well as the psychological and social impacts that spread to communities near coastlines. With the decline of fish stocks and the gradual loss of income of fishermen, people are faced with a state of greater financial unpredictability, which is stress, anxiety, and emotional exhaustion. The need to keep livelihoods going amid a declining resource base may erode fishermen's sense of identity and self-esteem, especially in societies where fishing is closely tied to cultural heritage. Decreased income and volatile catches may put social pressure on family relationships, distort customary roles, and lead to greater reliance on other, less stable sources of revenue. The scarcity of resources could heighten rivalry among fishermen, undermining social unity and trust. In other cases, the continued extraction of resources drives the migration of younger generations, leading to demographic changes and the slow death of fishing-related traditions. Altogether, the Table 2 data can be described as an example of environmental change that initiates a chain reaction: the first stage of ecological suffering, which then turns into economic poverty, and finally results in higher levels of psychological distress and social breakdown in vulnerable coastal communities.

Conclusion

The analysis and evidence clearly indicate that the impacts of environmental change and the depletion of aquatic resources are far-reaching and extend beyond ecological degradation. The gradual decline in fish stocks and fishermen's income is a sign of the increasing vulnerability of coastal populations, whose livelihoods directly depend on marine resources. With a decline in catches, the ensuing economic instability leads to increased psychological pressure, doubts about the future, and a loss of personal and professional identity among the fishermen. On the community level, the pressures disrupt social cohesion and lead to competition over limited resources, as well as changing traditional family and gender roles, which eventually endanger the cultural life of fishing communities. Adaptive capacity must be strengthened, livelihoods diversified, and supportive policies put in place to reduce the multidimensional effects of a changing environment on vulnerable coastal societies.

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