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PEOPLE'S PERCEPTION OF LAND USE CHANGES ALONG THE FLOOD PLAIN OF RIVER GWOI IN JALINGO, TARABA STATE, NIGERIA.

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Abstract

Land-use changes along river floodplains are among the environmental challenges faced in most floodplains across the world as well as in Nigeria. The causes ranges from population growth to urbanization processes while its effects on man and his environment depend on people's level of technology, awareness and measures set by governments to protect and preserve the areas. This study examines peoples' perception on the causes, impacts and adjustments to the land-use changes and Flooding along the floodplains of River Gwoi. The study used primary data which were generated from the respondents through the administration of 120 copies of structured questionnaire. The combination of stratified and systematic random sampling was used; Frequency counts were used to analyze the data. The study revealed that dwellers of River Gwoi flood plains have perceived the changes in land-use currently taking place on the flood plains. About 69.4% of people living on the floodplains are aware of the negative impacts caused by the change of land uses on their lives. The result further revealed that irrigation 60.7% and residential building 39.3% are the major land-use along the floodplains. The result also revealed that construction of embankments (50.2%), proper drainage system (40.3%) and evacuation (5.6%) are the prevention strategies taken before flood incidence. Thus, the following recommendations were put forward: there is need to streamline land-use activities, conserve vital ecosystems like watershed areas and maintain buffers along stream channels and there should be a constant awareness campaign by the relevant authorities on the risk associated with the stay on river flood plains. The town planning authority should enforce restriction of expansion of buildings on the floodplains of the river.

KEY WORDS: Awareness, Flood plains, Flooding, Land use, Impacts, Perception,

1. Introduction

Floodplain is an area of land adjacent to a stream or river that stretches from the banks of its channel to the base of the enclosing valley walls that experiences flooding during period of high discharge (Oladunni, *et al.*, 2015). Floodplains are made by a meander eroding sideways as it travels downstream and when river breaks its banks and flood, it leaves behind layers of alluvium (silt) that will gradually build up to create the floor of the floodplains. The Flood plains are valuable ecosystem performing important functions and providing space for habitats and food production and are considered to be one of the most endangered ecosystems worldwide (Tackerner *et al., 2008*). They are subjected to seasonal and periodic modification as a result of lateral and vertical mobility of river driving a change in the use pattern (Hazarika., 2015). However, with human settlement and development came the need for regulation and also the changes of different nature or forms along river floodplains and the uncontrolled human activities have led to significant modification of natural biodiversity in the world over the years. Looking at the evolution and development of societies, it becomes evident that floodplain areas have been preferred for human settlement. Some of the reasons for this development in the past have been the readily available natural resources such as fertile soils and abundance of water resources, readily available livelihood opportunities in agriculture and fisheries, transports links and access

to markets for economic goods. The level and trends in accumulating economic values on floodplains in particular in the form of land uses encroachment on the floodplains have in parts of the world led to discussion on acceptable levels of flood risk led to considerable changes in national flood management policies. Integrated flood management (IFM) as a development policy concept calls for a balance Such earthwork can be undertaken as part of developing new infrastructure, industrial and residential areas. However, the rapid growth in the population size, rural–urban migration and also the increase in urbanization across the world, hazards and disasters associated with flooding are reportedly increasing in urban areas and most specifically impacting negatively on poor people (Adewummi, 2013) and urban development in general. However, the increasing need for human development through rapid urbanization has led to a wide spread horizontal development especially in urban centres. Thus, river banks have been encroached, vegetal covers removed, soil properties modified and many micros to macro ecosystem have been driven into extinction. Where changes are not met with complementary planning and management measures, challenges such as water pollution, high risk disaster (flood) and unstable food production are unavoidable consequences particularly along river banks.

One of the most common and most occurring natural hazards that have been disrupting activities, causing a lot of damages to lives, destroying some vital infrastructural facilities. The increasing frequency and magnitude of the river flooding in Jalingo and other parts of Nigeria in the last decade, its worrisome when looking at the dangers and risks the habitants of the flood plains are to all over the world. However, different parts of Jalingo Local Government Area (LGA) are vulnerable and exposed to flooding events and its impacts at different level of exposure and magnitude. The 2011 flood which was devastating and has destabilized three north eastern states of Borno, Bauchi and Taraba, destroying over 4000 farms and destroying over 5000 houses (Timothy, 2011). In Taraba state alone, the flood destroyed over 2,068 farms, 363 houses and partially affected 1,562 houses. Over 6,213 persons were internally displaced and 1,420 families affected by the flood in 4 LGAs, Jalingo, Lau, Ardo Kola and Yorro (Timothy, 2011). The most exposed populations to the flood hazard are usually the most vulnerable which constitute the urban poor living in the informal settlements along the floodplain (Oruonye, 2015). Over the years, the response of government and relief agencies to flood hazards in Jalingo and other parts of the country has been in the area to rescue and supply relief materials to victims of flood (Hodo, 2011). These judgements vary among individuals due to different levels of information and uncertainty and different intuitive behavior. As a consequence, the individuals of a community may assess the risk of being flooded very differently because they do not have the same information about the probability of flood hazard events in their region, about flood mitigation measures, and they perhaps have a different historical background regarding the experience of living in a floodplain and of being flooded (Messner & Meyer 2006). With regard to the social and economic features of vulnerability, the notion of risk perception is crucial. To evaluate impacts, it is also necessary to consider the social characteristics of the population that are susceptible to be damaged (Maantay & Maroko 2009). Moreover, it is important to evaluate the experience of the population related to past disaster events. This previous experience influences the perceptual impact of the dwellers and their vulnerability to natural hazards. Perceived impacts is the way that a

between the development needs of the society and the flood risk orientation towards the maximization of net- benefits derived from the floodplains to ensure sustainable development. Large scale earthwork within river floodplains particularly the active share of it can result in obstructions to flood flows.

determined community notices risk based on its experience on previous disasters or the level of exposure to natural hazards. If flood risk perception is low in a region, perhaps due to the fact that flood events rarely occur or the level of flood protection in terms of dykes and levees is high, a community may consider that they could never be affected by flooding in their area. As a consequence, they probably would not take any action to decrease the risk or to prepare for the occurrence of flooding. Conversely, if people are well aware of possible flooding, perhaps because they have previous experience with floods, they tend to be better informed and prepared (Baan & Kljin 2004). As a rule of thumb, it can be stated that regions with low levels of flood risk perception and a low degree of preparedness for coping with flood events tend to experience flood damage levels above average (Messner & Meyer 2006). Floodplain is a natural setting which provides wide varieties of importance to man such as providing fertile soil for agricultural activities, an ecosystem for organism and also regulate the temperature in a given area. But human attitudes toward the use of the floodplains in converting it to other uses such as the development of residential, industrial and institutional buildings have so much caused a great impacts and effects on the environments and risk to the life of people living such areas through witnessing seasonal or occasional flooding which have caused a lots of loss and damages to lives and properties in recent times. Therefore, the need for awareness campaign, early warnings on the consequences and vulnerability level, risk and danger associated with the river floodplain encroachment.

2. Study Area

River Gwoi floodplain located within Jalingo metropolis, the State capital of Taraba State and headquarters of Jalingo Local Government Area. Jalingo having the landmass of approximately 195km^2 and is located between latitudes 8^{0}45' to 9^0 05'N and longitudes 11^{0}15' to 11^{0}35'E with altitude of 180m above sea level. Jalingo is bounded to the North by Lau Local Government Area, to the East by Yorro Local Government Area, to the South and West by Ardo-Kola Local Government Area (Oruonye, 2016).River Gwoi which drains the town is a third-stream order which took its sources from the Yorro Mountain near Gangoro and flows downhill through Yorro, Tazarang, Alkali Gwa, Bassa and Jalingo. River Gwoi which is a major tributary to river Lamurde and take it sources from the hills in Yorro Local Government Area and flow through the northern part of Jalingo Metropolis. The river flows for a short distance of 36km before emptying into the Lamurde Basin at Magami ward in Jalingo town (Oruonye, 2016). River Gwoi has extensive flood plain on both sides of the river. The northern bank of the river is heavily occupied by residential settlements despite the increasing devastating effects of recent floods in the area, while the southern bank is intensively cultivated. The farmers in the area cultivate the land three times per year through irrigation methods.

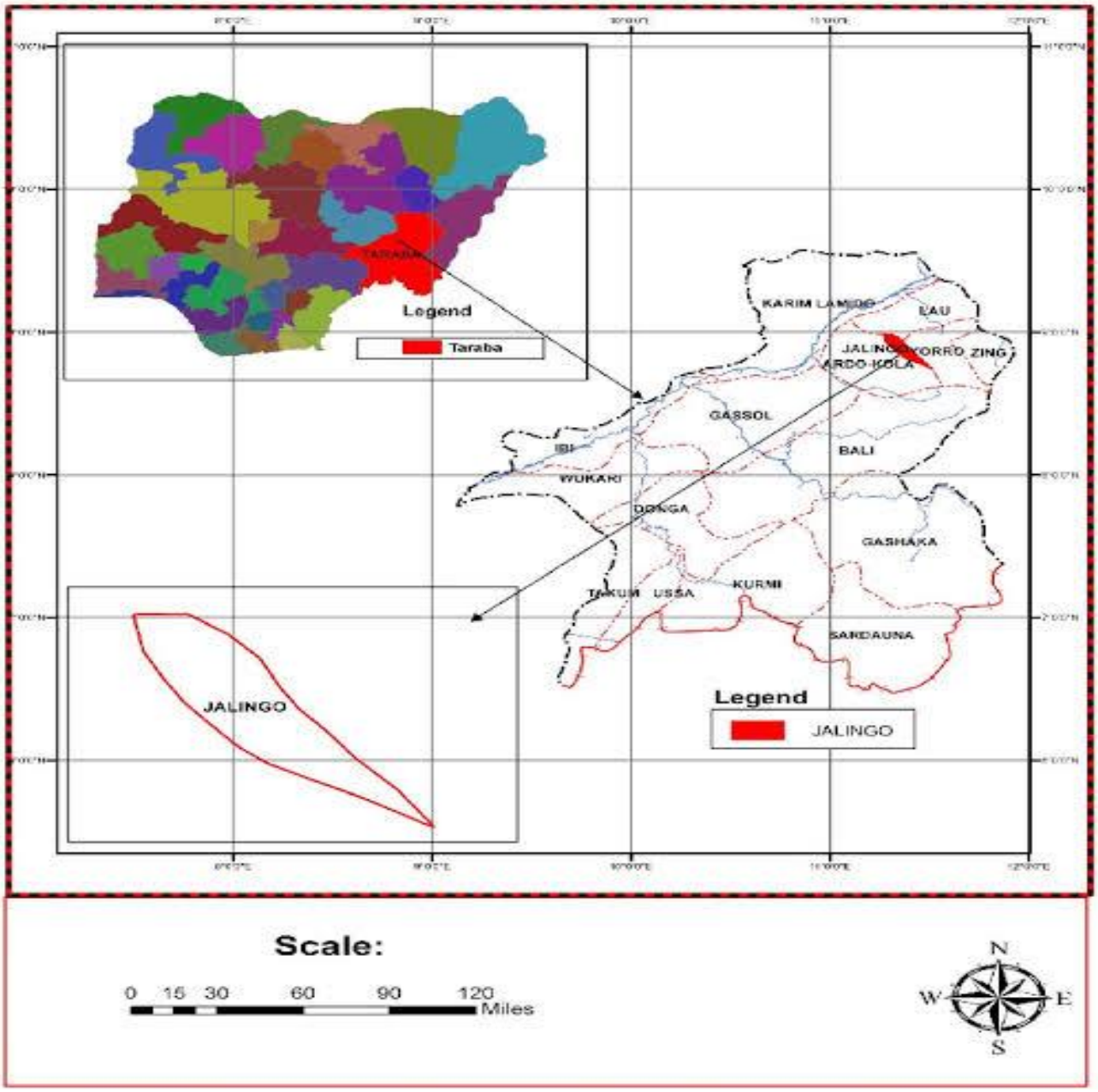

Figure 1: Map of Taraba State Showing Jalingo Local Government Area
Source: Ministry of Land and Survey, 2021

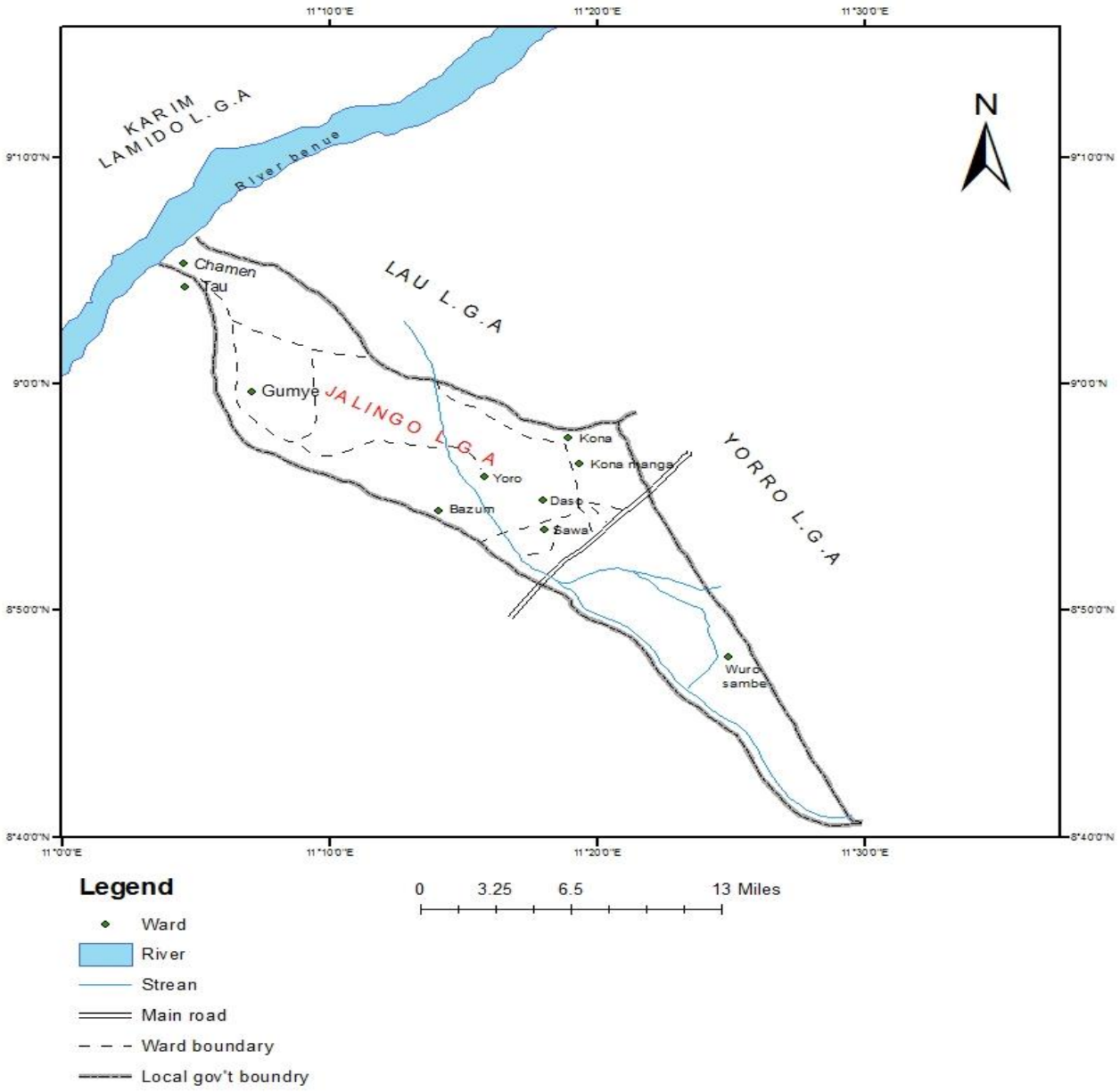

Figure 2: Map Of Jalingo Local Government Showing River Gwoi
Source: Ministry of Land and Survey, 2021

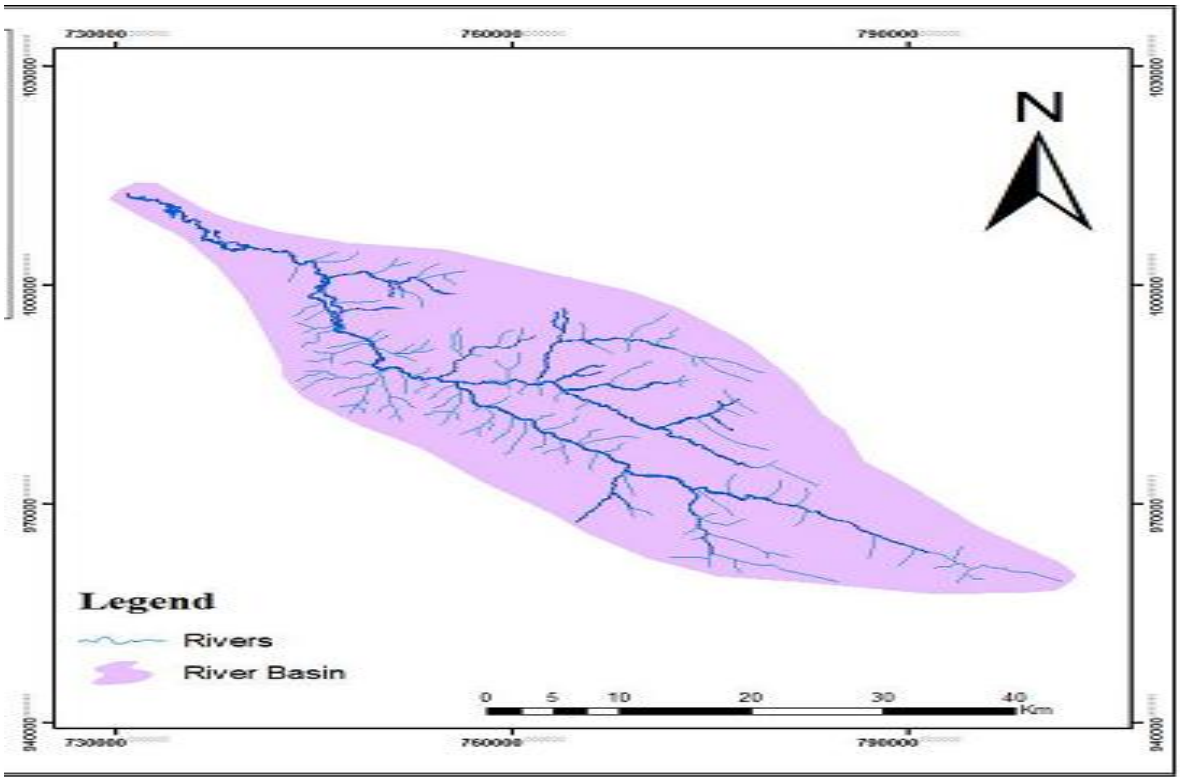

Figure 3: Location Map of River Gwoi
Source: Ministry of Land and Survey, 2021

3. Methodology

The study used primary and secondary sources of information. The primary source involved administration of 120 copies of structured questionnaire. The choice for the number of Questionnaires used was based on the population density of the two most encroached areas of Magami and Mayo Gwoi. Interview schedule was used to obtain firsthand information on the land use changes, level of perception and adjustments to the flooding events along River Gwoi. Purposive and systematic random sampling techniques are suitable and appeared to be the best option for sampling in this study were used. The choice for the statistical tools came as a result of the nature of impacts on the most vulnerable dwellers of the flood plains and their knowledge of the impacts caused at different locations and level in the past 15years. The first household sampled was selected randomly in each of the two communities while systematic sampling was used to select every fourth household in a community for the subsequent sampling. The questionnaire used comprises of closed ended which allow the respondents to answer the designed questions. Data collected, were subjected to descriptive statistical analysis using SPSS version 20.0. The descriptive statistics include frequency counts in percentages where results are presented in tables

4. Results and Discussion

4.1 Nature of Land uses on the Floodplains

Table 1 revealed that irrigation farming are the major land-use activities on the floodplain of river Magami and river Gwoi in the past 15years. By implication, it is as a result of the fertile alluvial soils deposited by river during flood events and access to water that support irrigation activities. The result further revealed that residential buildings take 39.3% and 38.5% in the area. Until recent times that Jalingo begin to grow as a complex urban center with population growth that necessitated the need for additional houses to accommodate the increasing population. The findings also indicate that River Gwoi floodplain was initially a Farm Land 50.8% and 65.9% with some parts of it as a vegetal cover 49.2% and 34.1% which covers some areas of the floodplain around Magami and Mayo Gwoi. Oruonye, (2015) observed that within the urban city of Jalingo and along the River Lamurde floodplains where the ecological, hydrological and the physical properties of the Floodplains are altered through human activities.

Table 1: Major land-use activities on the floodplain in the past 15years

Sample Areas	Major Land use Activities on Floodplains			Nature of the Flood plains		
	Frequency			Frequency		
	Irrigation Farming	Residential Building	Total(%)	Farm land	Vegetal cover	Total (%)
Magami	60.7	39.3	100	50.8	49.2	100
Mayo - Gwoi	61.5	38.5	100	65.9	34.1	100

Source: Field survey, 2021.

4.2 Perception of Impacts of Land- use Changes on the floodplains

Table 2 present results on the duration of activities and level of encroachment of river Gwoi floodplain. The encroachment is said to have started in the past 11-15years and continued to increase in a greater rate from the past 6-10years. By implication these changes came as a result of the recent developments of social and financial institutions as well as the establishment of tertiary institutions within Jalingo which have attracted people and others activities from nearby town and villages thereby arises the needs for additional residential houses and structures to accommodate the population and the developmental projects. Considering the level of encroachments which indicated that land-use changes continues to increase on the floodplain in less than five years which drastically changed the nature and the physical appearance of the floodplains

which use to be predominantly agricultural in nature with some few houses in the past 15years

Table 2: Duration of activities and Level of Encroachment on River Gwoi floodplain

Duration of Activities	Sample Area		Level of Encroachment		
	Magami	Mayo- Gwoi		Magami	Mayo - Gwoi
<5 years	34.4	30.3	Increase	22.2	63.0
6 – 10years	33.5	35.6			
			Moderate	64.4	25.9
11- 15years	17.3	21.1			
16-20years	10.0	5.6			
			Decrease	13.4	11.1
20years and above	4.8	7.4			
Total	100	100		100	100

Source: Field Survey,2021

4.3 Perception of the Causes of Land- use Changes on the Floodplains

Table 3 indicated that low cost of land 30.6% and 36.4% are the major cause of recent encroachment to the floodplain the plots of lands are in cheaper rates than in the other parts of the city and are not financially buoyant to buy land within the urban center of Jalingo most especially along the CBD district. While, proximate to urban center also plays its role with 27.4% and 24.3% respectively

Table 3: Level of Encroachment in Recent Times and the Causes of the Changes

Encroachment in Recent time	Sample Area		Causes of recent Encroachment		
	magami	mayo gwoi	magami		mayo gwoi
increasing	64.4	63.0	Low cost of land	30.6	36.4
			Prox. To urban centre	27.4	24.3
decreasing	22.2	25.9	Access to irrigation water	16.4	16.2
			Fertile Alluvial Soil	25.6	23.1
moderate	13.4	11.1			
Total	100	100		100	100

Source: Field Survey, 2021

4.4 Perception of the level of Awareness and Measures taken on the impacts of Land-use Changes

Table 4 shows that public awareness and fear of flood incidence are the two major factors that control the encroachment of the floodplains in recent times. This shows that the more people were aware of such risk and dangers, the more they become conscious of their actions. looking at the previous records of flood incidence, people still move to the floodplains ignorantly and blindly but for the fact that awareness were made following the flood incidence that occurred in 2009 and 2012, the damages and hardship experienced by the residents of the flood prone areas. It begins to discourage people to buy plots of land and carry out their activities along the floodplain. The implication is that, the more people are enlightened, the less they find themselves encroaching the floodplains as awareness and enlightenment will open up their minds and give them a broad understanding of the risk associated with staying on the prone areas of the floodplain.

Table 4: Reason for people retarding River Gwoi Floodplain in recent time

Sample Areas	Frequency	
	Public awareness by agencies (%)	Fear of flood incidence of 2009 and 2012 (%)
Magami	20.8	59.7
Mayo – Gwoi	79.2	40.3
Total	100	100

Source: Field survey, 2021

Table 5 presents result on the prevention strategies adopted before flood incidence, the result indicated that construction of proper drainage system could be the major prevention measures that can be taken before the flood incidence, because if well drainages are constructed along the houses it will give an access for the storm water to have it way down to the river channel. Other measures to be taken can either be by evacuating people from the prone areas as demolition process is to be made to the highly encroached parts of the floodplains or construction of embankment along river floodplains. these measures can help in reducing or curtailing the effects of flood and can help in safeguarding the areas as people are restricted from carrying activities immediately close to the river system but only far behind the constructed embankments.

Table 5: Prevention Strategies before Flood incidence

Sample Area	Frequency					
	Evacuation	Proper drainage system	Construction of embankment	Rising ground level	No response	Total
Magami	5.6	40.3	50.2	2.3	1.6	100
Mayo -Gwoi	10.4	39.3	42.5	5.7	2.1	100

Source: Field Survey,2021

Table 6 shows some of the management strategies adopted during the flood event which can aid in minimizing the damages and loss can be through evacuating and relocating from the flooded areas can reduce the flood menace for example residents of Magami which has the highest level of encroachment, other strategies can be either by shifting to high elevated areas,

making canals as other alternative options. These however, help in safeguarding the river system as well as protecting the lives; properties and health of the people living along the prone areas are secured through these measures.

Table 6: Mitigation strategy during the flood incidence

Sample Area	Frequency				
	Moving to high elevated areas	Making Canals	Evacuating and relocating from the area	Nothing done	Total
Magami	20.2	15.5	40.1	24.2	100
Mayo - Gwoi	30.6	18.3	31.2	19.9	100

Source: Field survey,2021

Table 7 indicate the level of awareness to flood and the result revealed that majority of the respondents from the selected sample areas of Magami and Mayo Gwoi indicated that they are aware of the risk and dangers associated with the stay on river flood plains. This shows that there was adequate level of awareness about the dangers and risks associated with the stay along river flood plains in recent times. According to the table also, about 20% agreed that they are slightly aware to some extent about the risk of dwelling on floodplains by relevant authorities and only about 10% of the dwellers said not to be aware of the dangers and risks. This corroborates with the findings of Derek, (2015) when assessing the peoples' awareness and perception of flooding in Donga local government area of Taraba state Nigeria, that majority of the floodplains dwellers are aware of the flooding before moving to the areas. Buchecker *et al.*, (2013) carried out Studies and reports on flood risks and other natural hazards to review of risk perceptions and other factors that influence flood mitigation behavior across the world, however, has shown that though considerable time, money and efforts have been deployed, yet the level of individual and collective preparedness remains low. Terpstra *et al.*, (2011) also observed that one of the critical reasons behind this low preparedness rate is

top-down risk communication practice, which simply presupposed that providing adequate information would be sufficient to encourage household flood preparedness. Provision of information alone might be insufficient, because the decision to adopt preventive measures and actions need to take under uncertain conditions. To this end, risk communication strategies can improve flood risk awareness, but, to tailor them properly, it is fundamental to understand what influences risk awareness and how it changes overtime.

Table 7: Level of awareness of the impacts of flooding

Sample Area	Frequency			Total
	Strongly aware	Moderately aware	Not aware	
Magami	69.4	20.5	10.1	100
Mayo – Gwoi	69.0	19.3	11.7	100

Source: Field Survey 2021

Table 8 indicated that majority of respondents showto flooding. By implication, government poor their readiness to vacate the prone areas and feelstrategic approach to protect the flood plains and its relatively safe leaving the area, reporting about 50%habitants has been the major reason why people have of the residents of River Gwoi flood plains. Theirnot shown their readiness to vacate the areas in the readiness to vacate the flood prone areas at any timepast. However, if proper and adequate compensation when compensated will enable them move to areasmeasures are employed on the flood plains, surely, away from the flood plains which will reducethe impacts and risk will be reduced or minimized. seasonal and occasional loss of lives and properties

Table 8: Level of Readiness to Adjustments

Sample Area	Frequency				Total
	Ready to vacate if compensated	Only to relocate during the flooding incidence	Only to vacate when given an early warning	Not ready to vacate nor relocate	
Magami	50.4	15.1	18.2	16.3	100
Mayo – Gwoi	48.4	10.5	20.8	20.3	100

Source: Field Survey 2021

Table 9 reveals that efforts by relevant authorities to reduce or minimize the impact of flooding on residents of the floodplains is commendable where 48% of the respondents commend the authorities in giving an early warning about the possible occurrence of flooding on the floodplains, about 20% of the respondents have also attested that the prompt awareness campaign by relevance authorities, 10% of the respondents said some relief materials were said to have been given to them after flood incidence whereas 20% of the respondents said some preventives measures were put in place by the relevance authorities to safeguard the flood plains and protect the life and properties during the flood incidence. By implication, adequate awareness campaign and given early warning can help to reduce the impact to some bearable minimum.

Table 9: Efforts by relevant authorities to reduce the risk and impacts of flooding on the flood plains

Sample Area	Frequency				Total
	Adequate Early warning system	Prompt awareness campaign	Provide some relief materials	Provide some preventive measures	
Magami	48.4	20.7	10.2	20.7	100
Mayo – Gwoi	41.9	11.5	11.8	34.8	100

Source: Field Survey 2021

Table 10 reveals that 40.4% of the respondents in Magami and 41.9 % in Mayo Gwoi said to have been informed about the impacts of flooding and land use changes through television stations and about 20.7% of the respondents in Magami and 11.5% said to have heard about the dangers associated with the stay on the flood plains through radio broadcast whereas about 9.2% in Magami and 11.8% in Mayo Gwoi only to have been informed of the dangers and risk through the flyers produced and placed around the town by relevant authorities and only about 10.7% in Magami and 34.8% in Mayo–Gwoi areas received the awareness campaign through physical visitation and interactive session they had with some of the voluntary organization members as they visit them time to time on the flood prone areas. However, the studies further reveal that there is need to put more efforts and strategized new medium of educating the dwellers of the flood prone areas as this will help in reducing their vulnerability to flooding in the future

Table 10: Medium of Awareness by relevant authorities

Sample Area	Frequency				Total
	Television	Radio Stations	Flyers	Visitation to Prone Areas	
Magami	40.4	20.7	9.2	10.7	100
Mayo - Gwoi	41.9	11.5	11.8	34.8	100

Source: Field Survey 2021

5. Conclusion

Land use changes along river floodplain have been the most common environmental challenges with much devastating consequences and impacts. Based on the findings of this study, it was concluded that, Land use changes is mainly associated with urbanization and population growth processes and the increase in demand for residential houses to accommodate the influx of population into the urban city of Jalingo from the neighboring towns and villages where insecurity said to have forced people to migrate and their needs to improve their standard of living through the earnings of better white collar jobs which are not found outside the urban settings.

In addition, these changes equally occurred on the floodplain of river Gwoi due to improper and inadequate management measures and regulations put in place by government or its agencies to conserve and protect the floodplain from human impacts and encroachments. It was also concluded that, negligence on the part of government has led to the conversion of agricultural lands within the flood plain to other non-agricultural purpose which in null shell affects the socio-economic life of the people living in the areas. Moreover, majority of the affected individuals perceived the impacts of the changes during flood events as catastrophic while others perceives it to be tolerable, due to its consequences on their lives, socio-economic aspects through devastation of buildings and eroding of their plots by erosion, damages to crops as well as changing the quality of water through dumping of refuse and washing of chemicals from farms lands and availability of water for their irrigation and other activities.

6. Recommendations

The study opined some policy recommendations which if implemented could play an important role in averting the impact of land-use changes on the environments as well as on the lives and properties of people living on the floodplain; Floodplains should be declared by government policy and ordinance as “Flood plain Conservation Areas” especially reserved for Agricultural uses in support of the recent Introduced Fadama Agricultural Development Project nationwide and the present government efforts and to diversify the economy of the nation to Agricultural base as other alternative to Oil. Proper land-use planning and regulations should be put in place by the relevant authorities concern such as Ministry of Environment, Ministry of Land and Survey as well as Town planning Authorities which can play a key role in balancing the developments requirements and the conservation and preservation of the natural resources on the floodplains.

Furthermore, proactive measures should be taken to stop the development on the remaining parts that is the un-encroached parts of the floodplain; this could be achieved through buyouts policy by buying properties or vacant land located in the floodplains of river by governments to prevent future development, and also the need for public enlightenment and awareness on the risk and dangers associated with living in the floodplain by the Government Agencies through Medias, Pamphlets and posters so as to put fear and let them know the risks and consequences.

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