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ASSESSING THE CAUSES AND IMPACTS OF CLIMATE CHANGE-INDUCED MIGRATION IN NIGERIA: A CASE STUDY OF AGEGE AND MAKOKO AREAS OF LAGOS STATE

[1] Chinenye L. Okafor, [2] Steven O. Onibalusi, [3] Christopher M. Agosu & [4] Michael A. Ahove

[1,2,3,4] Centre for Environmental Studies and Sustainable Development, Lagos State University, Ojo, Lagos Nigeria.
Corresponding author e-mail: chinenye.okafor@lasu.edu.ng

Abstract

Migrating to urban centers like Lagos State has become a coping mechanism for individuals affected by climate change. This research assessed the causes and impacts of climate change-induced migration in Agege and Makoko areas of Lagos State. A survey research design was employed using a structured questionnaire and mixed sampling techniques. Data collected was analyzed using both descriptive and inferential statistics. Results show that Climate Change has necessitated migration of people from their original settlements to Lagos State with impacts such as environmental degradation, drought, sea level rise, erosion, flooding and loss of livelihoods. Majority of the migrants moved to locations with livelihood opportunities that are historically associated with where they are coming from, creating a natural environment for them to resettle. In both locations, the influx of people contributed to environmental issues such as pollution and indiscriminate waste disposal. The test of hypotheses showed that there is a significant difference between the factors that led to migration of people and that the environmental changes are largely contributed to by the level of immigrants into the host communities. The study recommends that the provision of affordable housing to cater for the population growth that climate change-induced migration may cause. It also recommends that a database be kept capturing migrants within the state to include them budgetary and infrastructural development plans.

Keywords: Climate Change, Displacement, Global Warming, Migration, Planned Relocation, Mobility.

Introduction

Climate Change is one of the most pressing issues of our time, and its impacts are far-reaching and devastating. In brief, Climate Change refers to the long-term change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period typically decades or longer. It is attributed directly or indirectly to human activities due to an increase in average global temperatures (Ahove et al., 2021). This phenomenon is primarily caused by human activities that release greenhouse gases, such as carbon dioxide (CO_2), and methane (CH_4) into the atmosphere, leading to a range of environmental, social, and economic impacts. On one hand, the three broad categories of impacts have potential for causing environmental degradation, climate related disasters, water scarcity, food insecurity, loss of livelihood, health risks and social and cultural disruption. However, depending on the severity of climate change impacts, human beings react differently, migration is considered as one of the coping strategies to the resulting impacts of climate change (Trummer

et al., 2023). The mobility strategies could either be forced movement-Displacement, Voluntary Movement-Migration or organized relocation which are often organized by the government or humanitarian or environmental safety organizations. Renaud et al., (2007) in attempt to classify and define environmental migrants, identified three categories of environmental migrants, namely: environmentally forced migrants and environmentally motivated migrants. Within the context of this research work, focus shall be on environmentally motivated migrants which may be for security (food and life) or for any other forms of adaptative strategies.

Natural disasters, due to climate change, influences migration or displacements. As the planet warms, extreme weather events such as hurricanes, wildfires, and landslides are now becoming more frequent and intense, forcing people to abandon their original homes for security and safety. In 2017, Hurricane Maria devastated Puerto Rico, leading to an estimated 200,000 people migrating to the United States (Acosta et al., 2020). In 2019, Ethiopia witnessed unimaginable season of precipitation that displaced over 200,000 people (Teku, 2025). Lake Chad Basin is also suffering from the impact of Climate Change and the means of livelihood of the individual around the basin is being threatened hence, resulting to migration of millions of inhabitants of the Lake Chad area. Kenya, Northern Mali, Ecuador, Peru and Uganda too are not left out from environmental disasters due to prolonged season of drought that had adverse effects on both the crop and animal farming (Zieba et al., 2017). This has led to water scarcity and food insecurity which is responsible for migration of people to places perceived to be a safe and economically buoyant environment leaving their original place of settlements.

The International Organization for Migration (IOM) predicted that climate change may result in the internal migration of about 44-113 million people globally by 2050 due to the slow onset of climate impacts such as drought, scarcity of water and sea level rise. This figure is further projected to increase to 125-216 million people globally under a more pessimistic scenario with many being either forced or voluntarily migrated away from original settlements to another in search of better living conditions (IOM, 2022).

Sea-level rise is another significant driver of Climate Change induced migration. As the planet warms, glaciers and ice sheets at arctic regions melt, causing rise in sea levels. The sea level rise when occurring leads to coastal erosion, flooding, and saltwater intrusion into freshwater zones, making it difficult for people to live in coastal areas or to carry out their natural occupational activities. For example, in the Maldives, a small island nation in the Indian Ocean and Karigram District of Bangladesh identified Sea-level rise as a threatening factor to the existence of their country, leading to a significant migration of its population (Abbasi et al., 2024). Changes in temperature and precipitation patterns are also driving migration. As the planet warms, some areas are experiencing more frequent and severe droughts, while others are experiencing floods. The change in temperature and precipitation pattern leads to water scarcity, crop failures, and loss of livelihoods with an outcome of forcing people to migrate in search of better living conditions.

Nigeria as one of the Sub Sahara Africa countries can never be denied of her own fair share of the impacts of Climate Change that are now global environmental phenomenon. According to the IOM, Nigeria is one of the countries that are most affected by Climate Change in West Africa with an estimated 1.3m displaced people by the Climate Change related events such as rising sea levels, extreme weather events, drought and changes in precipitation patterns as reported between 2014-2018 (IOM, 2022). One of the main drivers of Climate Change induced migration in Nigeria is the increasing frequency and severity of droughts. The country has experienced several severe

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droughts in recent years, including a devastating drought of 2016 that affected over 20 million people, mostly in the Northern part of Nigeria (Ogunrinde, 2022). Droughts have a significant impact on agriculture, which is a major source of livelihood for many Nigerians. As crops fail or produce low yields and livestock dies due to water scarcity and lack of forages. The vulnerable individuals are forced to migrate to a perceived safe environment either as a survival strategy for protection or to seek alternative means of livelihood, many of them always end up in urban areas.

Another driver of Climate change induced migration in Nigeria is the increasing frequency and severity of floods. Flooding is an environmental condition when there is an overflow of water that submerges land and consequences damage to properties, infrastructure, and the environment. This scenario occurs when the water level in a river, lake or ocean exceeds its normal limits, often due to heavy rainfall, storm surges and snow melting. Or dam failure. Nigeria had experienced several major floods in recent years; worthy of note is the devastating flood of 2012 that affected 30 out of the 36 states of Nigeria with Kogi and Benue and Taraba being the worst affected states. In total over 7 million people were reported to have been affected by different degrees of economic loss and hardship (Umar and Gray, 2023). Floods have a significant impact on homes, infrastructure, and agriculture, forcing many people to migrate to higher ground or urban areas too to seek better living and protection from outbreak of diseases. Climate change is also having a significant impact on the Lake Chad Basin, which is a major source of water and livelihood for many people in the Northwest Nigeria and other West African countries. The lake has shrunk by over 90% in recent decades, due to a combination of Climate Change effects, overgrazing, and population growth (Onuoha, 2009). This has led to a significant decline in fishing and crop agricultural practices, forcing many people to migrate to other areas in search of employment opportunities and food. Climate change induced migration in Nigeria has significant implications on individuals, communities, and the country.

In many cases it leads to social, economic, and cultural disruption, as well as psychological trauma. Migrants, sometime due to limited resources may face challenges in accessing basic services like healthcare, education, and sanitation, and they may also face discrimination and xenophobia within their host communities (United Nations High Commissioner for Refugees, UNHCR, 2019). Furthermore, Climate Change induced migration can also have significant economic implications. It often led to loss of skilled workers, a decline in economic productivity, and a strain on public services in host communities (Feriga et al., 2024). At this junction, we must remind ourselves that Lagos State, Nigeria is a prime choice for the potential migrants and displaced individual for possible resettlement. The State, however, is vulnerable to Climate Change impacts due to its low-lying terrain and topography (Nicolson et al., 2021). Climate-induced migration poses significant challenges to the social, economic, and environmental fabric of Lagos State, particularly in the Agege and Makoko areas. The influx of migrants has also put a strain on limited resources such as infrastructure, housing, portable water, sanitation, and healthcare services.

Additionally, climate-induced migration has significant economic and social impacts, including loss of livelihoods, income, and property, as well as changing community dynamics, social structures, and cultural practices. This development needs government attention to manage this natural growth through sustainable governance practices. It may be argued that migration has contributed to the urbanization process of Lagos State, but this is not without some negative environmental impacts. Also worthy of note, is that migrants and their host communities are dire need of support services from the government to cope with developments and these have to be

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done through incorporation of social and environmental concerns into policy making that may support provision of basic services like healthcare, education, and sanitation as to meet their social, economic and cultural disruption needs as well as providing psychological support and counseling for the affected individuals (IOM, 2022; UNHCR, 2019).

This study examined the impacts of climate-induced migration from other states and the neighbouring countries into Lagos State, with a specific focus on the Agege and Makoko areas of Lagos. Three research questions and two research hypotheses were raised and they include:

1. What is the migration flow pattern and the factors that contribute to climate-induced migration?
2. What are the social, economic, and environmental impacts of climate-induced migration?
3. What are the adaptation strategies of host communities to climate induced migration in addition?

H10: There is NO significant difference between factors that contribute to climate induced migration in Agege and Makoko.
H20: Climate induced migration DO NOT contribute to environmental changes in Agege and Makoko.

This study will no doubt contribute to the understanding of the dynamics of Climate Change induced migration in Lagos State, its effects, identifying adaptation strategies including government policy and intervention approaches to address the impacts of climate change-induced migration. The study is significant to both the government and the host community to develop resilience to the impacts of climate-induced migration. To ensure a focused and manageable research scope, a geographical (climate-induced migration into Agege and Makoko areas of Lagos State from other states and neighboring countries. It does not cover internal migration within the Lagos State), population (only on migrants and residents in Agege and Makoko were considered.

Research Methodology

Research Design

The study used a cross-sectional design survey, which involved collecting data at a single point in time. This design was chosen because it allowed for the collection of data from many participants in a relatively short period.

Study Area

The study was conducted in Agege and Makoko Areas, Lagos State Nigeria. Agege and Makoko are amongst the largest informal settlements, or slums, in the State but with distinct characteristics: Makoko is a famous floating slum built on stilts over the Lagos Lagoon, known for its stilt houses, boat transportation, and economy centered on fishing. Agege, though also informal and crowded, is a land-based slum where residents are often involved in informal economic activities like trading, carpentry, and other labor-intensive work. Both communities have high population densities and face challenges like poverty, lack of sanitation, and pressure from the government and development. Their physical environments and primary livelihoods differ significantly but with limited access to basic infrastructural services such as clean water, sanitation, health and educational services just to mention but few (Ajayi et al., 2014; Ademola et al., 2022).

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Agege is bounded by the following sets of coordinates: 6.6167° N, 3.3167° E (NE), 6.6499° N, 3.3499° E (NW), 6.6167° N, 3.3667° E (SW), 6.6499° N, 3.3999° E (SE) while Makoko is bounded by 6.4667° N, 3.3667° E (NE), 6.4999° N, 3.3999° E (NW), 6.4667° N, 3.4333° E (SW), 6.4999° N, 3.4667° E (SE). The influx of people or migrants into the study areas has led to high population densities as witnessed today. Information from United Nation Department of Economics and Social Affairs (2020), Lagos State population projection of 2019 and National population Commission (2006 and 2019) all agree to the geometric population growth of the two communities. In 1993, the population of Agege and Makoko were 288,000 and 123,000 respectively while in 2022 it was estimated to be 676,000 and 304,000 respectively.

Figures 1, 2 and 3 show the map of sampling points at both areas, sampling points in Agege and sampling points in Makoko respectively along with their geographical coordinates.

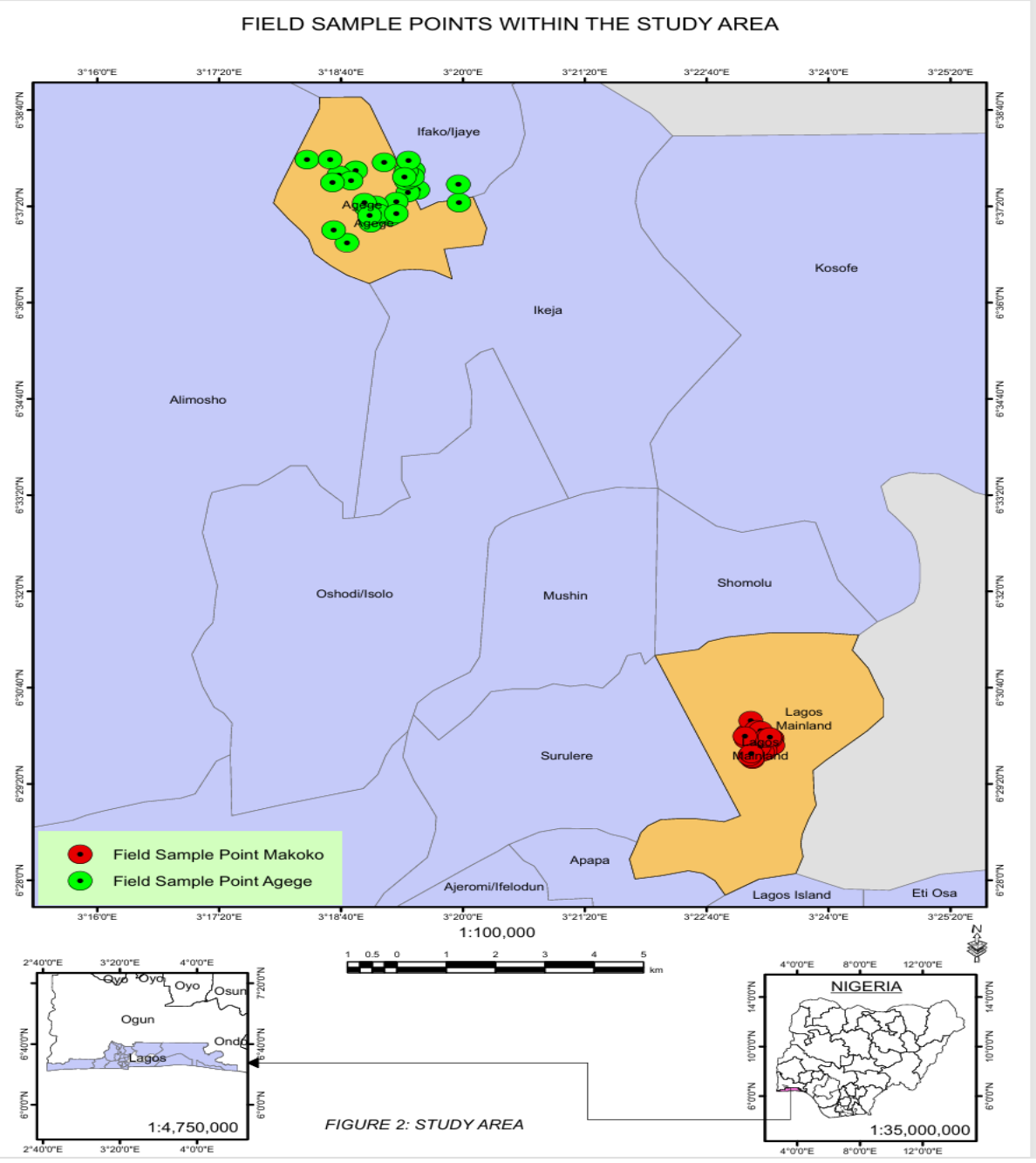

Figure 1: Map of the Study Area showing sampling points for Agege and Makoko

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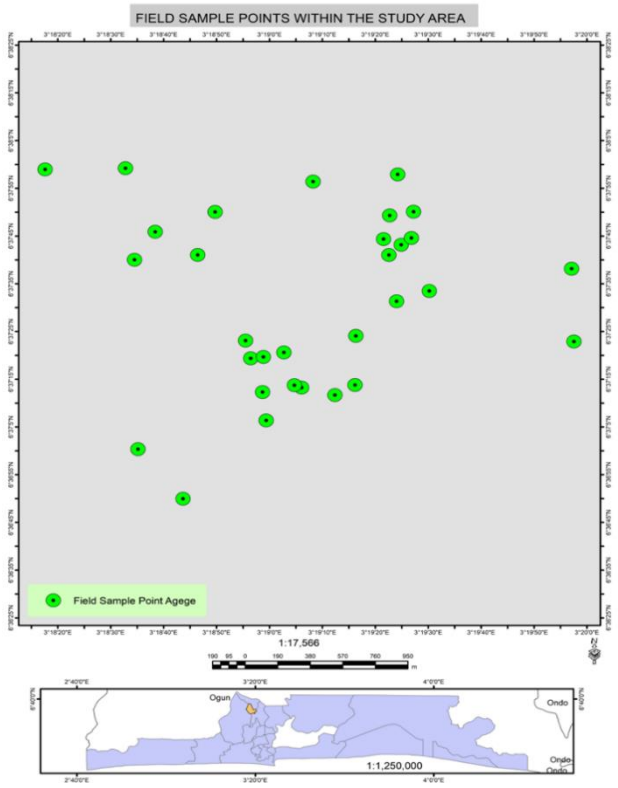


Table

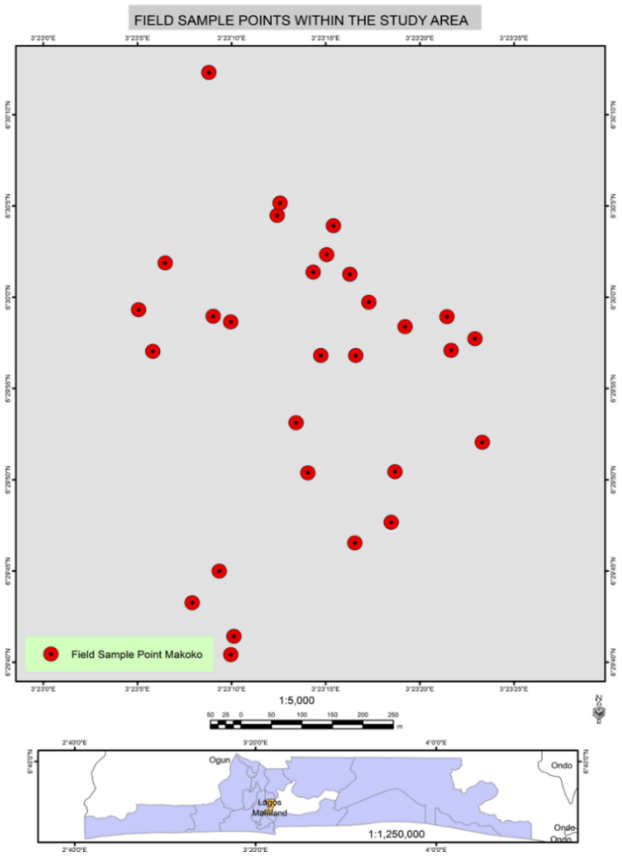
Field Sample Point Agege

FID	Shape *	Y	X	Location
0	Point	6.633042	3.304889	Isale Odo
1	Point	6.63057	3.313815	Okekoto
2	Point	6.625966	3.325059	Darocha
3	Point	6.62537	3.32334	Agege Train station
4	Point	6.619911	3.320104	Alfa Nla Rd
5	Point	6.623355	3.321204	Papa Ashafa
6	Point	6.62806	3.322941	Ifako Agege
7	Point	6.628656	3.323587	Anipupo St
8	Point	6.63058	3.324233	Iju Ishaga Rd
9	Point	6.613878	3.312131	Dopemu
10	Point	6.622049	3.315683	Morikaz
11	Point	6.62213	3.31635	Morikaz mosque
12	Point	6.62905	3.32412	Pen Cinema
13	Point	6.629411	3.310669	Okekoto
14	Point	6.63311	3.309107	Orile Agege
15	Point	6.620342	3.318357	Oniwaya
16	Point	6.616762	3.309768	Agbotikuyo
17	Point	6.618433	3.316495	Oniwaya
18	Point	6.630365	3.322982	Odejobi St
19	Point	6.632334	3.318958	Oko Oba/ Tabon Tabon
20	Point	6.623027	3.332652	Keke
21	Point	6.627263	3.332532	Oba Ogunji
22	Point	6.632752	3.323402	Off Iju Rd
23	Point	6.628066	3.312898	Omoroga
24	Point	6.627785	3.309583	Ayige St
25	Point	6.628989	3.322658	Nrc
26	Point	6.62239	3.317426	Owo St
27	Point	6.623078	3.315412	Ogunjimi St
28	Point	6.620482	3.317977	Akinjobi St
29	Point	6.620081	3.316307	Oriretan St
30	Point	6.620497	3.321159	Papa Ashafa

(0 out of 31 Selected)

Field Sample Point Agege

Figure 2a & b: Map of the study area showing Agege sampling points



Table

Field Sample Point Makoko

FID	Shape *	Y	X	Location_N
0	Point	6.498089	3.387063	Olaiya St
1	Point	6.499624	3.386098	Alh. Sule St
2	Point	6.50052	3.385132	Sariyu St
3	Point	6.499709	3.38584	Makoko
4	Point	6.500349	3.387857	Adetia Olulu St
5	Point	6.501244	3.386785	Development St
6	Point	6.499923	3.388136	Igbehinadun St
7	Point	6.499112	3.387943	Rafiu St
8	Point	6.500647	3.387514	Ololu St
9	Point	6.499112	3.387428	Makoko
10	Point	6.497343	3.388523	Romotu St
11	Point	6.503419	3.385776	Ibeno Close
12	Point	6.499368	3.389703	Ramotu St
13	Point	6.497791	3.38981	Makoko Rd
14	Point	6.500381	3.387315	Ololu St
15	Point	6.49919	3.38935	Ramotu St
16	Point	6.496574	3.388467	Makoko Rd
17	Point	6.49626	3.38793	Makoko rd
18	Point	6.497326	3.387237	Olaiya St
19	Point	6.499175	3.38495	Alhaji Imam Raimi st
20	Point	6.501431	3.386827	Falodu St
21	Point	6.501086	3.387615	Ololu st
22	Point	6.499551	3.388672	Akanbi Cres
23	Point	6.499703	3.38929	Irepodun St
24	Point	6.499809	3.38474	Igbehinadun St
25	Point	6.49456	3.3861	Makoko Fish Market
26	Point	6.494838	3.386146	Alhaji Sule St
27	Point	6.49535	3.38553	Uba stores
28	Point	6.49583	3.38593	Lagoon View Estate

(0 out of 29 Selected)

Field Sample Point Makoko

Figure 3a & b: Map of the study area showing Makoko sampling points

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Study Population

The study population include the host community and the migrants that settled and lives at Agege and Makoko. Migrants were defined as individuals who had moved to Agege and Makoko from another location within the past 30 years, while the hosts are the perceived natives of the two focused communities. The population of Agege and Makoko by the Lagos State Government estimate are 676,000 and 304,000 respectively. In average,100 participants each were targeted as a population sample from each of the settlements, Agege and Makoko bringing the total sampled size to about 200.

Sample and Sampling Techniques

For data collection, a mixed sampling was basically used to select participants for this research study. These techniques avail every individual of the population an equal opportunity of being selected. This ensures that the sample is representative of the population, reducing bias and increasing generalizability, validity and reliability of the data. Purposive sampling was used to identify immigrants who have stayed in the study area for a reasonable number of times. Snowball sampling techniques were also adopted to compliment the results of the random sampling technique. Both the purposeful and the snowball sampling assisted in in-depth understanding of the individual under a better relaxed condition. To achieve fair representation of the data, the population was subjected to the formula given by Yamane (1967) and cited Oluigbo et al., (2024) with the 2022 projected population of both locations and a limit of tolerable error of 0.05. This approach and calculations led to the sampling population of 200 participants. However, after data collected, a total of 190 questionnaires were considered valid for analysis.

Research Instrument

A well-structured questionnaire tagged 'Assessing the Causes and Impacts of Climate Change-Induced Migration (ACICCIM) as seen in Appendix:1was drafted in line with the research objectives to gather data from the population. The questionnaire consists of both the closed-ended questions and the open-ended questions. The instrument was subdivided into five sections, with each aimed at answering a specific objective of the research.

The sections are:

Section A: Demographic Information
Section B: Causes of Climate Change-Induced Migration
Section C: Socio-Economic Impacts
Section D: Environmental Impacts
Section E: Adaptation Strategies

Data Collection and Analysis

Face to face questionnaire administration was conducted in both Agege and Makoko during the months of June and July 2024. The data analysis process for this research involved a systematic approach to derive meaningful insights from the collected data. The procedure for data analysis started with sorting, numbering and coding activities after which the data went through a cleaning process to ensure accuracy and consistency. The cleaned data was uploaded into the SPSS package for descriptive statistics analysis, such as frequency and percentages overview of age distribution, gender, occupation and waste generation pattern just to mention but few. For the inferential analysis, an analysis of variance (ANOVA) and t-Test (Popularly known as student test) were carried out on the on the different hypotheses highlight in the report. These statistics test made it possible

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to compare the means of various environmental factors that may be responsible migration of people into Agege and Makoko and to determine their respective significance levels.

3. Result and Discussion

VARIABLES	Options	FREQUENCY	PERCENTAGE (%)
Age	18-30	33	17.4
	31-45	61	32.1
	46-60	64	33.7
	>60	32	16.8
Gender	Male	115	60.5
	Female	75	39.5
Occupation	Self Employed	33	17.4
	Employed	114	60.0
	Unemployed	24	12.6
	Retired	19	10.0
Education Level	No Formal	46	24.2
	Primary	46	24.2
	Secondary	61	32.1
	Tertiary	37	19.5
Household Size	1-3	16	8.4
	4-6	53	27.9
	7-9	74	38.9
	10 or more	47	24.7
Nationality	Nigerian	180	94.7
	Non-Nigerian	10	5.3
Geo-Political	North-West (NW)	17	8.9
Distribution	North-East (NE)	13	6.8
	North-Central (NC)	29	15.3
	South-West (SW)	91	47.9
	South-South (SS)	12	6.3
	South-East (SE	28	14.7
Duration of Stay	<1 yr	5	2.6
	1-3 yrs	6	3.2
	4-6 yrs	20	10.5
	7-10 yrs	39	20.5
	>10 yrs	120	63.2

3.1 Demographic Information

Table 1: Percentage Distribution of Respondents to Demographic Information

A total of 190 respondents were interviewed in the two focused area, and their distribution patterns are 47.9 and 52.15 for Agege and Makoko respectively. The age range distribution 31-60 represents 65.8% are the highest respondents while age range 18-30 and >60 have nearly the same percentage contributions of 17.4% and 16.8% respectively. With the age distribution pattern, it indicates that the active age in the study area ranges between age 31-60 while age range 18-30 and >60 is passive. The age range between 18-30 years is the growing age and most of them fall within student/apprentice categories that were likely in school during the period of visit and >60 is

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relatively old in age. The data also revealed that Agege and Makoko area maintain an average large family with a minimum of 7 household members. This may not be unconnected to the high population density in the area, and which may also contribute to Lagos State high population growth. The respondents in the two areas are largely Nigerians, and the areas have a well-mixed people from different geopolitical regions of Nigeria.

Since Lagos State is within the South-Western geopolitical region of Nigeria, it is logical that it's percentage would be higher hence, for the purpose of this research the percentage of South-West shall be considered as nonexistence. Therefore, the focus shall be on the remaining five geopolitical zones. In view of this, the northern region comprising of North-West, North-East and North-Central makes up of 31% while the Southern region comprising of South-East and South-South have percentage contribution of 21%. The two figures indicate that migrants from the Northern region are more in number than the migrants from the Southern in terms of resettlement in Lagos State. This agrees with the Intergovernmental Pannel on Climate Change (IPCC) (2019) and Nguyen et al., (2023) on extreme events conditions such droughts, desertification, flooding, erosion sea level rise, outbreak of pest and diseases resulting in displacement and migration of people.

Because migration is one of the adaptive measures of vulnerable class to impacts of Climate Change as opined also by Adger et al., 2013, Table 1 shows that the participants are not just new members of the two communities since over 80% of the respondents have stayed longer than 7years. Hence, the results gave credence to the data collected for this research work.

Research Question 1: What is the migration flow pattern and the factors that contribute to climate-induced migration?

To respond to this question, variables such as geopolitical zone of respondents, question on reason for migration and the rate of migration were asked and results analyzed.

Table 2: Percentage Distribution of Respondents' Migration Flow Pattern

	Frequency	Percent	Frequency	Percent
	Agege		**Makoko**	
	Respondents' Geopolitical Zones			
NW	15	16.5	2	2.0
NE	9	9.9	4	4.0
NC	22	24.2	7	7.1
SW	38	41.7	53	53.5
SS	2	2.2	10	10.1
SE	5	5.5	23	23.2
	Reason for Respondent's migration			
Flooding	15	16.5	6	6.1
Drought	16	17.6	1	1.0
Economic activities	26	28.6	45	45.4
Employment	18	19.8	22	22.2
Family	10	11.0	9	9.1
Loss of vegetation	2	2.2	2	2.0
Erosion	1	1.0	0	0.0
Heatwave	1	1.0	0	0.0

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Water scarcity	0	0.0	1	1.0
Food scarcity	1	1.1	8	8.1
Disease	0	0.0	5	5.1
Others	1	1.0	0	0.0
Total	**91**	**100.0**	**99**	**100.0**
Rate of migration into respondents 'community				
Rapidly increasing	29	31.9	79	79.8
Slowly increasing	59	64.8	17	17.2
No change	1	1.1	2	2.0
Rapidly decreasing	2	2.2	1	1.0
Total	**91**	**100.0**	**100.0**	**100.0**

Table 2 showed the flow pattern of the migrants into the study area of Agege and Makoko. The assumption is that Southwest (SW) respondents are not significant since Lagos State cannot be clearly separated from the entire SW region. Hence, we consider having Northern Migrants comprises of NW, NE and SE and Southern Migrants comprises of SE and SS. By the new classification, Northern migrants are more prevalent in Agege area than the Southern migrants while in Makoko, Southern Migrants are more than the Northern Migrants. The reasons for the differences could be traced to economic/occupational reasons in line with the studies of Atufu, (2021) and Bakare (2024).

People from the Northern part of the country are historically and predominantly livestock farmers primarily by groups like the Hausa-Fulani. Migrating to the Agege area of Lagos is only reasonable because the area is a major long-established hub for the wholesale of livestock and related products. This allows them to continue their traditional livelihood in a new, urban environment, directly connecting their rural skills to an urban market. On the other hand, migrants from the Southwestern Nigeria which is home to the Yoruba people of Nigeria with livelihoods historically associated with the coast and its resources, including the lagoon. Migration to the Makoko area of Lagos (a famous floating slum built on stilts over the Lagos Lagoon) makes it a natural destination for fishermen and those involved in the timber trade. The proximity to the lagoon and the associated resources provides direct access to a community centered around these specific trades, allowing migrants to find employment in a familiar industry.

Considering the reasons for migration as seen in Table 3, economic and employment purposes stand out to be the top two reasons in alignment with the migration flow pattern already established in Table 2. Other environmental factors identified are flooding, drought, loss of vegetations, erosion, heatwave, water scarcity, food scarcity, diseases, economy, employment and family ties. These factors are closely linked with climate change push and pull factors in line with the study of Warner et al., (2010) who posited that push factors have the tendency of forcing individuals to take adaptative decision of exiting their original settlements to settle in a new one while the pull factors involve attractive conditions in another place that a potential migrant may consider before taking a decision of emigrating to the place. Based on the foregoing definitions, economics, employment opportunities and family ties can be considered the pull factors while the environmental reasons are considered to be the push factors. In Agege and Makoko area the pull factors are prominent with cumulative percentage values 59.4% and 76.7% respectively. However,

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flooding is the most prominent push factor at Agege while food scarcity, flooding and diseases were the push factors identified at Makoko.

On analyzing the rate of flow into Agege and Makoko, the results show that the rate of migration is at increasing level in line with the study of Murenzi & Yishao (2023) and Oginni & Adebamowo (2013). The cumulative percentages increase is 96.7% and 97.0% respectively (Table 2). The skewedness is slow towards Agege while it is considered being rapid at Makoko. The general deduction from the results was that there is a continuous inflow of people to Lagos and this has impacted the population growth. This is also in agreement with the study of Emetere et al, (2021).

In summary, the Northern Regions (NW, NE and NC) are the zones that migrate most to Agege while Southern Regions (SS and SE) are the major identified migrants at Makoko area. In the study areas, the pull factors are the most responsible reasons for migrating into Lagos. Finally, the data shows that there is a steady increase in number of people that migrate to Lagos state through these two communities. The discussions agree with IOM (2022) that predicted that there will be a geometrical increase in number of migrants if anthropogenic activities remain unchecked.

Impacts of climate-induced migration on the Agege and Makoko areas of Lagos State

Environmental impacts

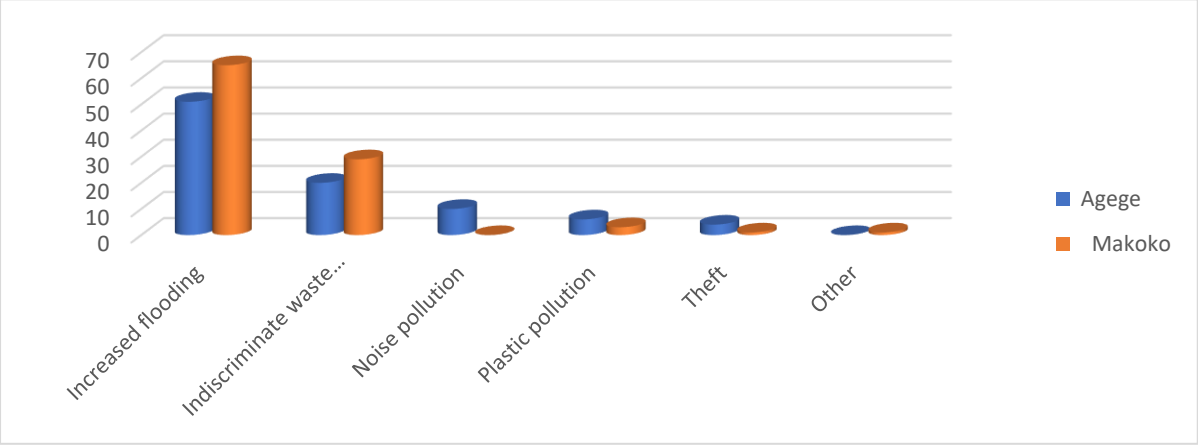

Figure 4.1: Observed Impacts of Climate-Induced Migration in the past 10 years

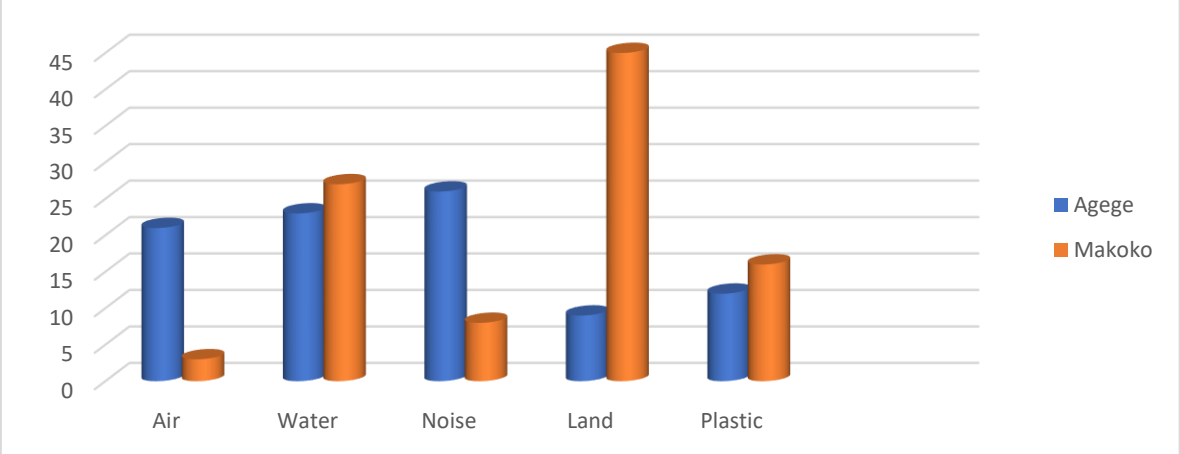

Figure 4.2: Prevalent Pollution in the Study Communities for the past 10 years

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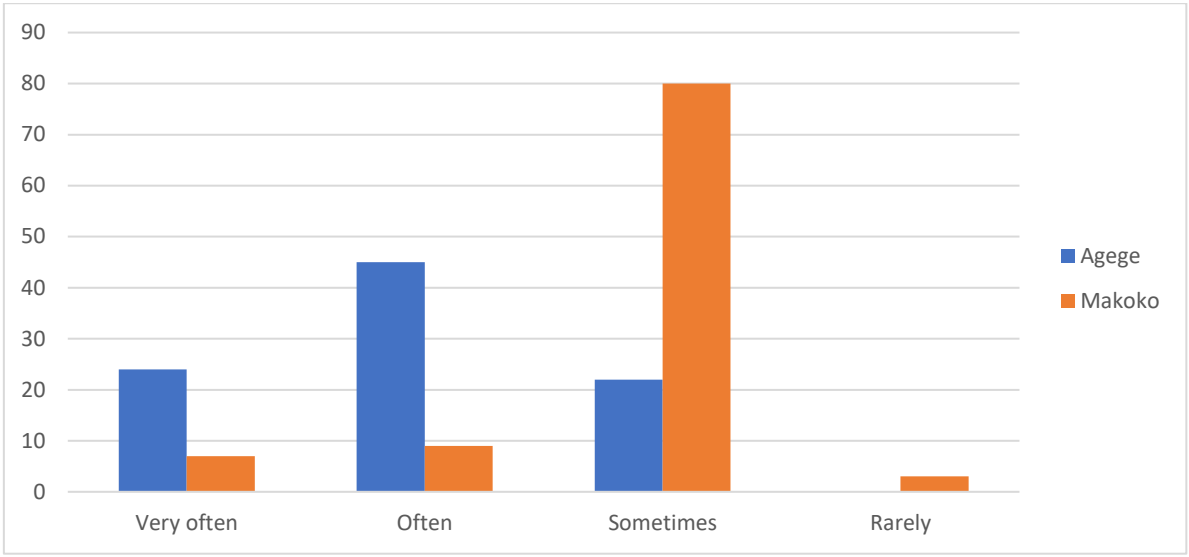

Figure 4.3: Frequency of waste disposal problem

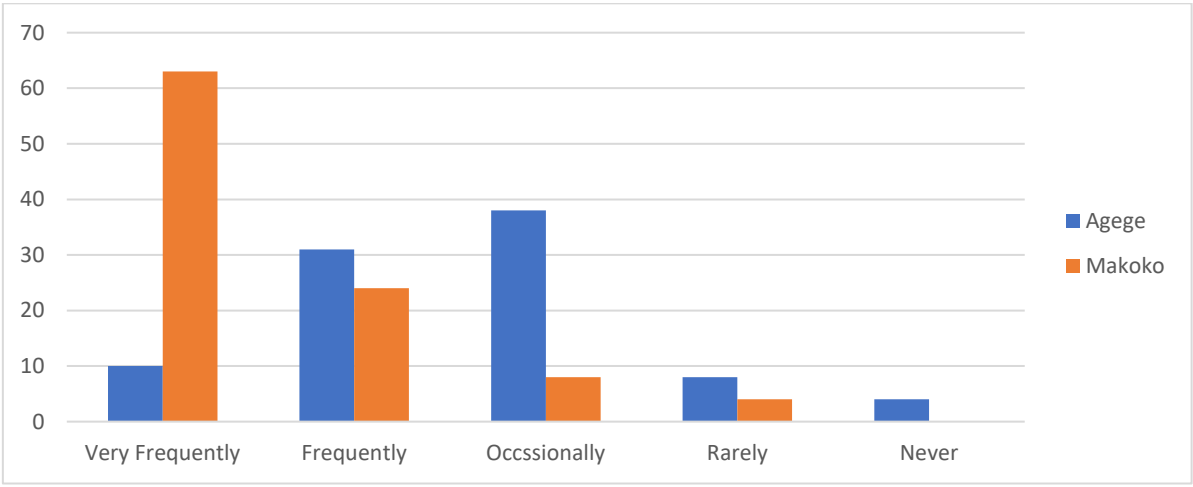

Figure 4.4: Flooding frequencies

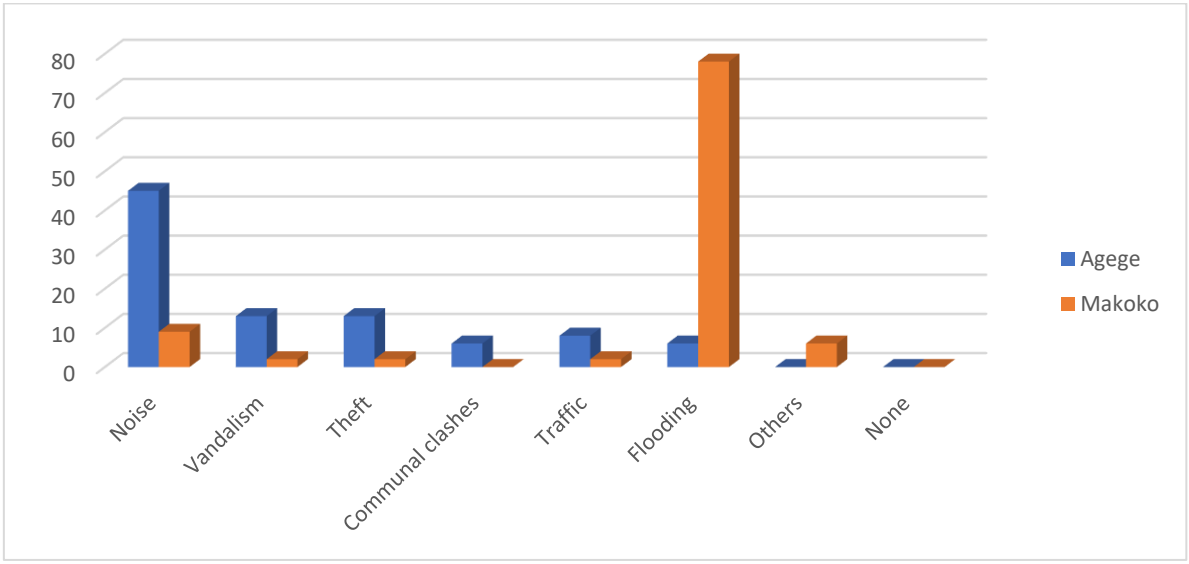

Figure 4.5: Perceived environmental nuisance experience since the influx of migrants

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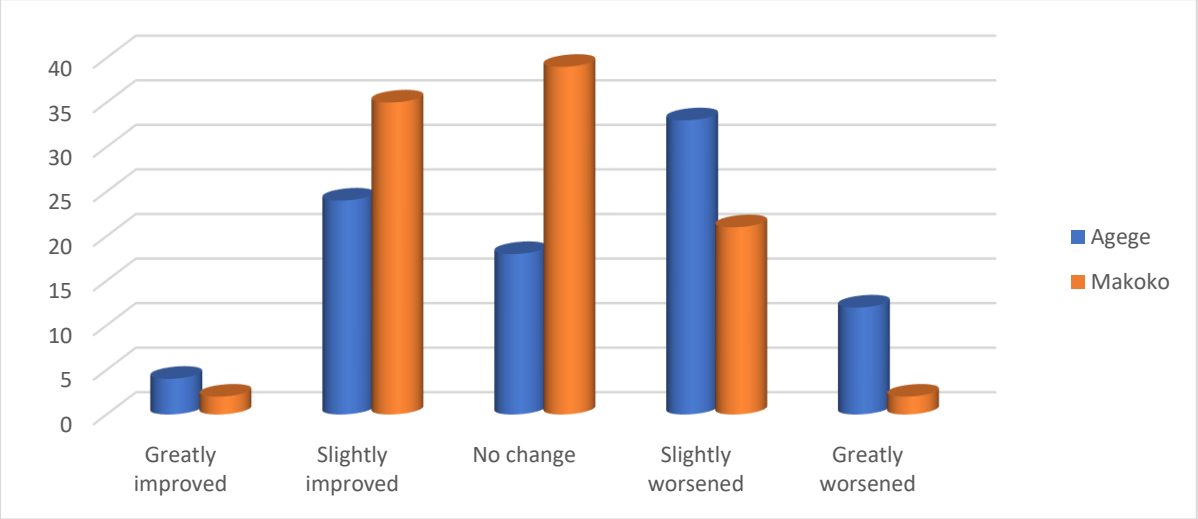

Figure 4.6: Respondents perceived environmental conditions in the area over the past 10 years

Figures 4.1 to 4.6 shows respondents' perception of the environmental impact of climate change induces migration in the study areas. Figure 4.1 shows increased flooding is the highest identified consequence of migration in both communities and this is followed by indiscriminate waste disposal. These top two environmental impacts are seen to be higher in Makoko than Agege. Other environmental impacts such as noise pollution, plastic pollution and thefts are relatively high in Agege when compared with Makoko. It is important to note that all these variables are population sensitive in line with the study of Halliru et al., (2024). Figure 4.2 focused on prevalent environmental pollution within the study area. Air, water, noise, land and plastic pollution were considered as variables. The result indicate land pollution at Makoko is the worst source of pollution and this is followed by the water pollution also at Makoko. Agege however is identified with noise pollution. Water and air pollution are also noted but significantly lower than that of Makoko.

Figure 4.3 shows the frequency of waste disposal problems Agege and Makoko. Majority (80%) of respondents in Makoko stated that waste disposal problems occur sometimes while in Agege, about 50% of respondents stated that waste problem often occurs. About 30% among the respondents at Agege also agreed to facing waste disposal problems very often. The results at Agege are an indication that the agency responsible for waste management need to improve their activities within Agege to avoid indiscriminate waste disposals in line with the study of Ebelechukwu & Asekun (2024). At Makoko as seen in Figure 4.4, very frequent flooding is seen, and this may be due to poor drainage patterns and the blockages to the canal. Considering the nature of Makoko (a floating slum), it may not be uncommon for residents to experience flooding issues which will be exacerbated by the influx of people in the community. At Agege, flooding is mostly reported to occur occasionally, however some respondents believe it occurs frequent. Climate change induced migration appears culpable for flooding issues in these areas not only because of increased rainfall intensity and duration but because of increased population density that puts pressure on existing infrastructure and sanitation efforts earlier pointed out by Ajayi et al., (2014) and Ademola et al., (2022). Figure 4.5 shows perceived environmental nuisances in study areas due to migration. Surprisingly, all respondents believe that the influx of migrants into the community

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has led to one environmental nuisance or the other. Figure 4.5 also affirmed the flooding issue that was identified in Figure 4.4, and the noise pollution identified at Agege in Figure 4.2. From Figure 4.5, Agege area of Lagos appears to be facing more environmental nuisance such as vandalism and theft than the Makoko community. Figure 4.6 shows the perceptions about changes in environmental conditions already discussed. Majority of the respondents in Agege believe that environmental conditions has slightly worsened from what it used to be in the past 10 years. However, majority of the respondents believe that there has been no change in environmental conditions over the past 10 years.

Socio-economic impacts

Table 3.1: Respondents' perception of common challenges posed by climate-induced migration faced by the host community.

What are the common challenges posed by climate-induced migration faced by the host community?							
Location	**Employment**	**Access to housing**	**Integration with host**	**Access to basic services**	**Legal or administration issues**	**Others**	**Total**
Agege	37	38	12	1	3	0	91
Makoko	27	31	11	19	3	8	99
Total	64	69	23	20	6	8	190

Table 3.2: Respondents' perception of the impact of migration on the cost of housing

What has been the impact of migration on housing cost?				
Location	**Improved**	**Worsened**	**No change**	**Total**
Agege	12	68	11	91
Makoko	6	77	16	99
Total	18	145	27	190

Table 3.3: Respondents' perception of the impact of migration on income

How has migration affected your household income?				
Location	**Increased**	**Decreased**	**No change**	**Total**
Agege	52	27	12	**91**
Makoko	15	65	19	**99**
Total	**67**	**92**	**31**	**190**

Table 3.4: Respondents' perception of the impact of migration on social networks

How has migration affected your social network and community ties?				
Location	**Strengthened**	**Weakened**	**No change**	**Total**
Agege	49	24	18	**91**
Makoko	19	23	57	**99**
Total	**68**	**47**	**75**	**190**

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Table 3.5: Respondents' perception of the cost of living

What is your perception of the cost of living since migration began?					
Location	**Significantly increased**	**Slightly increased**	**Slightly decreased**	**Significantly decreased**	**Total**
Agege	35	44	11	1	**91**
Makoko	38	58	1	2	**99**
Total	**73**	**102**	**12**	**3**	**190**

Tables 3.1 to 3.5 show the socio-economic impacts of climate change induced migration on the focused settlements.

Table 3.1 deals with the common challenges faced by the residents of the two communities with variables such as employment, access to housing, integration with the host communities, access to basic services, administration issues and others if available. The result followed a similar pattern in both Agege and Makoko with the housing being the highest, followed by employment and interaction with the host communities. However, at Makoko, access to basic services was considered to be a more common challenge when compared to integration with the host community. At Makoko also, we observed that there was synergy between the host community and the migrants through the efforts of their community leaders. This result agrees with the study of Feriga et al., (2024) on climate change induced migration having significant economic implications such as loss of skilled workers, decline in economic productivity, and a strain on public services in host communities.

Table 3.2 answered the question on what on the impacts of migration on the cost of housing and it was observed that in the two communities, the cost of housing has generally gone up since immigrants increases. This agrees with the economics principle of demands and supply and with the study of Abbasi et al., (2024). The high cost of housing is not unexpected since demand outweighs the supply in two areas of study. Table 3.3 showed how migration has affected the household income of the respondents. Putting the two communities together, about half of the respondents believed that migration had decreased their household income while a reasonable percentage consented that migration has positively increased their own incomes over the years while 31 respondents representing 16.35% were indifferent to the question. The result of either increasing or decreasing the household income is also subjective to the source of income of the household. However, the fact remains that migration has impacted the income of the people in one way or the other.

Table 3.4 answered the question on how migration has affected social networks and community ties for the respondents. In this case, the relationships that bind people together within a given location can be strengthened or weakened through shared experiences, values and mutual support. Out of 190 total respondents, 68 (35.8%) people agreed that migration of any form has strengthened their social and community ties while 47 (24.7%) respondents believed that migration has weakened their own and 75 (39.5%) believed that on no change. Lastly, Table 3.5 shows the perception of the cost of living since migration began, a greater percentage of the respondents (about 53.7%) agreed that it has slightly increased the cost of living while 73 respondents representing 38.4% believed that migration has significantly increased the cost of living. The result

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also shows that very minimal number of respondents agreed that migration has slightly and significantly decreased their cost of living since people started migrating into the communities.

3.4 Adaptive measures available against climate-induced migration

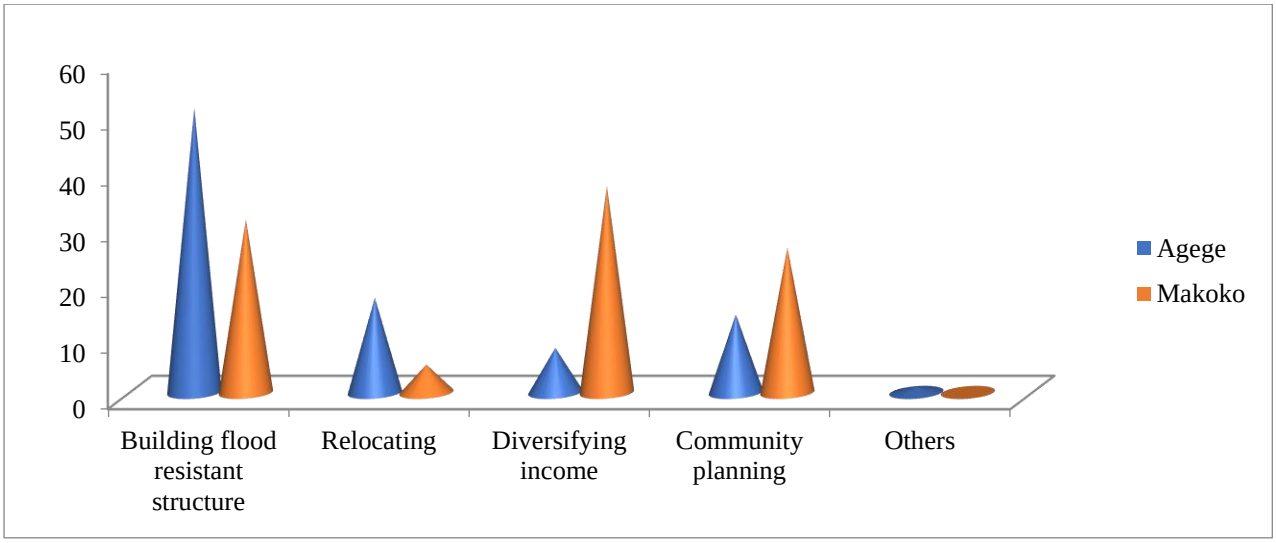

Figure 5.1: Respondents' perception on adaptive measures

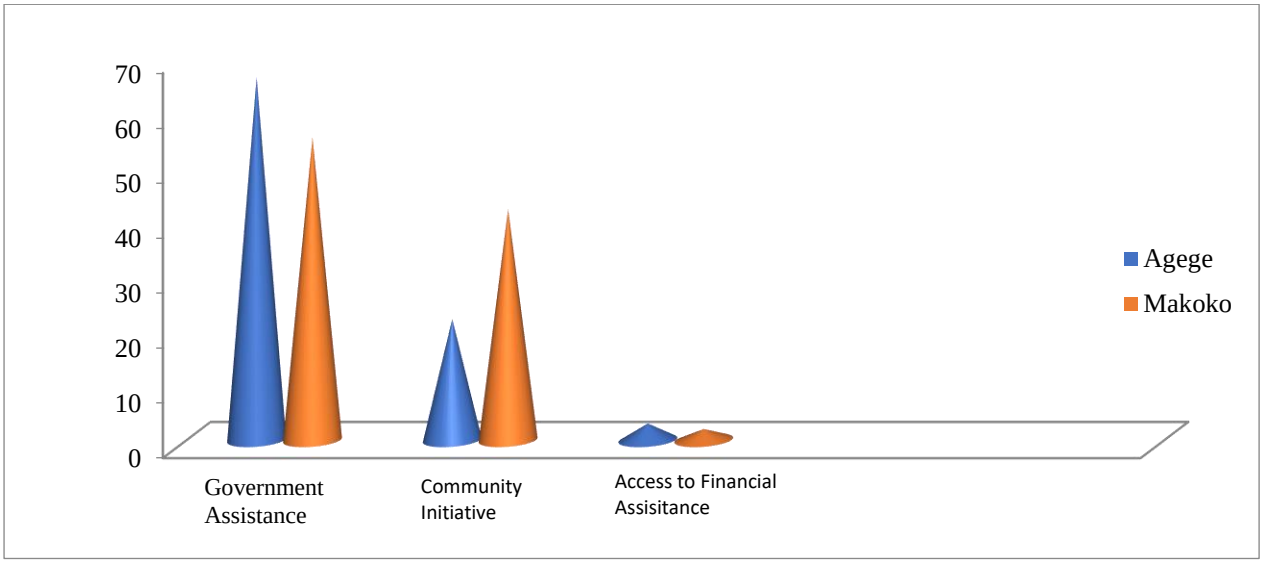

Figure 5.2: Perception on the support needed to cope better with climate change induced migration

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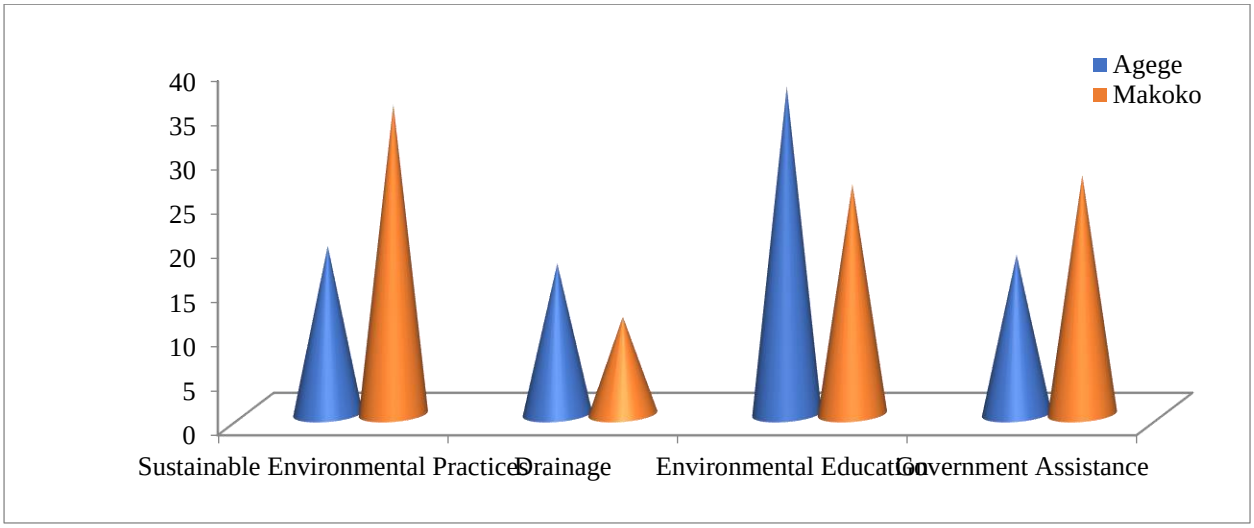

Figure 5.3: Respondents' perception of sustainable solution

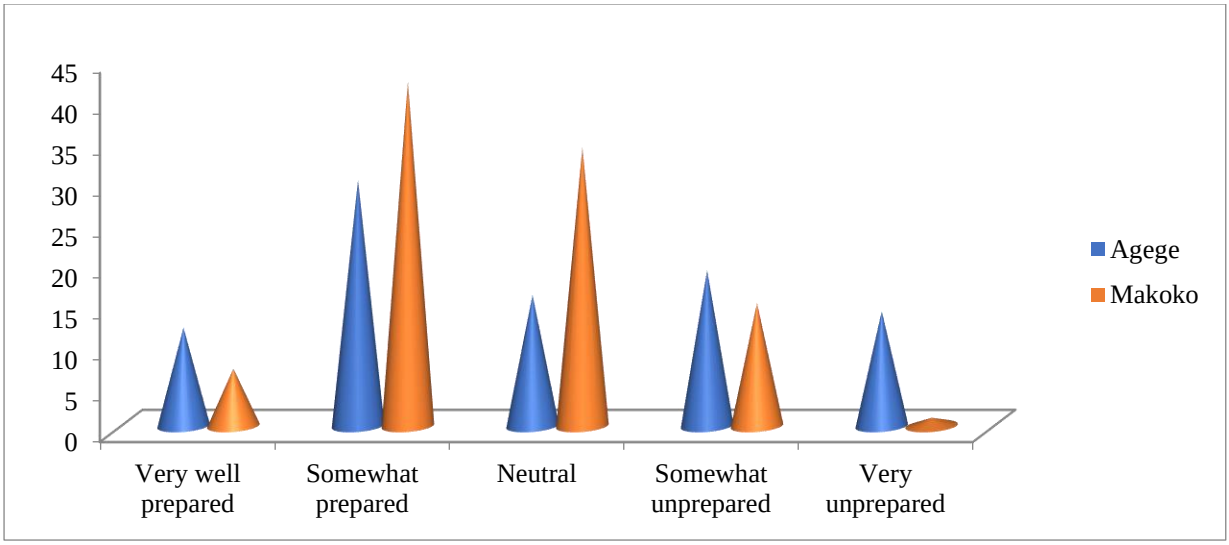

Figure 5.4: Respondents' perception of community preparedness

The question focused on the possible adaptive measures to the Climate Change induced migration in the two communities. Majority of the respondents in Agege believe in building flood resistant structures while majority of Makoko respondents believe in diversifying their sources of income as seen in Figure 5.1. Although the rate of their responses in Makoko for building of flood resistant structures and community planning amongst were similar. Figure 5.2 shows the views of the communities on the support needed to cope better with climate change induced migration. Majority of the respondents in both communities believe that government assistance is needed followed by community initiatives. This is not uncommon based on previous literature because the government is expected to formulate and implement sustainable environmental policies, construct and maintain drainages and provide infrastructures to cope with the challenges of climate change induced migration. This also agrees with the study of Trummer et al., 2023.

Figure 5.3 presents the perceptions on the sustainable solution concurrently in use, while majority of Makoko respondents suggested sustainable environmental practices as the possible and most effective solution, most of Agege respondents suggested environmental education and awareness of climate change and its impacts. These are among other considerations such as drainage

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constructions and government assistance. Figure 5.4 focused on how prepared the communities are to combat the growing impacts of Climate Change-induced migration in their respective communities. On discussing this we shall be standing at the divides of "Neutral" a base for our arguments, upon that basis, it may be safe to say that the two communities are prepared to combat the environmental changes that the climate induced migration may present to their communities as we have greater commutative percentages of participants on the left-hand side when compared to the right-hand side of the chart.

Hypothesis one: H_1O

There is NO significant difference between factors that contribute to climate induced migration in Agege and Makoko.

Table 4.1: Descriptive Group Statistics

	Location	N	Mean	Std. Deviation	Std. Error Mean
Migration Reason	Agege	91	3.2527	1.87731	0.19680
	Makoko	99	4.3636	2.60476	0.26179

Table 4.2: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Migration Reason	Equal variances assumed	5.195	0.024	-3.347	188	0.001	-1.11089	0.33192	-1.76566	-0.45612
	Equal variances not assumed			-3.392	178.119	0.001	-1.11089	0.32751	-1.75718	-0.46459

The descriptive statistics analysis seen in Table 4.1 compared the **mean scores of migration reasons** between respondents in **both communities.** The findings indicate a mean value of **3.25 (SD = 1.88)** for Agege and **4.36 (SD = 2.60)** for Makoko, suggesting that respondents in Makoko reported stronger or more pronounced reasons for migration compared to those in Agege. The higher mean in Makoko may reflect the community's socioeconomic vulnerabilities and environmental challenges, which are often stronger push factors influencing population movement in line with Warner et al., (2010) and Ahmadzai (2020).

The independent samples *t*-test as seen in Table 4.2 compared the **reasons for migration** between respondents from **Agege** and **Makoko.** The Levene's Test for Equality of Variances ($F = 5.195$, $p = 0.024$) indicates that the assumption of equal variances was **violated** ($p < 0.05$). Therefore, the result from the row labelled *"Equal variances not assumed"* provides a more reliable interpretation

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of the *t*-test outcome. The test revealed a statistically significant difference in the mean migration reason scores between the two locations (t (178.12) = –3.39, p = 0.001). Respondents in **Makoko (M = 4.36, SD = 2.60)** reported higher mean scores for migration reasons compared to those in **Agege (M = 3.25, SD = 1.88).** The mean difference (–1.11) with a 95% confidence interval ranging from –1.76 to –0.46 confirms that this difference is not due to chance. This finding implies that **respondents in Makoko exhibit stronger or more diverse motivations for migration** than those of Agege. The relatively higher variability in responses further reflects the heterogeneous experiences of migrants in Makoko, ranging from displacement due to environmental degradation to movement driven by economic survival (Gueye et al., 2015).

Conversely, Agege, a more urbanized and structured community, appears to present a comparatively lower migration motivation. Migration into Agege tends to be influenced by **employment opportunities in addition to climate change induced** distress or displacement (Semenza & Ebi 2019). Thus, the statistically significant difference observed underscores the **spatial disparity in migration drivers to both communities**, shaped by urban informality, socioeconomic conditions, and environmental exposure.

These results are consistent with broader studies on urban migration in sub-Saharan Africa, which emphasize that informal coastal and waterfront settlements are more prone to **climate change induced migration,** while established urban districts attract **economically motivated migrants** (UNHCR) (2019); IOM, 2022). It is also in consonance with Renaud et al., (2007) with the opinion that the pace of change in the environment will have a significant influence on the mode of displacement and migration-related decisions. Hence, Preferred occupation and economic standards are some of the reasons that a potential migrant will always consider before choosing a new settlement when displacement or migration is imminent. Therefore, migration dynamics in Lagos are influenced not only by economic pull factors but also by **environmental and social vulnerability**, especially in communities like Makoko. The null hypothesis which stated that there is no significant difference between the factors that contribute to climate induced migration in Agege and Makoko was rejected, and the alternative hypothesis was accepted.

Hypothesis Two (H_2O)

Climate induced migration DO NOT contribute to environmental changes in Agege and Makoko.

Table 5.1: Descriptive statistics of environmental change factors

	N	Sum	Mean	Std. Deviation
Environmental impacts'	190	311.00	1.6368	1.02338
Prevalent Pollution	190	582.00	3.0632	1.28327
Environmental Nuisance	190	749.00	3.9421	2.25417
Valid N (listwise)	190			

Table 5.2: Analysis of variance

		Sum of Squares	df	Mean Square	F	Sig.
Prevalent Pollution	Between Groups	30.050	1	30.050	20.091	0.000
	Within Groups	281.192	188	1.496		

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	Total	311.242	189			
Environmental Nuisance	Between Groups	466.534	1	466.534	177.609	0.000
	Within Groups	493.829	188	2.627		
	Total	960.363	189			
Environmental impacts	Between Groups	5.431	1	5.431	5.304	0.022
	Within Groups	192.511	188	1.024		
	Total	197.942	189			

The analysis seen in Tables 5.1 and 5.2 tested whether climate-induced migration significantly contributes to environmental changes in the two study areas. The **descriptive statistics** show varying mean values across the environmental change indicators and these averages indicate that environmental nuisances were the most prominent forms of environmental change observed among respondents.

The **ANOVA results** in Table 5.2 reveal statistically significant differences across all three environmental factors. Since the significance values ($p < 0.05$) for all variables are below the conventional threshold, the null hypothesis (H_{20}) was **rejected.** This indicates that **climate-induced migration significantly contributes to environmental changes** in both Agege and Makoko. These results align with global and regional findings that link migration to increased environmental stress in rapidly urbanizing areas. In Lagos, communities such as **Makoko,** located along the lagoon, have become major destinations for climate-displaced persons from coastal or flood-prone regions (Ogunrinde, 2022). In summary, the findings demonstrate that **climate-induced migration significantly contributes to environmental changes** in both Agege and Makoko through heightened pollution, increased environmental nuisances, and observable degradation of urban environmental quality.

Conclusion and Recommendations

The study assessed the causes and impacts of climate change-induced migration in Agege and Makoko areas of Lagos State, Nigeria through a survey method. A face-to-face administration of the research questionnaire was conducted to 190 respondents who were selected through a purposive and the snowball sampling techniques. Both descriptive and inferential statistics were used for data analysis. Results showed that majority of Northern migrants are more prevalent in Agege area than the Southern migrants while in Makoko, Southern Migrants are more than the Northern Migrants. An implication that migrants tend to move to locations with livelihood opportunities that are historically associated with where they are coming from, creating a natural environment for them to resettle. Results also show Climate change-induced migration into Lagos like any other cities in the world or in the developing countries is driven by a complex interplay of factors such as increased flooding and drought. In both locations, it was observed that the influx of people has added to environmental issues such as pollution, indiscriminate waste management and seasonal erosion events. The test of both hypotheses showed that there is a significant difference between the factors that led to migration of people in both locations and that the environmental changes in the two locations are largely contributed to by the level of immigrants into the host communities.

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This study underscores the need for integrated migration and environmental management policies, such as improved waste management systems, settlement planning, and resilience-oriented urban policies, to mitigate the negative impacts of climate-change induced migration in Lagos. Based on the findings, the study recommends that the government should provide affordable housing to cater for the population growth that climate change- induced migration may cause. It is also recommended that Lagos state Government should create a robust Database structure to capture migrants and their movements within the state to include them budgetary and other policy making.

Conflict of Interest

The Authors declare that there is no conflict of interest.

Funding Information: None

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