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Coping and Adaptive Approaches of Fisherfolks in Ilaje Fishing Communities, Ondo State to Impacts of Climates

Siyanbola A Omitoyin*, Kemisola D Osakuade and Adeniyi P Ogungbure

Department of Aquaculture and Fisheries Management, University of Ibadan, Nigeria

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Corresponding author: Siyanbola A Omitoyin, Department of Aquaculture and Fisheries Management, University of Ibadan, Nigeria

Abstract

Fish stocks have been reported to have been depleted as a result of climate change impacts in Ilaje Local Government Area of Ondo State, Nigeria, where a large number of people depend on water bodies for their livelihood, this research therefore look into livelihood vulnerability of fisherfolks in the area to climate change and how they are coping and adapting to the changes brought by it. A Multi-stage sampling technique was employed to select a total of two hundred (200) fisherfolks within the regions, data collected were aggregated using a composite index and differential vulnerabilities LVI–IPCC was scaled from -1(least vulnerable) to 1 (most vulnerable). The result show that coastal fishing communities in Ilaje, had a higher livelihood vulnerability index (0.357) than the freshwater fishing communities (0.356), indicating relatively greater vulnerability to climate change impacts. It however shows that people in the freshwater regions were adapting and coping more than the people in the coastal regions as they were clearing the drainages and river courses to prevent flooding; they have access to farmland and farm produce, which is cheaper and easily accessible for them. They also have access to hospital, good health care and make livelihood diversification. Nonetheless, the well-being of fisherfolks in the coastal communities is better because of their economic access to the essential resources needed contrasting the freshwater fisherfolks. Conclusively, improving access to credit facilities could improve fishers' capacity to diversify into other income-generating activities, provision of hospitals and other social facilities should also be provided.

Keywords: Coping and Adaptive strategies; Climate change; Livelihood diversification; Vulnerability; Fishing communities

Introduction

The environment to a great extent is crucial for man's existence and survival because most of his daily actions are made possible by the subsistence of his environment. However, this environment is continually under the direct and indirect destructive menace of climate change such as desertification, flooding, rise in sea level, erosion, windstorms, dehydration, the spread of infectious diseases, etc [1]. This climate change is acknowledged to be one of the overwhelming challenges facing man and the ecosystem of the world in the 21st century, resulting from indiscriminate human actions such as deforestation, discharge of domestic and industrial effluents, gas flaring, and large-scale irrigation, etc. Islam and Wong [2] postulate that climate change is gaining extensive notice and concern as it can directly/ indirectly affect our standard of living and quality of life and has a great negative consequence on food production systems, causing food insecurity and malnutrition. Climate change is daily leading to shifts in distributions of aquatic lives, increasing the alarming state of food insecurity, disrupting fishing communities and causing an economic setback for the fisherfolks and thus taking its toll on people's livelihoods, economies, and society alongside the entire food supply chain.

Climate change is affecting many regions, the coastal zones of the Levantine Mediterranean Sea at the basins of nations like Egypt, Lebanon and Israel which are experiencing continuous coastal land erosions with consequently declined fisheries, Nigeria is not exempted from all these effects [3]. Enete reiterated that the durations and intensities of rainfall have increased and have been projected to continue to increase, causing enormous runoffs and flooding in many places in Nigeria [4]. Precipitation in southern districts is projected to the upswing and rising sea levels are expected to exasperate flooding and submersion of coastal lands [5]. All these extreme weather events can disrupt economic growth through losses of production and infrastructure and the need for unexpected expenditure in curbing the effects. Fishing will be obstructed by sea level rise and extreme weather while the feasibility of inland fisheries will also be endangered by amplified

salinity and shrinking rivers and lakes [6,7]. These changes have brought about a constant reduction of coastal and freshwater resources, displacement of households, loss of biodiversity, eutrophication; aquatic habitat destruction, outbreaks of waterborne diseases, and food insecurity [8].

Vulnerability is the exposure of groups or individuals to stress as a result of climate variability and change [9]. The degree of the impact of climate change in fisheries depends upon the level of exposure and vulnerability of fisherfolk to these impacts [10]. An evaluation of vulnerability is an approach to assess the pressure on an ecological system and its capability to manage the pressure [11]. There is a need for building adaptive capacity in local coastal communities to develop alternative coping strategies for the impacts of climate and environmental changes [12]. Adaptation is indispensable in adjusting to the aftermaths of climate change; it focuses on deeds that would assist in minimizing the sensitivity of systems in different affected regions. According to Jellason *et al* [13], premeditated adaptation approaches consist of government interference and public policy, such as investment in infrastructure, research, modernism, financial supports, and tax regimes. Self-directed adaptation involves coping strategies by the fisher folks and others being affected in rural locales. These may include livelihood diversification; migration to another community in search of jobs mainly during low season, raising of the foundation of the house to prevent a flood from entering, irrigation of their plants and using tolerant varieties of crops.

According to Omitoyin and Fregene [14] coping strategies involve alternative sources of livelihood. Amy Morin believes that coping skills help you in tolerating, minimizing, and dealing with stressful situations in [15]. Adaptation is considered unavoidable and essential to tackle additional shocks and stresses due to climate change [16,17]. It is a process whereby the affected community get themselves ready to deal with the uncertainty in a better way that minimizes the shocks. It is however essential to fortify the adaptation competence of fisherfolks against climate change since it helps them to take up negative brunt, lessen menaces or vulnerability, and also persuade them to take advantages of any prospect that might materialize from the incidence of climate change. Demographic factors of the respondents some such as age, income, experience, and education status were found to influence the community's climate change adaptation practices [18,19].

Fisheries according to Idowu *et al* [20] is a source of revenues of the majority of the people in the coastal areas, a key source of protein for waterside and coastal rural communities and this is largely being affected by the effects of climate change. The nature and characteristics of freshwater resources are being affected by climate change, which varies between ecological zones, aggravating the existing problem of drought, flood, and conflict [7]. It has been projected by the majority of researchers that climate change will be altering the efficiency of many of the world's marine and freshwater fisheries yearly; this is also expected to take a toll on the source of income of millions of the rural people depending on fisheries for their livelihood. Olusanya and van Zyll de Jong [21] believes that freshwater fish populations are speedily diminishing internationally due to the impacts of quick climatic and existing non-climatic anthropogenic stressors.

Fishing as an occupation carries its risks, however, people involved in fisheries and fishery-related livelihoods are vulnerable to a variety of external factors [22]. Fish stocks have been reported to have been depleted as a result of climate change impacts in Ilaje Local Government Area, where a large number of people depend on water bodies for their livelihood, it is, therefore, necessary to take a cognizant look at livelihood vulnerability of fisherfolks in Ilaje fishing communities to climate change and how they are coping and adapting to the changes brought their way through climate change. It is therefore paramount to appraise how fisherfolks in Ilaje fishing communities are coping and adapting to the effect of climate change over the years.

Specific objectives

- To assess the socio-economic characteristics of the respondents
- To examine the coping plans of the fisherfolks against climate change
- To evaluate the adaptive measures adopted by the fisherfolks to cushion the effects of climate change in their communities

Materials and Methods

Research locale

Ilaje Local Government Area of Ondo State housed the largest coastal area of the state. According to the documentation of Adebowale *et al* [23], Ilaje comprises about 50 settlements scattered around the river tributaries which empty directly into the coast with an annual increment of 2.2% in population size, 80% of which engages in fishing and always recording the bulk of fish production in Ondo State [24]. This important region of Ondo State falls within the oil prospecting states in Nigeria called the Niger Delta region which is often referred to as the richest part of Nigeria, in terms of natural resources endowment. This region lies between longitudes 6°12°E and 6030°E of the Greenwich Meridian and between latitudes 4°10°N and 4°6°N of the Equator, it shared boundary with Ogun State in the West, with Irele Local Government Area and Edo State in the East, with Okitipupa Local Government Area, in the North while in the South it is bounded by Bight of Benin and Atlantic Ocean [25]. The 2006 National Population Commission census figures revealed that the LGA had 290,615 dwellers. The primary occupation of these dwellers is fishing, and they move from one place to the other by water using small and locally constructed canoes and boats (Figure 1).

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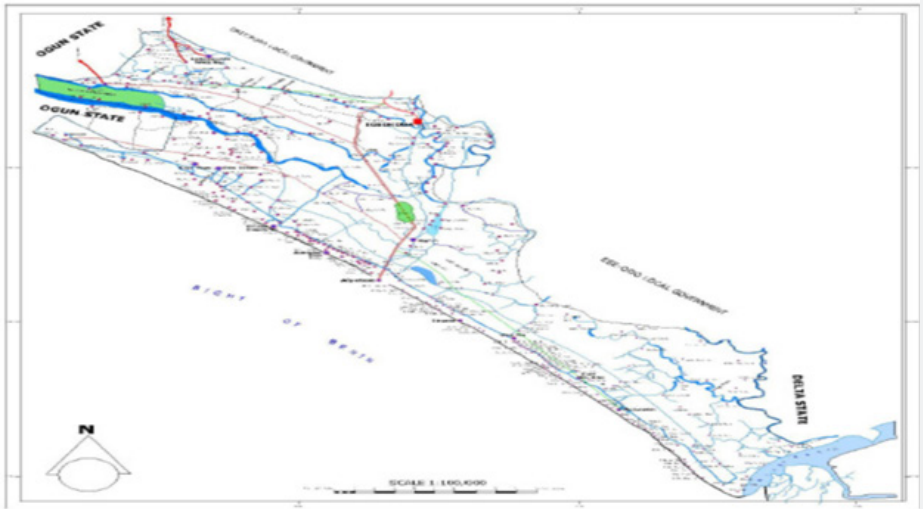

Figure 1: Map of Ilaje Local Government Area of Ondo State.

Data collection and Sampling Technique

A Multi-stage sampling technique was employed to select a total of two hundred (200) fisherfolks from one of the two Agriculture Development Project (ADP) zones in Ondo State. Mahintedo, Igbokoda, Mahin and Ugbonla were the selected cells under the freshwater community, while Etiikan, Zion-ipepe, Idiogba and Ayetoro were the selected cells under the coastal community [26]. Twenty-five (25) fisher folks were selected in each of the eight selected cells using simple random sampling techniques to give a total of 200 fisherfolks. Primary data were collected on climate change vulnerability assessment which will consider the data on exposure, sensitivity and adaptive capacity to erosion, flooding, sea level rise, storm, and drought, following the method of Hahn *et al* [27].

Data Analysis

Statistical Package for the Social Sciences (SPSS) Version 21, Microsoft Excel 13, and STATA were used to analyse the collected data. Frequencies, Mean, Standard Deviation were analysed through descriptive analysis. Data on vulnerability (on a set of vulnerability indicators such as socio-demographics, livelihoods, social networks, health, food and water security, natural disasters, and climate variability) were aggregated using a composite index and differential vulnerabilities were compared as documented by Hahn *et al* [27].

Calculation of the LVI–IPCC: IPCC Framework Approach

This was calculated according to the method described by Hahn *et al* [27]. The LVI includes seven major components: Socio-Demographic Profile, Livelihood Strategies, Social Networks, Health, Food, Water, and Natural Disasters and Climate Variability. The LVI–IPCC diverges from the LVI when the major components are combined. Major components were combined, following the equation below:

$$CFd = \sum i^{n} = WMiMdi$$

$$\sum i^{n} = WMi$$

where CFd is an IPCC-defined contributing factor (exposure, sensitivity, or adaptive capacity) for district d, Mdi are the major components for district d indexed by i, wMi is the weight of each major component, and n is the number of major components in each contributing factor. Once exposure, sensitivity, and adaptive capacity were calculated, the three contributing factors were combined using the following equation:

$$LVI\_IPPC_{d} = (e_{d} - a_{d}) \times s_{d}$$

where LVI–IPCCd is the LVI for community d expressed using the IPCC vulnerability framework, e is the calculated exposure score for community d (equivalent to the Natural Disaster and Climate Variability major component), a is the calculated adaptive capacity score for community d (weighted average of the Socio-Demographic, Livelihood Strategies, and Social Networks major components), and is the calculated sensitivity score for community d (weighted average of the Heath, Food, and Water major components). LVI–IPCC was scaled from -1 (least vulnerable) to 1 (most vulnerable).

Result and Discussion

Socio-Economic Characteristics

The categorization of the educational status of the fisher folks in the study area is presented in Table 1. The result indicates that those with senior secondary education constitute the highest percentage for those in the coastal area and fresh water representing 42% and 29% of the respondents respectively. This does not connote with the findings of Olufayo *et al* [26] who reported that the majority of the fisherfolks in Ilaje do not have formal education. However, since the fishers have a lower level of

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education, their coping and adaptive strategies might be limited since they have limited. Education is a key aspect of the global response to climate change, it helps young minds to understand and address the impact of climate change and to adapt to its change-related trends [28,29]. Franklin and Velusamy [30] observed that fishermen in Kanyakumari, India who possessed higher education are dealing better with the livelihood stress, than the fishermen with lower education.

Table 1: Demographic characteristics of respondents.

Variables	Categories	Frequency (%)	Mean / Mode	SD	Frequency (%)	Mean / Mode	SD
		Coastal Areas			Fresh Water		
Educational Status	No Formal	8 (8.0%)			4 (4.0%)		
	Primary	21 (21.0%)			28 (28.0%)		
	Junior Secondary	6 (6.0%)			16 (16.0%)		
	Senior Secondary	42 (42.0%)			29 (29.0%)		
	Higher Diploma	10 (10.0%)			10 (10.0%)		
	Graduate	13 (13.0%)			13 (13.0%)		
	Total	**100 (100.0)**			**100 (100.0%)**		
Fishing experience	1 – 10 years	4 (4.0%)					
	11 – 20 years	30 (30.0%)					
	21 -30 years	43 (43.0%)					
	>30 years	23 (23.0%)					
	Total	**100 (100.0%)**	**23.21**	**8.2**	**100 (100.0%)**	**22.23**	**9.34**
Electrical facility	Yes	80 (80.0%)			80 (80.0%)		
	No	20 (20.0%)			20 (20.0%)		
	Total	100 (100.0%)			100 (100.0%)		
Communication technology used	Yes	99 (99.0%)			99 (99.0%)		
	No	1 (1.0%)			1 (1.0%)		
	Total	100 (100.0%)			100 (100.0%)		

The result revealed that the majority of fisherfolks have fishing experience exceeding 10 years. This represents about 96% and 93% for the coastal and freshwater regions respectively. Since majority of the fisherfolks are in their young age (below 46 years) as reported by Omitoyin *et al* [31] it might perhaps mean that the fisherfolks started fishing at a very early age in these communities. This is similar to the report of Islam *et al.* [32] in the south-west coastal region of Bangladesh that almost all the respondents from the two regions of their study area have fishing experience exceeding 10 years. It was expected that experienced fishers possessed better climate change adaptation practices as they have attained lifelong skill and knowledge to overcome threats from climate change compared with the younger fishers [18,33,34].

Electricity is needed in charging electrical appliances such as the Global System for Mobile Communication (GSM) and internet usage which could help the farmers in acquiring genuine information on coping and adapting to changes brought about by climate. It was shown that the majority of the respondents in the study areas have access to electrical facilities, while communication technology is generally used by both locations 99% of them. Information gathered by Olufayo *et al*. [26] indicated that the power supply is highly erratic and undependable in the region. This has a negative impact on industrial development as people would have to spend additional money to power their generator. According to Egesi [35], fishermen are using mobile phones to communicate with family, suppliers of fishing gears, middlemen and merchants. Jensen [36] reiterated that the introduction of mobile phones in Indian fisheries has brought about a tremendous change in terms of efficiency and profitability and has allowed fishermen to land their catch in potential markets.

Livelihood Vulnerability to Climate Change

Climate change vulnerability of fisherfolks in Ilaje fishing communities is viewed in reference to their Livelihood. The Livelihood vulnerability index incorporates the IPCC vulnerability definition (LVI-IPCC framework), it has seven major components which are: socio-demographic profile, livelihood strategies, health, social networks, food, water, and natural disaster & climate variability. The LVI-IPCC analysis yielded similar results as it was reported that households in the coastal regions are more vulnerable as shown in table 2 and 3 respectively. The major vulnerability components represented in tables 2 and 3 provides information on the degree to which each household characteristic contribute to climate change vulnerability in each district.

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Table 2: LVI-IPCC contributing calculation for Coastal regions.

Contributing factors	Major components	Major components values	Number of subcomponents per major components	Contributing factor values	LVI-IPCC value for coastal region
Adaptive capacity	Socio-demographic profile	0.344	2		
	Livelihood strategies	0.403	3		
	Social networks	0.419	3	0.394	0.032
Sensitivity	Health	0.44	3		
	Food	0.218	2		
	Water	0.173	2	0.3	
Exposure	Natural disaster	0.501	3	0.501	

Table 3: LVI-IPCC contributing calculation for Fresh water area.

Contributing factors	Major components	Major components values	Number of subcomponents per major components	Contributing factor values	LVI-IPCC value for freshwater area
Adaptive capacity	Socio-demographic profile	0.494	2		
	Livelihood strategies	0.447	3		
	Social networks	0.419	3	0.448	-0.011
Sensitivity	Health	0.459	3		
	Food	0.23	2		
	Water	0.033	2	0.272	
Exposure	Natural disaster	0.409	3	0.409	

Note: The LVI-IPCC is on the scale from -1(least vulnerable) to 1 (most vulnerable)

For the coastal regions in Ilaje fishing communities, natural disaster contributes mostly to the vulnerability with value 0.5 (index for the most vulnerable), followed by health (0.44), social networks (0.42), livelihood strategies (0.40), socio-demographic profile (0.34), food and water contributes the least with an index value of 0.22 and 0.17 respectively, this is at variance with the work of Hahn *et al* [27] in their study on Moma coastal fishing communities in Mozambique, the difference can be attributed to the different locations of study, and Amos *et al* [37] who discovered those socio-demographic characteristics contributes the most to livelihood vulnerability in their study on three (3) coastal fishing communities in Anambra State, Nigeria. This is in line with the work of Halim [38] carried out in Bangladesh, a country which is widely recognized to be one of the most vulnerable countries in the world, that frequent natural disasters are the most characteristic contributing factor to climate change vulnerability in the district, causing loss of life, damage to infrastructure and economic assets, and adversely affecting fish farming.

The freshwater fishing communities in Ilaje have a socio-demographic profile that contributes the greatest to their vulnerability (0.49) with health (0.46), livelihood strategies (0.45), social networks (0.42), natural disasters (0.41), and lowest in food and water with values 0.23 and 0.03 correspondingly, this is not in line with the findings of Hahn *et al* [27] on the livelihood vulnerability study on Mabote (freshwater community) in Mozambique, which can be ascribed to the difference in location of the study area. Coastal and freshwater fishing communities in Ilaje showed the least vulnerability (below half, 0.25) in relation to food and water. However, the work of Olusanya and van Zyll de Jong [21] carried out in Newfoundland and Labrador proved that freshwater fish resources are getting vulnerable to climate change.

Overall, the coastal fishing communities in Ilaje, had a higher livelihood vulnerability index than the freshwater fishing communities (0.357 versus 0.356) respectively, indicating relatively greater vulnerability to climate change impacts. This is not in line with Hahn *et al* [27].who reported that freshwater fishing communities have the highest vulnerability index in his work on livelihood vulnerability index in Moma and Mabote districts in Mozambique. It has been proved by some researchers that the rural regions of a country are the most vulnerable regions of such a country since they receive less attention. In China, a country that is classified as a moderately vulnerable nation, it was been reported by Chen *et al* [39] that Liaoning, Fujian, and Hainan are the comparatively underdeveloped coastal regions of the country and happened to be most vulnerable due to an insufficient adaptive capacity to compensate for sensitivity, whereas, Hebei, which had a very low level of sensitivity, was identified as the most vulnerable province mainly due to an insufficient adaptive capacity to offset moderate exposure.

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Coping Strategies of Fisherfolks

Table 4 presents the respondents' views on the different coping strategies they have adopted at different times. About 96% of the respondents agreed that they do not send their children to live with relatives to ease the burden of the financial burden. However, 52% of the respondents allow their children to work to make ends meet in each area considered. Additionally, 36% of the respondents often migrate to another community in search of jobs to make ends meet. During seasons of low catch and low economic returns on fishing, fisherfolks devise measures to deal effectively with their predicament before returns on fish catch increases, some respondents in the coastal and freshwater communities cope by eating less preferred food due to inadequate finances, reducing the proportion size of food, skipping meals because there was not enough food, a relatively borrow money to buy food and send children to live with relatives to ease the financial burden, and some migrate to another community in search for jobs (including fishing) to make ends meet. This is in concordance with the findings of Halim *et al.*[38] who reported that fish farmers in Borguna, Bangladesh had changed their occupation that made their socio-economic condition vulnerable, to cope with the situation.

Table 4: Frequency Distribution of Respondents' Coping Strategies.

Coping Strategies	Categories	Frequency (%)	Frequency (%)
		Coastal region	Fresh water
Eating less preferred food due to inadequate finances	None	48 (48.0%)	48 (48.0%)
	Sometimes	7 (7.0%)	7 (7.0%)
	Cannot count	6 (6.0%)	6 (6.0%)
	1 -3 times	32 (32.0%)	32 (32.0%)
	6 times	3 (3.0%)	3 (3.0%)
	7 times	2 (2.0%)	2 (2.0%)
	10 times	2 (2.0%)	2 (2.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**
Reducing the proportion size of food eating because of inadequate finances	None	48 (48.0%)	48 (48.0%)
	Sometimes	2 (2.0%)	2 (2.0%)
	Cannot count	15 (15.0%)	15 (15.0%)
	1 -3 times	33 (33.0%)	33 (33.0%)
	20 times	2 (2.0%)	2 (2.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**
Borrow money to buy food	None	76 (76.0%)	76 (76.0%)
	1 -3 times	21 (21.0%)	21 (21.0%)
	8 times	3 (3.0%)	3 (3.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**
Skipping meals because there was no enough food	None	49 (49.0%)	49 (49.0%)
	Sometimes	9 (9.0%)	9 (9.0%)
	Cannot count	2 (2.0%)	2 (2.0%)
	1 -3 times	25 (25.0%)	25 (25.0%)
	10 times	6 (6.0%)	6 (6.0%)
	12 times	2 (2.0%)	2 (2.0%)
	15 times	5 (5.0%)	5 (5.0%)
	22 ties	2 (2.0%)	2 (2.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**
Send children to live with relatives to ease financial burden	Yes	4 (4.0%)	4 (4.0%)
	No	96 (96.0%)	96 (96.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**
Allow children to work to make ends meet	Yes	52 (52.0%)	52 (52.0%)
	No	48 (48.0%)	48 (48.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**

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Migrate to another community in search for jobs (including fishing) to make ends meet	Yes	36 (36.0%)	36 (36.0%)
	No	64 (64.0%)	64 (64.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**

In the multiple responses section, fisherfolks in the freshwater regions coped through personal savings, monthly contributions, selling of farm produce (Gari, Vegetables, Yam, Melon, Maize), also selling of livestock (goats, chicken, ducks), selling of preserved fish, diversification into transportation (both water and land), borrowing of money, exchanging fish for other foodstuffs, making purchases on credit, selling of provisions, seeking help from relatives. However, respondents in the coastal regions leave the sea during seasons of high tides and waves that prevent fishing for the fishes in the brackish environment, some take the risk of going to the sea, most respondents have preserved food and fish towards this season, and as such, the price of the preserved fish is increased, some sell firewood that is used for cooking and smoking of fish, whereas others get involved in buying and selling of goods. This is similar to the work of Muflikhati and Hernawati [40] in their study of coping strategies and family well-being of small-scale fishers' household in Bekasi, west Java province in Indonesia. This work is similar to the findings of Atikah and Purnomo [41] who reported that fish farmers in Pangandaran District, West Java Province, Indonesia are allocating parts of fish production for household consumption, selling some to buy various kinds of food, while processing some portions to get added value.

It however shows that people in the freshwater regions are coping more than the people in the coastal regions as they have access to farmland and farm produce, which is cheaper and easily accessible for them to make livelihood diversification. Coastal fisherfolks household have to buy everything needed for their survival because of limited livelihood diversification disparate from the freshwater fishing communities. Nonetheless, the well-being of fisherfolks in the coastal communities is better because of their economic access to the essential resources needed contrasting the freshwater fisherfolks.

Adaptation Strategies of Fisherfolks

Table 5: Frequency Distribution of Respondents' Adaptive Strategies.

Adaptive Strategies	Categories	Frequency (%)	Frequency (%)
		Coastal region	Fresh water
Migration to another place till there is report on good catch	Yes	88 (88.0%)	37 (37.0%)
	No	12 (12.0%)	63 (63.0%)
	Total	100 (100.0%)	100 (100.0%)
Forsaking fishing and doing all kinds of work till report on good catch	Yes	12 (12.0%)	55 (55.0%)
	No	88 (88.0%)	45 (45.0%)
	Total	100 (100.0%)	100 (100.0%)
Clearing drainages and river courses to avoid flooding	Yes	0 (0.0%)	88 (88.0%)
	No	100 (100.0%)	12 (12.0%)
	Total	100 (100.0%)	100 (100.0%)
Our insurance company help when there is loss	Yes	0 (0.0%)	12 (12.0%)
	No	100 (100.0%)	88 (88.0%)
	Total	100 (100.0%)	100 (100.0%)
Before building, we consult town planners so as to avoid flood prone areas	Yes	62 (62.0%)	54 (54.0%)
	No	38 (38.0%)	46 (46.0%)
	Total	100 (100.0%)	100 (100.0%)
We make the foundation of the house so high that flood cannot enter	Yes	100 (100.0%)	90 (90.0%)
	No	0 (0.0%)	10 (10.0%)
	Total	100 (100.0%)	100 (100.0%)
Good community health centres to respond to disease outbreak or other injuries	Yes	0 (0.0%)	100 (100.0%)
	No	100 (100.0%)	0 (0.0%)
	Total	100 (100.0%)	100 (100.0%)

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We plant forest along the coast to help in reducing the impact of storm	Yes	25 (25.0%)	
	No	75 (75.0%)	
	Total	**100 (100.0%)**	
We build earth mounds for our livestock	Yes	39 (39.0%)	39 (39.0%)
	No	61 (61.0%)	61 (61.0%)
	Total	**100 (100.0%)**	**100 (100.0%)**

Table 5 above shows that 88% of freshwater fisherfolks clear the drainages and river courses to avert flooding, unlike the coastal fisherfolks. No insurance company for the coastal fisherfolks but a few 12% of the freshwater fisherfolks have insurance to cover up in times of losses. Both regions raise the foundation of the house so high to prevent flood from entering. The fisherfolks (coastal and freshwater) adapt to the effects of climate change through consultation of local town planners to avoid flood prone areas, also, when building the houses, the foundation is made so high that flood cannot enter the houses, and there are earth mounds built for livestock to prevent being swept away by the flood. Hay and Mimura [42] in their study on climate change vulnerability and adaptation assessment in the Asia-Pacific regions, has similar results. However, the adaptation strategy is poor in the coastal regions as there are no drainages in these communities, no insurance company in case of destructions by sea level rise, waves, and other natural disasters, also there are no hospitals in these communities, which increase the vulnerability of these communities in case of disease outbreaks or other injuries. Meanwhile, the mangroves along the coast have been destroyed by sea-level rise which limits their adaptation. Freshwater fisherfolks have hospitals in their communities and clearing of drainages and river courses to prevent flooding is also done, perhaps, the nearness of the community to infrastructure unlike the coastal communities is responsible.

Migration provides farmers with an opportunity to make non-marginal adjustments in adapting to climate change [43], it is in the opinion of Sudarmo *et al.* [44] that skills aside from catching fish are needed to get extra income when fish is scarce. Economic diversification is the main adaptive strategy adopted by fisherfolks in Zimbabwe to reduce vulnerability to climate change [45]. An increase in income from the alternative source of income will enable farmers to adapt to coping with financial shocks from climate change [46]. Islam [47] reported from their work carried out in the coastal fishing communities in Bangladesh that the majority of fishers do not have instant access to medical facilities because they are in remote communities, however, their low health resistance may destabilize the efficiency of their fishing activities and livelihoods. Access to formal credit is one of the major constraints in coping with climatic changes by fishers in South Asia [48]. The majority of respondents in artisanal fishing households in Mkomani, Kenya, identified the lack of sufficient income (and the numerous domestic deprivations this caused), as well as the failure to receive any meaningful assistance from the government as the primary manifestations of their poverty [49].

Conclusion and Recommendation

The study identified the livelihood vulnerability of climate change and the adaptive and coping strategies peculiar to the fishermen in Ilaje LGA, Ondo State, Nigeria. A well-structured questionnaire was used to obtain information on the adaptive and coping strategies in study regions, the result revealed that those with senior secondary education constitute the highest percentage for those in the coastal area and freshwater representing 42% and 29% of the respondents respectively. The result revealed that the majority of fisher folks have fishing experience exceeding 10 years. This represents about 96% and 93% for the coastal and freshwater regions respectively. It was shown that majority of the respondents in the study areas have access to electrical facilities, while communication technology is generally used by 99% of the respondents in both locations. Generally, the coastal fishing communities in Ilaje, had a higher livelihood vulnerability index than the freshwater fishing communities (0.357 versus 0.356 respectively), indicating relatively greater vulnerability to climate change impacts. It however shows that people in the freshwater regions are coping more than the people in the coastal regions as they have access to farmland and farm produce, which is cheaper and easily accessible for them to make livelihood diversification. Coastal fisherfolks household have to buy everything needed for their survival because of limited livelihood diversification disparate from the freshwater fishing communities. Nonetheless, the well-being of fisherfolks in the coastal communities is better because of their economic access to the essential resources needed contrasting the freshwater fisherfolks. Government, NGOs, and other financial institutions should provide improved access to credit facilities with minimal interest rate could improve fishers' capacity to diversify into other income-generating activities, provision of hospitals and other social facilities should also be provided for good health care and ability to access internet to gain information to cope well with climate change.

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