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IMPACT OF FLOODING ON LIVELIHOODS AND MITIGATION STRATEGIES IN SELECTED COASTAL COMMUNITIES IN AKWA IBOM STATE

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Abstract: In this study, impact of flooding on livelihoods in Obianga, Emereoke, Inua Eyet Ikot and Iwuo Okpom Opulom Communities of Eastern Obolo and Ibeno Local Government Areas, Akwa Ibom State was assessed. The study adopted cross-sectional survey with sample population comprised of inhabitants in the coastal communities which was determined using purposive and random sampling techniques via by Godden formula. Data were collected from primary (researcher-made questionnaire) and secondary sources (archives, agricultural / meteorological stations and United States Geological Surveys). Data collected comprised of participants' demographic characteristics, their perspective on the degree of flood tendency in their communities, digital elevation model (DEM) output of flood tendencies using climatic data variables between 2010 to 2019, major livelihood activities, their vulnerabilities to flooding and coping strategies to mitigate the impact of flooding on livelihoods. Ethical issues were upheld before copies of questionnaire were administered and collected back. Data were analyzed using geographical information (GIS) techniques, ArcGis software 10.3 and Microsoft Excel 2016. A total of 287 respondents were interviewed.

The demographic characteristics revealed that more household heads were men, majority were young people, whereas the singles were migrants. Household earning was negligible with an average size of five people. Iwuo Owo Opulom Community had more flooding destructive tendency than Obianga.

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Emereoke Community may be subjected to flooding overtime whereas Inua Eyet Ikot Community may gradually become flood risk site if neglected as assessed participants. Three (3) main livelihoods were crop production, fishing and trading. Fishing, crop production and trading livelihoods in Ibeno district (Inua Eyet Ikot Community) had the highest vulnerability scores of 0.225, 0.178 and 0.165 respectively. These imply that Inua Eyet Ikot Community is the most vulnerable to flooding than the others. Local coping strategies to mitigate flood impact comprised of physical assets, social networks, credit facilities, insurance and government waivers and alternative livelihoods. It was suggested that drainage systems should be constructed and precise flood warning system should be amounted particularly in the flood prone areas through various agencies and NGOs.

***Keywords**: Flooding, Livelihoods, Coastal Communities, Mitigation strategies*

INTRODUCTION

Environmental catastrophes are not only resulted from natural drivers but have also been fostered by human interventions [1]. World population has surpassed 7.7 billion people with probability to reach nine billion by 2030 [2]. Meaningfully, 44% of the world population, lived within 150 km of the world' coastlines. The mean population density in these coastal areas is expected to rise to 80 people / km^2. In addition, coastal populations are increasing faster than those of inland populations in many countries. Globally, it is well known that a cumulative share of the populace and economic assets lie in areas prone to riverine and coastal flood menace. These trends have geometrically observed [3]. Majority of the inhabitants in coastal region, for example, in Nigeria, are associated with either agriculture or fishing or both, which are extremely dependent on the natural ecosystems. Unfortunately, livelihoods in these regions have progressively decreased pushing farmers and fishermen to look for other livelihoods over the past decades [4]. Factors responsible for heavy flood hazard are numerous and correlated. It was revealed that the possible climate variations are anticipated to cause an increase in the frequency, and rainfall intensity, which may result in a more extensive and fatal natural catastrophe [5]. Evidence has shown that the influence of climate variation on livelihoods is probable to be experienced by smallholder farmers who is deficient in essential means for adaptation [6]. Ionita and Nagavciuc [7] reported that some scientific evidence of an upsurge in average precipitation and precipitation intensity, which suggests that extreme flood events might become more recurrent. Flooding has been observed to worsen poverty levels and vice versa. However, community resilience and ability to deal with both flooding and poverty have been established to be inefficient in most communities. For instance, in the just year 2010 alone, floods had contributed 82.6% of all catastrophes that happened in the African continent, an increase from 66.5% that was observed in 2009, [8].

Africa's poverty would persist and possible be worsen as proved by the noticeable low life expectancy, low per capita income, disease and hunger [9]. As such, upsurged poverty levels in Africa have forced people to live under vulnerable situations [10]. Again, impact of flood resulting from sea level rise on livelihoods would continue to be aggravated because coastal areas are usually highly populated with many economic opportunities.

High population density along coastal regions is motivated by the fertile land, transport opportunities and easy access to sea food, etc. [11] and coastal areas are highly productive areas [12]. Rises in sea levels had negatively impacted several coastal regions of the world, especially in developing nations [13]. In Nigeria, more people are living in unhealthy regions due to poverty and poor governance, majorly as impacts of natural calamities, and its consequences [14]. A careful looked at several studies related to flooding along coastal regions [15, 16, 17, 18, 19, 20, 21, 22, 23] only produced a link between flooding and livelihood and majority focused on the poor rural inhabitants and not on their sources of livelihood. Some previous researches centered on geographical information system and remote sensing, cross sectional surveys and use of secondary data. This present study used the mixed methods of Geographical Information System (GIS) and survey method to obtain information. Therefore, more awareness had to be created on the impact of flooding on livelihoods and mitigation strategies in selected coastal communities: Iwu Owo Opulom, Inua Eyet Ikot, Emeroeke and Obianga in Ibeno and Eastern Obolo LGAs respectively, in Akwa Ibom State. The study would establish underlying causes of vulnerability of people in these communities and would give key inputs in designing of sustainable mitigation measures to minimize the impacts of coastal flooding in Akwa Ibom State.

METHODOLOGY

Study Area

The study areas were some coastal communities (Obianga, Emereoke, Inua Eyet Ikot and Iwuo Okpom Opulom) found in Eastern Obolo and Ibeno Local Government Area (LGA) of Akwa Ibom State (AKS), Nigeria. However, Eastern Obolo LGA lies between latitudes 4°28' and 4°53' and longitudes 7°50' and 7° 55' East whereas Ibeno LGA lies between 4°33′N and 8°4′E. The major occupation of the inhabitants is fishing. Hence, most of them are fishermen. However, crop production and inconsequential trading are also found, [24].

Fig. 1. The location of the study, [24].

Research Design, Sampling Method, Population and Sample Size

Research design adopted was cross-sectional survey. The sampling techniques used were purposive and random sampling techniques. The population consisted of inhabitants in the coastal communities in Akwa Ibom State. The sample size (n) was found using Z as 1.96 for 95% confidence level, P as % population [25] and C as 0.05 for confidence interval in Godden formula given in Equation (1):

$$n = \frac{Z^2.P.\ (1-P)}{C^2} \quad (1)$$

Sources of Data and Data Collation Modes

The study data were obtained from both primary and secondary sources. A researcher-made questionnaire was used. It contained either closed-ended or open-ended questions or both. The secondary data were gathered from archives, agricultural / meteorological stations [25, 26].

However, data collection modes were as follows:

(a) Demographic Characteristics

The respondents were requested to provide their sex, age range, income and marital status and house hold size;

(b) Flood Status in the Study Areas

- The respondents were to access the degree of flood tendency in their communities;
- The researcher used digital elevation model (DEM) of 90 m × 90 m resolution from United States Geological Surveys, USGS, to collect climatic data variables, rainfall pattern and temperature data between 2010 to 2019 from Maritime Academy of Nigeria, NiMet office, Akwa Ibom Airport, and Accuweather Centre in assessing flood risk sites, its nature and possible impact on livelihood of the inhabitants.

(c) Livelihood Activities and their Vulnerabilities to Flooding

The major livelihood activities in the study areas were established. Their vulnerabilities to flooding from the household survey [27] were computed with respect to the following five (5) components as: (i) socio-economic variables (SDP) which had 5 subcomponents (dependency ratio, % female-headed households, average age of female head of household, % households head not attended school, % households with orphans), (ii) social Network (SN) which had 3 subcomponents (average receive: give ratio, average borrow: lend money ratio, % households that had not gone to their local government for assistance in the past 12 months), (iii) livelihood strategies (LS) had 3 subcomponents (% households with family member working in a different community, % households dependent solely on a single livelihoods such as fishing, artisan, trading, crop farming as a source of income, average rural livelihood diversification index), and (iv) climatic factors and natural disaster events (CN) had 3 subcomponents (mean standard deviation of monthly average of maximum daily temperature since 2010, mean standard deviation of monthly average precipitation since 2010, % households with an injury or death as a result of flood since 2010).

However, each component was measured on a different scale and standardized as an index ($\mathrm{Index_{Sd}}$) using $\mathrm{S_d}$ as the observed sub-component indicator for district *d,* $\mathrm{S_{min}}$ and $\mathrm{S_{max}}$ as minimum and maximum values, respectively in Equation 2 [27].

$$\mathrm{Index_{Sd}} = \frac{\mathrm{S_d} - \mathrm{S_{min}}}{\mathrm{S_{max}} - \mathrm{S_{min}}} \quad .. \quad (2)$$

Then, the sub-component indicators ($\mathrm{Index_{Sdd}}$), indexed by *i*, were averaged using *n* as number of sub-components in each major component in Equation 3 to obtain the index of each major component ($\mathrm{M_d}$) as:

$$\mathrm{M_d} = \sum_{n=i}^{n} \left(\frac{\mathrm{Index_{Sdd}}}{n}\right) \quad .. \quad (3)$$

Once the values for each major component for a region were calculated, they were averaged to obtain the district-level LVI ($\mathrm{LVI_d}$) using $\mathrm{W_{mi}}$ as the weights of each major component in Equation 4 as:

$$\mathrm{LVI_d} = \frac{\sum_{i=1}^{4} (\mathrm{W_{mi}} \cdot \mathrm{M_{di}})}{\sum_{i=1}^{4} (\mathrm{W_{mi}})} \quad .. \quad (4)$$

Thereafter, the major components were first combined according to three categories namely: exposure, adaptation capacity and sensitivity using Equation 5 to obtain IPCC-defined contributing factor (exposure, sensitivity, or adaptation capacity) [$\mathrm{CF_d}$] for district, d.

$$\mathrm{CF_d} = \frac{\sum_{i=1}^{n} (\mathrm{W_{mi}} \cdot \mathrm{M_{di}})}{\sum_{i=1}^{n} (\mathrm{W_{mi}})} \quad .. \quad (5)$$

Once exposure, sensitivity, and adaptation capacity were calculated, the three contributing factors were combined using Equation 6 as:

$$\mathrm{LVI - IPCC_d} = (\mathrm{e_d} - \mathrm{a_d}) \times \mathrm{S_d} \quad (6)$$

Where,

$\mathrm{LVI - IPCC_d}$ is the LVI for district,

d expressed using the IPCC vulnerability framework;

$\mathrm{e_d}$ is the calculated exposure score for district,

d (equivalent to the natural disaster and climate major component),

$\mathrm{a_d}$ is the calculated adaptive capacity score for district,

d (weighted average of the socio-demographic profile and social networks major components), and

$\mathrm{S_d}$ is the calculated sensitivity score for district, d (weighted average of the livelihood strategies major components).

Besides, the LVI-IPCC computation for the study was scaled from 0.01− 0.049 (very low vulnerability), 0.05− 0.099 (low vulnerability), 0.10− 0.149 (moderate vulnerability), 0.15− 0.199 (high vulnerability), and 0.20−0.249 (very high vulnerability) (Yusuf and Francisco, 2009; IPCC 2001). The implication is that a higher net value indicates higher vulnerability and lower net value indicates lesser livelihood vulnerability to flooding.

(d) Coping Strategies to Mitigate the Impact of Flooding on Livelihoods

The household heads were asked to indicate various coping strategies practiced to build their resilience and also mitigate the impact of flood events on their livelihoods based on the following options in the questionnaire: (I) ownership of fishing canoe, boats and nets, (II) construction of drainage/sand bags, (III) planting of shrubs/trees/cover crop, (IV) strength of social networks, (V) Form local groups/belong to cooperative society, (IV) use insurance/credit facility, (VII) availability/access to early warning system, (VIII) alternative livelihoods, (IX) international donation/supports and (X) remittance from family members.

Ethical Issues, Instrument Administration

In taking care of ethical issues, participants were informed of the purpose of the study before copies of questionnaire were administered by trained research assistants. They were also asked not to write their names on questionnaire, and feel to response to any item they desired. Key informant interview (KII) was conducted using two village heads, community leader, youth leaders and a church leader in a local dialect which was later translated into English language. Besides, copies of questionnaires were randomly administered to household heads and collected back for analysis. Again, in-depth discussion and interview were conducted on focus group who were affected by flood within the selected communities.

Method of Data Analysis

The analytical techniques included GIS techniques, descriptive and multivariate statistical analysis. The data obtained from the questionnaire were subjected to descriptive and multivariate analysis. Digital elevation model was obtained and analyzed using ArcGis software 10.3 in analyzing the topography of the study area for flood risk assessment

RESULT AND DISCUSSION

(a) Demographic Characteristics of the Respondents

The demographic characteristics of the respondents (household heads) such as sex, age range, income, marital status and household size are presented in Figures 2, 3, and Tables 1 and 2. There were more male respondents than females. About 61.7% were males, while 38.3% were females. However, a total of 287 respondents were interviewed.

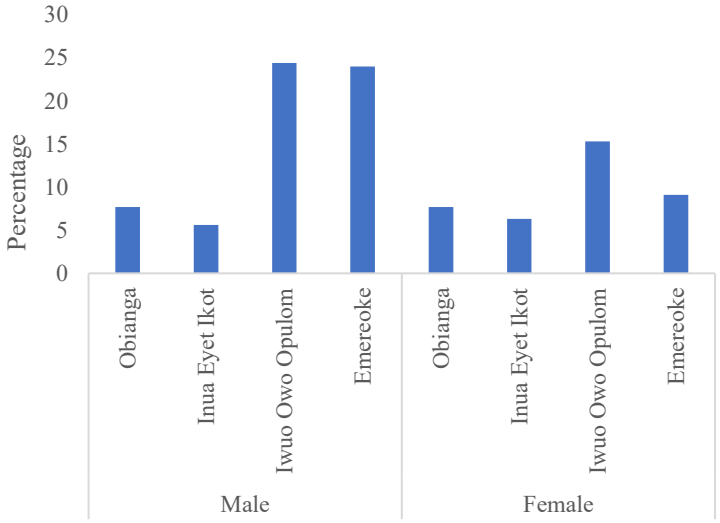

Fig. 2. Sex composition of household heads in each location

Table 1. Age range of the respondents

Age Range (Years)	Location	Percent (%)
<18	Obianga	4.9
20-39		5.6
40-59		3.9
>60		1.4
<18	Inua Eyet Ikot	5.6
20-39		3.8
40-59		1.0
>60		1.4
<18	Iwuo Owo Opulom	8.0
20-39		17.1
40-59		14.6
>60		0.3
<18	Emereoke	4.1
20-39		21.0
40-59		4.5
>60		3.4

From the Table 1, the majority of the household heads were between 20-39 years (47.5%), mostly in Iwuo Owo Opulom (17.1%). Those between the ages of 40-59 years were 24%, while 22.6% of the respondents were less than 18 years. The study further established that 6.2% of the respondents were more than 60 years.

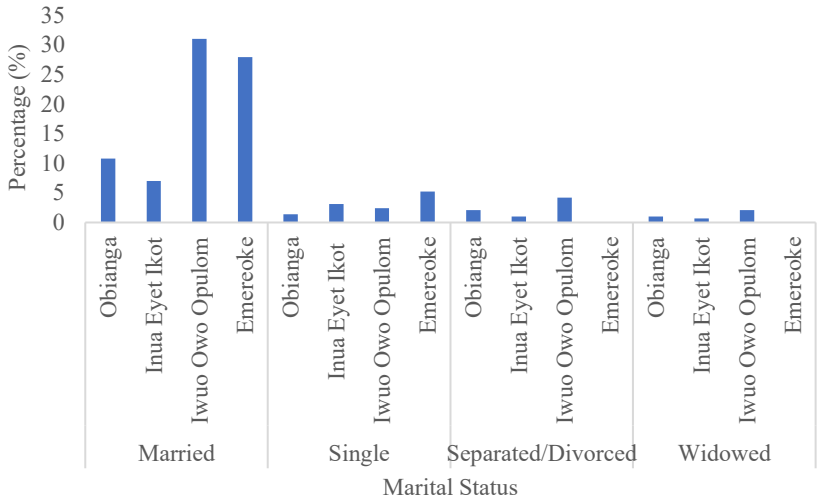

Fig. 3. Marital status of household heads

From the Figure 3, about 76.7% of the respondents were married whereas 12.2% were single. The separated/ divorced and widowed were 7.3% and 3.8% respectively.

Table 2. Income level of the respondents

Income Level (Naira or N)	Location	Percent (%)
2,000-5,000	Obianga	2.1
	Inua Eyet Ikot	1.0
	Iwuo Owo Opulom	7.7
	Emereoke	4.9
5,001-10,000	Obianga	3.1
	Inua Eyet Ikot	1.0
	Iwuo Owo Opulom	4.5
	Emereoke	4.5
10,001-15,000	Obianga	3.5
	Inua Eyet Ikot	2.1
	Iwuo Owo Opulom	8.7
	Emereoke	9.4
15,001-25,000	Obianga	4.2
	Inua Eyet Ikot	2.8
	Iwuo Owo Opulom	4.5
	Emereoke	10.1
> 25,000	Obianga	2.4
	Inua Eyet Ikot	4.9
	Iwuo Owo Opulom	14.3
	Emereoke	4.2

Table 2 shows that 25.8% of the respondents earn more than N25,000 in a month with Iwuo Owo Opulom (14.3%) having the highest proportion compared to Obianga (2.4%). Again 23.7% and 21.6% of the respondents earn between N10,001 - N15,000 and N15,001 – N25,0000 per month respectively.
Furthermore, the range: N2,000 – N5,000 and N5,001 – N10,000 per month were earned by 15.7% and 13.1% of the respondents accordingly. Besides, the household size of the respondents is shown in Table 3.

Table 3. Household size of the respondents

Household Size	Location	Percent (%)
1-2	Obianga	1.0
	Inua Eyet Ikot	1.4
	Iwuo Owo Opulom	3.1
	Emereoke	6.2
3-5	Obianga	7.7
	Inua Eyet Ikot	3.1
	Iwuo Owo Opulom	19.2
	Emereoke	6.3
6-8	Obianga	5.9
	Inua Eyet Ikot	5.9
	Iwuo Owo Opulom	5.6
	Emereoke	17.4
9-10	Obianga	0.7
	Inua Eyet Ikot	1.0
	Iwuo Owo Opulom	5.6
	Emereoke	2.9
>10	Obianga	0.0
	Inua Eyet Ikot	0.3
	Iwuo Owo Opulom	6.3
	Emereoke	0.0

From Table 3, the study established that household with less than 3 members were 11.7% whereas 36.3% of the household had 3 - 5 members, and 34.8% had 6 - 8 members. Those with 9-10, and more than 10 members were 10.2% and 6.6% respectively.

(b) Flooding Status in the Communities by the Respondents

The flooding status as responded by the participants in Iwu Owo Opulom, Obianga, Emereoke and Inua Eyet Ikot communities are presented in Table 4. Iwuo Owo Opulom community had the highest flooding intensity (46%), followed by Emereoke (30%), next by Obianga (14%), and lastly, Inua Eyet Ikot with the lowest percentage (10 %).

Table 4. Flooding Status in the Communities

S/N	Communities	Percent (%)
1	Iwu Owo Opulom	46
2	Obianga	14
3	Emereoke	30
4	Inua Eyet Ikot	10
	Total	100

(c) Nature of Flooding by Digital Elevation Model (DEM)

Here, the flood risk sites in the study areas were captured using climatic data variables. Figure 4 shows the digital elevation model (DEM) of Eastern Obolo and Ibeno Local Government areas (Emeroke, Obianga, Inua Eyet Ikot and Iwuo Owo Opulom).

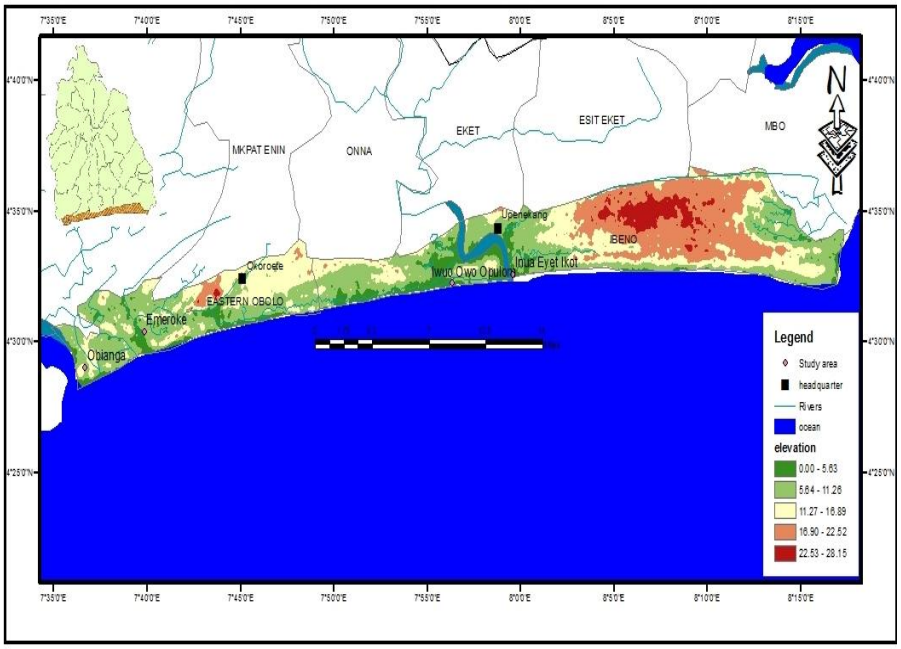

Fig. 4. DEM of Eastern Obolo and Ibeno LGAs

However, the rainfall data of the study areas between 2010 – 2019 is presented in Figure 5.

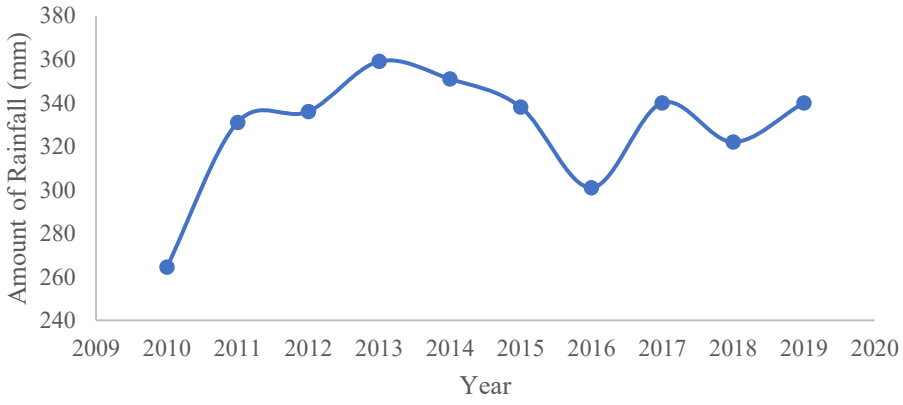

Fig. 5. Rainfall data of the study areas between 2010-2019.

As shown in Figure 5, in 2010, annual rainfall pattern rose steadily to a peak in 2013; and then dropped in 2016 before rose again between 2017 and 2019. The lowest amount of rainfall (264.4 mm) was in 2010 and the highest (364 mm) was seen in 2013. Another important climatic variable is temperature. Soils or areas that had experienced drought conditions for a certain period often get flooded during an episodic rainfall. However, the temperature data of the study areas between 2010-2019 is shown in Figure 6.

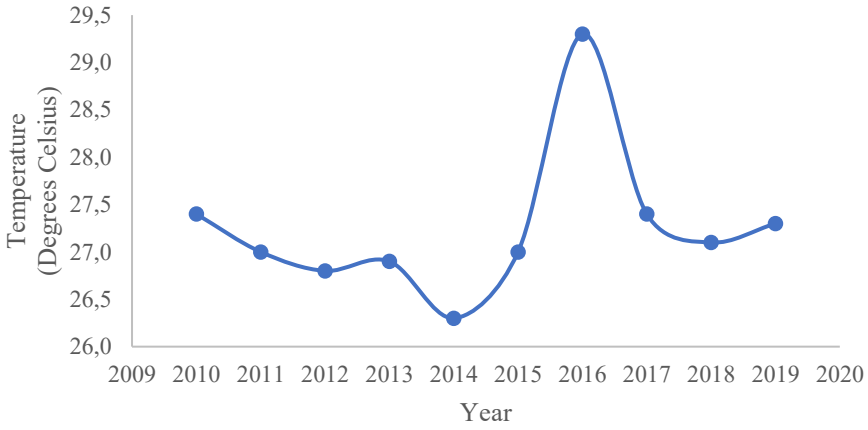

Fig. 6. Temperature data of the study areas between 2010-2019

As shown in Figure 6, temperature recorded a downward trend up to 2014 at 26ºC as the lowest annual temperature and peaked drastically in 2016 (29ºC) before further making a steep downward and steadily in 2019.

(d) Livelihood Activities and their Vulnerabilities to Flooding

The livelihood activities in the study areas are presented in Figure 7.

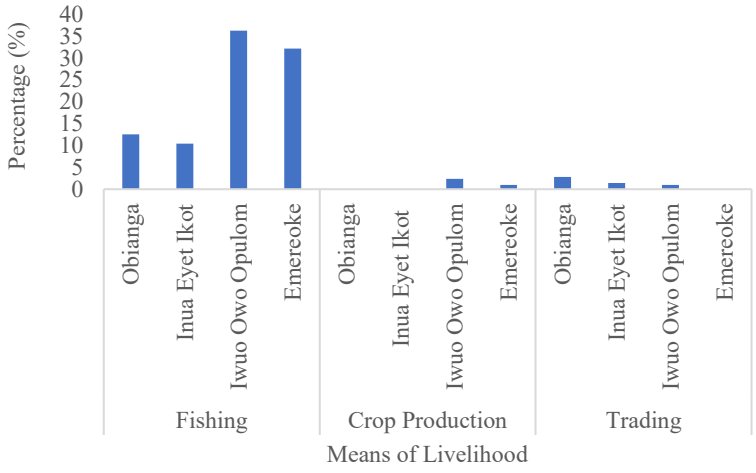

Fig. 7. Livelihood activities in the study area

Three (3) major livelihoods in the study areas were crop farming, fishing and trading. From Figure 7, 90.9% of the respondents depended on fishing as their major source of livelihood. This was followed by trading (5.6%) whereas 3.5% depended on crop production which is mostly subsistence farming. Nevertheless, Inua Eyet Ikot had highest (36.2%) in fish production. However, the major components of vulnerability were socio-demographic profile (SDP), social network (SN), livelihood strategies/adaptation (LS) and climate / natural disasters (CN). The summary of vulnerability of livelihood to flooding in the study areas is shown in Table 5.

Table 5. Vulnerability of livelihood to flooding

Livelihood	Location	Vulnerability Score
Fishing	Obianga	0.137
	Emereoke	0.130
	Inua Eyet Ikot	0.225
	Iwuo Owo Opulom	0.174
Crop Production	Obianga	0.098
	Emereoke	0.072
	Inua Eyet Ikot	0.178
	Iwuo Owo Opulom	0.166
Trading	Obianga	0.013
	Emereoke	0.111
	Inua Eyet Ikot	0.165
	Iwuo Owo Opulom	0.115

In Table 5, vulnerability of fishing livelihood to flooding varied across the study areas. Fishing livelihood in Ibeno district were highly vulnerable to flooding. For instance, Inua Eyet Ikot Community had the highest vulnerability score (0.225), followed by Iwu Owo Opulom Community with vulnerability score of 0.174. In Eastern Obolo district, Obianga and Emereoke Communities with vulnerability scores of 0.137 and 0.130 respectively, were moderately susceptible to flooding. In term of vulnerability of trading to flooding, Inua Eyet and Iwu Owo Opulom Communities had high vulnerability scores of 0.165 and 0.115 respectively. In Eastern Obolo district, Obianga recorded a very low vulnerability score (0.013) compared to that of Emereoke community (0.111) which was moderately vulnerable to flooding. Although crop farming activity was negligible, in Eastern Obolo district, Emereoke and Obianga communities had low vulnerability scores of 0.072 and 0.098 respectively. Conversely, Iwu Owo Opulom and Inua Eyet Communities in Ibeno district had high vulnerability scores of 0.166 and 0.178 respectively.

(e) Local Coping Strategies to Mitigate Impact of Flooding on Livelihoods

The local coping strategies to mitigate flood impact on livelihoods in the study areas are presented in Figure 8. These comprise of physical assets, social networks, credit facilities, insurance and government waivers and alternative livelihoods.

	Emereoke	Obianga	Iwu	Inua Eyet
Social network	38	22	29	11
Physical assets	32	30	10	28
Credit facilities/insurance	22	32	26	20
Alternative livelihoods	37	29	15	19

Fig. 8. Local Coping strategies to mitigate flood impact on livelihoods

DISCUSSION OF RESULTS

(a) Demographic Characteristics

From Figure 2, more households were headed by men, and this may be attributed to nature of the livelihood common in the study areas. For instance, fishing is dominated by men. It was established from a key informant that most occupants of the areas were migrants from the adjourning local government area looking for cheap labour. Again, the majority of the people in the study areas were young as seen in Table 1. This may be due to the fact that, fishing activity is mostly carried out by young people since it is a tedious job that requires much energy. In line with this, one of the main informants commented: "*…the old people will not be fishing any longer rather they will go into subsistence farming and trading*". Furthermore, the outcome in Figure 3 revealed that the singles were the migrants and job seekers that came from the hinterland or adjourning local government areas according to the key informant. Again, Table 2 further revealed that household earning was negligible due to weather conditions especially when there was flooding which might hinder them from fishing, trading and farming. Nevertheless, taxes levied by the community councils and sea pirates might also rob them of their assets like boat, engine and goods on the high sea. Besides, the trends in Table 3 showed that the average household size was five members which further implies that many households had 3 - 5 members and this may be the reason the livelihood and earning got depleted so fast, and they must have been demanding much resources.

(b) Flooding Status by the Respondents and Nature of Flooding by Digital Elevation Model (DEM)

In Table 4, Iwuo Owo Opulom Community had more flooding destructive tendency than Obianga, though the floods were intense but not destructive. The respondents in Emereoke Community commented that the flood normally encroached overtime with intensity. Besides, the flooding status in Inua Eyet Ikot Community was not intense but might gradually become a threat if neglected by participants' assessment.

Furthermore, the south-east drainage pattern in Eastern Obolo (Obianga and Emeroke), as seen in Figure 4, was highly influenced by coastal flooding. Similarly, that of Ibeno (Inua Eyet Ikot and Iwuo Owo Opulom) was mostly influenced by the Kwa Iboe River and its tributaries. Again, rainfall as an important climatic variable had also induced flooding in the study areas. Rainfall intensity, duration and frequency are essential elements for assessing flood events and perturbation. As observed in Figures 5 and 6, the rainfall and temperature trends revealed that flooding had been increasing over the past ten years compared to the recent years because it had been very intense and destructive. It had destroyed a lot of facilities, hindered fishing, traders and water transportation systems predominately in Iwuo Owo Opulom. This finding agrees with Fabiyi and Yesuf [28] that the coastal communities are undergoing rapid changes through flood by ocean surges and increase rainfall. Key informant interviewed further revealed that some areas were under threat because their houses are almost taken over by flood.

(c) Livelihood Activities and their Vulnerabilities to Flooding

The finding of livelihood activities in the study areas in Figure 7 is in line with the comment of one of the key informants that fishing was the main livelihood activity. Both the respondents and the key informant indicated that fishing is lucrative but could be disrupted when the sea pirates hold sway and flooding as a result of rainfall which increased the tides. They also indicated that crop farming was promising but could be hindered by ocean surged which is salty and flooding during the rainy season. The fishing has contributed a lot of income to Obianga, Emeroke, Iwuo Okpom Opulom and Inua Eyet Ikot Communities. According to the informant, fishing indirectly affects every other economic activity like trading, crop production, teaching, manufacturing, amongst others. If the fishermen are not able to have a good harvest, it would indirectly affect other economic activities. Another key informant, a medicine seller, intimated that without the fishermen having a good harvest, he wouldn't sell and this would not go well with his family. It was discovered that some households also relied on livestock production for income generation. Again, trading was mostly undertaken by women in these communities. Fish processing (drying) was mostly done by the spouses of the fishermen, sold to other traders and to final consumers. This correlates with Jayanti *et al.* [29] that majority of coastal communities in the rural areas take up fishing and agriculture as their livelihood. Also, the results in Table 5 indicated that crop farming in Ibeno district was sensitive to flooding. The farmers had no access to weather services and flood warning system. Nevertheless, there was no much difference between male and female household heads with regards to vulnerability to flooding.

However, women argued that they might be swept away by flood water while attempting to excrete at the sea or river bank. Moreover, it is against the culture for female over there to expose themselves compared to male household head. Considering the three major livelihoods (crop production, farming and trading) and their vulnerability to flooding at the community level, the high vulnerability scores observed in Inua Eyet Ikot and Iwu Owo Opulom Communities, Ibeno district, were as a result of lack of access to credit facilities, waivers from government and international donor agencies. Household heads (fishermen) also argued that they were vulnerable because they lack alternative livelihood and money to alleviate their plight.

This agrees with Mmon and Aifesehi [30] that vulnerability is a cultural factor and may be difficult for the residence to relocate to low risk area.

Key informant interview intimated that he lost one of his children to storm surge which swept away the community in a certain night.

(d) Local Coping Strategies to Mitigate Impact of Flooding on Livelihoods

Looking at Figure 8, households deployed several coping strategies to build their livelihood resilience against flood stress and shocks. These include: (i) physical assets which were tools and equipment such as canoe, boats, fishing nets, farm tools, fertilizer, etc. used in their daily livelihood activities; (ii) social networks such as associations, village savings and loans, associations, unions, cooperatives etc.; (iii) credit facilities, insurance and government waivers and (iv) alternative livelihoods which involved the capacity to combine other livelihoods to reduce shocks from flood events and other natural disasters when they occur. As soon as the flooding sets in, their livelihoods could be hampered, thereby reducing their daily income. There were cases where crops, such as cassava, maize and vegetables, mostly cultivated by women or aged people in the communities at subsistence level, were ravaged by flooding; for instance, in Inua Eyet Ikot Community, in as much as there was no early warning system, households often times resolved to lay sand bags and sand stones to reduce surface run-off and flood water into the farms. Most of household heads in Obianga were traders and had better social network strength which they could fall back or be assisted financially in case of any disaster.

CONCLUSION AND RECOMMENDATIONS

Impact of flooding on livelihoods in Obianga, Emereoke, Inua Eyet Ikot and Iwuo Okpom Opulom Communities of Eastern Obolo and Ibeno Local Government Areas, Akwa Ibom State was examined. A total of 287 respondents were recorded. The demographic characteristics showed that more household heads were men, majority of the inhabitants were young people, whereas the singles were the immigrants. Household earning was very small with an average of five members. Iwuo Owo Opulom Community had more flooding destructive tendency than Obianga. Emereoke Community may become intense overtime whereas Inua Eyet Ikot Community was not intense but might gradually become a threat if neglected by participants' assessment. Three (3) major livelihoods were crop production, fishing and trading. Fishing, crop production and trading livelihoods in Ibeno district (Inua Eyet Ikot Community) had the highest vulnerability scores of 0.225, 0.178 and 0.165 respectively using. These imply that Inua Eyet Ikot Community is the most vulnerable to flooding than others. Local coping strategies to mitigate flood impact on livelihoods comprised of physical assets, social networks, credit facilities, insurance and government waivers and alternative livelihoods. It was suggested that drainage systems should be constructed and accurate flood warning system should be amounted especially in the flood prone areas through various agencies and NGOs.

CONFLICT OF INTEREST

None is declared.

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UTICAJ POPLAVA NA SREDSTVA ZA ŽIVOT I STRATEGIJE ZA UBLAŽAVANJE POSLEDICA U ODABRANIM PRIOBALNIM ZAJEDNICAMA U DRŽAVI AKVA IBOM, NIGERIJA

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Apstrakt: U ovoj studiji procenjen je uticaj poplava na egzistenciju u zajednicama Obianga, Emereoke, Inua Eyet Ikot i Iwuo Okpom Opulom u lokalnim samoupravnim područjima Istočnog Obolo i Ibena, u državi Akwa Ibom, Nigerija. Studija je usvojila unakrsno istraživanje sa uzorkom populacije sastavljenim od stanovnika priobalnih zajednica, koji je određen tehnikom namernog i slučajnog uzorkovanja pomoću formule autora Goddena.

Podaci su prikupljeni iz primarnih (upitnik koji su sastavili istraživači) i sekundarnih izvora (arhive, poljoprivredne/meteorološke stanice i Geološki zavod Sjedinjenih Država).

Prikupljeni podaci obuhvatali su demografske karakteristike učesnika, njihovu perspektivu o stepenu sklonosti ka poplavama u njihovim zajednicama, rezultat digitalnog modela elevacije (DEM) o sklonostima prema poplavama koristeći klimatske promenljive podataka između 2010. i 2019. godine, glavne aktivnosti za život, njihovu osetljivost na poplave i strategije suočavanja sa uticajem poplava na egzistenciju stanovništva.

Etička pitanja su razmotrena pre nego što su kopije upitnika primenjene i prikupljene nazad. Podaci su analizirani korišćenjem geografskih informacionih (GIS) tehnika, softvera ArcGis 10.3 i Microsoft Excel 2016. Intervjuisano je ukupno 287 ispitanika. Demografske karakteristike su pokazale da je više muškaraca bilo među starešinama domaćinstava, većina su bili mladi ljudi, dok su samci bili migranti.

Prihodi domaćinstava su bili zanemarljivi, sa prosečnom veličinom od pet (5) osoba. Zajednica na području Iwuo Owo Opulom imala je veću opasnost od mogućih poplava nego Obianga. Zajednica Emereoke može biti izložena poplavama tokom vremena, dok zajednica Inua Eyet Ikot može postepeno postati mesto ugroženo poplavama ako se zanemare kao procenjeni učesnici.

Tri (3) glavna načina života bila su: proizvodnja useva, ribolov i trgovina. Ribolov, proizvodnja useva i trgovina u okrugu Ibeno (zajednica Inua Eyet Ikot) imali su najviše ocene osetljivosti od 0,225, 0,178 i 0,165 respektivno. To implicira da je zajednica Inua Eyet Ikot najosetljivija na poplave, od ostalih proučavanih zajednica. Lokalne strategije suočavanja sa poplavama za ublažavanje uticaja poplava sastojale su se od zaštite fizičke imovine, društvenih mreža, kreditnih olakšica, osiguranja i vladinih odricanja od odgovornosti i alternativnih načina života. Predloženo je da se izgrade sistemi za odvodnjavanje i da se uspostavi precizan sistem upozoravanja na moguće poplave, posebno u područjima sklonim pojavama poplava, putem raznih agencija i nevladinih organizacija.

Ključne reči: *Poplave, sredstva za život, priobalne zajednice, strategije ublažavanja*

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