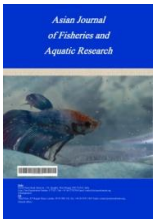

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Assessment of Livelihood Vulnerability of Fisherfolks in Coastal and Freshwater Fishing Communities of Ilaje in Ondo State

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Authors' contributions

This work was carried out in collaboration among all authors. Author SAO designed the study, supervised the field work and performed statistical analysis. Author APO carried out the field work, data entry and managed the literature searches. Author KDO wrote the first draft of the manuscript and updated the literature searches of the study. All authors read and approved the final manuscript.

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ABSTRACT

The study assessed the livelihood vulnerability of fisherfolks in both coastal and freshwater fishing communities of Ilaje Local Government area of Ondo state, Nigeria. Structured questionnaires were used to collect information from 200 fisherfolks from both communities. Data were analyzed using the descriptive statistics, Livelihood Vulnerability Index data were aggregated using a composite index and differential vulnerabilities were compared. The results showed that majority of the fisherfolks from freshwater and coastal communities were below 46 years old, respondents from the freshwater communities were 95% male, 5% females while all (100%) respondents in the coastal communities were male with majority assenting to fishing as their primary occupation. The freshwater communities showed greater vulnerability on the socio-demographic profile (SDP) index than coastal communities ($SDP_{freshwater}$ 0.49;$SDP_{coastal\ communities}$ 0.34). Freshwater also showed greater vulnerability on the livelihood strategies component (0.45) than coastal communities (0.40). The social networks indicators were the same for the two communities. The overall health vulnerability score for freshwater communities (0.46) was higher than that for coastal communities (0.44). Also, the overall food vulnerability score for freshwater households (0.23) was greater than

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that of coastal community households (0.22). Freshwater households had a lower vulnerability score (0.03) for the water component than coastal communities (0.17). Based on the incidents of flooding, droughts, storms and erosion, households in the coastal communities (0.50) were more vulnerable to natural disasters than those in the freshwater communities (0.41). Overall, coastal communities had a higher Livelihood Vulnerability Index (LVI) than freshwater (0.357 versus 0.356).This logical approach may be used to monitor vulnerability, programs and resources to assist fisherfolks. Also, there should be enlightenment on how to mitigate the factors enhancing climate change while good infrastructure and aids be given to those who suffer losses due to climate change impacts.

Keywords: Climate change; fisherfolks; subsistence; susceptibility; Ilaje fishing communities.

1. INTRODUCTION

Climate is the expected weather conditions of a given area over a period of time. However, any alteration in the climatic factors over the years, decades or centuries either naturally or through anthropogenic activities is termed climate change [1]. Climate change is a phenomenon that is known to have hazard effects on agricultural production and has been labeled as one of the greatest challenges of this age. Climate change could substantially alter the provision of the goods and services obtained from freshwater and marine ecosystems. The largest impacts to inland fisheries are likely to be driven by competition for scarce water resources with other more valued economic sectors. As an additional stressor, climate change impacts, such as increasing water temperature and altered discharge, are threatening approximately 50 percent of inland fish species [2,3], with decreased abundance in coldwater and coolwater fish as the most common directional response [4]. Evidence of climate change in coastal communities include severe flooding, severe storms, and the inundation of low-lying areas due rise in sea level. These usually results to loss of livelihood, especially among fisherfolks whose major source of livelihood depends on the natural environment. According to Omitoyin and Fregene [5] climate change is gradually modifying the distribution of fish species with changes in habitat, size, species diversification and productivity over the years.

Generally, out of all the continents, Africa has been known to be the most vulnerable continent to climate change. It has been reported that West Africa is one of the most vulnerable to the vagaries of the climate change, as the scope of the impacts of climate variability over the last three or four decades has shown from the record of [6]. Recent food crises in Nigeria are serving as a reminder of the continuing vulnerability of the region to the successive changing of climatic conditions [7]. The country is vulnerable to the impacts of climatic change as a result of desertification process progressing southward [8]. It was forecasted by Lam et al. [9] that Nigeria would suffer extreme loss in the economic output of fisheries in terms of direct, indirect or induced impacts from fisheries, in the 2050s under climatic change [10].

It was being reported by some experts that extreme weather conditions could affect multiple sectors adversely, challenging the livelihood and food security of high natural resource-dependent communities, particularly the fishing communities and fishery-based livelihoods [11,12]. The fisheries subsector of the Nigerian agriculture is an indispensable means for rural development through its provision of job, high-quality and cheap protein, and socioeconomic development of fishing communities [13,14]. According to the submission of [15], artisanal fishery in Nigeria is majorly from the marine and inland freshwater capture fisheries with up to about 60% of the artisanal fishery coming from marine water bodies. These artisanal fisheries is providing the nation with more than 82% of the domestic fish supply giving livelihoods to one million fishermen and up to 5.8 million small scale fisher folks.

Livelihood simply means the ways of making a living. According to Chambers and Conway [16] the submission of it entails the capabilities, assets (such as the material and social) and the activities needed for a means of living. It is said to be sustainable when it can cope and recover from the stress and shocks (drought, flood, war, dredging and the likes), maintain or enhance its capabilities and assets, while not undermining the natural resource base. According to FAO [17], vulnerability context is one of the factors that have controlling effects on livelihood and this refers to the full range of factors that can impact

on people's livelihoods and place them at the risk of becoming food insecure. Increasing temperatures due to high rates of melting ice, glacial retreat, drought and floods, have all had a big impact on the livelihood of locals [18]. Vulnerability to climate change is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change [19].

There are proved evident that the coastal communities in Nigeria are experiencing the impact of climate change on their livelihood. The research of [20] has shown that the effect of climate change in some parts of Ilaje Local Government Area of Ondo State will be pronounced soon. Fishing as the main source of livelihood by artisanal fisherfolks is declining due to climatic changes and over exploitation, making fishing income not able to meet the expected needs of the fisherfolks [21]. It is therefore paramount, to examine the vulnerability level of both the coastal and freshwater communities to climate related shocks and stress in order to give room for the communities that need much attention when considering climate change mitigation on their livelihoods.

The objective of this study is to assess the vulnerability level of the marine and freshwater communities of Ilaje Local Government of Ondo, Nigeria, to climate change.

The specific are:

i. to examine the socio-economic profile of the fishing community in these communities
ii. to ascertain the detrimental effects of climate change on the livelihood of the fisherfolks in the study areas
iii. to evaluate the most vulnerable region to the effect of climate change

2. MATERIALS AND METHODS

2.1 Study Locale

Ilaje Local Government is the largest Local Government in Ondo state, it is endowed with a shoreline that covers about 180 km thereby making Ondo state the longest coastline in Nigeria, it involves over 400 towns and villages, covering an area of 234,000 square kilometers [22]. Ilaje consist of resourceful dwellers that are mainly located along the coastline and engaged in fishing as their major source of livelihood for ages [23]. The estimated population of this location as excerpt from the National Population Commission census figures is less than 350,000 persons [24]. The region is located within longitude 5.166667˚E and latitude 7.366667˚N and shares boundaries with Ikale by the North, Ijebus by the West, Itsekiri by the East, Atlantic Ocean by the South, with the Apoi and Arogbo Ijaw to the North East (Fig. 1).

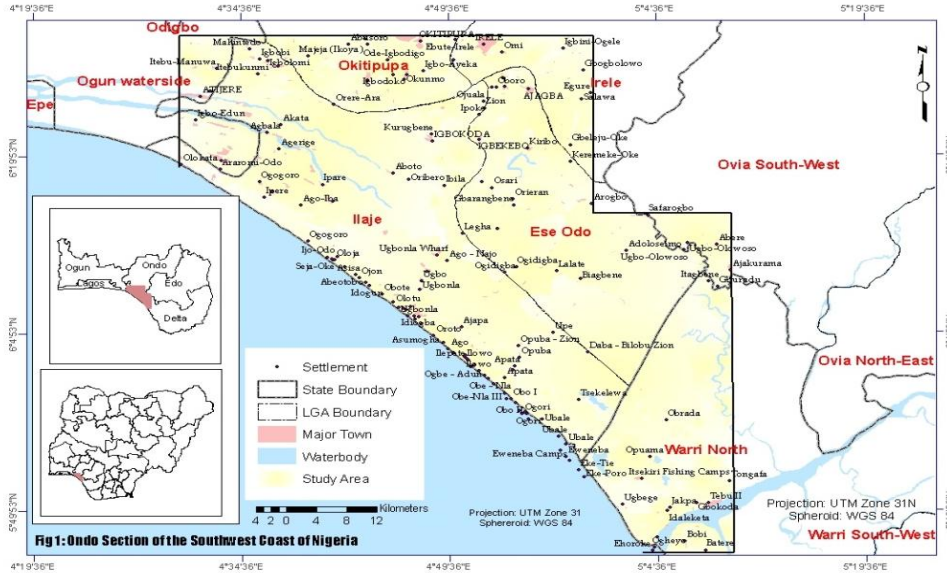

Fig. 1. Map of Ilaje, Ondo state [25]

2.2 Methods

Multi-stage sampling technique was used for the selection of two hundred (200) fishfolks from one of the two Agriculture Development Project (ADP) zones in Ondo State. In stage 1, Ilaje, a block from Ondo ADP zone was purposively selected for the study. In stage 2, Ilaje, one of the 10 blocks in Ondo ADP zone was selected and this block was further divided into eight (8) cells which comprises of four freshwater communities and four coastal communities, with each cells having sub-cells under it. The freshwater cells are: Mahintedo, Igbokoda, Mahin and Ugbonla while the communities under the coastal cells are: Etiikan, Zion-ipepe, Idiogba and Ayetoro. In stage 3, from each of the eight selected cells, 25 fish farmers were selected using simple random sampling techniques to give a total of 200 fish farmers. Structured questionnaire was used to obtained primary data (Socioeconomic, Climate change Vulnerability: exposure, sensitivity, adaptive capacity) from the selected 200 fisherfolks in both the marine and the freshwater communities of the area between February 2018 and November, 2018. Data were analyzed using the descriptive statistics (mean, frequencies and percentages) and Livelihood Vulnerability Index data were aggregated using a composite index and differential vulnerabilities were compared. The obtained data were processed using Statistical Package for Social Sciences (SPSS) software.

2.3 Assessing Vulnerability to Climate Change: The Livelihood Vulnerability Index (LVI)

The Livelihood Vulnerability framework is mainly pertinent to comprehending vulnerability to climate change because it provides a framework for evaluating both the key components that make up livelihoods and the contextual factors that influence them. The LVI was derived from all the households selected for the study, taking into account the IPCC definition of vulnerability to climatic impacts developed by Hahn et al. [26] and employed by Etwire et al. [27]. This is based on seven major components, namely socio-demographic profile, livelihood strategies, social networks, health, access to food, access to water and natural hazards, and climate change. Each component is made up of several indicators or sub-components, each of which is measured on a different scale; it is therefore necessary to standardize each as an index using either equation (1) or (2). Equation (1) was employed where a sub-component had a positive relationship with vulnerability while equation (2) was employed where a sub-component had a negative relationship with vulnerability.

Equation (1): Indexshi=Sh−SminSmax−Smin
Equation (2): Indexshi=Smax−ShSmax−Smin

where, Sh is the observed sub-component of indicator for household and
S_{min} and S_{max} are the minimum and maximum values, respectively.

After, each was standardized, the sub-component indicators were averaged using equation (3) to obtain the index of each major component;

Equation (3): Mh=∑I =1nindexshin

where, Mh is one of the seven major components [Socio-Demographic Profile (SDP), Livelihood Strategies (LS), Social Network (SN), Health (H), Food (F), Water (W), or Natural Hazard (NH)] for household *h*, $index_{shi}$ represents the sub-components, indexed by *I*, that make up each major component, and *n* is the number of sub-components in each major component.

Once values for each of the seven major components for a household were calculated, they were averaged using equation (4) to obtain the household-level LVI;

Equation (4):
LVIh = wSDPSDPh+wLSLSh+wHHh+wSNSNh+wFFh+wWWh+wNDCNDChwSDP+wLS+wH+wSN+wF+wW+wNV

The weights of each major component, wMi, were determined by the number of sub-components that made up each major component and were included to ensure that all sub-components contribute equally to the overall LVI. The LVI was scaled from 0 (low vulnerability) to 0.6 (extremely vulnerable).

3. RESULTS AND DISCUSSION

3.1 Demographic Characteristics of Respondents

This research find out that most of sampled fisherfolks in the coastal and freshwater communities were still below the age of 46 years

old (Table 1) which implied that they were still young and in their active years. In addition, the average age of the respondents was 41.59 (± 0.63) years old for those in the coastal area and 40.6 (±10.66) years for those in freshwater area.

The age distribution of fisherfolks in coastal and freshwater fishing communities shows that the fishers are still young, This is in conformity with the report of Okayi et al. [28] in their work on indigenous knowledge of shrimps and prawn species and fishing of the Benue and Niger river (middle – belt savannah) – Nigeria. Also, the studies conducted by Olawusi-Peters et al. [29] on gillnet fishing in Igbokoda coastline area of Ondo state, Akinwumi et al. [25] in their study on the characterization of artisanal fishery in the Coastal Area of Ondo State, Nigeria and Lawal et al. [30] study on the Socio-economic analysis of artisanal fishing operation in West and East Axes of Lagos State, Nigeria affirms that fishing is generally done by young people.

Data in Table 1 shows that the role of gender played an important role among fisherfolks in Nigeria. All of the respondents in the coastal area were male while 95% of the respondents in freshwater were male also. This is in agreement with many studies, including [25,30] is covered in their studies that fishing is majorly done by the male gender in two locations. The same trend was also observed in the work of [31] in Ogun State coastal communities. This may be due to the fact that women are mainly involved in fish processing and other fishing activities as they consider it less strenuous when compared to fishing [8].

All the respondents in in both coastal and freshwater communities were Christian, this is however contrast to the work of [32] in their work on artisanal fishing communities in Epe and Badagry areas of Lagos state. Christianity was the most prominent religion in the study area and it might be traced back to the early missionary that migrated via the coast to propagate their gospels in the early 1940s before the independence in 1960.

This research revealed that most (94% in the coastal communities and 67% in the freshwater communities) of these respondents owned their houses. Shelter is one of the basic needs of man, it is known that some people are homeless while some rent houses which they may not be able to maintain due to poor income. The fact that these ones are able to build their own houses is an evident that fishing is a profitable form of livelihood.

In both communities, fishing is the primary occupation, 77% and 74% of respondents in coastal and freshwater communities respectively, followed by fish related activities with 17% and 18% for coastal and freshwater communities respectively 18% for freshwater and coastal. This agreed with [33] who discovered that fishing is a major source of livelihood of fisherfolks in Ijebu-Waterside of Ogun State, Nigeria.

3.2 Livelihood Vulnerability to Climate Change

The result of the LVI sub component values for each area considered in this study as well as the minimum and maximum values for both combined. The dependency ratio was the same in both coastal communities and freshwater communities while the percentage of dependent individuals living in their households was higher for freshwater communities (90%) than coastal communities (60%) (Table 2)

The percentage of households that allowed children to source for livelihood was higher in coastal communities (53%) than freshwater area (52%). Children were supposed to be sent to school and be carter for, but many parents cannot afford this due to larger family size and vulnerability of their livelihood to disaster which had resulted into poor yield. Therefore, all they could do is to leave their children to fend for themselves. Koirala [34] opined that having smaller family in Makwanpur District Nepal makes it easy to send children to school rather than keeping a larger family. A higher percentage of freshwater household members reportedly rely solely on fishing as a source of income than coastal household members (freshwater 46%, Coastal communities 32%). In addition, equal numbers of households (36%) were found to have family members working in a different areas for livelihood diversification in both communities. This they do to search for greener pasture and to reduce pressure on a particular water body. This will help some people send remittances to their relatives, which help in building their resilience to climate change impacts [35,36]

Equal numbers of households (36%) in both communities reported that they do not approach the local government for assistance in the past

12 months. This could be as a result of lack of awareness of the benefit or unfair treatment of fishermen by the government. This is in line with the work of [37], who is of the opinion that the farming households preferred seeking assistance from their friends and relatives rather than from their local government authorities. Also, the respondents reported receiving more in kind assistance with ratio 1.42, frequently than borrowing money at the ratio of 1.39 for both locations.

Households in coastal communities reported travelling an average of 154.8 minutes because of none availability of hospital in their community while the households in freshwater communities travel for an average of 48.3 minutes. This long time in accessing health facilities will definitely increase their level of exposures to health vulnerabilities. Easy access to health facilities enhances the physical well-being of farmers, thus resulting to productivity at work [38]. Freshwater communities have access (63%) to health care facility in their communities whereas coastal fisherfolks have no hospital in their communities. Chronic illness was found to be more prevalent in the coastal communities (100%) than freshwater communities (97%). This is in agreement with the findings of [35] on Chepang community. According to [39] inadequate access to health services tends to decrease the health status of smallholder farming households, thereby increasing their vulnerability to extreme climatic conditions.

Food is the most essential commodities needed by man for survival and energy to carry out his/her daily activities. Yet, food availability is being disrupted by the aftermaths of climate change, 24% of both households borrow money to buy food while freshwater community households often eat less preferred meals with ratio 2.2 than coastal communities households with ratio 1.9. Food insufficiency was one of the implications of climate change reported by [40].

Both communities have good access to consistent water supply, however, households in the coastal communities reported to travel for an average of 44.75 minutes to get water while it takes an average of 12.6 minutes for households in the freshwater communities. This is in line with [41] in Brong-Ahafo region of Ghana. These people therefore need to be provided with pipe borne water to ensure easy and quick access to good quality and quantity water supply to reduce the household vulnerability to waterborne diseases associated with natural sources of water such as river, lake and stream.

Table 1. Demographic characteristics of respondents

Variables	Categories	Frequency (%)	Mean / Mode	SD	Frequency (%)	Mean / Mode	SD
		Coastal Communities			**Freshwater**		
Age (years)	18 -25	5 (5.0%)			4 (4.0%)		
	26 - 45	56 (56.0%)			64 (64.0%)		
	46 - 60	36 (36.0%)			28 (28.0%)		
	Above 60	3 (3.0%)			4 (4.0%)		
	Total	100 (100.0%)	41.59	0.63	100(100.0%)	40.6	10.66
Religion	Christian	100 (100.0%)			100 (100.0%)		
	Total	100 (100.0)			100 (100.0%)		
Gender	Male	100 (100.0%)			95 (95.0%)		
	Female	0 (0.0%)			5 (5.0%)		
	Total	100 (100.0%)			100 (100.0%)		
House ownership	Owned	94 (94.0%)			73 (73.0%)		
	Rented	6 (6.0%)			21 (21.0%)		
	Total	100 (100.0%)			100 (100.0%)		
Primary Occupation	Fishing	77 (77.0%)			74 (74.0%)		
	Fish related activities	17 (17.0%)			18 (18.0%)		
	Artisan	1 (1.0%)			1 (1.0%)		
	Civil servant	2 (2.0%)			4 (4.0%)		
	Farming	3 (3.0%)			3 (3.0%)		
	Total	100 (100.0%)			100 (100.0%)		

The percent of households that were not aware of climate change were more in the coastal communities (37%) than those in freshwater communities (23%). The result is a bit differ from the discovery of [42] that majority of respondents in their study area reported not to have received any warnings about potential floods and drought occurrence.

Also, the average reported number of floods, droughts and erosion in the coastal communities (16.125) was higher than freshwater communities (6.17) and the percent of households that did not receive warning about floods, droughts and erosions were more in freshwater communities (76%) than coastal communities (46%). Koirala [34] opined that floods were frequent climate related disasters occurring every year. Uninterrupted cycles of droughts and floods associated to damaging consequences for the social and economic development [43].

3.3 Indexed Sub-components, Major Components and Overall LVI for Coastal Region and Freshwater

Table 3 presents the major components and the composite livelihood vulnerability index (LVI) for both communities respectively. The result revealed that freshwater area showed greater vulnerability on the socio-demographic profile (SDP) index than coastal communities ($SDP_{coastal\ communities}$ 0.34; $SDP_{freshwater}$ 0.49). Freshwater also showed greater vulnerability on the livelihood strategies component (0.40) than coastal communities (0.45). The social networks indicators were the same for the two communities. In addition, the overall health vulnerability score for freshwater communities (0.46) was higher than that for coastal communities (0.44).Hazardous exposure to increased temperature can cause some illness and will also enhance the breed of mosquitoes which could leads to mosquito-borne diseases such as Dengue fever or Chikungunya transmission [44].

Also, the overall food vulnerability score for freshwater households (0.23) was greater than that of coastal communities' households (0.22). Nelson et al. [45] found that climate change could result in price increases for the most important agricultural crops—rice, wheat, maize, and soybeans—and that higher feed prices will result in higher meat prices. Even more severe food insecurity consequences have been documented for extreme weather events in other parts of the world [46]. Freshwater households had a lower vulnerability score (0.03) for the water component than coastal communities (0.17). Based on the incidents of flood, droughts, storms and erosion, households in the coastal communities (area) (0.50) were more vulnerable to natural disasters than those in the freshwater communities (0.41). Overall, coastal communities had a higher livelihood vulnerability index (LVI) than freshwater (0.357 versus 0.356). According to Benateau et al. [47] climate change is a pronounced phenomenon in freshwater bodies in Switzerland while [48] opined that climate change will ultimately affect the supply and quality of freshwater lakes and rivers throughout the world. This finding corroborate that of [42] which revealed that the households in Kombo South may be more vulnerable to climate change and its variability than Lower Niumi districts in Gambia.

Table 2. Livelihood Vulnerability Index (LVI) sub component values and minimum and maximum sub-component values in Coastal and Freshwater communities of Ilaje fishing communities

Major component	Sub-Component	Units	Coastal commu-nities	Freshwater communities	Maxi-mum value	Mini-mum value
Socio-Demographic profile	Dependency ratio	Ratio	0.087	0.087	1	0
	Percent of dependent individuals living in your house	Percent	60	90	100	0
Livelihood strategies	Percent of household that do have solely fishing as their source of income	Percent	32	46	100	0
	Percent of households that allow children to work for livelihood		53	52	100	0

Major component	Sub-Component	Units	Coastal communities	Freshwater communities	Maximum value	Minimum value
	Percent of households with family member working in a different community	Percent	36	36	100	0
Social networks	Average receive: give ratio	Ratio	1.42	1.42	4	0.3
	Average borrow: money ratio	Ratio	1.39	1.39	2	0.5
	Percent of households that have not gone to community leaders for assistance in the past 12 months	Percent	36	36	100	0
Health	Average time to Health facility	Minutes	154.8	48.3	420	30
	Percent of households with hospital in their community	Percent	0.0	63	100	0
	Percent of household with family members that have chronic illness	Percent	100	97	100	90
Food	Percent of households that borrow money to buy food	Percent	24	24	100	0
	Average times that less food preferred were consumed	Ratio	1.95	2.2	10	0
Water	Average time to water source	Minutes	44.75	12.6	120	5
	Percent of households that do not have consistent water supply	Percent	0	0	100	0
Natural disasters	Percent of households that are not aware about climate change	Percent	37	23	100	0
	Average number of flood, droughts, storm and erosion	Count	16.125	6.17	24	0
	Percent of households that did not receive warning about flood, droughts, storm and erosion	Percent	46	74	100	0

3.4 Livelihood Vulnerability to Climate Change

Fig. 2 depicts the results of the major component calculations which were collectively presented in a spider diagram. The scale of the diagram ranges from 0 (less vulnerable) at the center of the web, increasing to 0.5 (more vulnerable) at the outside edge. The diagram showed that freshwater is more vulnerable in terms of socio-demographic profile and health while coastal region was more vulnerable in terms of natural disasters and livelihood strategies.

Climate change vulnerability of fisherfolks in Ilaje fishing communities was viewed in reference to their Livelihood. The Livelihood Vulnerability Index incorporated the IPCC vulnerability definition (LVI-IPCC framework) which had seven major components. These were: socio-demographic profile, livelihood strategies, health, social networks, food, water and natural disaster & climate variability.

Table 3. Indexed sub-components, major components and overall LVI for coastal region and freshwater

Sub Component	Coastal communities	Fresh water	Major component	Coastal communities	Fresh water
Dependency ratio	0.09	0.09	Socio-Demographic profile	0.34	0.49
Percent of dependent individuals living in your house	0.60	0.90			
Percent of household that do have solely fishing as their source of income	0.32	0.46	Livelihood strategies	0.40	0.45
Percent of households that allow children to work for livelihood	0.53	0.52			
Percent of households with family member working in a different community	0.36	0.36			
Average receive: give ratio	0.30	0.30	Social networks	0.42	0.42
Average borrow: money ratio	0.59	0.59			
Percent of households that have not gone to community leaders for assistance in the past 12 months	0.36	0.36			
Average time to Health facility	0.32	0.05	Health	0.44	0.46
Percent of household with hospitals in their community	0.00	0.63			
Percent of household with family members that have chronic illness	1.00	0.70			
Percent of households that borrow money to buy food	0.24	0.24	Food	0.22	0.23
Average times that less food preferred were consumed	0.20	0.22			
Average time to water source	0.35	0.07	Water	0.17	0.03
Percent of households that do not have consistent water supply	0.00	0.00			
Percent of households that are not aware about climate change	0.37	0.23	Natural disasters	0.50	0.41
Average number of flood, droughts, storm and erosion	0.67	0.26			
Percent of households that did not receive warning about flood, droughts, storm and erosion	0.46	0.74			
Overall Livelihood Vulnerability Index (LVI)					
LVI: Coastal area			0.357		
LVI: Freshwater			0.356		

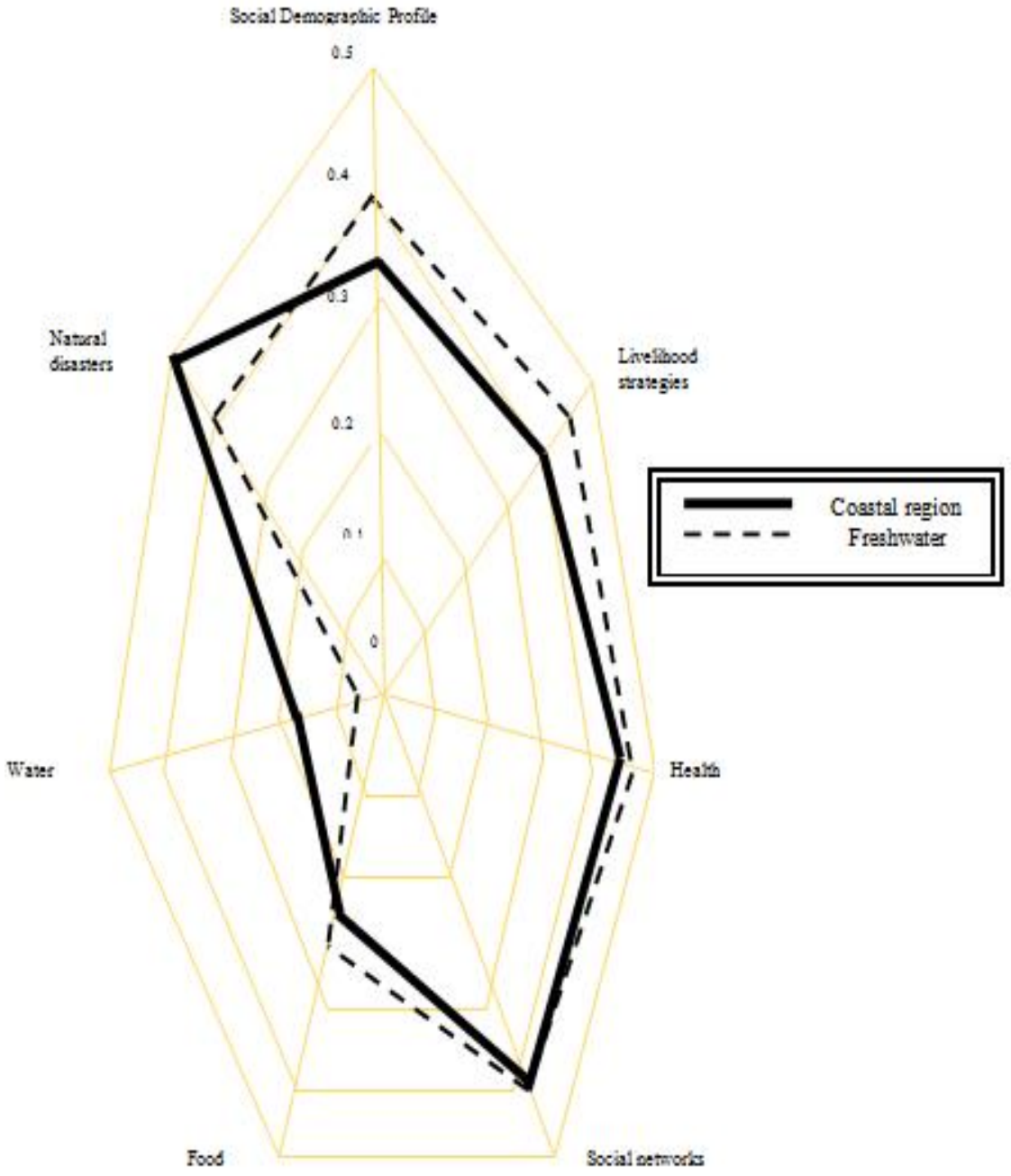

Fig. 2. Vulnerability spider diagram of the major components of Livelihood Vulnerability Index (LVI) for Coastal region and Freshwater area in Ilaje fishing communities, Ondo State

Source: Field Survey, 2018

The major vulnerability components represented in Fig. 2 provided information on the degree at which each household characteristics contributed to climate change vulnerability in each communities. For the coastal communities in Ilaje fishing communities, natural disaster contributed 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 contributed the least with index value of 0.22 and 0.17 respectively, this is at variance with the work of [26] in their study on Moma coastal fishing communities in Mozambique, and [49] who discovered that socio-demographic characteristics contributed the most to livelihood vulnerability of three coastal fishing communities in Akwa Ibom State, Nigeria. This corroborate the report of Limuwa et al. [50] who revealed that natural disasters are the major cause of low fish catch among fishers in Malawi and also similar to that of [51] that ranked natural disasters as the main climatic factors affecting the livelihood of farmers in Ethiopia.

The freshwater fishing communities in Ilaje had socio-demographic profile contributing 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. [26] on the livelihood vulnerability study on Mabote (freshwater community) in Mozambique. Coastal and freshwater fishing communities in Ilaje showed the least vulnerability (below half, 0.25) in relation to food and water.

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. [26] 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.

4. CONCLUSION AND RECOMMENDATION

This present study examines the livelihood vulnerability of freshwater and coastal fishing households of Ilajelocal government in Ondo state, Nigeria. The empirical results revealed that fisherfolks in freshwater households were more vulnerable in terms of major components such as socio-demographic profiles, livelihood strategies, health and food than those in coastal community. On the other hand, fisherfolk households in coastal community were more vulnerable in terms of natural disaster and water. While vulnerability in terms social network is the same for the two communities. However, the overall LVI computed from the major components indicate that fisherfolk households in coastal community were more vulnerable to climate change, with an index of 0.357 compared with that of freshwater households with 0.356. The results from this study connoted that climate change is being experienced in Ilajelocal government in Ondo state, Nigeria, and freshwater and coastal fishing households are being adversely affected by this incident.

The study suggests that there is a need to build more community health centers in both communities to reduce the time taken to reach a health facility and to provide maximum healthcare service that could leads to sound health needed for high productivity. Secondly, freshwater community should be given priority by both government and non-governmental agencies in terms of distribution of income generating and food security projects in order to reduce their farming households' vulnerability to food. Thirdly, there is a need to construct more boreholes in the in coastal community, to reduce the time taken to fetch water and to ensure availability of disease-free water. Moreover, since the majority of the respondents in both communities did not receive warning about impending disasters, they fisherfolks should be enlightened about the imminent natural disasters such as floods, droughts, erosion and storms,. Finally, given that the overall vulnerability of the coastal community is higher than that of the freshwater households, the community being a major platform for fishing should be closely monitor to reduce impact of climate changes on the livelihood of the households in this communities.

CONSENT

As per international standard or university standard, participant’s written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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