

ASSESSMENT OF URBAN POOR VULNERABILITY TO CLIMATE CHANGE IN IKORODU LOCAL GOVERNMENT AREA, LAGOS, NIGERIA

¹ADELEKE Elisha Ademola, ²HABIB Ademola and ¹ASHIRU Mujeeedah
Omotolani

¹Department of Geography and Environmental Management, University of Ilorin, Nigeria

²Federal College of Fisheries and Marine Technology, Lagos, Nigeria

Corresponding Author's email: adeleke.ea@unilorin.edu.ng



Abstract

Urban poor refers to people who live in cities and towns without basic needs and this set of people are usually vulnerable to the effects of climate change. This study examines the vulnerability of urban poor to the effect of climate change in Ikorodu Local Government Area of Lagos state, Nigeria. One hundred and fifty six copies of questionnaire were administered using a simple random sampling technique. Tables, percentages frequency, time series analysis, mean, standard deviation and coefficient of variation were employed in analyzing the data. The result of the study revealed that urban poor do not have the financial capacity and technological facilities to cope with climate change while majority of the urban poor lack access to good health facilities. The urban poor often depend on aids for health, food and shelter. The result also revealed that construction of drainage, planting of vegetation and building of well-ventilated buildings can be used to mitigate climate change. The study concluded that climate change has an adverse effect on urban poor in the area of health and livelihood. Based on the findings, the study however recommended that prediction of climate events should be communicated to the people in the study area, this will help them prepare for extreme weather in order to reduce their level of vulnerability.

Keywords: Climate, Vulnerability, Urban-poor, Environment, Diseases

Introduction

Globally, climate change has been identified as a threat to human existence with its effects been felt daily in all countries of the world. The effects of climate change is broad, touching all areas of man's life, ranging from economic to socio-cultural and political effect. Many studies have been conducted on effects of climate change on economic growth and local livelihood. The result of a study on impact of climate change on developed economies by Du, Zhao and Huang (2017) revealed that projected temperature increase had significantly negative impact on the economic growth of the United State and the European Union. In Asia, Akram (2012) found that economic growth is negatively affected by changes in temperature, precipitation and population growth. The result of the study further indicated agriculture as the most vulnerable sector to climate change. In Africa, torrential rains and destructive winds caused flash floods and landslides which led to an economic loss of about US\$2.2billion (Carbon Brief, 2014). Nigeria faces both direct and indirect risk of the impacts of climate change which are detrimental to national economy. The increase in drought, desertification, scarcity of food influenced by irregular pattern of rainfall and

temperature are indications of the impacts of climate change (Ezegwu, 2015). In Nigeria, many urban areas are at risk of flooding caused by heavy downpour, resulting in an annual damage of billions of naira (Ezeabasil & Okonkwo, 2013).

Since the past few decades, many rural communities in Nigeria have transited into urban settlements. Most world's economy and more than half of its populace now live in urban areas (International Institute for Environment and Development, IIED, 2021). Rapid rate of urbanization and change in world climate pattern have intensified poverty level in many Nigerian urban centres. The influx of low-income individuals from peripheral communities into cities and the associated increase in unemployment, as well as pressure on limited available infrastructure and the environment have negatively contributed to rise in urban poverty.

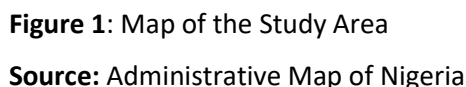
Vulnerability to climate change can be linked to high vulnerability to poverty. Many variables are responsible for people's vulnerability to the effects of climate change. Among these are nature of land and socio-economic such as infrastructure, health and education. The most vulnerable to poverty due to the effects of climate change are the urban poor. These are the set of urban residents or dwellers who, due to low resilience capacities suffer from economic and social difficulties traceable to different factors among which is irregular climate pattern. These categories of people are more vulnerable to climate change extreme events such as extreme heat, flooding from heavy rainfall, drought, strong wind (Baker, 2012). Many urban poor have limited choices when it comes to where they live. Due to low economic power, they are found in hazardous areas like coastal lands which are prone to rise in sea level and flood. Some are found in dry lands characterized with scarce water resources due to extended period of climate-induced drought. Houses in these areas are poorly constructed with non-durable building materials that cannot withstand strong wind, heavy rainfall or flood. Urban poor have less job security, low financial reserve and lack social safety nets to fall back on in time of crises. These conditions and lack of education about climate change make many urban poor in Nigeria to be highly vulnerable to poverty induced by effects of climate change. Similarly, the effects of climate change on the vulnerability level of urban residents to poverty can be observed in the area of risks to public health. Exposure of urban poor to extreme events such as earthquakes and landslides and unstable weather pattern have posed serious consequences for people's health, morbidity and mortality. Vector-borne disease such as malaria, and water-borne diseases such as cholera and diarrhea are very sensitive to unstable temperature and precipitation.

It has been predicted that if intensive actions and proper policy are not in place, over 215 million urban poor in developing countries, including Nigeria will be exposed to extremely high temperature due to climate change and to other climate related risks such as sea level rise, flooding and water scarcity (Climate Change Leadership Group, 2021). According to the report of IIED (2021), many urban poor might become homeless and many urban settlements uninhabited due to flood and many might be unable to carry out agricultural activities due to salt stress. Increased high temperature, along with low rainfall were predicted to result in low food production, high water demand, high risk of heat, mortality and low quality of life for poor urban residents. Moreover, poor responses to resource shortages could have serious negative effects, including more sickness and hunger, fewer jobs and poor economic growth, which in turn could open the door to more violence, in either rural or urban centre. Nigeria needs to consider the potential of climate to the vulnerability of the poor as the country figures out how to adapt.

Study Area

Ikorodu Local Government Area (LGA) is located approximately between latitude 3° 30'17.19" – 3°36'13.51" North of the Equator and Longitude 6° 37'26.20" - 6°45' 32.21" East of Greenwich

The basic soil type is sandy-clay soil, which is prone to runoff. Ikorodu LGA is located in an upland area with topography that enhances effective drainage through which several rivers flow into the Lagos Lagoon. The topography has flat and hilly elements. The area is approximately 30meters above sea level. Based on the NPC (2006) census, the population of the study area is put at 689,045. The municipality recorded a 186% population increase between the 1991 and 2006 censuses (i.e., from 184,674 to 689,045), and its population is estimated at 1.5million based on the United Nations Urbanizations Prospects projection for Lagos state of 12.9million (United Nations, Department of Economic and Social Affairs, Population Division, 2014).



Materials and Methods

The data required were both primary and secondary in nature. The primary data such as socio economic characteristics of respondents; effect of climate change on the people; extent of vulnerability of the poor to the effect of climate change; relationship between climate change and urban poor were gotten through the administration of questionnaire. The secondary data which include mean annual minimum and maximum temperature, rainfall, relative humidity and sunshine hours between 1982-2020 were collected from the headquarters of the Nigerian Meteorological Agency (NIMET) at Lagos, Nigeria.

The total population of Ikorodu local government area that was projected to 2020 (728,870) using Taro Yamane (1967) population projection formula with a growth rate of 3.2%. The formula is given below

$$\text{Formula } P_2 = P_1 (1+r)^n$$

Where P_2 =projected population

P_1 =current population

r = growth rate

n = number of years

$$P_2 = 535,619 (1+0.028)^{11}$$

$$535,619 (1.028)^{11}$$

$$535,619 (1.3608)$$

$$P_2 = 728,870$$

The sample size that will be used for the survey is 156 which was gotten using the projected population sample size by Taro Yamane (1973), this formula has been set as follows

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

Where n =sample size

N = population size

e = error of sampling

This study allows for error of sampling on 0.08, hence the sample size shows as follow;

$$n = \frac{728,870}{1+728,870(0.08)^2}$$

$$= \frac{728,870}{4664.8}$$

$$n = 156.3$$

$$\text{Approximately } 156$$

A multi-stage sampling approach was adopted in selecting the sample size. At the first stage, the study area was divided into four zones (East, West, North and South). A random sampling technique was used to select one slum area from each of these zones (Ijede, Oko-Itaw, Oreta and Magidun). Thirty-nine respondents were selected through a simple random sampling technique from each of the zones giving a total of 156 samples. Data collected were analyzed using descriptive statistics and were presented in Tables and Charts.

Results and Findings

Table 1 and Figure 2 present the descriptive characteristics of the climatic elements in the study area. The lowest minimum temperature of 22.6°C was recorded in 1985 while the highest of 26°C was recorded in 2011. The mean minimum temperature for the study period is 23.7°C with a standard deviation of 0.060 and a coefficient of variation of 2.56%; this implies that the minimum temperature during the study period is homogenous. Furthermore, the lowest maximum temperature of 29.2°C was recorded in 2009 while the highest of 32.2°C was recorded in 2012. The mean maximum temperature is 31°C with a standard deviation of 0.642 and a coefficient of variation of 2.07; this implies that the maximum temperature received during the study period is homogeneous.

Table 1: Description of Climatic Variables of the Study Area

Year	Min T	Max T	RH	Rain	Sunshine
Mean	23.7	31.0	82.3	131.8	5.07
STD	0.606	0.642	1.705	25.69	0.290
CV%	2.56	2.07	2.07	19.5	5.72

Source: Authors Computation, 2020

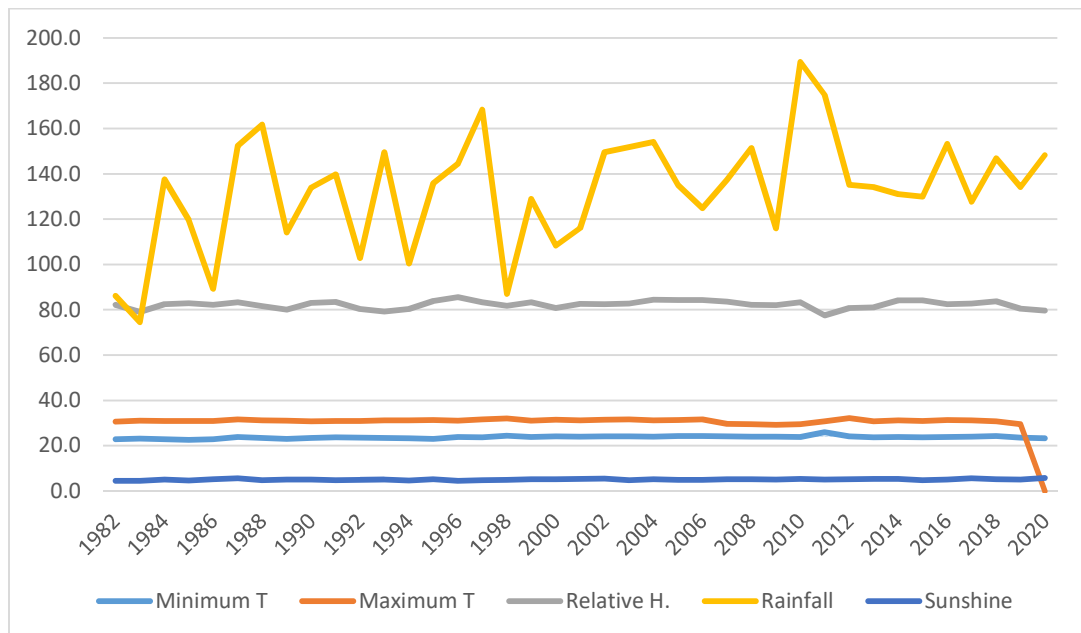


Figure 2: Pattern of Climatic Variables in the Study Area

As stated in Table 1, the lowest relative humidity of 77.6% was recorded in 2011 while the highest of 85.6% was recorded in 1996. The mean relative humidity for the study period is 82.3% with a standard deviation of 1.705 and a coefficient of variation of 2.07%; this implies that the relative humidity received during the study period is homogeneous. Furthermore, the lowest rainfall amount of 74.6mm was recorded in 1983 while the highest of 189.4mm was recorded in 2010. The mean rainfall for the study period is 131.8mm with a standard deviation of 25.69 and a coefficient of variation of 19.5%; this implies that the rainfall received during the study period is homogeneous. Also, the lowest sunshine hours of 4.5hours was recorded in 1982, 1983 and 1996 while the highest of 5.6 hours was recorded in 1987. The mean sunshine hours for the study period is 5.07hours with a standard deviation of 0.290 and a coefficient of variation of 5.72%; this implies that the sunshine hours received during the study period is homogeneous.

Socio Economic Characteristics of Respondents

Table 2 presents the socio-economic characteristics of the respondents. Out of the 156 respondents, 53% are male while 47% are female; this shows that both sexes are fairly represented in the study. Also, 36% are within the age of 18-30years, 31% 31-40years, 25% 41-50years and 8% above 50 years. This shows that majority of the respondents are in their productive ages. Furthermore, 30% of the respondents are single, 51% are married, 10% are divorced, 5% are widowed while 4% are separated.

Table 2: Socio Economic Characteristics of Respondents

Socio Economic Characteristics	Frequency	Percentage
Sex		
Male	82	53
Female	74	47
Total	156	100
Age Group		
18-30years	56	36
31-40years	48	31
41-50years	39	25
Above 50years	13	8
Total	156	100
Marital Status		
Single	47	30
Married	80	51
Divorced	15	10
Widowed	8	5
Separated	6	4
Total	156	100
Religion		
Islam	67	43
Christianity	81	52
Others	8	5
Total	156	100
Education		
No formal education	25	16
Primary	47	30
Secondary	32	21

Tertiary	38	24
Others	14	9
Total	156	100
Occupation		
Farming	32	21
Trading	27	17
Civil Servant	42	27
Unemployed	13	8
Others	42	27
Total	156	100
Income		
Less than 20,000	87	56
20,000-40,000	21	13
40,001-60,000	26	1
60,001-80,000	9	6
Above 80,000	13	8
Total	100	100

Source: Authors Computation, 2020

In Table 2, out of the 157 respondents, 43% are Muslims, 52% are Christians while 5% practice other religion. Furthermore, 16% of the respondent have no formal education, 30% possess primary education, 21% secondary, 24% tertiary while 9% possess other forms of education. This result shows that majority of the respondents have one form of education thus will have knowledge about the research questions. Further, 9% of the respondents are farmers, 32% are traders, 27% are civil servants, 8% are unemployed while 27% are engaged in other occupations like iron bending and welding, plumbing, Carpentry, hair dressing among others. Also, 56% of the respondents earn less than N20,000 monthly, 13% earn within N20,000-N40,000, 17% earn within N40,001-N60,000, 6% earn within N60,001-N80,000 while 8% earn above N80,000 monthly. This result shows that the income level of respondents is average. The implication of this result is that age, income, education and marital status of respondents determines how they cope with the vulnerabilities of climate change. Older people have lived in the area for a long while and have experienced various changes in the climate thus they may have devised means to adapt to the vagaries of climate change. Furthermore, income of respondent determines his financial capability to cope with the effect of climate change. The income level of respondents in the area is low thus majority of the respondents may not have the financial capability to cope with the effect of climate change.

Flood Experience

As shown in Figure 3, out of the 156 respondents, 105(67%) have experienced flooding while 51(33%) have not experienced flooding. This result shows that majority of the respondents have experienced flooding. In Ikorodu, flooding has become an annual environmental hazard that the people live with and this is as a result of increase in rainfall in the area. Furthermore, the relief of the area is lowland, the area is close to the ocean and surrounded by creeks. Climate change has led to increase in sea level and increasing flood risk of coastal area such Ikorodu.

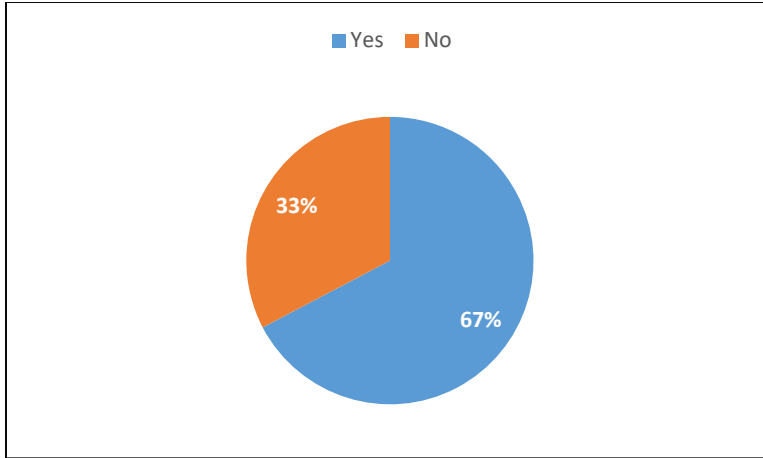


Figure 3: Experience of Flood

Source: Authors Computation 2020

Changes in Temperature

Figure 4 shows the respondents response to changes in temperature in the area. Out of the 156 respondents, 69% opined that there has been a high increase in temperature, 14% stated slight increase in temperature while 17% opined no changes in temperature. This result shows that majority of the respondents are aware of the increase in temperature in the area. This increase in temperature could affect the yield of crops, psychological comfort of the urban poor and so on.

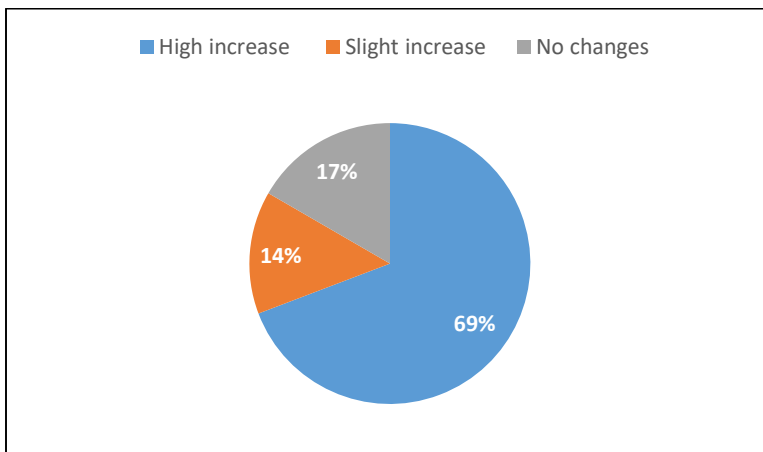


Figure 4: Changes in Temperature

Source: Authors Computation, 2020

Common Extreme Weather Events in the Area

Table 3 shows the extreme weather events experienced by the respondents in the area. It revealed that out of the 156 respondents, 20% of respondents opined that they have experienced late onset of rainfall, 11% stated early cessation, 65% stated heat waves while 4% stated intense harmattan. This result shows that heat waves have been on the increase in recent times. This is attributed to climate change effect that has led to increase in surface temperature. Heat waves caused health discomforts such as rashes, meningitis, heat cramps among others. Urban poor do

not have the capacity to buy electronics such as air conditions to reduce the impact of heat at homes which has made people to be more vulnerable to various kinds of illness.

Table 3: Extreme weather events

Common extreme weather	Frequency	Percentage
Late onset of rains	31	20
Early cessation	17	11
Heat wave	101	65
Intense harmattan	7	4
Total	156	100

Source: Authors Computation, 2020

Other Global Warming Effect Experienced

Water scarcity is one of the major observable effect of climate change in the area. Some wells dry up during the dry season while some do not produce as much water as they used to produce. The outbreak of heat related diseases such as meningitis, rashes, typhoid, malaria, cholera to mention a few are among the health diseases that have increased due to climate change impact in the area. Furthermore, farming such as urban vegetable farming has reduced in yield due to climate change because of the heavy rainfall usually lead to flooding in the area (Figure 2).

Extent of Vulnerability of Urban Poor

IPCC (2007) opined that West Africa region is the most vulnerable part of Africa to the vagaries of climate change. This has led to situation of water stress and scarcity, decrease in agricultural productivity an increase in various climatic hazards resulting to loss of lives and finances. Furthermore, poor people in the region cannot afford technological facilities to cope with the vagaries of climate change.

Financial Capacity to Cope with Climate Change

As indicated in Table 4 out of the 156 respondents, 91% opined that urban poor do not have the financial capacity to cope with climate change while 9% opined that they have the financial capacity to cope with effect of climate change. This result shows that majority of the respondents opined that urban poor do not have the financial capacity to cope with climate change. The implication of this is that when the effect of climate change such as flood, heat waves among others are experienced, the urban poor will not be able to cope due to low financial capability. This can result in deaths, increase in poverty level and exposure to various types of illnesses.

Table 4 Financial Capacity to Cope with Climate Change

Financial capacity to cope with climate change	Frequency	Percentage
Yes	142	91
No	14	9
Total	156	100

Source: Authors Computation, 2020

Technological facilities to cope with climate change

As shown in Figure 5, the response of the respondents to technological facilities to cope with climate change include 80% of the respondents stating that they have limited technological facilities to cope with climate change while 20% are of the opinion that they do not have limited facilities. This result shows that majority of the respondents have limited technological facilities to cope with climate change. Air conditions, generators, refrigerators and other technological facilities that could be used to cope with climate change are expensive and most of the respondents cannot afford them due to financial constraints and high level of poverty they were subjected to. Moreover, 8% of these respondents are jobless owing to the economic situation of the country among others (Table 2).

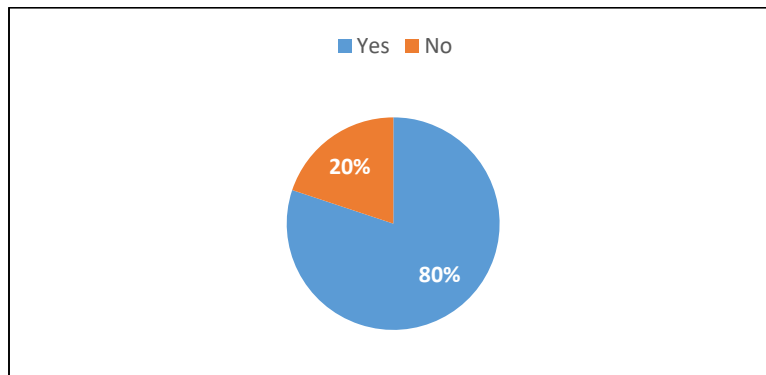


Figure 5: Technological Facilities to Cope with Climate Change

Source: Authors Computation, 2020

Lack of Access to Good Health Facilities increase Vulnerability

As indicated in Table 5, 16% of the respondent stated that lack of access to health facilities leads to vulnerability of heat strokes, 6% stated it leads to cancer vulnerability, 16% stated that it increases vulnerability to dehydration, 48% stated meningitis vulnerability while 14% stated other illness. The implication of this is that when the urban poor are infected by any of these diseases, they cannot afford good medical cares and this can lead to loss of life. Lack to access to health facilities could result to life threatening illness among the urban poor.

Table 5: Perceived Health Challenges due to Climate Change

Vulnerability	Frequency	Percentage
Heat strokes	25	16
Cancer	10	6
Dehydration	25	16
Meningitis	75	48
Others	21	14
Total	156	100

Source: Authors Computation, 2020

Vulnerabilities of People to climate change effect

Figure 6 shows the vulnerability of urban poor to climate change. 37% of the respondents stated that they are vulnerable to malnutrition, 8% stated that they were vulnerable to ulcer, 33% were vulnerable to starvation while 22% agreed that they were vulnerable to other ailment like recurring dengue fever, typhoid fever among others. Climate change induces hazards such as excess rain that causes flooding and destroying farm land; this can lead to hike in price of food exposing urban poor to malnutrition. For example, in 2016, there was a price hike in tomatoes and many people could not afford to buy it. Loss of yield can also lead to starvation. The implication of this is that climate change effect exposes people to various type of vulnerability which can affect their livelihood. Destruction or loss of crop yield will lead to high demand for limited supply of produce which will result in price hike thus many urban poor will not be able to afford it exposing them to malnutrition and starvation.

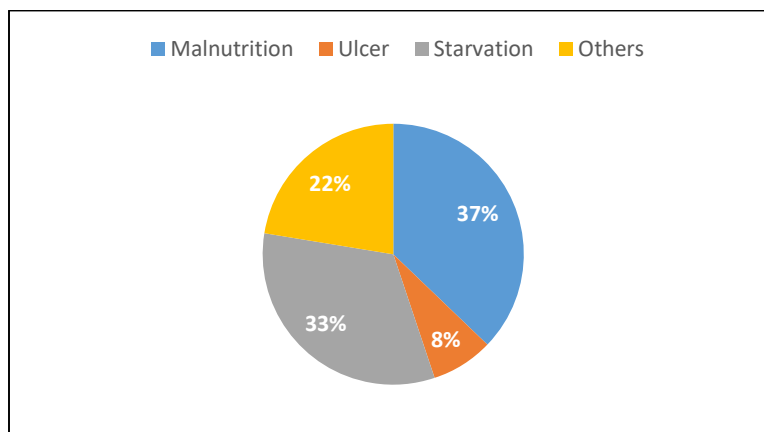


Figure 6: Vulnerabilities to Climate Change

Source: Authors Computation, 2020

Vulnerability of Urban Poor to Hazards

In Table 6, 33% of the respondents opined that they are most vulnerable to flood, 44% opined that they are most vulnerable to water scarcity, 8% stated that they are most vulnerable to water

quality while 15% stated that they are vulnerable to other hazards such as drought, air and water pollution, road failure and heat stress. The implication of this is that floods can destroy lives and property. When this destruction happens, many urban poor are left to depend on government and NGO for aids. Flooding can also pollute sources of water resulting to the problem of quality. If water of poor quality is consumed, it can lead to various types of illness among others. Furthermore, shortage of rains with excess heat can lead to drying up of water sources and reduction in recharge rate of wells and boreholes; this could result in water scarcity.

Table 6: Vulnerability of Urban Poor to Hazards

Urban poor are most vulnerable	Frequency	Percentage
Flood	52	33
Water scarcity	68	44
Quality water	12	8
Others	24	15
Total	100	100

Source: Authors Computation, 2020

Threats to Urban Poor and Coping Strategy

As indicated in Table 7, out of the 156 respondents, 81% opined that climate change threatens the coping strategy of urban poor while 19% stated that climate change does not threaten the coping strategies of urban poor. From the result, it could be seen that climate change threatens the coping strategies of urban poor by negatively affecting various measures put in place to mitigate the effects of climate change.

Table 7: Threat to Coping Strategies

Threat to coping strategy	Frequency	Percentage
Yes	127	81
No	29	19
Total	156	100

Source: Authors Computation, 2020

Climate Change Increases Poverty

As shown in Figure 7, 71% of the respondents were of the opinion that climate change has increased poverty level in the area while 29% had the view that it has not increased the level of poverty. From the result, it could be seen that climate change has increased poverty level in the area. There has been increase in flood in the area in recent times and these floods destroy properties, farmland and affects the livelihood of urban poor. This has led to increase in poverty in the area. Climate change effect in the area or extreme weather has affected the yield of crops in the area. It has affected fishermen and many people from all forms of life which has increased poverty in the area.

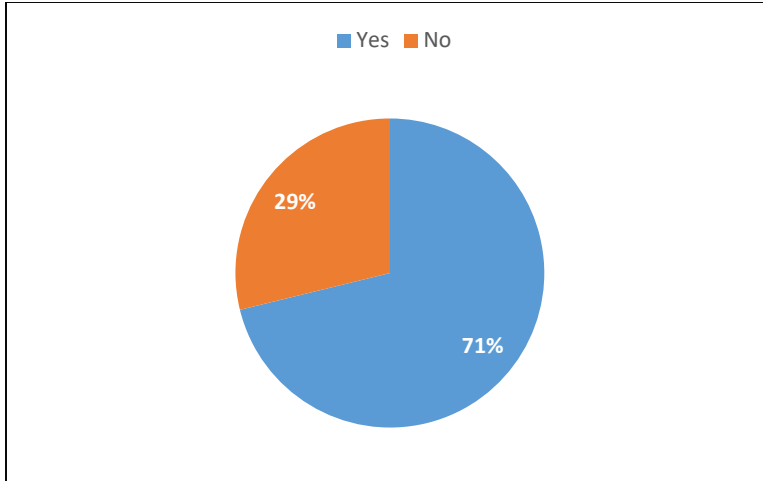


Figure 7: Increase in Poverty

Source: Authors Computation, 2020

Dependence on Aids

As stated in Table 8, out of the 156 respondents, 27% stated that climate change has increased the dependence of urban poor on health assistance from both the government and substandard healthcare providers, 65% stated that due to the effect of climate change, many people now depend on supports from members of their community for food, while 8% indicated that climate change effects such as rain storm and flooding had made many people homeless and therefore squatting with friends and relatives. The implication of this result is that majority of people could no longer feed themselves. This could be linked to the increase in the number of street beggars in the study area due to lack of access to food, health facilities and shelter.

Table 8: Dependence on Aids

Depend on aids	Frequency	Percentage
Health	43	27
Food	101	65
Shelter	12	8
Total	156	100

Source: Authors Computation, 2020

Coping Strategies

As shown in Table 9, 48% of the respondents agreed that drainages should be constructed to reduce flooding in the area, 27% opined that vegetation should be planted to reduce urban heat, 12% stated that well ventilated buildings should be constructed while 13% stated other method should be used to mitigate the effect of climate change.

Table 9: How to Mitigate Climate Change

How to mitigate effect of climate change	Frequency	Percentage
Drainage to reduce flood	75	48
Vegetation to reduce urban heat	42	27
Well ventilated building	18	12
Others	21	13
Total	156	100
Change of mode of dressing		
Yes	125	80
No	21	20
Total	156	100
Change of diet		
Yes	78	50
No	78	50
Total	156	100

Source: Authors Computation, 2020

Similarly, 80% of the respondents were of the opinion that they have to change their dressing to cope with climate change. Rising temperatures in summer which is accompanied by sporadic rainfall in the study area has made many of the respondents to always wear light-weight fabrics to prevent heat stress. Also, 20% stated there is no any need to change their mode of dressing for them to cope with any change in climate. Further, 50% of the respondents stated that they have changed their diet to cope with climate change, while 50% stated that they have not changed their diet. Climate change has made food production, distribution and utilization more vulnerable and this in turn affects dietary and nutrition (FAO, 2020). Irregular pattern of rainfall and temperature have led to low crop yield and this has resulted in high cost of food stuff in Nigeria. As a result of this, many poor urban households are unable to eat three square meals in a day and in many cases, rarely consume balance diet. This implies that people were quite aware of climate change and they have adopted their own primitive ways to cope with the challenges of climate change in the area.

Conclusion

Climate change effect is a phenomenon facing the society in the 21st century. A wider relationship has been in existence between urban poor and climate change. Poverty, whether at local, national or global level is considered to be a multinational problem. Urban poor due to high level of living standard in the area of their abode are majorly susceptible to threat of climate change. They are vulnerable to starvation, harsh climate, health, shelter and clothing challenge, among others. Increase in rainfall in the area often enhance rate of flooding, destruction of shelter and basic infrastructures. With respect to these findings, the study however recommends that prediction of climatic events should be communicated to the people by Government via her Environmental Agencies in the study area. This will help the people to get prepared for the unforeseen events in order to reduce their level of vulnerability. Moreover, empowerment programs should be created for urban poor because this will help them with the means to cope with the menace of climate change.

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