

Environmental Issues and Implications of Flooding in Nigeria: The Perception of Households in Cross River State

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Abstract

Flooding have become a regular event in recent times. Cross River State being a coastal area has been experiencing flooding over the years yet, available studies have not adequately appraised the perception of residents of Cross River State as it concerns flooding. It is against this backdrop that this study was conceived. Specifically, the study examined the issues and implications of flooding in Nigeria with particular reference to Cross River State. Data were obtained using copies of questionnaire. A total of 400 copies were administered in the sampled areas. The multi-stage sampling technique was adopted in the selection of the areas that were sampled while the systematic approach was used in reaching the target audience. Furthermore, analysis were done using frequencies, simple percentages and the Household Perception Index (HPI). It was observed in the study that indicators to flooding include excessive rainfall, indiscriminate waste dumping, poor environmental planning, property development on flood prone areas, and absence of sufficient drainages among others. The occurrence of flood lead to loss of lives, properties, release of pollutants, social disintegrations, destruction of crops as well as economic losses. Based on the observations of the study, it was recommended that appropriate approaches be applied in the control and management of flooding in the study area. Notably, indiscriminate waste dumping should be discouraged. Technologies that will help in the early detection of flood should also be made available while drainage channels should be provided adequately

Keywords: Flooding, livelihood, enforcement of laws, environmental issues, environmental planning

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Introduction

Flooding is a natural disaster. It manifest in the overflowing of a great body of water over land not usually submerged. Flooding also leads in the eruption of water in large amount on land that is usually dry. Several factors account for the causes of flooding as noted in literature. Yaode, Onifade and Olajide (2019) remarked that flooding is necessitated by indiscriminate refuse dumping, poor environmental planning practices, poor drainage system, raising development projects close river bank, high/excessive rainfall, blocked drainages and overpopulation. Mfon, Oguike, Eteng and Etim (2022) equally showed that poor environmental planning/monitoring, housing development in flood prone areas, deforestation, haphazard developments resulting in the blockage of drains, poor waste disposal practices, negligence by government in designing and implementing policies at various levels as well as poor environmental planning and weak enforcement of policies are the prime causes of flooding in Nigeria. In recent times, the overflowing of dams accounts for serious case offlooding in Nigeria. Unar and Gray, (2022) remarked that the causes of flooding in Nigeria include soil moisture, extreme weather conditions owing to climate change, how dams are functioning, especially those close to the country's borders, and topography

As expected, flooding have several negative implications. In both rural and urban areas, floods unravel negativities on sustainability. For instance, Mfonet *al.*, (2022) posited that flooding leads to the submerging of farm lands, housing properties and loss of lives of victims. Ani, Ezeagu, Nwaiwu and Ekenta, (2020) observed that flooding results in the submerging of farmlands, destruction of crops, destruction of irrigation facilities, destruction of harvested produce and it also have negative returns on fish farming as it leads to the spread of infection that causes diseases in fishes. Flooding equally, leads to pollution of river bodies and lead to the destruction fishes and other aquatic animals in the process. In urban settings, flooding affect housing, physical developments, halt social and economic development.

In Nigeria, there have been cases of flooding in time past. The effects of the floods are glaring both in urban and rural settings. In urban areas of Nigeria, floods are triggered by poor channelization, increasing population with corresponding poor waste disposal practices as well as poor town/environmental planning practices resulting in haphazard development of housing and other

physical developments. Thus, urban areas of Nigeria have been at the receiving end of various flood disasters. According to the National Emergency Management Agency

(NEMA), only in 2022, it was reported that flood led to the displacement of over 1.4 million people with over 603 persons losing their lives while over 2,400 persons were inflicted with varying degrees of injuries in Nigeria. Equally, over 82,035 houses were damaged with 332,327 hectares of land equally lost (Oguntola, 2022). Maclean (2022) remarked that since the 2012 floods, the 2022 floods were the worst that have occurred in the country. Although there were contradicting reports on the major causes of the flood, it was reported that heavy rainfall, climate change and the release of water from the Lagdo Dam in Cameroon from the 13th of September resulted in the 2022 floods. The 2022 floods lasted from September to the end November. From the foregoing, it is obvious that the 2022 floods in Nigeria were deadly. However, despite the fact that the flooding which has unraveled such negative impacts have occurred, the perception of households toward flood events have not been studied in available studies. Even more, several States in Nigeria are said to be flood prone. Cross River State in South South Geopolitical zone is one of the coastal states in the country with increasing intensity of rainfall thus creating room for possibilities of flooding. Therefore, the inability of studies to document these useful information suggest that there is a gap in knowledge that needs to be explored in order to guide policy direction for ensuring subsequent flood management in Nigeria generally and Cross River State in particular. Basically, an understanding of the perception of households to flood events will be useful in negotiating appropriate policy measures for containing/managing flooding. Based on the above premise, the present study seeks to examine the perception of the public relating to the flooding in Nigeria with particular reference to Cross River State.

Statement of Problem

Flooding in Cross River State has serious adverse effects on the economy, livelihood, environment and social integration. Both in urban and rural areas, flood have negative implications. Although studies relating to the subject matter are quite limited, it has been shown that flooding is necessitated by factors such as excessive rainfall, poor environmental sanitation practices and weak enforcement of laws (Ojikponget *al.*, 2016). These floods are continually occurring unabated yet, adequate studies have not been ventured into that will guide policy decisions that will be useful in stemming the tide of floods. In urban areas for instance, pilot surveys within the area have shown that housing properties/developments

are at the risk of being submerged due to flooding while lives and properties are also at risk. In rural area, inundation can trigger loss of crops, agricultural products and other properties. In fact, earlier observations of scholars (Okeleyet *al.*, 2016; Nnodim and Ezekiel, 2017; Abdulmajid, 2020) have demonstrated that flood events impede socio-economic development in other parts of the world.

Cross River State is a coastal state and rainfall is relatively high. Despite the fact that rainfall is high, flood management strategies such as development of drainages, discouragement in the siting of developments on flood prone areas, discouragement of indiscriminate waste dumping among others have not been given adequate others. The above and more reasons create room for flooding to thrive. By its nature, flooding is detrimental to development and environmental sustainability. Specifically, residents of the study area are facing varied negative effects which are not sufficiently discussed due to paucity of literature. In a bid to contributing to knowledge so as to devise and design operational approaches for sustainable flood management, the study was conceived.

Literature

Causes of Flooding

Several factors interplay in the build-up to flooding. As noted in literature, while the causes of flooding may be location specific, there abound multiple indices that result in the occurrence of the event. Tabiri (2015) summarized the indicators of flooding in Ghana into four broad categories. He posited that negligence/ignorance or sheer megalomania, poor planning cities, building on waterways and indiscriminate disposal of waste materials are the major factors that lead to the overflowing of water on dry land. Tabiri further remarked that the negligence of the government and concerned agencies/bodies as well developers results in weak enforcement of flood management approaches while poor planning manifest in the weaknesses of development control institutions toward managing and monitoring of settlements. Equally, settlements (especially urban areas) are characterized by indiscriminate dumping of wastes which leads to the blockage of drains that further hinders the free-flow of water especially in the midst of torrential down-pour, overflow of dams and other activities that are capable of resulting in the release of large water volume on dry land. Tabiri also observed that the erection of housing properties on flood plains exposes the housing properties to possibilities of flooding

In the view of Mfonet *al.*, (2022), flooding in Nigeria is due to poor environmental planning/monitoring, the continuous erection of developments on flood prone areas, increasing deforestation, uncontrolled urban housing development to the extent of blocking water distribution channels, indiscriminate dumping of wastes, increasing negligence by government in the implementation of policies and actions that are capable of managing flooding and enforcements of environmental management strategies. Magami, Yahaya and Mohammed (2014) revealed that flooding in Nigeria is majorly caused by dam failure, over flowing of major rivers, coastal storms, settlement of people at flood prone areas such as riverine areas and sea coast, climate change, extraordinary heavy rains and continued release of excess water from artificial reservoirs. Apart from the causes listed above, Nwigwe and Embergo (2014) added that the development of illegal structures on or across drainage channels, land reclamation or encroachment, poor physical planning, insufficient drainages and topography can lead to flooding. From the submissions above, it is obvious that both natural and artificial factors lead to flood occurrences. While the natural factors such as excessive rainfall, topography etc., may be difficult to manage, it is human effort which manifest in blockage of drains, indiscriminate waste disposal, poor environmental planning policies and so on that mostly results in flooding in Nigeria. However, it is basically the artificial causes that dominate the causes of flooding.

Implications of Flooding

Flooding is an unpleasant event that is highly undesirable. It leads to various negative effects on the environment, human life and threatens sustainability. The observations of scholars returned different results as it relates to the implications of flooding. Abdulmajid (2020) showed that flooding has resulted in the loss of properties and human lives. Okeleye, Olorunfemi, Sogbedji, and Aziadekey, (2016) showed that flooding results in submerging of farmlands and destruction of housing units. Their study specifically highlighted that farmers are seriously affected with flooding occurrences coupled with the low coping approaches occasioned by inaccessibility of farmers to insurance facilities. They further explained that there is inadequate and insufficient information relating to flood prediction in rural areas hence, the farmers lack timely preparedness. They also demonstrated the level to which the livelihoods are affected. They specifically noted that the livelihoods of farmers are significantly affected by the floods. In order to slow the tide of flooding, they called for provision of sufficient drainage channels as well as effective weather forecast approaches and insurance facilities.

In other related studies, it was identified that the submerging of land by excessive water results in the destruction of crops, aquatic lives such as fishes and other sea foods, destruction of the natural ecosystems and depletion of endangered species. Moreover, flooding leads to the release of pollutants into streams, rivers and trigger underground water poisoning (Nnodim and Ezekiel, 2020). The above implications have negative returns on the economy, environment and social lives of residents. Oruonye *et al.* (2017) in their study Taraba State, Nigeria showed the negative effects that flooding have on socio-economic status and livelihood. The study showed clearly that flood events devastated the economy to a large extent while threatening agricultural development. It also affect the environment to the extent of triggering gully erosion and environmental pollution. .

Mfonet *al.*, (2022) specifically mentioned that flooding leads to the submerging of farm lands, housing properties and loss the lives of victims. Ojikpong, Ekeng, Obongha and Emri (2016) buttressed on the findings of Mfonet *al.*, (2022) and while commenting that flooding also threatens socio-economic activities. Equally, the fear of flood possibilities constrains and limit proposed investments. Thus, flood likelihood in an area drastically reduces the level to which investors are ready and willing to set up establishments that can trigger socioeconomic development. In the observations of Agbonkhese, Agbonkhese, Aka, Joe-Abaya, Ocholi and Adekunle, (2014), flood have negative returns on human, natural and physical resource as well as monthly income and monetary asset-based. From the submissions of scholars, it is clear that flooding is a serious environmental disaster that needs to be taken seriously. In fact, it is caused by several factors and it effects are drastically negative. To help make appropriate recommendations that can stem the tide of flooding, it is necessary to appraise the perception of residents of particular locations. This is with the thinking that the perception of residents will be useful in gaining understanding of the level in which flood events affect the environment, economy and the livelihoods of victims of flood prone areas.

Materials and Methods

Study Area

The study area is Cross River State. The State is situated between Latitudes $4^{\circ}28'$ and $6^{\circ}55'$ North of the Equator and Longitudes $7^{\circ}50'$ and $9^{\circ}28'$ East of the Greenwich Meridian. In terms of geographic location, the State shares boundaries in the North with Benue State and in the North -West with Ebonyi State. In the South, the State shares boundaries with Akwa Ibom State and the Atlantic Ocean. Equally, the state is bordered in the East by the Republic of Cameroon and Abia State (Figure 1). The present day Cross River State has existed since 1987 when Akwa Ibom State was carved out of the State.

In terms of climate, both the wet and dry seasons are enjoyed by residents of the study area. The rainy season spans from April to October each years and the dry season last between November and March every year. The volume of rainfall reaches its peak during June and July. The rainfall in the study area is 3058mm on the average. The relative humidity exceeds 76.8 percent. With the volume of rainfall, the area is susceptible to flooding. This is due to the fact that the area being a coastal setting experiences massive rainfall with poor responses from relevant agencies implement mitigation strategies against the negative effects of flooding. The residents take advantage of the severity of rainfall in the area towards making investments in agricultural development. Therefore, the residents are predominantly engaged in agriculture as their main source for earning livelihoods (Bassey and Eteng, 2021).

The relief of the area is flat to a large extent (Inah, 2021). There are few projection in the Obudu Plateau and the Oban Hills. The Obudu Plateau is about 1596 meters above sea level. The Calabar River and Great Kwa River as well as other several water bodies drastically promote the availability of swamps and marshy areas which all have reduces the level of soil porosity and permeability of water thus promoting flooding.

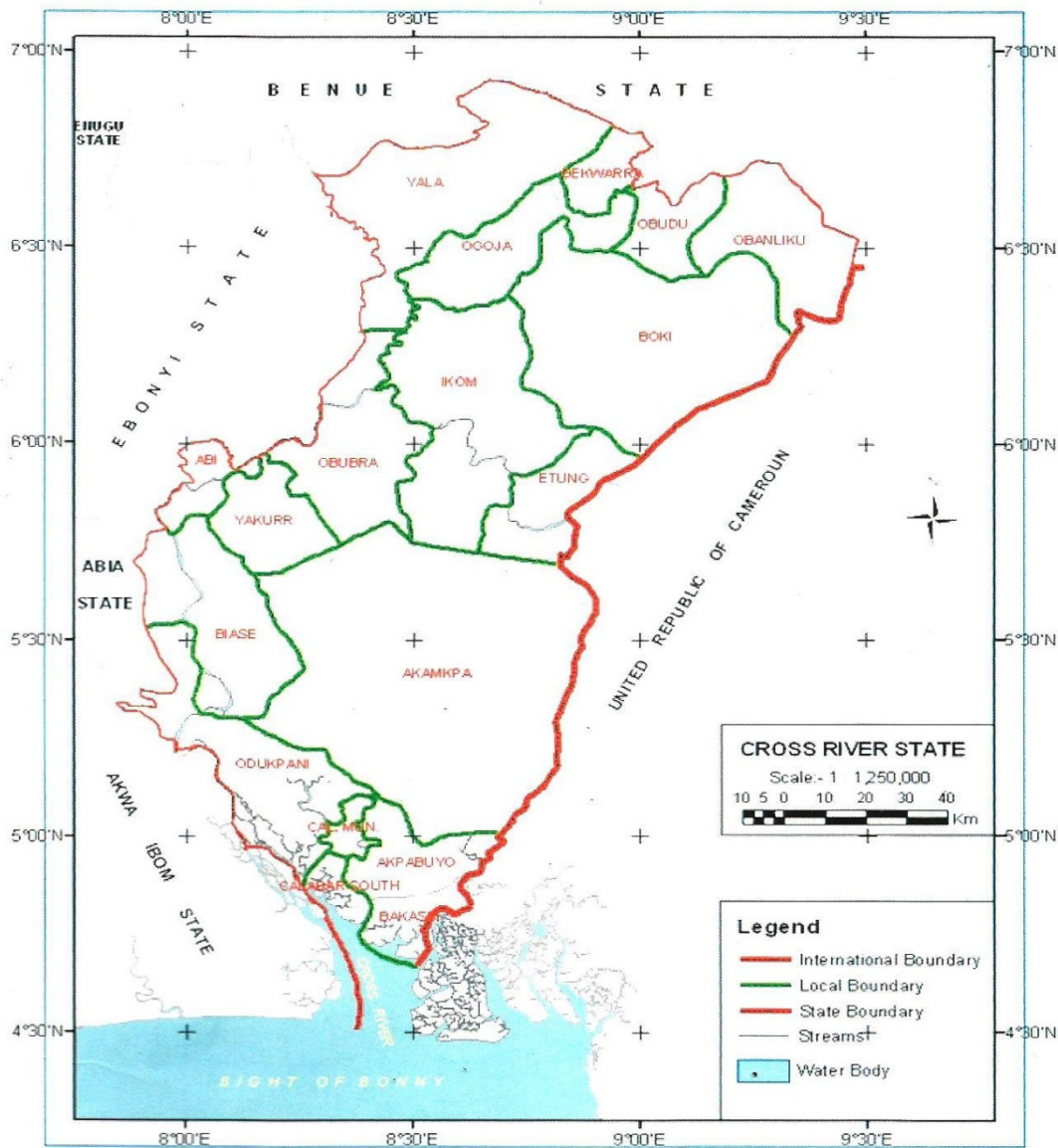


Figure 1: Map Showing the Regional location of Cross River State in Nigeria

Source: Cross River State Geographic Information Agency, 2022

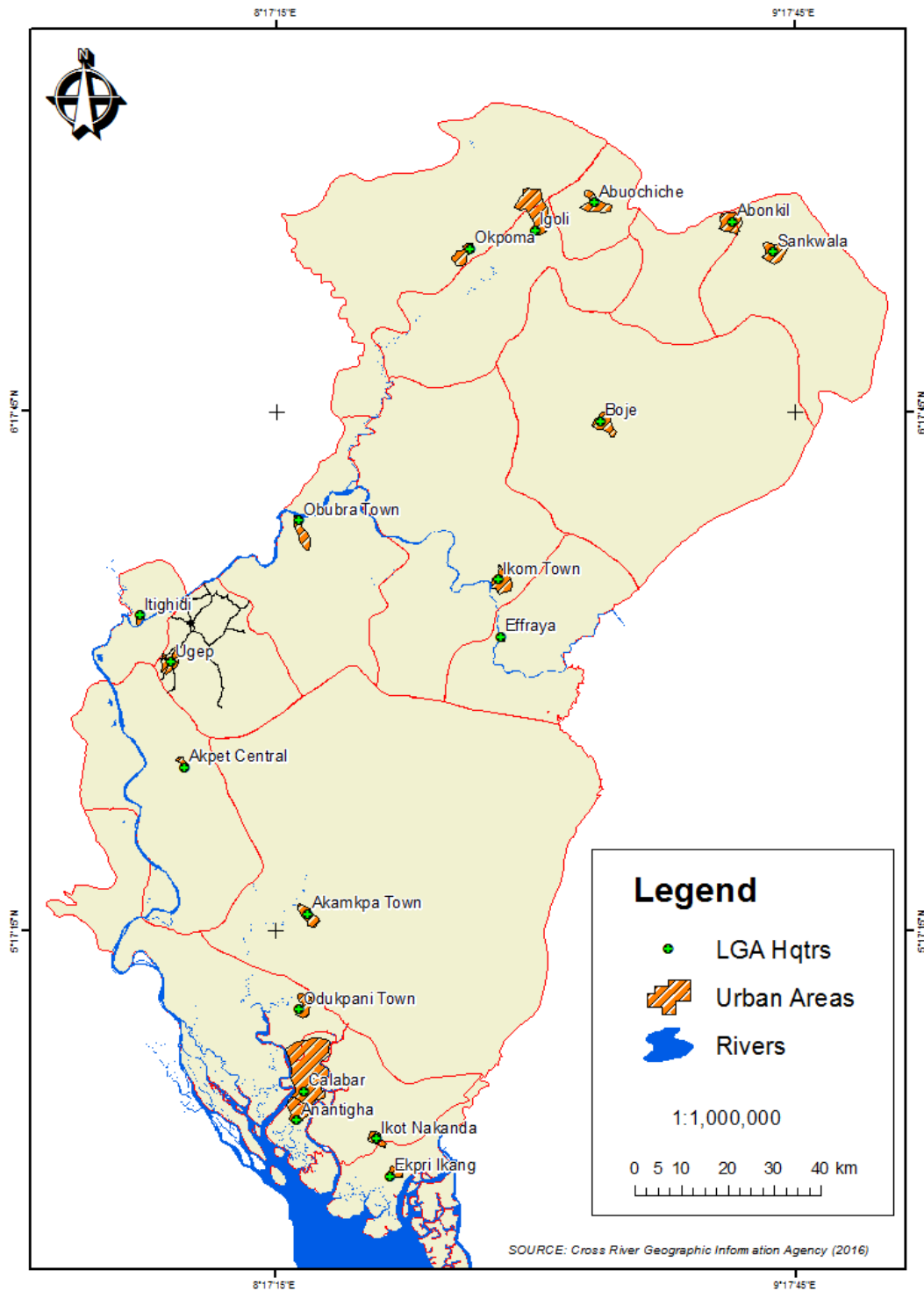


Figure 2: Map Cross River State Showing Local Government Headquarters
Source: Cross River State Geographic Information Agency, 2022

Methodology

The paper combined both quantitative and qualitative designs. Questionnaires were the major instrument for data collection. Questionnaires were considered appropriate due to the nature of the study which seeks to appraise the perception of the residents of the study area. In the study, the multistage random sampling technique was adopted. This involved the consideration of the entire 18 Local Government Areas (LGA) in Cross River State as possible areas of being studied. This is against the backdrop that all LGA show potentials of being flooded.

The stratified random sampling technique was employed. This led to the stratification of the study area across the three Senatorial Districts; Cross River State North, South and Central Senatorial Districts. The stratification was followed by a random selection of LGAs that were studied. In each Senatorial District, one LGA was randomly chosen for questionnaire administration. This brought the total number of Local Governments that were studied to three. Specifically, Yala LGA was chosen in Cross River Northern Senatorial District, Obubra LGA was selected in Cross River Central Senatorial District and Biase LGA was taken in Cross River State Southern Senatorial District. In each of the sampled LGAs, a random selection of 10 communities was done. In all, a total of 30 communities from the three LGAs were sampled. The 1991 population of the 30 villages that were sampled was projected to 2021 using a population growth rate of 2.8 percent. The projected population was further converted to households using average household size of 6 persons. This formed the population of the study. In order to take the appropriate sample size, the Taro Yamane formula was applied. The formula is mathematically explained as follows;

$$n = \frac{N}{1 + N(e)^2}$$

Where, n is sample size, N is population of the study, e is tolerable error (5%)

The exercise resulted in the selection of 400 households. Therefore, 400 copies of questionnaire were used in eliciting data. Data were obtained at the household level. The systematic random sampling technique was used in the distribution of copies of questionnaire. Analysis was done using frequencies and percentages were used in carrying out analysis. The perception of households as it relates to flooding in the study area was explored using the Household Perception Index (HPI). However, this was measured with weighted values of 5, 4, 3, 2 and 1 which were used in the rating. The summation of weight value (SWV) for each variable were obtained from the addition of the product of weight value of each rating and the number of responses to each rating (Yaode, Onifade and Olajide, 2017). The HPI

is obtained by dividing MWV by the total respondents that rated each variable. It is mathematically expressed as follows;

$$HPI_{i-j} = \frac{MWV_{ij}}{N_{ij}}$$

Where: HPI_{ij} = Household Perception Index i-j, MWV_{ij} = Mean Weight Value of facility i-j, N_{ij} = Respondents' rating each variable i-j (Adapted from Yaodeet *al.*, 2019 and modified)

Findings and Discussion

Socio-economic Characteristics of Respondents

Characteristics	Categories	Frequency	Percentage
Gender	Male	292	73
	Female	108	27
	Total	400	100
Age	18-27	83	21
	28-37	69	17
	38-47	108	27
	48>	140	35
	Total	400	100
Monthly Income	Below 30,000	85	21
	30,001-60,000	86	22
	60,001-90,000	99	25
	90,001-120,000	41	10
	>120,000	89	22
	Total	400	100
Marital Status	Single	96	24
	Married	260	65
	Separated	26	7
	Widowed	18	5
	Total	400	100
Educational Level	No formal Education	41	35
	Primary	32	8
	Secondary	51	13
	Post-Secondary	276	69
	Total	400	100
Occupation	Farming	191	48
	Civil Service	69	17
	Artisans	49	12
	Traders	41	10
	Applicants	50	13
	Others	-	-

	Total	400	100
Household Size	1-2	15	4
	3-4	52	13
	5-6	201	50
	7>	132	33
	Total	400	100

Source: Field Survey, 2022

Table 1 shows the socio-economic attributes of residents in the study area. The Table showed that males dominated the survey. Since the questionnaires were distributed at the household level, it was actually expected that males will dominate since there is superiority of men as household heads especially in Africa. The income of household heads was observed to be predominantly between ₦60, 000 and ₦90, 000. The least income group are those that generate between less than ₦30, 000 monthly. On the basis of marriage, the married population dominate the study area. The domination imply that population is likely to continually increase. Obviously, population growth is an indicator to flooding due to the possibilities it has on increasing socio-economic activities which have effects on the environment.

Furthermore, the Table indicated that literacy level is high. In fact, majority of the respondents had post-secondary education. Historically, during the colonial periods, residents of Cross River State had early contact with the colonial masters. Thus, the literacy level is general high in the Cross River State. Farming was observed to be the predominant occupation. With farming as the mainstay and source for earning livelihood, there is every need to assess the level to which the residents perceive flooding in the State. This is against the backdrop that agricultural farmlands are mostly affected by flooding. Furthermore, household sizes among respondents is relatively high implying that population is largely increasing thus, activities of humans that are capable of triggering flooding are likely to occur at high level.

Table 2: Household Perception of Flooding (Causes)

S/N	Variables	5	4	3	2	1	MWV	Decision
1	Poore environmental planning	299	56	42	3	-	4.6	Accept
2	Development on flood prone area	210	98	82	6	4	4.3	Accept
3	Overflowing of major rivers	266	126	-	8	-	4.6	Accept
4	Land Reclamation	191	111	65	33	-	4.2	Accept

5	Development across drainages	188	129	56	12	15	4.2	Accept
6	Dam failure	128	123	51	52	46	3.9	Accept
7	Insufficient drainages	216	91	93	-	-	4.3	Accept
8	Indiscriminate waste dumping	288	82		15	5	4.6	Accept
9	Topography	287	91		-	-	4.0	Accept
10	Excessive rainfall	301	99		-	-	4.8	Accept

Source: Field Survey, 2022

The perception of the households regarding flood occurrences was explained in both the causes and effects (Tables 2 and 3). In Table, it was observed that several causes of flooding were identified in the study area. Notably, excessive rainfall (4.8) was responsible for most events of flooding that is experienced in Cross River State. With a mean score of 4.8, it was revealed that since the study area is a coastal state, rainfall is relatively high and rain fall almost round the year. Coupled with other factors such as poor environmental planning (4.6), indiscriminate waste dumping (4.6), overflowing of major rivers (4.6), insufficient drainages (4.3) among others as seen in Table 1, flooding is inevitable in the study area. The observations aligned with Mfonet *al.*, (2022); Nnodim and Ezekiel (2020). They earlier revealed that excessive rainfall, dam failure, overflow of water bodies among others results in flooding.

Table 3: Household Perception (Effects)

S/N	Variables	5	4	3	2	1	MWV	Decision
1	Destruction of houses	262		22	4	7	4.5	Accept
2	Destruction of farmland/crops	321	79	-	-	-	4.8	Accept
3	Depletion of ecosystem	268	59	33	21	19	4.3	Accept
4	Loss of lives	282	66	52	-	-	4.6	Accept
5	Economic losses	291	61	30	18	-	4.6	Accept
6	Loss of properties	362	38	-	-	-	4.9	Accept
7	Social disintegration	332	12	48	8	-	4.7	Accept
8	Pollution	301	32	27	16	24	4.4	Accept
9	Loss of aquatic lives	312	88	-	-	-	4.8	Accept

Source: Field Survey, 2022

The perception of households relating to the effects of flooding was presented in Table 3. As seen in the Table, residents basically loss properties while their farmland/crops are largely destroyed during flood events. Flooding further results in the release of pollutants into water, bodies and the environment. The release of the pollutants affect the lives of fishes and other aquatic bodies. The presence of water in the environment drastically pollutes the environment and even results in the loss of lives among other negative implications..Economic losses are also recorded due to flooding. This is because the floods halt trading and commerce. As well, the destruction of crops affects the livelihoods of rural residents that depend solely on agriculture for their survival.

Conclusion and Recommendations

The study assessed the perception of Cross River State residents regarding flooding in the State. Perception was examined using the causes and effects that flood have on the residents of the study area. It was observed that flooding in the area is caused by several factors. For instance, excessive rainfall, indiscriminate dumping of waste, haphazard development and poor environmental planning were among the causes of flooding in the study area. The above factors trigger flooding with very little efforts by the government and other relevant agencies to invest in flood management. The study also revealed that the occurrence of flooding is not without severe implications. For instance, flooding leads to the loss of lives, properties and depletion of the environment. The release of pollutants affects marine and aquatic lives to a large extent and even bring about the extinction of endangered species. Based on the observations of the study, it was suggested that flood control/management approaches be instituted. Such should include the development of drainages, use of technological approaches in detecting flood and discouragement of developments on flood prone areas.

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