

Original Article

# Navigating Challenges: Climate Change, Digitization, and Economic Resilience among Fisherwomen in Neelankarai, Chennai

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Received: 15 June 2024

Revised: 28 July 2024

Accepted: 16 August 2024

Published: 31 August 2024

**Abstract** - India is the third largest player in the global fishing industry. Climate change and digitization pose significant challenges to this sector, particularly for small-scale fisherpeople in Tamil Nadu. The lack of research focusing on the fishing community in Chennai, despite Tamil Nadu's high economic activity, highlights a gap in understanding the localized impact of these macroeconomic forces. This qualitative, phenomenological study investigates how climate change and digitization affect fisherwomen in Neelankarai. Findings from seven semi-structured interviews indicate that fisherwomen primarily sell fish for sustenance, often supplemented by other jobs, but struggle with high transportation costs and variable expenses, leading to limited savings and reliance on high-interest informal loans. Although aware of e-commerce platforms, none utilize them due to concerns about product freshness and logistical hurdles. Digital payment methods like UPI are sparingly used, typically relying on accounts held by friends or family. Climate changes such as reduced fish yields and unpredictable rainfall exacerbate economic vulnerability among these women. The study underscores the need for targeted interventions: improving access to affordable loans, enhancing digital literacy, and developing infrastructure for online sales to bolster the socioeconomic well-being of Chennai's fishing community.

**Keywords** - Climate change, E-commerce, Fishing, Tamil Nadu, UPI.

## 1. Introduction

Seafood is the most popularly demanded meat in the world, being the preferred form of meat in over 56 countries. To accommodate this demand, China, the largest fishing hub globally, produced 85.9 million tons of fish in 2021. In comparison, India, ranking third, produced 14.4 million tons of fish in the same year, a figure that rose to more than 20 million tons in 2023 [1]. According to the Indian Economic Survey 2021-22 [2], fishing contributes significantly to India's agricultural Gross Value Added (GVA), accounting for 7.3% of the total. With such substantial demand and production, the fishing industry plays a crucial role in global food security and economic development. However, this industry is facing increasing challenges, particularly from the impacts of climate change. Cyclone Michuung in December 2023 is a recent example of this [3]. While climate change by itself can bring devastating effects to lives, climate change, working in tandem with other factors, such as human error, can make the problem far more severe. An oil spill in Ennore, allegedly caused by the Chennai Petroleum Corporation Limited, was exacerbated by the cyclone, which caused the oil from the oil spill to spread over 20 square kilometers. While this harmed the quality of life for those in Ennore, it also

brought fishing activity in surrounding areas to a halt. Dead prawns and crabs were found washed up on the shore. The fisher people were subjected to symptoms such as dizziness and itchy eyes as a result of the oil spill. Fishermen were not able to go out into the sea to fish, resulting in them losing out on a week's worth of income.

The effect of climate change on fishing communities is profound, impacting various aspects of their lives. Climate change has led to the destruction of traditional living conditions, increasing social exclusion, marginalization, conflicts, wars, and forced migration at local and global levels. For example, rising sea levels in Kerala have eroded coastlines, displacing many small fishing communities. Fisherpeople have noted the loss of beaches where people used to market fish and live not long ago [4]. The direct effects of climate change on fishing stocks influence physiology and behavior, affecting growth, reproductive capacity, mortality, and distribution. Indirect effects change the productivity, structure, and composition of marine ecosystems that fish rely on for sustenance. Fishing, biological interactions, and non-climatic environmental influences can all have similar consequences. [5]. Furthermore, difficulties faced by the



fishing community are not only due to climate change. Various non-environmental factors make the lives of fisher people more difficult. Increased competition in the fishing industry means traditional fishermen are forced to give way to large corporations that can provide increased quantities of fish at lower prices. Fishing communities are also losing much of the coastline - their homes and point of access to the sea - to new projects and urban development. In 2017, it was reported that 60% of the coastline had been appropriated for government and private projects.

Several studies have endeavored to shed light on the challenges faced by fishing communities in India due to various factors, including globalization and climate change. A research paper by [6] focused on the impact of globalization on fishermen in Vasai, highlighting significant changes in fishing activities and socio-cultural aspects. The study noted increased water pollution, particularly along the river Ulhas, leading to changes in fish species availability and catch volume. Building on this theme, Bhide and Karmakar (2013) [7] investigated the effects of globalization on fisherwomen in Mumbai, revealing how competition from large trawlers and corporations has reduced income for fisherpeople. Additionally, the study highlighted the preference among customers for shopping at malls and multinational corporations selling fish, leading to increased competitiveness in fish prices and the transformation of public and private spaces for fisherwomen. Another study [8] further explored the challenges faced by fishing communities, focusing on climate change. Their research revealed that unpredictable rainfall patterns and increasing sea surface temperatures have reduced fishing days and affected fish movement, particularly for high-value species. The financial constraints of small and medium-scale fishermen in upgrading their equipment have exacerbated these challenges, leaving them with outdated gear.

The lack of studies focusing on Chennai as a market, compared to Mumbai or Kerala, highlights a significant research gap. Despite Tamil Nadu's higher economic activity, with a projected GDP of Rs. 21,36,351 crores [9] compared to Kerala's projected Rs 8,76,283 crore in 2022 [10], there is limited research on Chennai's fishing community. This oversight is crucial, as increased economic activity can lead to higher levels of ocean pollution, affecting fish catch and posing unique economic challenges. Maher's (2021) [11] study on Kerala's rising sea levels, which have eroded coastlines and displaced small fishing communities, underscores the potential vulnerability of Chennai's coastal areas. Tamil Nadu's coastline is particularly susceptible to climate change due to its low-lying nature and heavy impact from monsoons, with 2-3 heavy cyclones annually disrupting fishing activities.

Moreover, the impact of digitization on Chennai's fishing community remains largely unexplored. The integration of

UPI and online fish purchasing platforms like TenderCuts and Fresh to Home could significantly alter the fishing business. The lack of research on the role of fisherwomen further emphasizes the need for comprehensive studies. While men predominantly engage in fishing activities, women play a vital role in post-processing, yet their perspectives and challenges are often overlooked.

This research aims to address these gaps by investigating the impact of climate change and digitization on the fishing community in Tamil Nadu, with a particular focus on Chennai. By conducting qualitative surveys and in-depth interviews in the Neelankarai community, the study seeks to understand how these macroeconomic forces have influenced the lives, economic activities, and social dynamics of fisher people. The goal is to identify challenges and opportunities faced by the community and inform targeted interventions to enhance their quality of life and socioeconomic well-being in the context of climate change and digitization.

## 2. Methodology

### 2.1. Research Aim

This study aims to explore the operational practices, financial behaviors, technological adoption, and perceptions of climate change among women in the fishing community. This research seeks to provide a comprehensive understanding of the challenges and dynamics that these fisherwomen face in their daily activities, with a focus on their roles, income variability, use of external finance, interactions with e-commerce platforms, adoption of digital payment methods, and the impact of climate change on their livelihoods. The following are the specific objectives of the study:

- To investigate the primary roles and responsibilities of fisherwomen in the fishing process, including their motivations and factors influencing their engagement.
- Analyzing the revenue, expenses, and profitability of fisherwomen in the fish trade and understanding the variability in their income and profits.
- To explore the use of external finance among fisherwomen, including the types of loans they utilize and their attitudes towards borrowing.
- To assess the awareness and collaboration of fisherwomen with e-commerce platforms and understand the reasons behind their engagement or lack thereof.
- To understand the adoption and perception of digital modes of payment among fisherwomen, including the challenges and benefits they experience.
- To document the observations of fisherwomen regarding changes in climate over the years and examine the impact of these changes on their fishing activities and income.
- To suggest potential strategies and interventions that could support fisherwomen in improving their operational efficiency, financial stability, and technological integration.

- To recommend measures that could help mitigate the impact of climate change on their livelihoods.

By achieving these objectives, the study aims to contribute valuable insights into the lives of fisherwomen, highlighting the unique challenges they face and identifying opportunities for their empowerment and support.

**2.2. Research Design**

The study employed a descriptive phenomenological qualitative approach to investigate the economic effects of digitization and climate change on the fishing community in Chennai. This type of study was done in order to examine and compile various realities, viewpoints, and experiences. Rather than drawing conclusions about a situation, a phenomenological study investigates the experiences of each participant to establish meanings which can provide a thorough analysis of the phenomenon under investigation. In order to gather data using phenomenological research methods, the researcher must put aside biases and preconceptions while maintaining a personal connection with the participant.

**2.3. Data Collection Methodology**

Semi-structured interviews were employed to facilitate flexible conversations with the participants regarding their experiences. These interviews were conducted in Tamil, the local language, to ensure comprehension and ease of communication. A local community member assisted in the interviews, ensuring that they were as detailed as possible, minimizing the risk of information being lost in translation, and helping participants feel comfortable. This approach encouraged detailed and extensive descriptions from the fisherwomen about their experiences with climate change and digitization in the fishing sector. The interviews were both audio recorded and written down. The collected data was first transcribed into Tamil and then translated into English. This methodical approach ensured the collection of rich, contextual data reflecting the participants’ lived experiences and perspectives.

**2.4. Sampling and Sample Characteristics**

The sample comprised seven women from the fishing community, selected using a combination of judgment and convenience sampling. The participants were recruited through a known individual familiar with this community. As seen in Table 1, the respondents ranged in age from 38 to 70, with a mean age of 52.8 years. They each had between one and four children. Notably, none of the participants were originally from the area where the interviews were conducted; most had moved there through marriage. The participants’ experience in the fishing industry varied significantly, from 15 to 53 years. Most had between 15 and 20 years of experience, while two had been working in the field for 33 and 53 years, respectively.

**Table 1. Demographic and Professional Profile of Participants (N=7)**

Participant	Age	Experience (in years)	Number of Children	Mode of Sale
FW1	68	20+	1 daughter	Sits in one place
FW2	35	20	2 sons	Walks around
FW3	70	53	3 sons, 3 daughters	Walks around
FW4	52	15	2 sons, 2 daughters	Has a shop
FW5	57	33	3 sons, 1 daughter	Sells at the market and walks around
FW6	48	18	1 son, 1 daughter	Walks around
FW7	38	18	1 son, 1 daughter	Walks around

**2.5. Analysis Technique**

The transcribed and translated interviews were subjected to thematic content analysis to identify and interpret patterns within the data. Thematic content analysis is a qualitative method that involves coding the data, which allows for the organization and categorization of recurring themes and sub-themes. After transcription and translation, the data were thoroughly reviewed, and initial codes were generated based on significant and relevant features of the responses. These codes were then collated into potential themes, which were reviewed and revised to ensure they accurately captured the data. This process involved constant comparison and re-evaluation of the themes to ensure they were coherent and distinct. Each theme was then defined and named, providing a clear framework for presenting the data. This technique allowed for a structured yet flexible approach to understanding their practices, challenges, and perceptions related to their fishing activities and the broader socioeconomic and environmental context.

**2.6. Ethics and Informed Consent**

Participants were fully informed of the study’s aim prior to their involvement. An interview schedule was reviewed by a key informant before the commencement of the study to ensure that no questions would be insensitive or cause distress. All participants who arrived at the temple were briefed on the details of the study and provided their informed consent. Before starting the interviews, participants were asked if they

were comfortable with the recording process, ensuring their willingness and comfort with all aspects of the study.

### 3. Results and Discussion

The section sheds light on the multifaceted challenges faced by fisherwomen in Southern India, emphasizing their resilience and adaptation strategies amidst economic, environmental, and technological pressures.

#### 3.1 Operational Overview

The primary role of the sample in the fishing process is selling fish. All the women in the sample group sell fish caught by their family members as well as fish purchased from the market, distributing them either through stalls or house-to-house. Their motivations for engaging in fishing are diverse, with the primary one being sustenance. For instance, one fisherwoman (FW1) engages in fishing to avoid societal judgment. In contrast, two others do so for familial reasons, such as continuing a mother-in-law's legacy (FW3) or supplementing a husband's income (FW7).

Most of the fisherwomen rely solely on fishing for their income. However, two of them have additional sources of income: one scrape of leaves from coconut trees to make brooms (FW3), and the other works as domestic help in houses (FW7) because she cannot depend solely on the yield from the sea, especially during the two weeks of the year when there are no fish and, consequently, no income. The frequency of engagement in fishing activities varies among the participants, with some engaging in fishing every day and others doing so three times a week. Factors affecting their engagement include health issues and religious observances, which influence the demand for fish.

The participants procure fish through various means, with all of them purchasing from the market. Four out of the seven women also sell fish caught by their husbands or sons, although this source is not always reliable. As a result, they purchase fish from different markets, sometimes traveling up to 23 kilometers away. This leads to high transportation costs, which significantly reduce their profits. Notably, 71% of these fisherwomen sell fish on foot, roaming the streets of their designated areas.

#### 3.2 Revenue, Expenses, and Profitability

Trade expenditures among fisherwomen vary significantly, ranging from low transport costs to substantial stock spending. Expenses for stock range from Rs. 200 to Rs. 5,000, while transport costs vary from Rs. 100 to Rs. 500 depending on the mode of transport used. Some individuals face challenges such as poor sales due to inconvenient shop locations, affecting their overall expenditure and revenue. The mean expenditure is approximately Rs. 1,707, with a mode of Rs. 500 and a standard deviation of around Rs. 2,034. The high standard deviation indicates significant variance in their trade expenditure, directly reflected in the profit and revenue they

earn. However, the data collected on income per trip and profit are not very clear due to the group interview setting, where individuals were hesitant to share their earnings and profits in front of their peers.

Income varied from Rs. 700 to Rs. 5,400, but 3 out of 7 participants (FW4, FW6, FW7) were hesitant to disclose this information. Profit also varies significantly, with a mean profit of approximately Rs. 354, a mode of Rs. 100, and a standard deviation of around Rs. 293. Profits range from as low as Rs. 80 to Rs. 1,000 a day. Challenges such as competition with door-to-door sellers, reliance on regular customers, and additional costs like ice further reduce their profits. This variability highlights the uncertain and often precarious nature of their earnings. All seven participants reported being unable to save anything due to their minimal profits. One participant expressed this sentiment by stating, "No. No such habit at all. Only loans. We have to educate our children. How can we save?" (FW2)

#### 3.3 Usage and Perception of External Finance

The interest rates on loans within this community vary dramatically, ranging from 1% to as high as 30% per day. The predominant interest rate, as reported by most participants, is around 1% per day. Out of the seven participants, four regularly take loans, while one expressed interest in obtaining a loan but faced difficulty as no one was willing to lend to her. The primary source of external finance for this community is 'tandal' loans, which are informal, high-interest loans provided by individual money lenders without requiring collateral. These loans are favored for their convenience and speedy approval process, making them attractive to those who need external finance but are deterred by formal procedures.

Five out of the seven participants reported utilizing 'tandal' loans. FW5 mentioned that in urgent situations, she might pawn her nose rings or other small jewelry for quick access to 100 or 200 rupees. She explained, "If I need, I will take my ring or nose ring and hock at the seth shop (pawn broker). If I need some small cash of 100 or 200 rupees, I will take a hand loan from my peers or the other fish traders. That is all. We only need loans for weddings and big functions. Otherwise, we are small timers."

The general attitude towards external finance among the participants is largely negative. One participant commented, "Who will pay the interest, this is a big strain for me and a big headache. We want to be disciplined in our expenses." Despite this, some participants are willing to take loans but only when absolutely necessary. The older participants, in particular, are wary of taking on debt due to feelings of humiliation and concerns about their ability to repay. One older participant recounted a bad experience with external finance and loans, which has motivated her to live solely off what she earns. (FW1)

### **3.4. Perceptions and Barriers to E-commerce Adoption**

All participants were aware of the existence of E-commerce platforms on which they could sell fish to customers. However, not a single participant works with these platforms. There are various reasons for this, but the primary one is that they don't consider online fish to be fresh fish. "Booking online is done. But we cannot go and deliver the goods. So, what is the purpose of it? We give fresh fish. Online fish will be from the ice box only. Online fish is not fresh." One respondent stated that there are multiple facilities required for it that just aren't available to small vendors like them. E-commerce requires expensive ice boxes, a network of delivery boys, and an investment of Rs. 30,000 to purchase a smartphone.

### **3.5. Challenges and Perspectives in Adopting Digital Payment Methods**

Most vendors in the sample predominantly accept cash and credit as modes of payment. Only three participants (FW1, FW2, and FW7) reported using online payment methods such as Google Pay. FW1, who uses her daughter's UPI account, shared that she adopted UPI after her daughter encouraged her, emphasizing, "Why should you miss out on sales because you don't have a smartphone?" Interestingly, none of the three fisherwomen using UPI have their own accounts; instead, funds are transferred to someone close, such as a daughter or husband, who then forwards the money to them.

Among those using UPI, all three indicated they adopted it to ensure they do not lose customers due to their limited technological familiarity. Conversely, all four participants who do not use UPI explained their decision, citing reasons like the high cost of smartphones or impracticality within their profession. FW4 mentioned that handling fish leaves a smell on her hands, known as "kavuchi," which could transfer to the phone, rendering it unusable. She also expressed concerns that using a phone could distract her from attending to customers, potentially leading to reduced sales.

Participants perceived that there was a growing customer demand for UPI payments. However, they noted that customers who know them typically continue to pay in cash, reducing the urgency to adopt UPI. Participants also find UPI inconvenient, preferring to collect cash payments the next day instead. When asked if UPI has contributed to increased sales, only FW7 acknowledged its convenience, which could potentially lead to more sales. Other respondents attributed any sales growth in their fish business solely to their personal efforts in cultivating customer relationships. FW6 also voiced apprehension about UPI, citing the risk involved if payments fail, as she has no recourse to recover the amount owed later.

### **3.6. Climate Change and its Impact on Fishing**

6 out of 7 respondents observed changes in the climate over the time they have been involved with fishing. Out of these changes, the most commonly observed one is that there

has been a fall in fish output ever since the 2004 tsunami. FW2 said that even if the men go further into the sea, they do not get any fish. As they go further, they also incur higher costs in the form of fuel required for their boats. This effect of climate change on fishing is supported by findings from Cheung et al.'s (2012) [12] study that states that ocean warming is causing shifts in the distribution of species. This is affecting the productivity of fish stocks and the marine ecosystems in which they live. Participants also say rain is more unpredictable. Fish breed in sync with the monsoon season, and when they get cyclones instead of monsoons, they breed less frequently.

When asked about their aspirations for future generations in fishing and whether they want their children to continue the trade, 5 out of 7 said their children aren't in the trade and they are happy. FW4's son received a college education but returned to the fishing profession. She said, "a fisherman will always have the sea in his blood, but I hope my children will find a future outside of this way of living". Many of their children have been educated and moved on to more reliable professions, such as working as clerks at banks, running their own shops, and working as domestic help.

## **4. Recommendations**

The study revealed that these fisherwomen would benefit from improved access to affordable loans, which can alleviate the financial burdens they face and reduce their dependence on high-interest informal loans. Enhancing digital literacy and infrastructure for online sales can provide new revenue streams and broaden market access. Furthermore, targeted interventions to address climate change impacts, such as sustainable fishing practices and better weather prediction systems, can mitigate the adverse effects on fish yields and economic stability. Policymakers and stakeholders must consider these insights to develop comprehensive strategies that support the socio-economic well-being of Chennai's fishing community. This can be done by providing a support network on how to engage with these bigger institutions in order to make the livelihoods of the fisher people more sustainable, reliable, and predictable.

## **5. Conclusion**

This study aimed to investigate the effects of climate change and digitization on fisherwomen in Neelankarai, Chennai, through a phenomenological approach. The findings indicate that these fisherwomen face substantial economic challenges, including high transportation costs, variable expenses, limited savings, and reliance on high-interest informal loans. Despite awareness of e-commerce platforms, none utilize them due to concerns about product freshness and logistical difficulties. Digital payment methods like UPI are minimally used, typically through accounts held by friends or family. Climate changes such as reduced fish yields and unpredictable rainfall further exacerbate their economic

vulnerability. None of these fisherwomen are able to save due to their minimal earnings and the unpredictable nature of their income.

However, this study has certain limitations. The small sample size and qualitative nature of the research may limit the generalizability of the findings. Additionally, conducting

interviews in a group setting may have influenced participants' responses, particularly regarding financial matters. The focus on women means the findings cannot be generalized to all fisher people. Future research should extend similar investigations to other regions, including larger and more diverse samples, and ensure individual interviews to validate and expand upon these findings.

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